

Prevention priorities for online challenges and harms in adolescence
and assessment of smartphone distraction: An emotive-cognitive
perspective

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I declare that the work presented in this thesis is, to the best of my knowledge and belief, original and my own work, except as acknowledged in the text. The material, presented as my own has not been submitted previously, in the whole or in part, for a degree at any other institution.

Statement of Contribution of Others

Where the work presented in this thesis was the product of collaborative efforts, I declare that my contribution was substantial and prominent, involving the development of original ideas, as well as the definition and implementation of subsequent work. Detailed information about my contribution to collaborative work in this thesis is outlined in Appendix 14.

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“The measure of intelligence is the ability to change.” — Albert Einstein

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Abstract

Evidence suggests that problematic use of gaming, the internet and social media among adolescents is on the rise and developing into global growing issues affecting multiple cognitive, emotional and behavioural domains. How are these experienced and conceptualized among students, parents and teachers?

The first part of this thesis comprised two systematic literature reviews on school-based interventions for internet addiction and excessive screen time. Findings indicated the need to focus prevention beyond time spent into harms and challenges faced in adolescence through mental health literacy and skill development and by incorporating parent and teacher media literacy training.

Five qualitative studies followed as a qualitative needs assessment investigation. The first analyzed key adolescent motivations for online engagement and highlighted control as a new motivational factor driving engagement. This study led to the development of the *control model* of social media engagement, proposing individual, social and environmental pathways from normative to potentially problematic online behaviours. Additionally, adolescent online harms were conceptualised by stakeholders as running on a severity continuum from benefits to harms beyond addiction. Parent and teacher perspectives informed key recommendations for media literacy education.

The second part of the present thesis involved two quantitative studies, addressed smartphone distraction impacting students' academic performance through the design of the first psychometric instrument within smartphone use. The final study encompassed the assessment of a brief online randomized controlled trial to curb smartphone distraction and findings indicated the efficacy of the intervention and the reduction of potentially problematic smartphone-related psychological constructs.

The present thesis addresses critical priorities and recommendations for online harm reduction in adolescence. Dissemination of findings are timely for media literacy in schools in the UK and other countries with policy intentions to safeguard for young people's emotional health. Assessing smartphone distraction contributes to the understanding of this emergent disruptive construct contributing to initiatives to enhance students' academic performance and well-being within higher education and work environments.

Chapter 1: Introduction

1.1 Background

Access to information and communication has been facilitated by technological advances, and children and adolescents are increasingly engaged in technologies for information, recreation and communication. Time spent on non-digital interactions between 2003 and 2017 for adolescents and young adults in the US has demonstrated declines of 140 hours a year (Twenge & Spitzberg, 2020), which may suggest an increase of digital use in young people. Adolescents use the new technologies primarily to gather social capital, maintain constructive interpersonal relationships, and seek help online (Ophir et al., 2020). Despite offering numerous benefits, the internet has also enabled excessive use of activities and smartphones which can result in multiple mental and physical problems such as behavioural addiction, cognitive impairment, and emotional distress (Derevensky et al., 2019; Ophir et al., 2020).

1.1.1 Social media

Scientific evidence in relation to social media has focused on (i) education opportunities: for media literacy, perceptions and impacts, and (ii) digital citizenship, mental health and addiction, negative impacts, and identity-related research (Dennen et al., 2020). Evidence to date derives primarily from three sources: media, obesity, and behavioural addictions research. Research on sedentary lifestyles has established associations between screen time and non-communicable diseases. Behavioural addiction research has provided evidence on *content specific* addictive use – primarily on online gambling and gaming and emerging evidence on problematic social media and smartphone use and its associations to mental health. Social media and smartphone use have been reported to be implicated in a host of mental health problems such as anxiety, depression, suicidality, self-harm, negative self-perception, negative interactions, aggressive acts and exposure to harmful content (promoting self-harm or suicidality), arguably in a dose-response relationship (Abi-Jaoude et al., 2020). Heavy smartphone use and media multitasking have been associated with sleep problems and poor cognitive control, academic performance, socioemotional functioning, and an increase of ADHD symptoms (Boer et al., 2019). Cognitive impacts (i.e., attentional loss) of mobile technologies on daily functioning and academic performance constitute an emerging area of research (Montagni et al., 2016).

However, despite evidence supporting that the more time spent online increases the possibility of exposure to risks and pathological tendencies (e.g., cyberbullying) and potential benefits (e.g., enhancing social relationships), longitudinal evidence that time spent using social media is detrimental for mental health over time is still conflicting and highly debated (Boers et al., 2019; Coyne et al., 2020; Przybylski & Weinstein, 2017, 2019; Stockdale & Coyne, 2020; Twenge et al., 2018, 2019; Twigg et al., 2020), with academic debates arguing the thresholds of normative and problematic behaviours. However, research at a population level on *prevalence* of the different activities within the total mix of recreational screen time is scarce with limited and conflicting evidence on *physical* and *mental health* impacts deriving from longitudinal research (Boers et al., 2019; Bucksch et al., 2016; Hygen et al., 2020). Emerging longitudinal findings demonstrated (Coyne et al.,

2020) no evidence in the within-individual level and moderate association at the between-individual level, suggesting that other risk factors may account for these associations given the multifaceted and complex aetiology of these disorders. This could be partially attributed to conceptual and methodological shortcomings primarily due to: small sample sizes and effect sizes, use of convenience sampling, use of inconsistent terminology and construct proliferation, lack of common diagnostic criteria and standardized assessment tools, use of different or poor methodological approaches in assessing confounding variables and scarcity of representative and longitudinal studies (Colder Carras et al., 2020; Orben, 2020; Rumpf et al., 2019).

Still, increasing concerns regarding the wide impact that problematic internet use has on adolescent and adult populations' lives in schools, communities, and nations has led to the development of policymaking, especially in East Asian countries where excessive use has become a serious public health issue (Koo & Kwon, 2014; Shek & Ma, 2014). In the Western world, expert institutions have developed position papers and guidelines for screen time for young people (American Psychological Association, 2019; Dubicka & Theodosiou, 2020; Picherot et al., 2018; World Health Organization, 2019) and attempts at governmental level to clarify the evidence to guide policy choices.

1.1.2 Gaming

Gaming is a prominent recreational option for approximately 2.69 billion individuals (Statista, 2020) with a large social community, conferring multiple positive effects across domains (Colder Carras et al., 2018; Granic et al., 2014; Griffiths et al., 2017; Nuyens et al., 2019). However, extended evidence on disordered gaming led to its inclusion initially in the DSM-5 in 2013 (as Internet Gaming Disorder – IGD) (American Psychiatric Association, 2013), as a condition for further study with reference to online games, and in 2019 in the 11th Revision of the International Classification of Diseases (ICD-11) (World Health Organization, 2019) providing a distinction amongst problematic gaming and gaming disorder. Both the DSM-5 and the ICD-11 have been influenced for their diagnostic criteria by the components model of addiction (Griffiths, 2005), which consists of six major components that the behaviour needs to meet in order to be classed as an addiction with subsequent adaptations on the criteria for social media/smartphone addiction:

- Salience: excessive preoccupation with online activities
- Mood modification: using the online activity in order to modify mood
- Tolerance: seeking increasing time or activity-related rewards to achieve satisfaction
- Withdrawal: when unable to perform the online activity
- Interpersonal and intrapersonal conflict: in relationships with significant others, social relationships or academic/work-related problems because of the activity
- Relapse: inability to control the behaviour despite efforts

However, the ICD-11 has focused on two criteria as being more prominent: loss of control for the activity and negative consequences arising as a result of gaming. A recent systematic literature review and meta-analysis

has estimated prevalence of gaming disorder to be 1.96%, which is higher than problem gambling and comparable to some substance-related addictions (Stevens et al., 2020).

Gaming, gambling and compulsive sex are the behavioural addictions which to date have a legitimate clinical status (DSM-5, ICD-11). Emergent research suggesting the presence of social media addiction and smartphone addiction have followed the criteria from the components model of addiction (Griffiths 2005) and the abovementioned clinical manuals adjusted for social media and smartphone use.

1.1.3 Problematic internet use (PIU)

In their most pathological forms internet uses meet the criteria for addiction (Griffiths, 2005), and have been conceptualized as generalised internet addiction (Kuss & Pontes, 2019), technological addictions (Griffiths, 1995; Kuss & Billieux, 2017), social networking addiction (Griffiths et al., 2014), and Internet Communication Disorder (Wegmann et al., 2017). Some of these addictions have been specific to platforms, such as Facebook addiction (Pontes et al., 2018), Instagram addiction (Kircaburun & Griffiths, 2018) and YouTube addiction (Balakrishnan & Griffiths, 2018). PIU and problematic online gaming (POG) have been considered distinct psychological constructs, with POG associated more with being male and affecting a small minority of adolescents, while PIU associated with online gaming, online chatting, and social media use (Király et al., 2014; Andreassen et al., 2016).

The proliferation of terms in recent years has suggested – apart from a lack of an agreed upon terminology amongst scholars since interaction with these technologies is recent – an increasing need to move from more generic all-encompassing terms to constructs that address with specificity problematic conditions associated with a primary online activity or a medium providing access to the activity (i.e., smartphones) to which young people form attachments (Throuvala et al., 2019c). Additionally, it reflects: (i) a conceptualization of online engagement on a continuum from normative to addictive behaviours, with problematic, excessive or pathological uses manifesting along the continuum, (ii) the constantly evolving nature of online activities offering diverse user experiences, defined by trends and the industry's commercial interests, and (iii) an interplay between individual, social and platform/game design factors, which influence users' level of engagement and their position along the continuum (Throuvala et al., 2019a).

Evidence referring to problematic internet use among adult populations refers to many different activities (i.e., general surfing, online shopping, use of online auction websites, social networking, use of online pornography etc.) with age being a significant moderator for the majority of these activities (Ioannidis et al., 2018). In the context of adolescence, PIU primarily refers to social media and gaming activities with evidence for other problematic activities, such as compulsive streaming (YouTube) (de Bérail et al., 2019) or exposure to online pornography (Malamuth, 2018). The majority of the previous literature has focused on time spent on social media and/or gaming as evidence for problematic use, and as an increasingly prevalent aspect in sedentary behaviours overshadowing other more traditional behaviours (e.g., television viewing) (Chaput, 2017).

Recent evidence has expanded the scope of inquiry into specific behaviours associated with problematic outcomes beyond time spent engaged in the activity: compulsive texting and diminishing academic performance (Wegmann et al., 2017); daily interruptions and reduced productivity (Duke & Montag, 2017); excessive selfie-taking and negative comparisons associated with narcissistic tendencies, disordered eating, body image concerns and body dysmorphic disorder (Halpern et al., 2016; Ryding & Kuss, 2019; Saunders & Eaton, 2018); the experience of fear of missing out (FoMO; missing out on pleasurable activities), and nomophobia (no mobilephone phobia) (Buglass et al., 2017; Yildirim & Correia, 2015); compulsive use and checking behaviours (Chan et al., 2014; Klobas et al., 2018); exhibiting aggression, cyberbullying and cyberstalking (Kircaburun et al., 2018); phubbing (snubbing an individual by using ones smartphone instead of engaging socially) (Chotpitayasunondh & Douglas, 2016); sexting and sext-sharing (Madigan et al., 2018); and problematic smartphone use (Hussain & Griffiths, 2019; Rho et al., 2019).

1.2 Adolescence and Emergent Adulthood

Adolescence is a critical and demanding developmental period with increasing needs for autonomy and connectedness, and the display of higher negative emotionality (American Psychological Association, 2002). In adolescence: (i) the peer group becomes dominant displacing parental relationships (Albert et al., 2013), and (ii) it is the period where agency, cognitive skills, personality formation, and other developmental milestones with many structural and functional changes (Mills et al., 2016). Early adolescence (10-14 years) is characterized by hormonal and brain development, low resistance to peer pressures, low risk evaluation, and poor self-regulation (Blakemore et al., 2010) due to a still developing self-regulatory processes of emotion control (Berthelsen et al., 2017; Blakemore & Choudhury, 2006; Pokhrel et al., 2013). In late adolescence (15-19 years) these processes continue to mature acquiring more self-regulatory skills and ability to evaluate of risks and benefits (Arain et al., 2013).

Social media and gaming offer opportunities for reflection, identity exploration, affiliation and new social skill acquisition (Boyd, 2014) and facilitate and intensify the tasks of adolescent psychosocial development (Patton et al., 2016). Adolescence, however, presents with risks for the onset of mental illness with half of mental disorders' onset before midde adolescence (HM Govenrment, 2011). Late childhood and early adolescence represent the age group with the highest media use (Rideout et al., 2010) experimentation and susceptibility to problem/risk behaviours (Leather, 2009), and risk for the development of addictions (Chambers et al., 2003; Kuss & Griffiths, 2012a; 2012b; 2012c). Therefore, investing in adolescent health provides large benefits in adult life and promoting positive mental health can help prevent or mitigate mental illness. Engaging adolescents in research can provide a rich insight in their experience (Davis et al., 2019) and it is an approach that has been effective in tackling psychosocial problems with school-based interventions increasingly used for prevention purposes (Livingood et al., 2017).

Emergent adulthood (approx. 18-29 years) forms another critical developmental period, signalling the transition from late adolescence to adulthood. In terms of brain development, there is less brain plasticity and

maturation of the prefrontal cortex is still developing, impacting reasoning and self-regulatory processes. Psychologically, this developmental period is marked by changes in critical processes and self-concept, characterised by exploration, instability, self-focus, ‘feeling in-between’ and optimism (Arnett et al., 2014; Pavis et al., 1998). The adoption of more adult roles, entering the workforce or further education is accompanied with increased anxiety and ambivalence regarding choices, relationship formation, autonomy and financial independence (Bleidorn & Schwaba, 2017; Layland et al., 2018). Longitudinal research has demonstrated a delayed developmental maturation and the assumption of fewer adult roles (i.e., work for pay, dating, driving), which presents with many cultural and social implications and it appears that this trend has been intensified in the digital age (Bleidorn & Schwaba, 2017; Twenge et al., 2018; Twenge & Park, 2017; Twenge, 2009). Additionally, this development stage is also characterised by increased time spent online, less physical activity and novelty seeking behaviours for emotion regulation (Corder et al., 2017; Coyne et al., 2014; Henchoz et al., 2016; Ream et al., 2013)

1.3 Prevention & Interventions

Prevention is an emergent field in psychology (American Psychological Association, 2014) and comprises three different intervention levels: universal prevention (approaches designed for the entire population), selective prevention (targeted to specific subgroups), and treatment (National Research Council and Institute of Medicine, 2009). Selective prevention in youth has been recommended as the most effective method (Choi et al., 2019). Experimental interventions have provided initial evidence that reducing time spent on social media may increase life satisfaction and physical activity and decrease depressive symptoms and other psychosocial outcomes (Brailovskaia et al., 2020; Mo et al., 2020). Online interventions utilising technological solutions have also provided initial evidence for efficacy and cost-effectiveness (Marsch & Borodovsky, 2016) as well as skill-based interventions in the form of ‘self-discovery’ camps fostering self-regulation and communication (Sakuma et al., 2017). However, evidence on the effectiveness of interventions in schools for the prevention of problematic internet use, gaming or overall recreational screen time have been scarce. Additionally, our knowledge of which problems constitute prevention priorities, which intervention outcomes should be expected and which effective strategies to approach are lesser known. Given that both gaming and social media are newly adopted recreational activities, with new potential problematic presentations, it is timely to review and develop an in-depth understanding of prevention for online pathologies and assess their scope.

1.4 Theoretical frameworks

Different theoretical models have been proposed to serve as explanatory frameworks for problematic online engagement. According to Lee and colleagues (2017), the most prominent ones are the following:

- *Disease model of addiction* (Leshner, 1997): Problematic use is equated to a mental/psychiatric disease present within the individual who may exhibit compulsive tendencies

- *Neurobiological and psychophysiological perspective* (Grant et al., 2006). The model explains levels of dependency (high vs. low) based on neural activity and imbalances in the dopaminergic, serotonergic, or opioid systems
- *The components model of addiction* (Griffiths, 2005) is analysed in section 1.1. and includes six criteria for a behaviour to be classed as addictive.
- *Addictive personality model* (Lang, 1983) refers to specific personality traits such as neuroticism as being associated with addictive engagement.
- *Operant conditioning model* (Marlatt et al., 1988): According to this model the individual goes through four stages from *initiation* (engagement due to positive expected outcomes), *transition* to *on-going* use (engagement for gratification becomes habitual), to *addiction* (engagement becomes the only pathway to gratification)
- *Pathological Internet use model of addiction* (Davis, 2001) draws from the cognitive behavioural model emphasizing cognitive and behavioural aspects in problematic Internet use.
- *Social cognitive model of addiction* (Bandura, 2001; LaRose & Eastin, 2004) refers to a model of engagement which is determined by online uses and gratifications, positive expectancies and difficulties in emotion regulation and control of habitual behaviour.
- *Problematic Internet use model* (Caplan, 2002, 2003, 2005): Drawing from the pathological Internet use model (Davis, 2001) the cognitive-behavioural model of Pathological Internet Use was developed focusing on the maladaptive cognitions associated with PIU and distinguishes between specific PIU and generalized PIU (encompassing a broader set of online behaviours). The model was extended by accounting for social skills' deficits leading to a deficient self-regulatory capacity and generalised or specific PIU.
- *The Interaction Person-Affect-Cognition-Execution (I-PACE) model* (Brand et al., 2016, 2019) claims that addictive behaviours are the result of the interaction of predisposing, cognitive and affective reactions to stimuli and executive function failures, maintained by habitual behaviour and underpinned by an imbalance in the fronto-striatal circuits.

The abovementioned theoretical models present with limitations in terms of explanatory power and fail to explain the underlying mechanisms leading to problematic use or lack of accounting for environmental risk factors which act as triggers contributing to the development and maintenance of addictive behaviours (Lee et al., 2017). Some hypotheses formed – like *the rich get richer* (individuals with existing high social support will benefit more from online uses) (Kraut et al., 2002) or *the compensatory model* (Kardefelt-Winther, 2014) – have been supported, however these refer more to motivations for use rather than addressing the harm or the pathway to addiction.

1.4 Theoretical considerations

Given the scarcity of studies and scientific knowledge in relation to prevention of at-risk online behaviours, the main aim of this thesis is to understand the state of the art of prevention for these at-risk behaviours, and to explore and define prevention priorities as these are understood by important stakeholders and the relative importance they ascribe to the issues and the impacts experienced (Radesky et al., 2016). The majority of research conducted in schools is of a quantitative nature. However, these studies fail to provide rich in-depth data and there is no evidence of multiple stakeholder perspectives in defining priorities. Therefore, concerns and recommendations as a multi-informant approach will be explored. Second, a theoretical explanatory framework in understanding these phenomena will be developed. Third, one key priority area of stakeholder concern will be isolated and an intervention will be designed to target this behaviour. To achieve these aims, in this thesis a mixed methods research design was utilized.

The present thesis draws for its quantitative investigation from two large theoretical frameworks, the distraction conflict theory (Baron et al., 1978), theory of social facilitation (Zajonc, 1965) and the perceptual control theory (Powers, 1973). The distraction-conflict theory provides an explanatory framework for an individual's performance on a task which is hindered due to an attentional conflict which interferes with concentration on the primary task (Baron et al., 1978). Performance in simple tasks is facilitated by arousal experienced when performing in the presence of others, whereas in complex tasks performance is inhibited under the same arousal (Zajonc, 1965). In this thesis it is suggested that adolescents experience the gaming and social media environment as a fun, engaging but also performance-driven environment, where peers constantly monitor and socially compare activity and engagement. This may facilitate and encourage 'performance' online but may also create attentional arousal and a constant distraction from main activities.

Following on from the two abovementioned theories to perceptual control theory (Powers, 1973), viewed as the new impactful theory in psychology, following behaviourism and the cognitive perspective (Mansell & Marken, 2015), behaviours are the result of individuals' needs to control their own perceptions. Therefore behaviour focuses on reducing the potential discrepancy between the occurrence of two competing goals which may be mutually exclusive. This discrepancy results in conflict and therefore potential distress requiring a re-adjustment of the perception in order to minimise the discrepancy between the perceptions and the ensuing distressing experience. The basic premise of this model is therefore the perception which engages in a feedback loop of comparison with others and action. Based on perceptual control theory, adolescents' behaviour online could be motivated and the result of the need to maintain consistency and to emotionally regulate by providing a source for distraction. Distraction therefore may act as a facilitator to conflicting and distressing experiences. Social facilitation with others' presence online may be reinforced in well-rehearsed behaviours (i.e., routine/habitual online engagement) providing ample opportunities for distraction, while in poorly learned or challenging tasks, it may deteriorate performance (Platania & Moran, 2001; Zajonc, 1965). Recent evidence suggests that social presence may have strong effects on attentional processes and may even influence neuronal activity (Belletier et al., 2019).

These three theoretical frameworks combined along with psychosocial and structural platform-related factors influencing social media and smartphone use led to the development of a new hybrid theoretical framework, named the ‘**control model**’ of social media engagement, which is analysed in Chapter 6. The control model takes into account individual, social, and environmental processes in prompting, maintaining and reinforcing online engagement. The control model was primarily developed for social media usage based on adolescents’ personal accounts and experiences but can be largely adapted and applied to gaming as well. The present thesis was based on this explanatory framework and considers the contribution of other contextual factors (social and activity-specific) in online engagement and distraction, as one of the key themes to focus prevention efforts.

1.5 Thesis’ studies and outline of chapters

This thesis utilises a mixed methods approach and draws on data from adolescents and young and older adults in the UK. The present thesis is being divided in four main parts: (i) understanding current state of school-based prevention for PIU, (ii) understanding underlying mechanisms of engagement and potential harms, (iii) addressing concerns and recommendations , and (iv) acting on recommendations with a focus on smartphone distraction.

An outline of the thesis chapters is presented below and Figure 1 presents the studies conducted for this thesis and the order in which they were conducted.

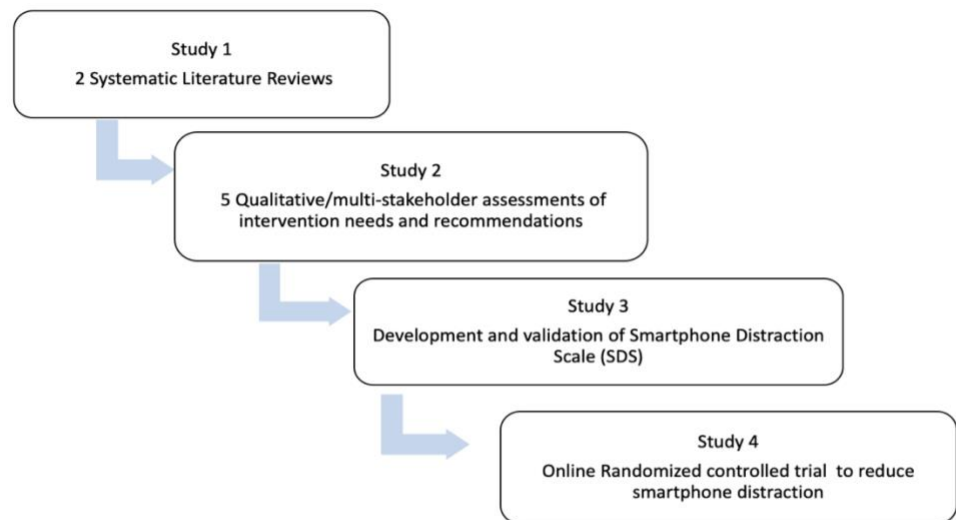


Figure 1. Thesis’ studies

Chapter 1: Introduction. This chapter provides an overview of the literature on internet use in adolescence, provides operational definitions and outlines the research aims across the studies.

Part 1: Understanding current state of school-based prevention for PIU

Chapter 2: Literature review I: School-based prevention for adolescent internet addiction and gaming disorder. This chapter covers a systematic literature review on school-based prevention programmes for Internet addiction targeting adolescents and examining the programmes' effectiveness and future recommendations for prevention.

Chapter 3: Literature review II: The role of recreational online activities in school-based screen time sedentary behaviour interventions for adolescents. This chapter reviews screen time and its role within sedentary or obesity school-based interventions targeting adolescents and assesses their efficacy.

Chapter 4: Thesis Methodology. This chapter outlines the methods utilised in the empirical studies, providing a rationale for each chosen method and general methodological aspects. The specific methodology used in each empirical study will be included in the relevant chapters.

Part 2: Understanding underlying mechanisms of engagement and harms

Chapter 5: Motivational processes and dysfunctional mechanisms of social media use among adolescents: A qualitative focus group study. This chapter explores adolescent online uses and motivations for social networking site use.

Chapter 6: A 'control model' of social media engagement in adolescence: A grounded theory analysis. This chapter analyses a conceptual model outlining the psychological processes involved in social media use, integrating individual, social, and environmental variables.

Chapter 7: Perceived challenges and online harms: A psychological perspective to social media use impacts on a continuum. A thematic analysis. This chapter outlines adolescent challenges and potential online harms as conceptualized by students, parents and teachers.

Part 3: Addressing concerns/recommendations - Stakeholder perspectives

Chapter 8: Policy recommendations for prevention of problematic adolescent online experiences: Parental perspectives. This chapter presents parental perceptions of intervention needs to prevent problematic online uses and reduce conflicts within the family environment.

Chapter 9: 'An echo-chamber of emotions': Teacher perspectives for prevention of problematic adolescent online experiences. This chapter presents teacher perceptions of recommendations for school-based prevention.

Part 4: Acting on recommendations – The case of smartphone distraction

Chapter 10: Smartphone distraction – An emergent construct in the smartphone literature. This brief chapter provides operational definitions for the construct of smartphone distraction and provides a short overview for its role as an emergent construct in the smartphone literature.

Chapter 11: Exploring the dimensions of smartphone distraction: Development, validation, measurement invariance and latent means differences of the Smartphone Distraction Scale (SDS).

This chapter outlines one primary area of concern identified by stakeholders: Distraction from smartphone use due to the need to attend to external notifications and internal triggers. Additionally, the chapter outlines the process of developing and testing a new scale measuring distraction from smartphones for reliability, validity and gender invariance.

Chapter 12: The efficacy of an online intervention programme for smartphone distraction in University students: A preliminary randomized study. This chapter assesses an online intervention combining mindfulness, mood tracking and self-monitoring of usage to reduce smartphone distraction measured with the SDS.

Chapter 13: Synthesis, limitations and implications and conclusions. This chapter synthesises findings of the previous studies and theoretical and applied implications and provides recommendations for future research.

1.6 Research question and aims

The overarching research question relating to this thesis is:

- What are the perceived concerns for online engagement in adolescence and what are the prevention priorities in school-based prevention?

The main aim of this thesis is:

- To explore the perceived prevention priorities from a multi-stakeholder perspective in relation to school-based prevention, identify an area of priority and design an intervention to reduce it

Additional aims of the thesis include:

- To explore key adolescent motivations
- To obtain an integrative view of the challenges and harms of social media and smartphone use on adolescents' well-being
- To explore key concerns and recommendations from a stakeholder perspective for early detection and prevention of adolescent psycho-emotional distress and cognitive impairment

- To develop a theoretical understanding of key psychological processes implicated in social media and smartphone use
- To identify a key perceived impact as designated by stakeholders (smartphone distraction) and design an intervention
- The following two aims were further defined following the qualitative input:
- To develop, validate and assess the invariance of an instrument to measure smartphone distraction
- To design an evidence-based intervention to reduce smartphone distraction and measure its effectiveness

1.7 Conclusion

This introductory chapter presents a brief overview of research studies relevant to this thesis, as well as the context of the research, and indicates why there is a need to explore stakeholder views on online impacts and harms and identify prevention priorities. The chapter then outlines the structure of the empirical chapters and the overarching research questions and aims of this thesis. Study specific aims and rationale for each study are detailed in the individual chapters.

Chapter 2 follows after critical operational definitions provided below and is a systematic literature review on school-based interventions to date, exploring their objectives, strategies, and effectiveness, and presents a set of recommendations for future initiatives.

1.8 Definitions

The terms “internet addiction” (IA), “problematic internet use” (PIU), “compulsive internet use” (CIU), “pathological internet use” and other variations have been used to refer to patterns of problematic behaviour associated with internet use. Research cited for the purposes of the present thesis, may refer to any of the above terms. Specifically:

Internet Addiction (IA) refers to dysfunctional online behaviours, meeting core characteristics of addiction: salience (cognitive preoccupation with online activities), tolerance (seeking increasing engagement with the activity to achieve satisfaction), withdrawal symptoms (when unable to use the Internet), using online activities to modify mood, conflict (within oneself, in relationships, or with academic/occupational activities because of online engagement) and relapse (unsuccessful attempts to control the behaviour) (Kuss et al., 2013). The term is increasingly being substituted in scientific literature by the term problematic internet use as IA appears to be increasingly inadequate and limiting (Fernandes et al., 2019; Starcevic & Aboujaoude, 2017; van Rooij et al., 2017).

Problematic internet use (PIU) has been defined as “a constellation of thoughts, behaviours, and outcomes, rather than a disease or addiction” (Caplan & High, 2011, p. 35), which creates psychological or social

difficulties in an individual's personal, work, or school life (Lopez-Fernandez & Kuss, 2019) or a behavioural pattern of “overuse of the internet with associated impairment(s) across various domains of functioning” (Restrepo et al., 2020, p. 1).

PIU (alongside similar constructs such as pathological internet use, internet dependency, and excessive internet use) is the umbrella term for a variety of specific problematic activities carried out online – resulting in excessive preoccupation, withdrawal symptoms, loss of control, and conflict. Activity-specific constructs encountered in the literature are the following:

- *problematic social networking site use (PSNSU)* (Hussain & Griffiths, 2018),
- *problematic social media use (PSMU)* (Raudsepp & Kais, 2019),
- and *problematic smartphone use (PSU)* (Sohn et al., 2019) with smartphones serving as as the media to online activities

Problematic smartphone use (PSU) refers to an excessive use of mobile phone devices, causing significant distress and interference in everyday life (Billieux, 2012; Billieux et al., 2015).

Problematic social media use (PSMU) is defined as a psychological state characterised by constant preoccupation with social media use, use of social media to modify mood, the experience of negative emotions when social media is unavailable, and negative consequences in various life domains as a result of excessive social media use (Kırcaburun et al., 2019).

Internet Gaming Disorder (IGD) refers to a mental health condition of dysfunctional gaming with impacts experienced on a cognitive, psychological, and emotional level and meeting criteria for addiction according to the DSM-5 (DSM-5; American Psychiatric Association, 2013).

Gaming Disorder (GD) refers to a pattern of gaming behaviour (digital-gaming or video-gaming) of such severity that it causes significant impairment experienced on a cognitive, psychological, and emotional level. The condition involves increasing priority and involvement in gaming over other activities and escalation of engagement despite the negative consequences. GD is since 2019 a formal diagnostic entity in the 11th edition of the International Classification of Diseases (ICD-11; World Health Organization, 2019), drawing a distinction with hazardous gaming with duration for its diagnosis of at least 12 months (George & Griffiths, 2020).

Distraction is an emotion regulation mechanism of moving attention or mentally distancing oneself from negative emotions to neutral topics (Senn & Radomsky, 2015) and is considered one of the key negative impacts experienced from excessive media use by young people (Bozzola et al., 2019).

Smartphone distraction (SD) is a phenomenon reflecting disruption in attention due to smartphone use because of: (i) external cues (smartphone notifications received), (ii) internal cues (cognitive salience related to social media content), (iii) cognitive avoidance to emotionally regulate, and (iv) multitasking (Throuvala et al., 2020b)

1.9 Other abbreviations

Social Media Use (SMU)

Social Networking Sites (SNSs)

Smartphone Use (SU)

Smartphone Distraction Scale (SDS)

Sedentary Behaviours (SBs)

Screen Time (ST)

Physical Activity (PA)

Fear of Missing Out (FoMO)

No mobile phobia (NOMO)

Problematic online gaming (POG)

Exploratory Factor Analysis (EFA)

Confirmatory Factor Analysis (CFA)

Root Mean Square Error of Approximation (RMSEA)

Standardized Root Mean Square Residual (SRMR)

Comparative Fit Index (CFI)

Goodness of fit index (GFI)

Tucker-Lewis Fit Index (TLI)

Goodness of Fit Index (GFI)

Critical Ratio (CR)

Part 1: Understanding current state of school-based prevention for PIU and excessive screen time

Chapter 2. Literature review I: School-based prevention for adolescent internet addiction and gaming disorder

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2019a). School-based prevention for adolescent internet addiction: Prevention is the key. A systematic literature review. *Current Neuropharmacology*, *17*(6), 507–525. <https://doi.org/10.2174/1570159X16666180813153806>

The present chapter consists of a systematic literature review on school-based interventions conducted to prevent internet addiction and gaming disorder in adolescence. The study was critical to develop an understanding for intervention objectives, strategies and an evaluation of the efficacy of current prevention approaches for IA, and IGD.

2.1 Introduction

Adolescents' media use represents a normative need for information, communication, recreation and functionality (Dreier, Wölfling, Beutel, & Müller, 2015; Kuss & Griffiths, 2011a). In spite of the many beneficial aspects of Internet use (Boyd, 2014), problematic internet use (PIU) has increased (Kaess et al., 2016; Kuss, Griffiths, Karila, & Billieux, 2014), and has been associated with less physical activity and diverse negative neurophysiological and psychosocial consequences in adolescents (de Leeuw, de Bruijn, de Weert-van Oene, & Schrijvers, 2010; Pontes, Kuss, & Griffiths, 2015). Heavy use can potentially lead to addiction in vulnerable adolescents (Kuss et al., 2013), and is a growing public health concern with variability in prevalence rates (from 0.8% in Italy to 26.7% in Hong Kong) (Kuss, Griffiths, et al., 2014).

Internet addiction (IA) is a complex disorder in terms of its conceptualization, clinical manifestation, and measurement. For the purposes of the present review, IA is operationally defined as a consistent and potentially pathological behavioural pattern, characterized by salience (preoccupation with online activities), tolerance (seeking increasing time to achieve satisfaction), withdrawal symptoms (when unable to use the Internet), using online activities to modify mood, conflict (within oneself, in relationships, or with academic/occupational activities because of online engagement) and relapse (unsuccessful attempts to control the behaviour) (Kuss, Shorter, van Rooij, van de Mheen, & Griffiths, 2014). Specific online activities, such as gaming and using social networking sites (SNSs), are particularly relevant to adolescents and constitute a popular form of entertainment (Griffiths et al., 2004; Griffiths & Kuss, 2011; Kuss & Griffiths, 2012a). However, both are increasingly recognized as having addictive qualities (Gamez-Guanix, 2014; Kuss et al., 2014), with many common but also some idiosyncratic characteristics (Andreassen et al., 2016; Griffiths &

Kuss, 2011; Kuss & Griffiths, 2012d, 2017). IA and gaming addiction have been well evidenced for their negative impacts, and social media addiction is increasingly associated with negative consequences on academic achievement (Seo, Park, Kim, & Park, 2016) and related problems (i.e., procrastination, distraction, poor time management; (Kirschner & Karpinski, 2010), less physical activity, and greater unhappiness (de Leeuw et al., 2010). Given the academic and psychosocial burden, both for gaming and social media use, any recognition of a dysfunctional Internet use pattern needs addressing at the crucial developmental stage of adolescence (Kaltiala-Heino, Lintonen, & Rimpelä, 2004; Kuss & Griffiths, 2012a).

2.1.1 Adolescence and IA

Adolescence, operationally defined as the developmental period between the ages of 10 to 18 years (American Psychological Association, 2002), represents a vulnerable period for engagement in risky behaviours (i.e., alcohol drinking, drug taking and engaging in violence) (Leather, 2009), and the development of addictions (Chambers et al., 2003; Griffiths & Kuss, 2011). It is also a critical period of value formation, personality, and rapid psychological development, characterized by the adoption of various lifestyle, health behaviour and educational choices, which hold a defining role in adulthood (Kaltiala-Heino et al., 2004; Pavis et al., 1998). Need satisfaction (e.g., peer communication, self-expression, desire for recognition) (Liu et al., 2016; Liu et al., 2016; Soh et al., 2014) and peer group pressures (Esen, 2009) may offer a partial explanation for adolescents' high online media use frequency and high engagement in potentially addictive online behaviours (Berdibayeva et al., 2016; Kuss & Griffiths, 2012a). Considerable research has focused on treatment for affected individuals (Chun et al., 2017; Day, 2017; Khazaal et al., 2012; King et al., 2012; King & Delfabbro, 2014; King et al., 2011; Young, 2011). However, researchers in this field are increasingly discussing prevention and health promotion as a method of positively impacting youth engagement with the online environment (Kaess et al., 2016; Tsitsika et al., 2013; Turel et al., 2015). According to the American Psychological Association (APA) guidelines for prevention (2014), the prevention field has documented its effectiveness and is progressively acknowledged as a crucial component of practice, research and training, bridging research and public policy. Evidence based prevention practices are therefore encouraged to be viewed as complementary to treatment and crisis intervention with numerous benefits (i.e. reduction of illness and problem behaviours, enhancement of human functioning and reduced health care costs) for policy making, health and well being promotion (Throuvala, Christidi et al., 2018).

2.1.2 Prevention, health promotion, and addiction

Prevention is a broad term encompassing a wide array of interventions aimed at reducing the incidence of disease and disability, or slowing the progression and exacerbation of a condition, with health promotion serving as a component of prevention (National Research Council and Institute of Medicine, 2009). Prevention approaches mostly encountered in the literature have been categorized according to two definitional frameworks (Caplan, 1964; Gordon, 1983). Caplan's (1964) framework comprises: *primary* (prevent onset of a disease), *secondary* (reduce the incidence of a disease) and *tertiary* (reduce the impact of a persistent health issue)

prevention, emphasizing a public health perspective. Gordon's (1983) framework comprises three levels: *universal* (targeting a wide population), *selective* (targeting subpopulations) and *indicated prevention* (targeting at risk or vulnerable individuals) (National Research Council and Institute of Medicine, 2009). Health promotion refers to the combined educational and environmental resources driving health (Kok et al., 2004). Prevention programmes to address risky adolescent lifestyles have historically been aimed toward non-users (primary prevention), screening for potential problems (secondary prevention), and treatment (tertiary prevention) for adolescents who exhibit problematic behaviours, such as substance abuse or problem gambling (Gupta & Derevensky, 1998). Recent findings suggest more evidence-based, multi-system approaches, involving parents, schools, the community and other relevant stakeholders in guiding prevention efforts (Rutter & Glonti, 2016).

2.1.3 Need for evidence-based health promoting prevention programmes for IA

There is therefore, current scientific consensus for the need to develop well-controlled, methodologically robust interventions for IAs that are grounded in empirical evidence and theory (Craig et al., 2008; Kok et al., 2004). Evidence-based policy provision needs to be informed by reliable research findings and appropriate dissemination by the media (Livingstone, Haddon, Görzig, & Ólafsson, 2011), proper evaluation of school-based intervention programmes, and more randomised controlled trials (RCTs) with embedded evaluation standards to inform evidence-based recommendations (Busch et al., 2013; Shek & Leung, 2013; Vondráčková & Gabrhelík, 2016). These initiatives should target specific populations (i.e., adolescents) and specific online activities, such as problematic social media use (Bányai et al., 2017) or gaming (Wartberg et al., 2017; Wartberg & Lindenberg, 2020), should reflect the current state of knowledge, be theory-driven, and have the aim of enhancing skills and competencies associated with risk and protective factors (Griffin & Botvin, 2010; Hagger et al., 2015). This could then justify funding and development of public health policy that could lead to a decrease in the incidence and prevalence of IA (de Leeuw et al., 2010; Xu et al., 2012). Yeun and Han (2016), who conducted a meta-analytic review on psychosocial treatment interventions that included prevention initiatives, found large effects for reducing IA and improving self-control and self-esteem, especially where parent-involved counselling, self-control training programmes or where a specific (theory-based) form of therapy was applied.

Detailed protocols to guide the development of theory driven health promotion interventions are now available. One influential approach, "Intervention Mapping" (Kok et al., 2004) divides intervention development into six processes: (i) needs assessment based on the PRECEDE-PROCEED Model (PRECEDE: health, behavioural, environmental factors and determinants – PROCEED: development, implementation and evaluation of intervention); (ii) the setting of proximal programme or 'performance' objectives (i.e., what needs to be learned or changed that may be linked to individual, organizational or community level change) and its determinants (personal or external); (iii) the selection of theoretical methods (i.e., modelling) and practical strategies to apply it (i.e., video with peer models); (iv) the actual design into one comprehensive programme that supports the theoretical basis; (v) a plan for its systematic implementation by the programme users; and

(vi) a process and effect evaluation to assess effects. However, the authors emphasize careful application of theory to avoid risk of undesirable outcomes (i.e., they offer the example of how using ex-drug addicts as role models in school-based programmes has led to increase in drug use – due to implicit messages that drug use can still lead to socially acceptable actions [ex-drug addicts as lecturers] and focusing on the dangers of use, rather than decision-making skills, social resistance skills, and self-efficacy (Kok et al., 2004).

2.1.4 School-based prevention of IA in adolescence

The school system is increasingly used as a venue to drive prevention efforts and to address health promotion and public health concerns (Romano, 2014). This can take the form of teacher and parent training, student education, and awareness raising, may enhance protective factors and reinforce positive behaviours or aspects of the environment that reduce the likelihood of negative occurrences (Romano, 2014). School-based efforts are efficient in that they offer access to large numbers of students in a cost-effective way (Caulkins et al., 2002; Griffin & Botvin, 2010). Programme benefits have been estimated to exceed programme costs, with cumulative benefits, potentially in more areas than the intended ones (i.e., academic achievement or other health promoting behaviours; (Caulkins et al., 2002), as assessed in school-based addiction prevention programmes (i.e. drugs, alcohol, gambling (Newton et al., 2009; Walther et al., 2013). Given the similarities between behavioural and non-behavioural addictions (Alavi et al., 2012; Kuss & Griffiths, 2012b; Sussman et al., 2011), examining the evidence from school based initiatives in substance addictions, eating disorders and gambling could fortify the approaches in IA prevention (Dickson et al., 2004; Gupta & Derevensky, 1998; Tobler et al., 2000; Todirita & Lupu, 2013). Findings for the effectiveness of universal school based prevention programmes appear to be positive (Durlak & Wells, 1997; Wells et al., 2003), whereas the effectiveness of targeting specific mental health issues is still conflictual (Das et al., 2016; Soole, Mazerolle, & Rombouts, 2008).

2.1.5 The present study

IA as a phenomenon has been addressed differently in various parts of the world in terms of prevention. Over the past 20 years, the increased risk of IA in South East Asia has prompted respective governments to initiate comprehensive national prevention and intervention plans as well as considerable investment in academic research into the behaviour (Yeun & Han, 2016; Young, 2017). For example, in South Korea, with 7% of the population being at risk for IA according to the National Survey on Internet Addiction [2013 (Cho, 2016)], IA prevention education has become compulsory by law (Article 30, item 8 National Information Basic Act) (Cho, 2016), with all levels of education undergoing age-appropriate IA prevention training with the support of local and central government. Such initiatives have only been sporadically introduced in recent years in Western countries and are still in an emerging phase in terms of prevention (Turel et al., 2015).

King and colleagues (King et al., 2017), who conducted a systematic literature review on worldwide prevention strategies for disordered and hazardous gaming and Internet use, concluded that: (i) formal

recognition and definitional confusion remains a challenge in order to develop robust prevention programmes, and (ii) the prevalence of the phenomenon in a global context and the geographically dispersed prevention programmes point to the importance of integrating prevention efforts and successful practices across countries, with attention to cultural differences. Additionally, studies and other reviews report a lack of evidence-based prevention programmes and RCTs – considered the “gold standard” in evaluating intervention outcomes (Saturni et al., 2014) and effectiveness in educational interventions (Torgerson et al., 2013) - to guide clinicians, educators, community centres and other important stakeholders with these types of behavioural addictions (Shapira et al., 2003; Vondráčková & Gabrhelík, 2016; Young, 2017).

Building further on the aforementioned findings and the documented benefits of school interventions in the addiction field (Caulkins et al., 2002; Griffin & Botvin, 2010), it is timely to focus on school-based initiatives for IA prevention. More specifically, the aim of this systematic literature review is to (i) identify relevant prevention programmes or protocols within the school context and to examine the programmes’ effectiveness, and to (ii) highlight strengths, limitations, and best practices to inform the design of new initiatives, by capitalizing on these studies’ recommendations. To the authors’ knowledge, this review extends general reviews on prevention of IA (King et al., 2017; Vondráčková & Gabrhelík, 2016) that only partially covered school-based IA programmes as part of the overall prevention initiatives and will focus exclusively on the effectiveness of school based prevention programmes for adolescents providing recommendations that could be useful in informing future designs.

2.2 Methods

A systematic literature review was conducted on adolescent school-based prevention interventions for IA and gaming addiction. Inclusion criteria for the present review were the following: (i) all journal papers – referring to published protocols of preventive interventions, even if not accompanied by an evaluation, as well as any type of quantitative and qualitative evaluation of effectiveness; (ii) studies targeting adolescents, aged 11-17 years in a school environment; (iii) studies with publication dates between 2007-2017, since IA prevention approaches are a relatively nascent field within literature; (iv) full-text studies published in English, German, Spanish and Greek language (the native languages of the co-authors); and (v) studies targeting multiple risk behaviours (i.e., drugs, alcohol), where IA was included as one of the targeted behaviours.

Excluded from the review were: (i) studies referring to IA and general prevention; (ii) East Asian countries’ studies with the main text not published in English language or with small sample sizes, that risk poor transferability of findings due to low ecological validity; (iii) studies that evaluated Internet safety exclusively or school-based interventions focusing on screen time, as this construct is operationally different from IA and refers to sedentary behaviours that encompass a variety of behaviours that are not necessarily Internet-related (i.e., television watching); (iv) studies on the use of the Internet as a medium for other prevention purposes; and (v) cyberbullying and gambling prevention studies, as these do not have IA or gaming as their primary preventive focus.

The systematic literature search consisted of selecting papers from the following electronic databases: *Web of Science*, *PsycINFO*, *PubMed*, *Science Direct*, and *Google Scholar* and was conducted using the following broad search terms: prevent*, intervention, program*, adolescent*, school*, gam*, addict*, “internet addiction”, “social media”, “social networking sites”, “digital media”, “internet use”. These database search parameters yielded a total of 1,597 hits, which included the following results in each database: *Web of Science* (388 results), *PubMed* (481 results), *PsycINFO* (243 results), *Science Direct* (186 results), *Google Scholar* (249 results), and articles identified from other sources (50 results). A flow chart process for the present review is presented in Figure 2. Table 2.1 presents an outline of all the reviewed studies. The interventions and outcomes evaluated in the studies reviewed were too diverse and not reported in all of the studies to allow a quantitative synthesis of the findings. A narrative synthesis of type of interventions, outcomes and effectiveness - where applicable - has therefore been provided.

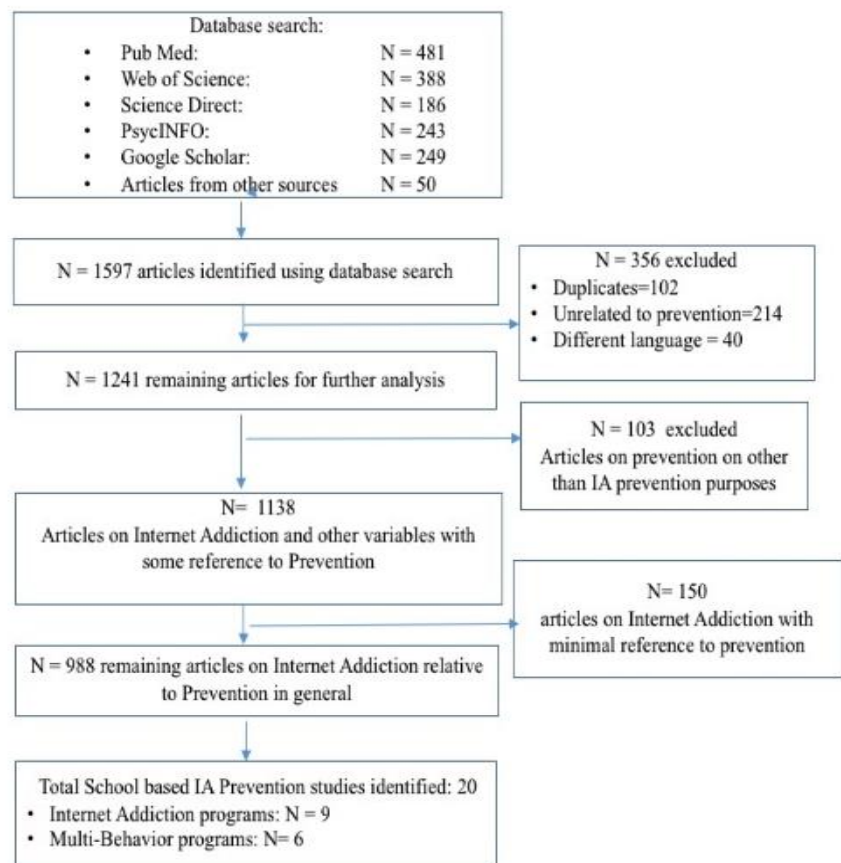


Figure 2. The flow diagram of the selection process literature review 1

2.3 Results

All studies that met the inclusion criteria were universal prevention studies, targeting general adolescent student populations, except for one indicated prevention study (Lindenberg et al., 2017), which was a protocol for a study targeting high risk adolescents for IA. These high risk adolescents were identified through

an initial screening based on the protocol's inclusion (adolescents aged 12-18 years at risk for IUD) and exclusion criteria (meeting DSM-5 criteria for Internet Gaming Disorder (IGD), comorbid depression and anxiety disorders – social phobia or performance anxiety). Interventions varied from digitally supported workshops (1) and peer to peer training (Dreier et al., 2015) to more complex designs: media literacy intervention on digital media use (Korkmaz & Kiran-Esen, 2012), multi-behaviour health promotion programmes with internet use and gaming included as a target behaviour (Busch et al., 2013; de Leeuw et al., 2010) to cognitive behavioural group intervention protocols (Lindenberg et al., 2017) and integrated intervention models for IA (Shek & Leung, 2013) that embedded preventive/psychoeducational and therapeutic elements in their approach to target at risk and affected adolescents.

Multi-behaviour programmes were: health education programmes that were part of an integrated school health promotion programme (as described by the European Network of Health Promoting Schools in Europe [SHE] in the case of de Leeuw and colleagues (2010); the Utrecht Healthy School (UHS) (Busch et al., 2013); and large multi-addiction and positive youth development programmes (Shek & Ma, 2014; Shek, Ma, & Sun, 2011). These involved a range of high risk behaviours rather than targeting a single mental health promoting intervention [68]. Seven such programmes were reviewed, where IA and gaming were part of the targeted behaviours, but five papers referred to the same programme (the Hong Kong P.A.T.H.S. Programme - The Project Positive Adolescent Training through Holistic Social Programs) (Walther et al., 2014).

Table 2.1

School-based internet addiction/gaming prevention programmes

Objectives	Brief description/Methods	Sample	Scales used	Results	Country
Primary outcome: the 12-months incidence rate of IUD. Secondary outcomes: the reduction of IUD and comorbid symptoms and the promotion of problem solving, cognitive restructuring and emotion regulation skills.	Study protocol: An indicated theory-led, evidence-based, systemic intervention study protocol of a two armed randomized controlled trial to measure the efficacy of a 4 week cognitive-behavioural prevention intervention for adolescents with high risk of IUD. assessments at baseline, and follow-up at 1, 4 and 12 months. 4 weekly sessions (of 90 minutes) by trained professionals. intervention consists of 4 modules addressing: (1) boredom and motivational problems, (2) procrastination and performance anxiety, (3) social interaction and (4) emotion regulation based on empirical findings of IUD risk factors. Cognitive Behavioural focus: (i) psychoeducation, (ii) cognitive restructuring (dysfunctional beliefs), (iii) behaviour modification (problem solving skills, contingency management, 4) emotion regulation training	Total sample for screening N=3,240 to obtain a total N=340 of high risk adolescents, 12-18 years, approx. 170 classes in 43 schools	Self-report questionnaire (sociodemographic data, usage etc.), screening for risk of IUD: baseline, the German version of the Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009; Rumpf et al., 2011) + clinical interviews to assess IGD based on DSM-5 (American Psychiatric Association, 2013) criteria, at 12 month follow up (primary outcome), assessment at baseline and follow-ups of IUD, potential risk factors, comorbid psychopathology + school related consequences (grades + truancy). Other assessment tools: the German Computer Gaming Addiction Scale (CSAS) (Rehbein et al., 2015), the German Depression Inventory for Children and Adolescents (DIKJ) (Stiensmeier-Pelster et al., 1989, 2014), the Strength and Difficulties Questionnaire (SDQ) (Goodman et al., 1998), the 7th scale of the German adaption of the Fear Survey Schedule for Children – Revised (PHOKI) (Döpfner et al., 2006), the German version of the Social Interaction Anxiety Scale (SIAS) [100,101], the German Interaction Anxiety Scale (SIAS) (Mattick & Clarke, 1998; Stangier et al., 1999), the German Questionnaire for Assessment of Emotion Regulation in Children and Adolescents (FEEL-KJ) Grob & Smolenski, 2011), the German	N/A	Germany

			Questionnaire for Procrastination (APROF) (Höcker et al., 2013), the German Student Assessment List for Social and Learning Behaviour (SSL) (Petermann et al., 2014), the German Self-Efficacy Scale (SWE) (Schwarzer & Jerusalem, 1995), and the WHO-5 Well-Being Index (Topp et al., 2015) User evaluation (acceptance and satisfaction with the intervention).			
Walther, Hanewinkel & Morgenstern (2014) - Effects of a Brief School-Based Media Literacy Intervention on Digital Media Use in Adolescents: Cluster Randomized Controlled Trial	Primary outcomes: 1. computer gaming 2. Internet use: days per month, hours per day, and addictive use patterns. Secondary outcomes: 3. Parental media monitoring 4. rules at home	Cluster randomized controlled trial of a 4 week media literacy program on adolescent gaming and Internet Use behavior (Vernetzte www.Welten - Connected www.Worlde), 3 assessment periods (baseline/posttest/follow-up), delivered by trained teachers.	Students (10 -14 years) 2,303 students initially - 1, 843 final sample- in all 3 assessment periods, 27 schools, 102 classes.	the German Internet Addiction Scale (ISS) (Hahn & Jerusalem, 2001) + additional questions on use, the German Computer Gaming Addiction Scale (KFN-CSAS-II) (Rehbein et al., 2015)	Mixed outcomes: significant intervention effects only for gaming but not for Internet use: lower increase in self-reported gaming frequency (b= -1.10[95% CI - 2.06, - 0.13]), gaming time (b = - 0.27 [95% CI - 0.40, - 0.14]), and proportion of excessive gamers (AOR = 0.21 [95% CI 0.08, 0.57]) (vs the control group). No intervention effects for frequency and duration of Internet use or for students' reports of parental monitoring or rules about media behavior at home, the number of internet users doubled during the intervention.	Germany
Dreier, Wölfling, Beutel & Muller (2015) - Prevention of Internet Addiction. Digitally supported workshops for children and adolescents	To enhance students' awareness of potential dangers from excessive media use, initiate discussion, encourage the use of critical thinking and recognition of early signs and counter measures for internet gaming disorder and behavioural addictions.	A prevention program consisting of 3 digital workshops for children and adolescents, discussing internet addiction, internet gaming disorder and diagnostic criteria and structural characteristics of games, employing a peer approach. Three types of Workshops were provided i) to raise awareness for potential IA dangers ii) of Internet Gaming Disorder and its diagnostic criteria iii) and free to play games. Students were asked to create their own free to play game and to evaluate its structural characteristics, the game	N/A	N/A	N/A	Germany

mechanics and other related factors.

<p>de Leeuw, de Bruijn, de Weert-van Oene & Schrijvers (2010) - Internet and game behaviour at a secondary school and a newly developed health promotion program: a prospective study</p>	<p>Internet use (hours/day), game use, compulsiveness of use and relationship with other health behaviour outcomes (alcohol use, physical activity, psychosocial wellbeing and body mass index)</p>	<p>Multi-behaviour, pre-post design, pilot project for case-control study. Duration: 2 hours/week for a year by trained teachers, assisted by expert local health agencies and addiction centres. Media Education on: Internet use (digital communication), online bullying, online image, online sexuality, distorted beauty ideal and Internet advertisements.</p>	<p>N=475 initially- N=367 final sample, students 11-16 years at a secondary school</p>	<p>The Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009; Rumpf et al., 2011), an adapted version, the Compulsive Game Use Scale (CGUS) (de Leeuw et al., 2010), the Strengths and Difficulties Questionnaire (SDQ) (Goodman et al., 1998)</p>	<p>Heavy internet users presented with more behavioural problems (higher SDQ scores 13.8% vs. 1.4% of non-heavy users) as well as game users (14.3% vs. 4.3 of non-heavy users). Girls were heavier users (24.3% vs. 17.4% boys) and children of the lower general secondary education group (33.9% vs. 7.1% non-heavy users). Boys were heavier game users than girls (29.5% vs. 7.7%) and with higher CGUS score with more play time. Heavy game users were less happy at school and scored higher on CIUS than non-heavy game users. Post-intervention effects: the time spent on Internet (hours/day) and the number of pathological Internet users increased (2.22 vs. 1.44) and (97.6% vs. 95.5% respectively), during the study. Heavy game use increased (4.3 vs. 3.24) but number of game users decreased (64.1% vs. 72.5%). Heavy internet use was associated with psychosocial problems. Heavy</p>	<p>Netherlands</p>
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					game use was associated with both psychosocial problems and less physical activity.	
Ma, Chu & Chan (2011) - Construction of a teaching package on promoting prosocial internet use and preventing antisocial internet use [83]	Learning targets: social skills and abilities, self-concept and self-management, social values and social relationships	Protocol description of the new P.A.T.H.S. teaching package for internet use consisting of 9 units on Internet Use: cheating, privacy issues, effects of excessive use on life and study, on-line shopping, online pornographic materials, copyright infringements, impacts on health, negative consequences	N/A	N/A	N/A	Hong Kong
Andrisano-Ruggieri, Santoro, De Caro, Palmieri, Capunzo, Venuleo & Boccia (2016) - Internet addiction: a prevention action-research intervention	Objectives were promotion of awareness of subjective relationship with technologies and healthy lifestyles among peers	Pre-experimental research design model for the evaluation of a prevention intervention program in schools: a 1 year peer education programme. Use of active methods (e.g., brainstorming, circle time, role playing, tutoring, peer action)	A total of 90 young subjects (45 males and 45 females)	The Internet Addiction Test (IAT) (Young, 1998a, 1998b)	Results reported significant positive difference in the post-treatment values for both males and females: a significant decrease in post-intervention IAT scores (i.e., for the severe level, from 4% to 2.2%, and for the moderate level from 62% to 42.3%) . However, there was an observed increase for the mild level from 34% to 55.5%. Researchers did not provide any possible justification for this occurrence.	Italy
Korkmaz & Kiran-Esen (2012) - The Effects of Peer-Training about Secure Internet Use on Adolescents	examine the effects of peer training for secure internet use on adolescents in Turkey.	10-session peer-education program: 12 Peer trainers received a 10 x 90 session and delivered 2 x 40 minute -sessions	825 students, 13-15 years, at two elementary schools, N=410 were in the experimental group and N=415 were in the control group.	The Internet Use Habits Scale (IUHS) [Yılmazhan-Gültutan 2007 in (Korkmaz & Kiran-Esen, 2012)]	Findings: i) statistically significant positive difference ($Z=-3.267$, $p<0.05$) in the experimental groups in Internet Use Habit Scale total scores; no baseline differences between experimental and control group ii) statistically significant difference in IUHS post-test scores ($U=40350.5$, $p<0.05$).	Turkey

Shek & Leung (2013) - Development of an integrated intervention model for internet addiction in Hong Kong	Description of the development of the "Youngster Internet addiction prevention and counselling service" for young people with Internet Addiction problems. Includes: provision of preventive services at the community, school, family and individual provision. peer and family levels, and use of both case and group approaches.	Focus of the counselling model is: controlled and healthy use of the Internet, understanding the change process in adolescents with Internet addiction problem, use of motivational interview methods, adoption of a family perspective, multi-level counselling at the individual, peer and family levels, and use of both case and group approaches.	N/A	N/A	Evaluation findings provide support for the model; use of both objective and subjective outcome evaluation methods.	Hong Kong
Hswen,Rubenzahl & Bickham (2014) - "Cyberhero Mobile Safety": Feasibility of an online and mobile videogame curriculum for teaching children safe and healthy cellphone and Internet behaviours	To transfer knowledge and skills for safe and balanced mobile (cellphone and mobile internet) behaviours	A videogame-based education program consisting of six educational concepts focusing on social responsibility and citizenship to address risk and protective factors and to build on competencies relevant to healthy online usage.	N=108	Measured the number of gameplays for each game, the proportion of gameplays where game-specific success criteria were achieved and the length of time required to successfully complete the game.	Positive student perceptions for usability, feasibility, appeal, and perceived impact.: Videogame usability of 82.7 percent of the students' gameplays. Mean ratings were 4.09 (standard deviation [SD] = 1.28) for likeability, 3.54 (SD = 1.61) for acceptability, and 4.16 (SD = 1.33) for perceived message usefulness.	USA

Multi-behavioural studies

Busch, de Leeuw & Schrijvers (2013) - Results of a Multibehavioural Health-Promoting School Pilot Intervention in a Dutch Secondary School [48]	Evaluation of the multi-behavioural health promoting intervention	Results of a pilot study of a secondary school based, health-promoting intervention (3 year curriculum) that simultaneously targeted a range of adolescent health behaviours that appear to be interrelated and interacting synergistically with common determinants: alcohol use, cannabis, compulsive internet and gaming, and bully victimization. pre-post intervention design.	N=336, 15-16 years	Most survey items were from the Dutch Health Behavior in School-aged Children (HBSC) questionnaire (Busch et al., 2013), Family Affluence Scale (FAS) (Boyce et al., 2006), Strengths and Difficulties Questionnaire (SDQ) (Goodman et al., 1998), the Olweus Bully/Victim Questionnaire (Wang et al., 2009), the Compulsive Internet Use Scale (CIUS) (Meerkerk et al., 2009; Rumpf et al., 2011), and the Videogame Addiction Test (VAT) (Van Rooij, 2011), scales on other risk behaviours (alcohol consumption, drug use etc)	The intervention brought significant behavioural changes for weekly screen time (computer and television), only for boys. CIUS scores were significantly different only for girls (1.37 in 2010 vs. 1.50 in 2007) and VAT scores (1.49 in 2010 vs. to 1.10 in 2007). No differences in weekly hours of gaming for boys (still playing for 3 hours/week vs. half hour for girls). Only one intervention school, without a control group. Comparing participant students results with trends over the same period of time (2007 vs. 2010) with peers participating in the Dutch HBSC (2009 vs. 2010) a significant reduction was observed on all health behaviour measures.	Netherlands
Shek, Ma & Sun (2011) - Development of a new curriculum in a positive youth development program: The Project P.A.T.H.S. in Hong Kong	Protocol study: curriculum design of the Project P.A.T.H.S. universal positive youth development program	The design of a 4-year project, with a curriculum for a positive youth development program (Project P.A.T.H.S.) targeting substance abuse, sexuality issue, Internet addiction, bullying, and money and success issues. Collaboration of the Research Team, the Hong Kong Social Welfare Department and Education Bureau - 20 hour curriculum - with 10 hours for core units and another 10 hours for elective units, 40 units/grade x 30 minutes	Since 2005-2006: 280 secondary schools, 212,000 students, 10-13 years	N/A	Description of the curriculum and its rationale: Program P.A.T.H.S. (Positive Adolescent Training through Holistic Social Program), is a curriculum, in both Chinese and English versions, tailored for each secondary school grade, 120 teaching units are designed with reference to 15 positive youth development constructs. The extension phase of the project (3 more years) involves: 60 teaching units with specific reference to five major adolescent developmental issues (substance abuse, sexuality issue, Internet addiction, bullying, and money and success issues)	Hong Kong
Shek, Yu, Leung, Wu & Law (2016) - Development,	i) objective outcome evaluation with a pretest-posttest experimental-control	The B.E.S.T. Teen Program aimed to promote behavioural, emotional, social, and thinking competencies to prevent multiple-addictions	N=679 students 10-11 years, 10 schools (5 experimental and	The measures were: i) an objective outcome evaluation questionnaire (based on IAT (Young, 1998a, 1998b), expert	Partial support for program effectiveness, the experimental group reported less intention by 45% for excessive Internet use (β	Hong Kong

implementation, and evaluation of a multi-addiction prevention program for primary school students in Hong Kong: the B.E.S.T. Teen Program	group design: 1. addictive behaviours 2. behavioural intentions 3. psychosocial competencies 4. knowledge about addiction, and 5. beliefs about addiction. ii) subjective outcome evaluation: students' perceptions of the program		5 control) in Hong Kong	views and intended learning outcomes) that was developed and validated by the research team, and assessed: addictive behaviour, behavioural intention, psychosocial competencies, knowledge about addiction, beliefs about addiction ii) a subjective outcome evaluation measured program attributes, implementer attributes and program effectiveness.	= -0.61, S.E. = 0.19, OR = 0.55, p < .002), group significantly predicted participants' intention to use Internet excessively in the coming 2 years ($\beta = -.07$, $p = .02$) experimental group scored higher on psychosocial skills, knowledge and beliefs compared to control. No significant effects for the other outcome indicators (i.e. intention for smoking). High positive views expressed for the curriculum content and high program satisfaction.	
Shek & Ma (2014) - Effectiveness of a Chinese positive youth development program: the Project P.A.T.H.S in Hong Kong	To examine the effectiveness of Project P.A.T.H.S. 4 months post intervention and provide supplementary research findings on its effectiveness	Social survey data - use of a static-group comparison design (pre-experimental design)	3,328 students were recruited from 28 secondary schools for the wave 1 data (4 months post-intervention), with 16 schools intervention group and 12 schools controls	The modified version of the Chinese Positive Youth Development Scale (CPYDS) (Shek & Ma, 2014) with 15 subscales: (1) bonding, (2) resilience, (3) social competence, (4) recognition for positive behaviour, (5) emotional competence, (6) cognitive competence, (7) behavioural competence, (8) moral competence, (9) self-determination, (10) self-efficacy, (11) clear and positive identity, (12) beliefs in the future, (13) prosocial involvement, (14) prosocial norms and (15) spirituality. 10 item Internet Addiction Test (IAT) (Chinese version) (Shek et al., 2008) and other measures of adolescent psychological symptoms and risk behaviour (Substance Use, Deliberate Self-Harm Behavior, Hopelessness, Exposure to pornographic materials etc.)	This study examined the effectiveness of Project P.A.T.H.S. The data collection took place 4 months after the inception of Project P.A.T.H.S. Compared with students in the nonparticipating schools, students participating in the Project P.A.T.H.S. had better positive youth development and displayed less adolescent risk behaviour.	Hong Kong
Shek & Yu (2011) - Prevention of adolescent	Examine the longitudinal impact of project P.A.T.H.S.	A longitudinal randomized group design with six waves of data, collected from 19 experimental schools and 24 control schools	Experimental group: n = 3,797 at Wave 1, control	Chinese Positive Youth Development Scale (CPYDS) (Shek & Ma, 2014)	Results demonstrated that adolescents receiving the program exhibited significant increases in self-control over Internet use. The	Hong Kong

<p>problem behavior: Longitudinal impact of the Project P.A.T.H.S. in Hong Kong</p>		<p>analysed with individual growth curve (IGC) modelling</p>	<p>group: (n = 4,049 at Wave 1)</p>	<p>control group showed a gradual deteriorating trend, while the experimental group first showed a slower rate of decrease and then changed to a tendency of increase, offering evidence for long-term effects in preventing adolescent problem behaviour through promoting positive youth development.</p>		
<p>Busiol & Lee (2015) - Prevention of Internet Addiction: The P.A.T.H.S. Program</p>	<p>The developmental issues underpinning the P.A.T.H.S programme and how these are addressed</p>	<p>commentary based on findings of the P.A.T.H.S program</p>	<p>N/A</p>	<p>N/A</p>	<p>The impacts and consequences of Internet addiction might be less easily recognized or ignored. Project P.A.T.H.S against Internet addiction, advocates that positive youth development promotion in adolescence is key to an effective prevention programme. Results indicated improvement in psychosocial competencies and decrease in problem behaviour vs. control group. Authors discussed the extension phase of Project P.A.T.H.S. on Internet addiction.</p>	<p>Hong Kong</p>

regards to study designs in papers reporting programme evaluations, two studies were randomized controlled trials (RCTs); one used three assessment points (baseline, post-test, and 12-month follow-up) (Walther et al., 2014), and the other used assessments at one, four and 12 months after admission (Lindenberg et al., 2017). Four used pre-post intervention pre-experimental pilot designs (Andrisano-Ruggieri et al., 2016; Busch et al., 2013; de Leeuw et al., 2010; Korkmaz & Kiran-Esen, 2012). Three studies were protocols of studies with no accompanying evaluation (Dreier et al., 2015; Lindenberg et al., 2017; Ma et al., 2011). An analysis of objectives, methods and respective effectiveness of interventions is presented below and key challenges will be highlighted that can be taken into account when addressing future designs.

Lindenberg and colleagues (2017) designed a cluster prospective randomised controlled two-armed registered trial protocol (intervention vs. assessment only), using strict clinical criteria accounting for RCT methodological elements (randomisation, allocation concealment, blinding, measuring compliance, controlling for co-interventions, and accounting for dropout). Walther and colleagues (2014) designed a two-wave (baseline, post-intervention) RCT with two arms (intervention vs. control group). Cluster randomisation, in both studies, was stratified according to school type (based on the German education system). In Walther and colleagues' study (2014), the blockwise randomisation led to unequal sample sizes and different types of schools in the two groups, whereas in the Lindenberg and colleagues' study (2017), each school was considered a unit of randomisation.

Risks of biases were acknowledged in the studies where an intervention was assessed. The following were identified: selection bias (allocation generation) (Busch et al., 2013; de Leeuw et al., 2010; Walther et al., 2014), for baseline differences between groups, potentially compromising the studies' validity, performance bias (blinding procedures of participants) in all studies, attrition bias (non-completion) (Busch et al., 2013; de Leeuw et al., 2010; Korkmaz & Kiran-Esen, 2012), detection biases (blinding process of outcome assessors), reporting bias (self-reporting or partial accounting of results), as all of the measures were self-reports, and social desirability biases (providing socially acceptable answers) (Andrisano-Ruggieri et al., 2016). Biases may potentially lead to faulty reporting of either beneficial or harmful or incorrect conclusions of intervention effects, such as lack of proper randomization that may be associated with more positive intervention outcomes (Gluud, 2006). No protocols were pre-registered with the exception of Lindenberg and colleagues' (2017) that is a registered pre-clinical trial.

The programmes targeted adolescents (of various ages between 8-18 years with the majority targeting middle adolescence: 12-18 years (Lindenberg et al., 2017); 10-14 years (Walther et al., 2014); 15-16 years (Busch et al., 2013); 11-16 years (de Leeuw et al., 2010); 13-15 years (Korkmaz & Kiran-Esen, 2012); 8-12 years (Hswen et al., 2014); and 12-15 years (Shek et al., 2011), spanning eight countries (Germany, The Netherlands, Italy, Australia, Korea, Hong Kong, USA, and Turkey). These programmes were delivered by a combination of either trained school teachers (with the guidance of expert health agencies) during class time (Hswen et al., 2014; Walther et al., 2014), trained professionals (psychologists, social workers, and researchers) and public health teams (Andrisano-Ruggieri et al., 2016; Lindenberg et al., 2017; Shek et al., 2016), a research

team comprising scholars in various disciplines (Shek & Ma, 2014), or by peer training (Dreier et al., 2015; Korkmaz & Kiran-Esen, 2012).

Intervention sample sizes ranged considerably from 90 adolescents (Korkmaz & Kiran-Esen, 2012) to 1,843 adolescents in all three assessment periods (Walther et al., 2014) with the exception of the Project P.A.T.H.S., that used exceptionally large sample sizes (250 schools) across the different phases of its implementation (Shek et al., 2011). The duration of interventions varied from two forty minute sessions and ten peer training sessions (Korkmaz & Kiran-Esen, 2012) to a three year curriculum (Busch et al., 2013). The programmes predominantly targeted Internet use and gaming, with the multi-behavioural programmes targeting a variety of adolescent risk behaviours (i.e. alcohol, drugs, and bullying), and aiming for holistic adolescent growth (Shek et al., 2011). Few studies included some degree of parental involvement and evidence-based parts that were customized based on school priorities (Busch et al., 2013): parental recommendations and encouragement of media-related communication with children (Walther et al., 2014), or made reference to parental engagement in the programme (de Leeuw et al., 2010). Consequently, the programmes featured variability in the objectives, methods, the assessment tools, and the outcomes they aimed to achieve.

2.3.1 IA and gaming-related outcomes

Problematic internet use was assessed as a function of the following variables: internet use disorder (IUD) and gaming addiction (Lindenberg et al., 2017), IA (Andrisano-Ruggieri et al., 2016), internet use habits (Korkmaz & Kiran-Esen, 2012), internet use and gaming frequency, proportion of excessive gamers (Walther et al., 2014), compulsive Internet use and gaming (Busch et al., 2013; de Leeuw et al., 2010). This demonstrates a wide range in outcomes assessing problematic Internet use and gaming, and reflects the diverse conceptualizations of the disorder and the conceptual confusion that characterizes research in the IA field.

2.3.2 Protective and risk factors

Further to IA symptomatology, the prevention programmes evaluated in the present review aimed to enhance protective factors and minimize risk variables of IA, reduce comorbid symptoms and negative psychosocial consequences related to IA. These variables were measured as secondary outcomes in the majority of the studies. Protective factors encountered were individual (rather than systemic) factors, related to skill enhancement, knowledge imparting and attitude changing, as well as reducing symptoms of comorbidities. These were related to increase of knowledge of IA risks and impacts, and promotion of psychosocial competencies: critical evaluation skills, social skills, problem solving skills, emotion regulation and self-control skills, cognitive restructuring skills, reduction of impulsiveness, self-concept, self-management, promotion of healthy social relationships, promotion of awareness of subjective relationship (personal relevance) with technologies, and social learning (peer training).

Overall, the following outcomes were assessed to determine whether these prevention interventions

for IA (i) reduce symptoms or severity, or (ii) confer a change in attitudes in psychosocial functioning compared to baseline measures. *Usage outcomes* included Internet use and gaming duration/frequency (days per month, hours per day, and addictive use patterns) (Andrisano-Ruggieri et al., 2016; Busch et al., 2013; de Leeuw et al., 2010; Korkmaz & Kiran-Esen, 2012; Lindenberg et al., 2017; Walther et al., 2014), the 12-month incidence rate of IUD and reduction of IUD (Lindenberg et al., 2017). *Knowledge and attitude shifting outcomes* included attitude/perception or awareness change towards Internet use (Andrisano-Ruggieri et al., 2016; Korkmaz & Kiran-Esen, 2012; Shek et al., 2016); behavioural intention, knowledge and shifting of misconceptions regarding addictions (Shek et al., 2016);. *Skill enhancement outcomes* included enhanced problem-solving, self-control, critical thinking, cognitive restructuring, self-reflection and emotion regulation skills (Lindenberg et al., 2017; Shek & Yu, 2011a; Shek et al., 2016), and media literacy (Walther et al., 2014). *Symptom reduction outcomes* included comorbid symptoms and negative school-related outcomes (Lindenberg et al., 2017), cognitive, emotional, social, and behavioural competence. *Process evaluation outcomes* included usability, likeability, knowledge, and attitude change (Hswen et al., 2014; Shek et al., 2011, 2016). *Multiple-risk behaviour outcomes* related to substance abuse and alcohol use (Busch et al., 2013), addictive behaviours, psychosocial competencies, and knowledge about addiction. *Qualitative outcomes* included parental media monitoring and rules at home (Walther et al., 2014). These outcomes were assessed with a variety of assessment tools.

2.3.3 Assessment tools for IA/gaming addiction

A wide variability was also observed in terms of the diagnostic tools used to assess the outcomes of the programmes with respective differences in the cut-off points that address clinical symptom severity, as well as those utilized to assess psychosocial symptom severity and improvement. All studies relied on use of self-report data with the exception of the study by Lindenberg and colleagues (2017), which included clinical diagnostic interviews according to the DSM-5 (American Psychiatric Association, 2013) IGD criteria to assess gaming addiction (used as exclusion criterion) in the 12 month follow-up of the PROTECT Study. Two of the programmes (Andrisano-Ruggieri et al., 2016; Shek & Ma, 2014); used Young's Internet Addiction Test (IAT) (Shek et al., 2008; Young, 1998a, 1998b); the Compulsive Internet Use Scale (CIUS) (Meerkerk, Van Den Eijnden, Vermulst, & Garretsen, 2009; Rumpf, Meyer, & John, 2011) was utilized in three studies (Busch et al., 2013; de Leeuw et al., 2010; Lindenberg et al., 2017); Walther and colleagues (2014) and Korkmaz and Kiran-Esen (2012) used the Internet Use Habits Scale (IUHS) [Yilmazhan-Gültutan 2007 in (Korkmaz & Kiran-Esen, 2012)]. Other scales used were the German Computer Gaming Addiction Scale (CSAS and KFN-CSAS-II) (Rehbein, Kliem, Baier, Mößle, & Petry, 2015); and the German Internet Addiction Scale (ISS) (Hahn & Jerusalem, 2001) were utilized in 2 studies (Lindenberg et al., 2017; Walther et al., 2014). The Compulsive Game Use Scale (CGUS) used in the de Leeuw and colleagues study (2010) was a non-validated version adapted for gaming based on the CIUS (Meerkerk et al., 2009). Similarly, Busch and colleagues (2013) used the Videogame Addiction Test (VAT) (Van Rooij, 2011) to assess video game addiction. In Shek and colleagues (2016), IA was measured with a single item question, therefore addictive behaviour may not be accurately represented in their results.

2.3.4 Assessment tools for psychosocial impacts and comorbid symptomatology

A number of assessment instruments were utilized to assess psychosocial symptom severity and improvement reflecting a variability in socio-emotional impacts and potential comorbid conditions. The German Depression Inventory for Children (DIKJ) (Stiensmeier-Pelster, Braune-Krickau, Schürmann, & Duda, 2014; Stiensmeier-Pelster, Schürmann, & Duda, 1989), the Strengths and Difficulties Questionnaire (SDQ) (emotional symptoms, hyperactivity, peer problems, conduct problems and prosocial behaviour) (Goodman, Meltzer, & Bailey, 1998) was used in three studies (de Leeuw et al., 2010; Lindenberg et al., 2017; Shek & Ma, 2014). Lindenberg and colleagues (2017) used the seventh scale of the German adaptation of the Fear Survey Schedule for Children – Revised (PHOKI) (Döpfner et al., 2006), the German Interaction Anxiety Scale (SIAS) (Mattick & Clarke, 1998; Stangier et al., 1999), the German Questionnaire for Assessment of Emotion Regulation in Children and Adolescents (FEEL-KJ) (Grob & Smolenski, 2011), the German Questionnaire for Procrastination (APROF) (Höcker et al., 2013), the German Student Assessment List for Social and Learning Behaviour (SSL) (Petermann et al., 2014), the German Self-Efficacy Scale (SWE) (Schwarzer & Jerusalem, 1995), and the World Health Organization-Well-Being Index (The WHO-5 Well-Being Index) (Topp et al., 2015). The Chinese Positive Youth Development Scale (CPYDS) was used in one study (Shek & Ma, 2014). In the case of the multi-behavioural studies, scales regarding other risk behaviours (alcohol consumption, drug use, bullying behaviours etc) were also administered.

2.3.5 Intervention methods

The reviewed prevention programmes embraced a range of intervention methods used unilaterally or in combination: (i) peer-to-peer approach (de Leeuw et al., 2010; Dreier et al., 2015); (ii) skill-based, competency enhancement strategy, psychosocial competencies to promote adolescent strengths, encouraging critical thinking, self-monitoring, self-reflection, critical perception and discussion about own use or media literacy enhancement (Busch et al., 2013; Dreier et al., 2015; Shek et al., 2016); (iii) reduction of comorbid symptoms and negative psychosocial consequences: anxiety, depression negative school-related outcomes (i.e., procrastination) (Lindenberg et al., 2017); (iv) awareness-raising/information imparting about the negative consequences and potential risks of IA (all studies), and (v) emphasis on positive psychology (the Positive Adolescent Training through Holistic Social Programs (Project P.A.T.H.S) (Busiol & Lee, 2015; Shek & Ma, 2014; Shek et al., 2011, 2016, Shek & Yu, 2011b, 2011a; Yu & Shek, 2013).

2.3.6 Effectiveness

Effectiveness measures were reported by seven studies (the remaining being protocol studies), with the majority reporting mixed outcomes as to Internet or gaming use. Effect sizes (Cohen's *d*) were calculated by the authors of this review, where applicable, for the RCTs and the pre-experimental designs, in order to employ a common method of measuring effectiveness across studies. De Leeuw and colleagues (2010)

presented small to medium effect sizes, ranging from $d=0.112$ (Cohen's d) in gaming use duration scores to $d=0.401$ for internet use duration. In third year students only, a higher effect size was observed for compulsive Internet use scores ($d=0.563$). The results indicated an increase in time spent on the Internet (hours/day), in heavy game use and an increase in the number of pathological Internet users contrary to expectations, but managed to achieve a decrease in numbers of game users, suggesting that the intervention partially managed to influence adolescents' intention to change Internet and game use. The study also confirmed the association between Internet use and psychosocial problems and between game use and less physical activity.

In the study by Walther and colleagues (2014), findings suggested mixed effects for computer gaming – a decrease in self-reported gaming frequency from baseline (Time 1) to post-test (Time 2) only for the intervention group, but an increase was reported from post-test (Time 2) to follow-up (Time 3) for both the intervention and the control groups. No intervention effects were found for frequency or duration of students' Internet use. On the contrary, Internet use increased during the study duration (15 months), while the number of Internet users doubled. Students' reports of parental monitoring or rules about media behaviour at home (secondary outcomes) were unaffected by the intervention.

Similarly, Andrisano-Ruggieri and colleagues' (2016) intervention had a medium effect size (Cohen's $d=0.579$ for males and $d=0.409$ for females) and exhibited a significant decrease in post-intervention IAT (Young, 1998a, 1998b) scores in the severe and moderate level, but an increase in IAT (Young, 1998a, 1998b) scores for the mild level. Statistically significant positive differences in the post-intervention findings ($Z=-3.267$, $p<0.05$) were observed for the intervention group vs. the control group in Korkmaz and Kiran-Esen's study (2012), as measured by the Internet Use Habit Scale pre- and post-test total scores.

The multi-behaviour intervention of Busch and colleagues (2014) also presented mixed findings. The intervention brought significant behavioural changes for weekly screen time (computer and television) only for boys, but no differences were observed for boys in weekly hours of gaming. Gender differences were observed in the results. CIUS (Meerkerk et al., 2009) scores were significantly different only for girls as VAT scores (Van Rooij, 2011). Comparing participating students' results with trends over the same period of time (2007 vs. 2010) with peers participating in the Dutch Health Behaviour in School-aged Children (HBSC) study [2009 vs 2010 – Trimbos Institute in Busch and colleagues (2013)], a significant reduction was observed on all health behaviour measures. No change was observed for time of use or compulsiveness for boys, but boys presented significantly fewer psychosocial problems in the post-intervention condition compared to the girls.

Positive results were observed in the multi-risk behaviour programmes. The P.A.T.H.S Project (the largest positive youth development programme implemented in Asia) (Shek & Yu, 2011) led to a reduction of IA and increased self-control over Internet use. It employed various assessment periods. In the initial phase, RCT data were collected over eight occasions. In year 1, pre-test and post-test scores were collected. In year 2, four waves of data were analysed with individual growth curve models, suggesting better performance and less risk in the experimental group on various outcomes. In years three and four, six and seven, respectively, results

were similarly positive (Shek & Ma, 2014). However, an exhaustive appraisal of this large scale project is beyond the scope of this review that has been analysed in over 120 papers (Shek & Yu, 2011).

The B.E.S.T. Teen Program (Shek et al., 2016) presented preliminary objective and subjective outcome evaluations based on pre-intervention scores, and predicted a 45% decreased likelihood of the intervention group to exhibit uncontrollable Internet use, significantly lower intention to use excessively, and higher scoring on psychosocial skills, knowledge and beliefs about addiction, and correction of misconceptions. Programme participants held high positive views of the curriculum content and programme satisfaction. However, results were based on single item scores for each addictive behaviour measured, including IA, that presented low reliability (Cronbach's *a* ranging from .24 to .31 pre-to-post-test).

In the US, the study of Hswen, Rubenzahl and Bichman (Hswen et al., 2014) provided a qualitative evaluation by assessing in-game measures of usability and student perceptions of likeability, acceptability and perceived usefulness of educational videogame content. These were evaluated at post-intervention via questionnaires and demonstrated that this educational platform appears feasible and effective in increasing knowledge of healthy and safe smartphone use in school aged children.

Shek and Leung's study (Shek & Leung, 2013) presented the development of a pioneering integrated IA prevention and intervention model in Hong Kong (the Youngster Internet Addiction Prevention and Counselling Service). However, the authors did not provide any analysis of effectiveness findings in this paper (Shek & Leung, 2013). Studies in South East Asian countries identified in the literature (mainly South Korean) reported positive changes for their outcome variables (Deng et al., 2013; Joo & Park, 2010; Kim et al., 2013; Kim et al., 2007; Mun & Lee, 2015; Park & Kim, 2011), but were excluded from this review because they were published in languages unknown to the authors (see exclusion criteria). Their findings should be interpreted with caution as with very small sample sizes it is inherently more difficult to find the true effects of the interventions and applicability and transferability of programmes in other cultural contexts should be carefully examined. However, lack of wider dissemination of research findings limits the evidence base that is essential to identify best practices (King et al., 2017), and to warrant an understanding for prevention approaches conducted in countries where IA constitutes a priority in public health policy and where prevention has already been established on a national level (Lim, 2012).

2.4 Discussion

Heterogeneity was observed in the scope, content, outcome evaluation (i.e., IA, screen time, frequency, attitudes, habits, etc.), and assessment tools used in the reviewed studies. This partially reflects the versatile conceptualization for IA, its complexity, and the different rationales on priorities that an IA prevention programme should focus on. The majority of programmes targeted reduction of IA. However, studies presented mixed outcomes with regards to Internet use and gaming, and it appears that setting reduced Internet use time as an outcome is rather problematic, similar to problems with the assessment tools for its measurement.

Increasing knowledge for impacts and risks, promotion of protective factors and the enhancement of skills and competencies, and using peer-to-peer training were the main strategies used by the prevention programmes. The study designs varied from complex RCTs to assess the effectiveness of an intervention that uses CBT techniques for at-risk individuals (Lindenberg et al., 2017; Walther et al., 2014) to pilot pre-experimental designs delivered and measured within one school without the use of a control group (Andrisano-Ruggieri et al., 2016; Busch et al., 2013; de Leeuw et al., 2010). Seven studies in this review were identified in support of a more integrated approach (multi-behaviour risk) for promoting healthier lifestyles in prevention efforts (Busch et al., 2013; Busiol & Lee, 2015; de Leeuw et al., 2010; Shek & Ma, 2014; Shek et al., 2011, 2016, Shek & Yu, 2011a, 2011b). However, five of the multi-behaviour prevention studies referred to the same programme and its extension period (Project P.A.T.H.S.) (Shek & Ma, 2014; Shek et al., 2016; Shek & Yu, 2011b; Yu & Shek, 2013; Shek et al., 2011), suggesting that only three programmes addressing multiple risk behaviours to date have included IA as an outcome among other risk behaviours. This could be attributed to different aetiology, such as substance addictions (tobacco, alcohol and illicit drug use) traditionally being considered as the main risk behaviours in adolescents (Jackson et al., 2012), the current scientific debate and lack of consensus for the clinical status of the disorder and its classification (Grant et al., 2010; Griffiths et al., 2016; Kuss et al., 2014; Kuss et al., 2017; Pontes et al., 2015), and potentially the different prevalence rates amongst different countries that do not signal the same degree of risk for adolescents across countries.

2.4.1 Effectiveness of interventions

Three major issues may be critical in terms of intervention effectiveness that appear to be compromising intervention results and need to be further addressed: i) the diversity of IA/gaming assessment tools used and the absence of diagnostic criteria and clinical status; ii) various methodological limitations encountered in the programmes' designs, and iii) the use of Internet and gaming time reduction as main outcome variables in IA prevention studies.

The heterogeneity in assessment tools and cut-off points, the absence of diagnostic criteria and clinical status, and the use of self-reported data remain critical issues in empirical research in IA. The contested nature of IA is reflected in the wide use of measurement tools assessing IA and gaming and in the dimensional structure of these instruments (Lortie & Guitton, 2013), presenting methodological shortcomings that have an impact in the assessment of programmes' effectiveness. Thus, deciphering the diagnostic/clinical status of IA is closely related to assessment and to serving prevention and clinical purposes. For example, the construct validity of the CIUS (Meerkerk et al., 2009) presents sound psychometric qualities, but factor loadings are invariant between heavy and non-heavy use (Kuss et al., 2013) and the measurement neglects other crucial dimensions of the construct (of withdrawal, tolerance or motives of escapism and social motivation) (Kuss et al., 2013; Lortie & Guitton, 2013). Similarly, the Internet Addiction Test (IAT) used in two of the studies uses cut-off points that are arbitrary, not reflecting clinical disorder severity based on symptom evaluation, and does not present a temporal assessment of symptom presence (Kuss et al., 2014).

More recent assessment tools base their factorial analysis on the DSM-5's (APA, 2013), IGD criteria,

whereas older instruments do not reflect this development. New intervention designs should then cautiously adopt measures that are concurrent to scientific developments. Lindenberg and colleagues (2017) used the only protocol in this review that applied DSM-5 criteria for IGD in a clinical interview, excluding gaming disorder and drawing a distinction between IUD and GD. This is the first prevention protocol that treats IA as a separate clinical entity from gaming addiction and uses assessment methods other than self-report data.

Other methodological design limitations that were encountered in the reviewed studies were: the pre-experimental designs, implemented with only one school (i.e., with students of higher socioeconomic background with higher levels of education), the lack of a control group to assess between-group differences (Andrisano-Ruggieri et al., 2016; de Leeuw et al., 2010), the absence of evidence-based recommendations, critical in current addiction intervention directives (UK Drug Policy Commission (UKDPC), 2012) - with the exception of one programme (Busch et al., 2013), and of follow-up assessments to estimate whether benefits are maintained over the long term (Shek et al., 2016), and small geographically restricted sample sizes ($n=104$) (Hswen et al., 2014) indicate the need for further empirical evidence. All studies relied on self-report data and self-selection processes at a school level (Walther et al., 2014), posing a threat to representative sampling and the generalizability of the results. De Leeuw and colleagues (2010) reflect on the inability to address which specific components of their intervention are driving the changes observed in the post-intervention with certainty, and whether these reflect knowledge benefits or extend to actual behavioural changes. Similarly, it was uncertain why gender differences in the results were observed in Busch and colleagues' study (2013), and it is crucial that research on gender differences be considered in the design of IA and gaming prevention and intervention programmes, attending to different gender needs (Ha & Hwang, 2014).

An equally important omission is a post-intervention process evaluation for the assessment of Type III errors (Busch et al., 2013) or other biases for the identification of other methodological shortcomings, and for a further account of effectiveness (Shek et al., 2016). Process evaluations are considered an essential component of an intervention, proposed by the new *Medical Research Council* guidance (Moore et al., 2015) and the APA guidelines for prevention (2014), as they provide information about replication in the same context or about the reproducibility of outcomes that are relevant to policy makers who cannot only rely on effect sizes. Employing multiple evaluation strategies to allow for triangulation of data has also been recommended as an optimum approach to measure effectiveness (Shek & Wu, 2016).

The present review has highlighted the diversity in programme scope and outcomes and the mixed results in reducing Internet and/or gaming use. This partial influence on adolescents' online behaviour was attributed by some of the authors to (i) the difficulty in assessing Internet use vs. gaming, and ii) the developmental trajectory that presents variability in use (increase and change in use with age increase). However, setting Internet time reduction as outcome appears to be particularly problematic for many reasons, although less so for gaming, as highlighted in the studies reviewed (Andrisano-Ruggieri et al., 2016; de Leeuw et al., 2010; Walther et al., 2014). In de Leeuw's (2010) study, although Internet use increased, this was not reflected in the CIUS (Meerkerk et al., 2009) scores, adding to evidence that time that individuals spend online is contextual and not generalized may not be the defining variable in problematic use as has been argued by

others (Griffiths, 2010a; Griffiths & Szabo, 2014; Kuss & Griffiths, 2012c). The Internet is an essential tool in modern education and recreation, but determining the optimal use limit is paradoxical and a general all-encompassing concept (browsing, various types of recreation and social interaction, etc.) in need of further specification. This can be easier to achieve for gaming, but is substantially more difficult for general Internet use since it is an integral part of adolescents' daily lives. Internet time reduction as an outcome in prevention studies has an inherent assumption that Internet use is negative. However, contrary to substance addictions, many beneficial effects have been evidenced for Internet use and gaming (Colder Carras et al., 2017; Griffiths et al., 2017). Therefore, what needs to be addressed is determining exactly what is required to be limited when designing an IA and gaming intervention. Complete abstinence is not proposed as a viable solution to any intervention (Shek & Leung, 2013; Walther et al., 2014), but in addition to contextual factors in adolescent life, examining motivational and harm-reduction factors (i.e., education, attention switching, and dissuasion) have been proposed to reduce game playing time and addiction levels (Xu et al., 2012).

2.4.2 Time reduction as a primary outcome variable

Focusing only on time spent online is also limiting in the conceptualization of gaming. First, in the context of gaming, the criterion of tolerance, which according to the DSM-5 (APA, 2013) relates to increased time involvement, has increasingly been challenged (King & Delfabbro, 2016) as not sufficiently representing the individual's experience, with time in IGD not being the equivalent of dosage in substance-related addictions. Conversely, it appears that tolerance reflects more than just the need to increase time involvement, and taps into powerful structural game characteristics associated with key gaming motivations: *inadequacy*, a perception of no satisfaction from any game duration; *achievement*, overcoming challenges and progressing, and *wealth*, the increasing need to acquire valuable game artefacts (King & Delfabbro, 2016). Second, there is an increasing convergence in activities on the Internet that complicate the traditional divisions between activities, rendering prevention and intervention objectives more difficult to operationally define. Recent research evidence challenges the traditional definitional boundaries between gaming and social networking (Kuss & Griffiths, 2012a) and emphasizes the increased social networking activity observed in gaming contexts and vice versa (Kuss & Griffiths, 2017), or between gaming and gambling activities (King et al., 2010). These appear to share many common characteristics with diffused boundaries, including structural differences (in gaming the elements of interactivity, skill-based play, indicators of progress and success; in gambling: betting and wagering components, chance outcomes, and monetary characteristics with risk involvement) (King et al., 2010; Kuss & Griffiths, 2012a). This issue highlights the complexity in the assessment of online activities and poses further challenges in the design of prevention initiatives.

2.4.3 Protective, risk and harm-reducing factors in IA prevention programmes

An emphasis on protective factors – characteristics that reduce the likelihood of IA occurrence – were encountered in the studies reviewed (Ma et al., 2011; Shek & Yu, 2011a). These were intrapersonal protective factors (i.e., related to genetic predispositions, personality traits and mental disorders), rather than systemic

(family or community wide). Specifically, the studies highlighted the promotion of positive psychology variables (i.e., self-esteem, self-efficacy), the enhancement of skills and competencies to prevent IA (i.e. self-control, emotion regulation, and social interaction) (Shek et al., 2016), and stressed the need for further assessment of mediating and moderating factors that may influence programme effects (Walther et al., 2014). In line with the reviewed studies, the evidence suggests that risk and protective factors have a higher association with IA in young age groups and supports the need to address intrapersonal variables when designing interventions: escapism, self-identity, attention, control and emotion regulation variables, temperamental characteristics (anger, aggression, addictive proclivity) and negative stress coping (Koo & Kwon, 2014); resilience, socio-emotional adjustment and positive developmental transitions (i.e., from adolescence to adulthood) (Jackson et al., 2012); positive psychology approaches (that increase positive emotions and enhance social competencies (Schwarzer & Jerusalem, 1995); active observation and awareness (facets of mindfulness) (Calvete et al., 2017).

Additional evidence from treatment studies of IA support the approach of strengthening protective factors (Cash et al., 2012), and minimizing harm-reducing factors (Xu et al., 2012): with the use of various techniques such as *attention switching* (distracting the individual's attention with other meaningful activities), *dissuasion* (perception of others as attempting to prevent playing with coaxing, argumentation, etc.), *rationalization/education* (training to understand impacts of problematic behaviour), *parental monitoring* (how an individual perceives parental attention on their life - active or passive), *resource restriction* (the extent to which an individual has been restricted to play in terms of resources, i.e., money or equipment), *perceived cost* (perception of financial cost involved in the activity) or *refraining from engaging* (Pontes et al., 2015). Overall, supporting positive mental health (comprising of both emotional wellbeing and social functioning) in school-based settings, and stressing agency, autonomy and optimism has been a positive proposition (Wells et al., 2003).

Apart from intrapersonal factors, capitalizing on interpersonal protective factors in IA prevention, such as family involvement and school relations (Jackson et al., 2012) in the design and implementation of interventions, is recommended as being a more effective approach than interventions that focus solely on adolescents (Romano, 2014; Tsitsika et al., 2013; Vondráčková & Gabrhelík, 2016). Health promotion is increasingly perceived in an ecological context, related to an individual's environment, family, social networks, communities and public policies (Kok et al., 2004). However, prevention efforts examined in this review are characterized by a lack of this multi-level involvement of stakeholders and have not tapped into family dynamics or the impact of parental monitoring and parental closeness, which has been found to be a protective factor and a major inhibitor of IA (Ding et al., 2017; Lin et al., 2009) and to reduce game playing. On the contrary, poor adolescent-parent relationships have been associated with IA (Soh et al., 2014). Evidence from the treatment context demonstrates that multilevel counselling (including counselling, motivational interviewing, family involvement, individual and group therapy) and multi-modal efficacy treatment (employing a variety of therapeutic approaches with the use of family training and/or teacher education) have been found to hold promise for individuals with IA (Cash et al., 2012). Therefore, the family has been proposed to be the focus of prevention strategies (Flora, 2015), by utilizing family-centered approaches, parental

education, initiatives to improve communication skills with adolescents, promotion of healthy interaction, and helping the family reduce maladaptive family behaviours (Yen et al., 2007).

Further to protective factors, the studies reviewed aimed at reducing psychosocial difficulties (i.e., motivational levels and social interaction) and comorbid symptoms (i.e. performance anxiety, depression, and procrastination). This is in accordance to IA literature, which emphasizes the strong comorbidity of IA with various disorders (attention deficit hyperactivity disorder, anxiety, and depression) (Ho et al., 2014) and the association with psychosocial problems. The prospective study of Lindenberg and colleagues (2017) utilizes therapeutic techniques, such as cognitive-behavioural approaches to address cognitive biases (i.e., the vicious cycle of Internet use reinforced by operant conditioning) and behaviour modification (i.e., problem solving and contingency management). Cognitive mechanisms (i.e., stonewalling, minimizing, blaming, excusing, and rationalizing) have been suggested to be implicated in IA (Young, 1998a), and CBT has been proposed as the most effective form of treatment for IA (King et al., 2012; Kuss & Lopez-Fernandez, 2016), therefore applying therapeutic techniques for at risk individuals may be a promising approach.

4.4. Multi-behaviour, health-promoting focus

The shared underlying determinants, the protective and harm-reducing factors of risk behaviours in young people and the ensuing clustering of risk behaviours has driven the prevention field to integrate practices employing a more holistic, multi-behavioural approach in prevention. Risk behaviours appear to be interrelated and according to de Leeuw and colleagues (2010) and other authors (Busch et al., 2013), heavy Internet and game use and the respective psychosocial problems are not separate concerns, but are concomitant with other health issues interacting synergistically, indicating that prevention programmes should address related health problems. Sharing common goals (e.g., developing refusal skills, coping with emotions and inhibitions, considering long-term consequences, and increasing awareness) relevant risk areas (i.e., risk behaviours such as drug and alcohol use, gambling, and gaming) can be thematically integrated (Hale et al. 2014; Jackson et al., 2012) and delivered as a broader prevention curriculum that also bears academic performance benefits. This rationale was adopted by the school-based multi-risk behaviour Project P.A.T.H.S. (Shek & Ma, 2014) and the multi-addiction programme B.E.S.T. (Shek et al., 2016).

Treatment and prevention strategies that target both problematic Internet use (PIU) and other problem behaviours, such as problem gambling (Yau et al., 2014), have been suggested to synergistically improve multiple health outcomes, leading to a reduction of risk-taking behaviours in adolescence (Šmahel et al., 2012; Vondráčková & Gabrhelík, 2016). An inherent limitation of school-based programmes is the lack of assessment/screening data at a school level (Andrisano-Ruggieri et al., 2016; Klaniene & Jocubaite, 2012) and the practical difficulty in promoting selective prevention for at-risk and/or addicted adolescents (Vondráčková & Gabrhelík, 2016). Also, there is a lack of systematic prevention curricula in Western societies, aiming to endorse an understanding for IA impacts and potential risks, despite the arguably alarming prevalence rates worldwide. Therefore, an interesting challenge is for researchers to assess the role that the school could play in

the future as part of an overall systemic approach towards IA, co-attending to the specific prevention or therapeutic needs for at-risk adolescents and addressing challenges presented in methodology and implementation (Forman et al., 2009).

2.5 Conclusion

With an ever-growing reliance on technological media for information, work, leisure, shopping, and communication, the online environment is increasingly meeting adolescent needs, and the need to balance technology use from an early age is growing. The present review provided insights on current evidence of school-based prevention initiatives for IA, the variety of the approaches employed, and their respective effectiveness. Findings emphasize the scarcity of prevention research. Future research should include RCTs using rigorous methodological designs to provide evidence-based recommendations. Such studies add to a growing body of evidence, which may have a considerable impact on the formulation of health and education policies, as well as on guidelines for schools and parental monitoring. More specifically, future research is needed to provide further insight into mediating and moderating variables, protective and harm-reducing factors, and focus on the needs of the stakeholders to formulate the design of interventions.

Additionally, reaching a consensus regarding the definition, clinical status and assessment of IA, gaming addiction and social media addiction would upgrade prevention efforts targeting adolescents significantly as it will allow comparisons between intervention studies and the identification of factors that are critical in such interventions. Validated findings could then inform promising strategies for IA prevention. Researchers and mental health professionals are increasingly acknowledging the necessity of developing and using prevention approaches, and it is timely that IA is recognized as a problematic condition for a minority of users and addressed within public health and education policy.

The following chapter is a systematic and critical literature review of recreational online activities in school-based screen time sedentary behaviour interventions for adolescents. This chapter reviews screen time and its role within school-based behavioural interventions targeting adolescents and assesses the effectiveness of these interventions, while highlighting issues in the current prevention approaches.

Chapter 3. Literature review II: The role of recreational online activities in school-based screen time sedentary behaviour interventions for adolescents

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2020a). The role of recreational online activities in school-based screen time sedentary behaviour interventions for adolescents: A systematic and critical literature review. *International Journal of Mental Health and Addiction*, <https://doi.org/10.1007/s11469-019-00213-y>

The present chapter consists of a second systematic literature review on school-based interventions conducted to prevent screen time within sedentary behaviour interventions and evaluate the efficacy of the interventions, their limitations and recommendations for future studies. The study was critical to develop an understanding for intervention objectives, strategies and an evaluation of the efficacy of current prevention approaches.

3.1 Introduction

Recent evidence from nationally representative US adolescent samples suggests that psychological wellbeing has decreased since 2012 due to more time being spent on electronic media and screen time (Twenge, Martin, & Campbell, 2018). The proliferation of media use (Council on Communications and Media, 2016) and the increase in the time spent using media (Rideout et al., 2010; Wahi, 2011) has brought about an overall increase in screen-based sedentary behaviour (SB). SB has been increasingly linked to obesity and other physical and mental health concerns. Prevalence rates for obesity have risen ten times in the last four decades and assuming the current trend continues, there will be more obese children and adolescents than moderately to severely underweight adolescents by 2022 (World Health Organization, 2017) in spite of efforts to define prevention priorities (Moreno et al., 2011; Pratt et al., 2008). Currently, in the US about one in six children and adolescents aged two to 19 years are considered obese (National Institute of Diabetes and Digestive and Kidney Diseases, 2017), with a 17% prevalence of obesity and 5.8% of extreme obesity (for ages two to 19 years) (Ogden et al., 2016). In the UK, over one in five children in reception class, and over one in three children in sixth grade, were found to be obese or overweight (NHS England, 2017).

Television (TV) viewing accounts for one-third of the share in SB time and is considered the most studied behaviour to date and the one most strongly related to overweight conditions (Heilmann et al., 2017). However, there is a significant increase in new media consumption leading to SB (Robert Wood Johnson Foundation, 2014), with screen time (ST) and internet use still requiring further investigation (Vandelanotte et al., 2009). Current revised UK public health guidelines (Chief Medical Officers, 2019) recommend an average of at least 60 daily minutes of MVPA across the week for school-aged children and adolescents using a variety of types and intensities and with an emphasis on minimizing SBs and increasing break up of long periods of sedentariness. Increasingly SB recommendations include in addition to MVPA a focus on ST reduction

strategies also reflected in lifestyle interventions for obesity and the increase of physical activity (PA). The Canadian Paediatric Society (Ponti & Digital Health Task Force, 2019) recently announced a new position statement providing evidenced-based guidance for clinicians and parents stressing four main pillars (i.e., healthy management, meaningful ST, positive modelling and balanced, informed monitoring of ST and signs of problematic behaviours), suggesting a transition from restrictive-only strategies to the inclusion of advice on qualitative assessment of time spent online and screening. Equally, following a comprehensive review, the Royal College of Paediatrics and Child Health (2019) in the UK recommended an approach to ST tailored to the child, while the French Academy of Paediatrics (Picherot et al., 2018) recommended developing parental awareness of risks and benefits and an active involvement in alternative activities, endorsing balanced use of ST. All expert advice provision contains a healthy mix of restrictive and active mediation approaches, following the updated guidelines of the American Academy of Paediatrics (Council on Communications and Media, 2016). However, uptake is still poor with evidence of only 37% of US children meeting ST recommendations (Walsh et al., 2018).

Evidence to date for ST harm is still weak with potential confounding factors (i.e., low PA, high sugar intake, data deriving from low socio-economic samples). However, risks appear to be involved in increased ST (Ashton & Beattie, 2019). Prevalence rates from 30 large and population-representative studies demonstrated an average of 8.1 h/day for SBs, which increased from childhood to adolescence and an exceeding the daily recommendations average of 2.9h/day for ST (Bauman et al., 2018). Children and adolescents in the US have been found to spend an average of six to eight hours daily engaged in SB, during and out of school, with 32.4% of children and adolescents on an average school day devoting about three to four hours on TV, playing video games, or on using a computer for leisure activities, with 95% reporting having access to a smartphone, and 45% being online almost constantly (Pew Research Center, 2018; Robert Wood Johnson Foundation, 2014). The amount of time children (5-15 years) in the UK spend daily is approximately two hours online and two hours TV watching, with online access exceeding TV viewing by 20 minutes (Ofcom, 2019). ST behaviours, internet use, and gaming are particularly attractive to young people because they involve the active engagement of the individual rather than the passive nature of TV consumption, and there are rising parental concerns over use (Ofcom, 2016, 2018b). It is still unclear how different ST behaviours are related to obesity (Coombs & Stamatakis, 2015) since the aetiology of obesity is complex and multi-faceted (Griffiths, 2004) – similar to ST behaviours – that constitute different activities with common, but also different motivations, risk factors, and clinical manifestation (Kuss et al., 2014).

Screen time – being a relatively new phenomenon (Coombs & Stamatakis, 2015; Griffiths, 2010b) – has recently been operationalized by the Sedentary Behaviour Research Network (SBRN), who conducted a terminology consensus project to account for sedentary and active time spent on screen-based behaviours. This time is divided into the following categories: (i) *recreational* ST (not related to school or work), (ii) *stationary* ST (time spent on screen-based devices [smartphone, tablet, computer, television] in stationary situations regardless of context [i.e., school or work]), (iii) *sedentary* ST (time spent on screen devices in sedentary situations regardless of context), and (iv) *active* ST (time spent on screen devices not being stationary regardless of context, i.e., playing videogames, running on treadmill while watching TV) (Tremblay et al., 2017). This is

differentiated from sedentary behaviours (SBs), a broader construct, increasingly connected to leisure time (Griffiths, 2010a; Vandelanotte et al., 2009) and operationally defined as “any waking behaviour characterized by an expenditure ≤ 1.5 Metabolic Equivalents (METs) while in a sitting or reclining posture” (Sedentary Behaviour Research Network, 2012, p. 540). These are behaviours that involve limited energy expenditure, such as sit-down activities (i.e., reading, listening to music) as well as involvement in ST.

Research has demonstrated the relationship between ST and obesity in overweight and obese adolescents and in young adults (18-25 years) (Maher et al., 2012; Mitchell et al., 2013; Vaterlaus, Jones, Patten, et al., 2015). However, the evidence is inconclusive concerning the role of PA in SBs. SBs accompanied by a lack of PA have been identified as a potential risk factor for adolescent obesity (Griffiths, 2010b) and to partially displace physical exercise (Liu, Wu, & Yao, 2015) as well as face-to-face time spent with friends and family, resulting in lower levels of psychological wellbeing (Liu et al., 2015; Mannell, Zuzanek, & Aronson, 2005; Nie, Hilygus, & Erbring, 2002; Twenge et al., 2018). Other findings claim obesity to be irrespective of PA levels and not associated with less engagement in leisure-time physical activities (Gebremariam et al., 2013; Mendoza et al., 2007). Given the multi-factorial nature of obesity (Hamulka et al., 2018), various intrapersonal and interpersonal correlates interact, touching upon individual, social and environmental factors, which have been evidenced as protective or risk functions (Amarasinghe & D’Souza, 2012). ST has been associated with other lifestyle choices (such as sleep, diet, and sedentariness), which interact promoting obesity, arguably in a dose response manner, suggesting there is a need for integrated efforts in prevention (Chaput, 2017), with attention to the specific activities because correlates differ between television and computer use (Babey et al., 2013), but with significant confounding variables (Vincent Busch et al., 2013).

Therefore, despite the advantages of adolescent media use documented in several studies (Council on Communications and Media, 2016), there are many studies demonstrating the widespread negative impacts that excessive ST has on adolescent wellbeing, the increasing prevalence rates of problematic use, and the risk factors that are associated with the development and maintenance of addictive internet use (Durkee et al., 2012; Kaess et al., 2016; Kuss, van Rooij, et al., 2013; Kuss et al., 2014; Kuss & Griffiths, 2011b). Apart from the negative physical impacts of ST sedentary behaviour, there is an emerging literature on the relationship of prolonged SB and mental health problems (i.e., depression and anxiety) (Asare, 2015; Boers, Afzali, Newton, & Conrod, 2019; Liu et al., 2015; Teychenne, Costigan, & Parker, 2015) including: severe depressive symptomatology in obese adolescents (Goldfield et al., 2016; Liu et al., 2015); body weight perception, weight control behaviours and problematic Internet use (Park & Lee, 2017), leisure Internet and computer use, weight status, time spent in leisure time PA and other SBs (Vandelanotte et al., 2009); and, various negative correlates (i.e., bullying, less PA, truanting from school, alcohol use, and unhealthy eating habits), and compulsive and excessive screen use with psychosocial problems and being overweight (Busch et al., 2013).

Additionally, SBs have been associated with psychological distress and decreased quality of life, sleep deprivation (primarily shortened duration and delayed timing) among school-aged children and adolescents (Hale & Guan, 2015), and unfavourable changes in dietary habits (Gebremariam et al., 2013). Mobile phone dependency was found to negatively predict attention and positively predict depression in adolescents, which

in turn affected social relationships with friends, as well as language, arts, and mathematics achievement (Seo et al., 2016). Additionally, adolescents with problematic social media use presented with low self-esteem, depression symptoms, and elevated social media use levels in a nationally representative sample (Bányai et al., 2017). Video game playing has also been found to trigger central nervous system arousal (Wang & Perry, 2006) that is in turn potentially associated with increased levels of anxiety. To reduce ST therefore requires more than time restriction in addressing problematic content and activities. This may be achieved by providing parental and child media literacy, focus on screen-free recreational activities, and skill enhancement in older children and adolescents (Bleckmann & Mößle, 2014).

It has been argued that adolescents are potentially the most appropriate target groups for interventions due to (i) their vulnerability to addictive and excessive behaviours (Chambers et al., 2003; Kuss et al., 2013), (ii) a decrease in the engagement with PA compared to previous activity levels (Hankonen et al., 2017; Hynynen et al., 2016; Todd et al., 2015), (iii) a significant increase in their media engagement and autonomy over recreational time (highest media and videogame use in late childhood and early adolescence) (Babic et al., 2015; Garcia et al., 2017; Rideout et al., 2010) and (iv) an identified need for more research in this age group for the reduction of SBs (Biddle, Petrolini, & Pearson, 2014). Additionally, there is an increasing scientific focus on the developmental aetiology or precursors of problems (Catalano et al., 2004), highlighting the importance of targeting this age group.

The aforementioned concerns and other negative health outcomes (Moreno et al., 2011) (i.e., cardiovascular disease, type two diabetes), crucial health indicators (Chinapaw et al., 2011; Tremblay et al., 2011), and shorter sleep duration particularly for portable devices (Hysing et al., 2015) require interventions that attend to ST correlates, whether social, physical or emotional (Huffman & Szafron, 2017). This, in turn, has led to a growing number of intervention studies that aim to reduce ST and SBs either as a primary or a secondary outcome (Cong et al., 2012) along with other health-compromising behaviours (i.e., physical inactivity, and poor nutrition). School-based interventions are increasingly suggested as an effective vehicle for the implementation of these programmes and a growing number of studies document the potential and the effectiveness of programmes by targeting multiple health behaviours (Hale et al., 2014; van Grieken et al., 2012). However, the evidence is still mixed (Hynynen et al., 2016). Previous reviews and meta-analyses on sedentary intervention studies have reported mixed effects ranging from no effects (Wahi, 2011) to small to medium effect sizes (Biddle et al., 2015; Maniccia et al., 2011; Schmidt et al., 2012), to significant intervention effects for some of the studies reported (Altenburg et al., 2016; Friedrich et al., 2014; Tremblay et al., 2011; Van Grieken et al., 2012), suggesting a need for optimizing effects.

To further understand the role of recreational ST in SBs and the obesogenic environment (Egger & Swinburn, 1997) – which is considered an evolving risk factor given the increasing habitual involvement of adolescents in these behaviours – and the way these activities are addressed in school-based interventions, a systematic literature review was conducted for adolescents. The aim of the present review was to identify school-based programmes for adolescents that include recreational ST behaviours additional to TV viewing, and to assess the ways these are targeted within the interventions and their contribution in reducing SB or increasing PA in obesity-reducing interventions, which has been increasingly recognized as a significant determinant of a host of health behaviours, including sleep, cognitive, and behavioural outcomes (Martin et al., 2018).

3.2 Methods

A systematic literature review was conducted, following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines (Moher et al., 2009). Eligibility criteria were based on the PICOS (Participants, Intervention, Comparison, Outcome and Study Design) framework to inform the review objectives (outlined in Table 1 and 2).

Literature search

The systematic literature review identified school-based interventions for ST in SBs, where reduction of ST beyond TV/DVD viewing (i.e., computer/internet use and gaming) was an outcome. The systematic search consisted of selecting papers from the following electronic databases: *Web of Science*, *PsycInfo*, *PubMed*, *Science Direct*, and *Google Scholar*, and was conducted using the following broad search terms: prevent*, intervention, program*, “randomized controlled trial”, trial, adolescents, school*, “screen time”, “sedentary behaviour”, gam*, addict*, “internet use”, “social media”, and “social networking sites”. Excessive internet use and other internet-related pathological activities with addictive proclivity (compulsive, problematic or excessive Internet use) could be a result of excessive ST and were therefore used as a related construct for the purposes of the review.

3.2.1 Inclusion/exclusion criteria

Eligible for inclusion were: (i) protocol studies or studies that evaluated school-delivered ST or SB interventions targeting a reduction of screen-based SBs alone or with other physical and mental health issues that included other media use apart from TV viewing (i.e., computer, smartphone, and other media use, online or offline gaming), (ii) effectiveness SB studies that targeted adolescents aged 10-16 years, published between 2007-2019, as SBs have recently started to attract scientific attention (Coombs & Stamatakis, 2015) and prior SB interventions mainly examined TV viewing in terms of recreational behaviour (Tremblay et al., 2011), (iii) interventions where reduction of ST was an outcome, and (iv) studies for which a full-text was available, were published in the English, German, Greek or Polish language (the native languages of the authors) and which were peer-reviewed. Obesity intervention and PA increase studies that included reduction of online-related screen-time behaviours as an outcome were also included.

Excluded were studies that involved only PA as an outcome or SB that assessed only TV viewing or other non-screen (non-internet), sitting-down, related to leisure time (i.e., reading, and listening to music). Additionally, school-based interventions targeting internet use/addiction and problem gaming or gaming addiction focus, and multiple-risk behaviour intervention studies – which included other than obesity or PA-related risk behaviours (i.e., substance use, and alcohol) – were excluded because these have been critically examined in other reviews (Throuvala et al., 2019a).

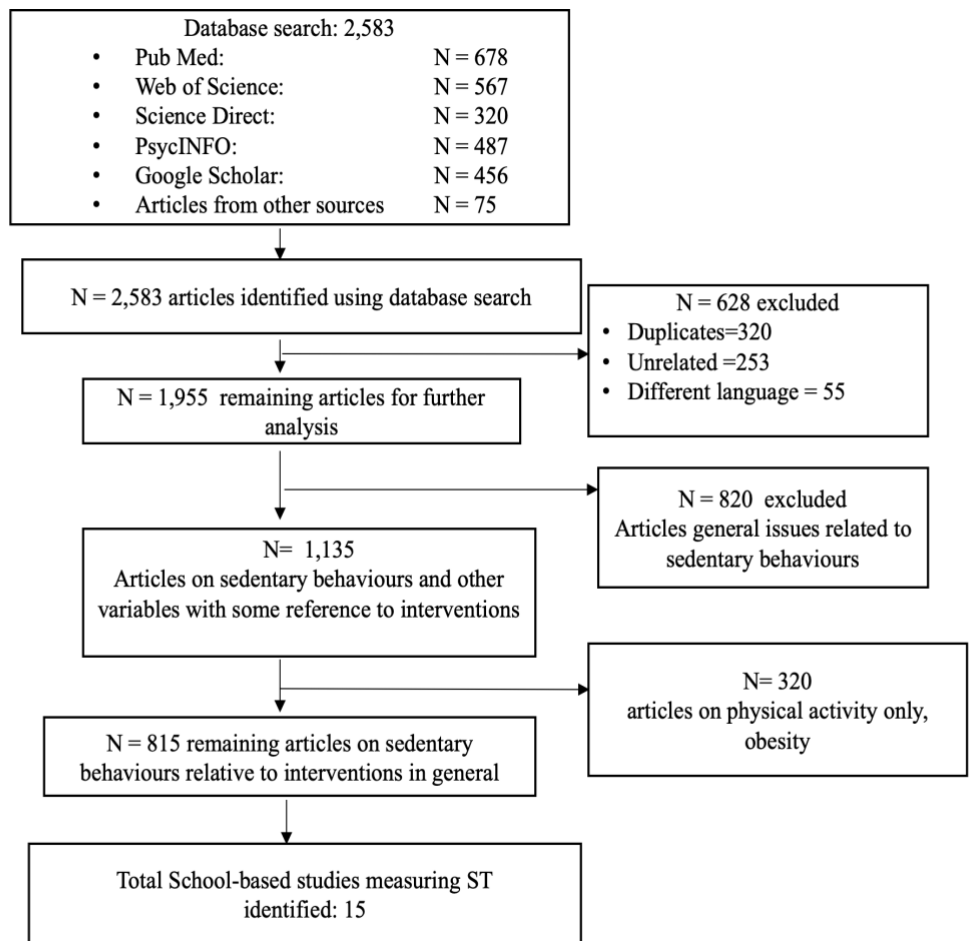


Figure 3. The flow diagram of the selection process literature review 2

3.2.2 Data extraction and synthesis

Study selection of ST school-based intervention studies consisted of two phases: an initial search for titles and abstracts followed by a detailed examination of the full-text studies and their references. Eligibility assessment was performed by two assessors through an unblinded review process. Occasions where subjective judgments differed were resolved by consensus. A data extraction sheet [based on the Cochrane Consumers and Communication Review Group’s data extraction template (Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0, 2011) was developed and adapted to account for trials in education settings. Studies were assessed for their (i) objectives, SB outcomes, and methodological integrity, (ii) intervention content and strategies, and (iii) effectiveness. A synthesis of the most critical findings was undertaken. Reviews and meta-analyses were not included but were consulted in the analysis of the studies identified. All tasks undertaken were reported in a flow diagram identifying and documenting all processes of literature searching and the sifting process that led to a specification of the full-text papers. These were extracted and reviewed by all authors before the preparation of the manuscript.

Since the studies were randomized controlled trials (RCTs) and protocols of these RCTs, two reviewers

independently assessed their validity and risk of bias based on the following domains: (i) randomization/sequence generation (including comparability of baseline characteristics), (ii) allocation concealment, (iii) blinding of students, providers/assessors and outcome assessment, (iv) incomplete data, (v) attrition and selective reporting bias, and (vi) other sources of bias (i.e., sample size justification). Effectiveness results varied for ST reduction and a critical evaluation of the intervention components and the rationale of the studies was undertaken in order to explore reasons for this potential variability in the results.

3.3 Results

In spite of the plethora of obesity and sedentary behaviour school-based interventions for children and adolescents, few studies have included ST behaviours additional to TV/DVD viewing in their assessments, limiting the number of studies that met the inclusion criteria of the present review. The search resulted in 2,583 items (see flow diagram in Figure 3), and identified 30 published papers analysing 15 intervention studies (12 registered RCTs, three pre-post designs) that met the criteria for inclusion in the review ([Aittasalo et al., 2019](#); [Andrade et al., 2014, 2015](#); [Babic et al., 2016](#); [Babic et al., 2015](#); [Bagherniya et al., 2018](#); [Barbosa Filho et al., 2019](#); [Barbosa Filho et al., 2016](#); [Barbosa Filho et al., 2015](#); [Cui et al., 2012](#); [Foley et al., 2017](#); [Hamulka et al., 2018](#); [Hankonen et al., 2016, 2017](#); [Jussila et al., 2015](#); [Leme et al., 2016](#); [Leme & Philippi, 2015](#); [Lubans et al., 2016](#); [Lubans et al., 2016](#); [Majumdar et al., 2013](#); [Singh et al., 2006](#); [Singh et al., 2009](#); [Singh et al., 2007](#); [Smith et al., 2017](#); [Smith et al., 2014](#); [Tarro et al., 2017, 2019](#); [Vik et al., 2015](#); [Wadolowska et al., 2019](#)). Out of the 15 studies, eight were analysed in more than one paper, presenting a separate rationale/study protocol or protocol and baseline results and additional effectiveness of RCT papers (Table 3.1). The studies spanned 16 countries: USA, Australia, Brazil, Ecuador, Finland, Belgium, the Netherlands, Poland, Germany, Greece, Spain, Hungary, Norway, Finland, Iran and China. All studies targeted the reduction of SB and ST as a primary or secondary outcome amongst other outcomes, accompanied in the majority with parallel strategies to increase PA, or other health behaviours.

Table 3.1

School-based interventions for screen time

Authors/ Country	Intervention Characteristics	Assessment Periods + Measures	Objectives/ Outcomes	Results
Babic et al., 2015, 2016 “Switch- off for Healthy Minds” Australia Protocol + Registered Randomize d controlled trial (RCT)	<p><i>n</i>=8 secondary schools <i>n</i>=322 students <i>M</i>_{age}=14.4 ±0.6 years Duration: 6 months TG: students, parents Consolidated Standards of Reporting Trials (CONSORT) (Campbell, Elbourne, & Altman, 2004)</p>	<p>Baseline + 6 months post-test Adolescent sedentary activity Q (ASAQ) (Hardy, Booth, & Okely, 2007) The 10-item Kessler psychological distress scale (Kessler et al., 2002) The aggression scale (Orpinas & Frankowski, 2001) The strength and difficulties Q. (SDQ) (Truman et al., 2003) The physical self-description Q. (PSDQ) (Marsh, 1996) Household screen time rules (Ramirez et al., 2011) The pathological video gaming scale (Gentile, 2009) The motivation to limit screen time Q (MLSQ) (Lubans et al., 2013) Process evaluation (student retention, adherence, feasibility, satisfaction data).</p>	<p>Primary: Recreational screen time (ST) Secondary: Self-report: self-reported psychological wellbeing, psychological distress, global physical self-concept, resilience, pathological video gaming and aggression Objective: physical activity (PA) (measured by accelerometer), body mass index (BMI) Cost-effectiveness of intervention</p>	<p>Reduction in ST for both the intervention group (IG) and control group (CG) (<i>M</i>=-50 min/d, <i>p</i><0.05 vs. <i>M</i>=-29 min/d, <i>p</i><0.05) but no statistically significant adjusted difference between the groups (<i>M</i>=-21.3 min/d, <i>p</i>=0.255). No intervention effects for other psychological outcomes (i.e., well-being, psychological distress, self-perceptions), PA, and BMI. Mediation effects for autonomous motivation.</p>

<p>Hankonen et al., 2016, 2017 “Let’s Move it” Finland Protocol + Registered Cluster feasibility RCT</p>	<p>For future RCT: $n = 6$ vocational schools $n=57$ classes – $n=30$ IG – $n=27$ CG, $n=1,123$ Age=15-17 years Target group (TG): students, teachers Duration: 2 years Feasibility study: $n=64$ students randomized in matched pairs $n=18$ teachers CONSORT guidelines (Campbell et al., 2004)</p>	<p>Baseline, 2-month, 14-month follow-ups Objective measures (i.e. accelerometer, body composition) Self-report PA, sedentary behaviour (SB) and breaks measures adapted from national monitoring reports (i.e. Nordic monitoring of diet, PA and overweight) (Nordic Council of Ministers et al., 2012) A sedentary behaviour measure - SIT-Q (Lynch et al., 2014) Other health related outcomes/covariates (body composition measures, health somatic symptoms, dietary habits, sleep): Self-reported health & physical fitness (National Institute for Health and Welfare, 2016) Somatic symptoms (Karvonen et al., 2005; Merikanto, Lahti, Puusniekka, & Partonen, 2013; Ståhl, El-Metwally, & Rimpelä, 2014), dietary habits (Hoppu, Kujala, Lehtisalo, Tapanainen, & Pietinen, 2008; Hoppu et al., 2010) Psychosocial correlates of PA & restricting SB: Behavioural Beliefs (Fishbein & Ajzen, 2011; Francis et al., 2004; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003) PA intention, PA self-efficacy/perceived behavioural control (Francis et al., 2004; Hagger et al., 2003; Markland & Tobin, 2004) Autonomous and controlled motivation (Markland & Tobin, 2004); integrated regulation subscale (Wilson, Rogers, Loitz, & Scime, 2006) Automaticity (Gardner, Abraham, Lally, & de Bruijn, 2012) PA action and coping planning (Sniehotta, Schwarzer, Scholz, & Schüz, 2005) Big five personality traits, brief measure (Gosling, Rentfrow, & Swann, 2003) Student group climate (Richer & Vallerand, 1998) Behaviour Change Technique (BCT) use (Abraham & Michie, 2008) PA & SB related BCT use: i.e. frequency Acceptance & evaluation (i.e. recall, satisfaction) Perceived teacher behaviour and group climate Adverse effects (i.e. injuries, illnesses) Perceived opportunities for SB reduction within school, perceived teacher actions to reduce students’ sitting Teacher: sitting reduction behaviour, motivational behaviour for reducing student SB Intervention arm only measures: Recalled number of intervention sessions attended, intervention satisfaction, evaluation and use of home workout videos, workbook & website The perceived autonomy support scale for exercise settings (PASSES) (Hagger et al., 2007) BCTs high vs. low engagement (Hankonen et al., 2015)</p>	<p>Primary: Self-report: PA & sedentary behaviours (SB) + breaks in SB Objective: moderate to vigorous physical activity (MVPA) + breaks in SB Secondary: BMI, ST, breaks in ST (accelerometry), physical and mental wellbeing, and psychological variables (e.g. behavioural automaticity) Teachers: Self-report: sitting reduction activities + observed student behaviour Feasibility primary: Student and teacher acceptability of allocation procedures (i.e., examining reasons of drop-outs) and feasibility of procedures for recruitment, measurement, retention Feasibility secondary: PA and SB, BMI, ST, well-being, use of BCTs Student perceptions of teacher sitting reduction activities</p>	<p>Recruitment rate 64% (for students), 88.9% (for teachers). Post-intervention student retention 76.7% teacher retention 93.8%. High acceptability ratings of sessions ($M=6.29$ on a scale 1-7) and teachers ($M=89.18$, 89.83 and $SD=7.36$, 5.31 respectively) feasibility of data collection procedures. Intervention group: increased use of BCTs [$M(SD)= 3.3$ (1.0) in T3 vs. 2.6 (1.5) in T1] with higher use for some (self-monitoring, graded tasks, and barrier identification) but sub-optimal utilization of key BCTs (i.e., self-regulation, self-monitoring, coping planning) BCT use correlated highly with objective measures of PA ($r=.57$, $p=.011$) Teachers in the intervention arm increased the use of sitting reduction strategies at post-intervention and T4 follow-up. Adjustments on BCTs were made for trial phase.</p>
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<p>Smith et al., 2014, 2017 Lubans et al., 2016 “Active Teen Leaders Avoiding Screen Time (ATLAS)” Australia Protocol + Registered RCT</p>	<p><i>n</i>= 14 secondary schools <i>n</i>=361 adolescent boys, <i>n</i>= 180 IG, <i>n</i> =181 CG <i>M</i>_{age}=12.7 ±0.5 years CONSORT guidelines (Campbell et al., 2004) Duration: 20 weeks</p>	<p>Baseline, 8- (post-intervention) and 18-months (follow-up) Resistance training skills battery (Lubans et al., 2014) Behavioural Regulation in Exercise Questionnaire—version 2 – (BREQ-2) (Markland & Tobin, 2004) Adolescent sedentary activity Q (ASAQ) (Hardy, Booth, et al., 2007) Sugar-sweetened beverage consumption based on 2 items from NSW schools Physical Activity and Nutrition Survey (SPANS) (Hardy et al., 2011) The physical self-description Q (PSDQ) (Marsh, 1996) The psychological flourishing scale (for subjective well-being) (Diener et al., 2010) The pathological video gaming scale (Gentile, 2009) The aggression scale (Orpinas & Frankowski, 2001) The paediatric daytime sleepiness scale (PDSS) (Drake et al., 2003) Hypothesized mediators: Motivation in school sport Q. (Goudas et al., 1994) Psychological needs satisfaction (19 items from existing validated scales) (Ng et al., 2011; Standage et al., 2003) The motivation to limit screen time Q (MLSQ) (Lubans et al., 2013) Screen time rules (Ramirez et al., 2011) Process evaluation: student attendance, leadership accreditation, teacher satisfaction (with workshop evaluation Qs), parental involvement, satisfaction for all groups, intervention fidelity</p>	<p>Primary: Height, weight, waist circumference, resistance training skills competence Secondary: objectively measured body composition body, muscular fitness, resistance training skill competency, muscular fitness (grip strength and push-ups), ST, sugar-sweetened beverage consumption, resistance training skill competency, daytime sleepiness, subjective wellbeing, physical self-perception, recreational ST, pathological video gaming, and aggression.</p>	<p>Significant intervention effects for ST (<i>M</i>= -30 min/d ±10.08; <i>p</i>=.03) for beverage consumption, muscular fitness and resistance training skills. No effects for BMI, WC, % body fat, PA. Sustained intervention effects for secondary outcomes 18-months post-intervention: ST (<i>M</i>=-32 min/d, <i>p</i><.01), training skill competency and self-regulation. 70% of boys reported using the app for goal-setting of reduction of ST.</p>
<p>Vik et al. 2015 The European Energy balance Research to prevent excessive weight gain among Youth) “UP4FUN” Belgium, Germany, Greece,</p>	<p><i>n</i>=62 schools, <i>n</i>=31 IG -<i>n</i>= 31 CG <i>n</i>= 3,147 students Age: 10-12 years Duration: 3 years CONSORT guidelines (Campbell et al., 2004)</p>	<p>ST (self-report and accelerometer based) Assessed as (hours per day of TV/DVD watching and computer/games console use self-reported, on (i) frequency (ii) what they did “yesterday” (i.e. the day before the survey, 24h-recall) (iii) the number of breaks from sitting time during one hour of TV/DVD watching, breaks/hour sitting and breaks/school hour. Child, parent, school management Qs, audit instrument and staff interviews Instruments for ST behaviours and potential determinants (44 items operationalized as statements) were developed and pre-tested for comprehension and duration of completion. Student instrument was based on a child Q. used in the study of the “ENERGY” project (Dewar et al., 2013). Process evaluation</p>	<p>Primary: ST (for TV/DVD and computer/ games playing) and breaking up sitting time Secondary: 44 potential determinants [personal (i.e. awareness, attitude) and family environment (i.e. parental practices, rule setting)] of ST involvement and 4 of breaking up sitting time</p>	<p>No significant intervention effects: self-reported TV/DVD ($\beta = -0.03$; 95% CI -0.12-0.05 <i>p</i>= 0.42), computer/game console time ($\beta = 0.01$; 95% CI, -0.10-0.09, <i>p</i>=0.90) accelerometer-assessed total sedentary time ($\beta = 0.11$; 95% CI, -0.18-1.52, <i>p</i>=0.34) and number of breaks in sitting time ($\beta = 0.17$; 95% CI, -0.11-0.33, <i>p</i>=0.81). Intervention group reported more positive attitudes ($\beta = 0.25$; 95% CI, 0.11-0.38, <i>p</i><0.001) and preferences/liking for ($\beta = 0.20$; 95% CI, 0.08-0.32, <i>p</i><0.002) breaking up sitting time than the</p>

Hungary, Norway Registered RCT				control group. Authors do not propose wider dissemination of the present intervention.
Cui et al., 2012 Beijing, China Registered RCT (pilot phase)	<i>n</i> = 4 schools <i>n</i> =346 IG - <i>n</i> =336 CG trained peer leaders, <i>M</i> _{age} =12.7±0.5 years weekly 40-min lessons to their classmates Duration: 4 weeks	Baseline, 3 months, 7 months PA & SB: A modification of a validated seven-day youth physical activity questionnaire (Liu et al., 2003) (MVPA, commuting, sedentary behaviour: TV/DVD viewing, computer usage, electronic game playing, extra-curricular reading, drawing/writing/listening to music, sitting to phone call or chat, playing instruments – for weekdays and weekends) (Sievänen et al., 2014) Process evaluation (direct observation and focus groups, in-depth interviews with principals)	PA and SB	A significant decrease in time in sedentary behaviour on weekdays, (<i>M</i> =-20 min/d, <i>p</i> =0.020) at 7 months for IG – reflected primarily from a reduction (<i>M</i> =-14 min/d, <i>p</i> =0.009) in computer usage on weekdays. No effects for other SBs (i.e., TV, DVD, videogames, extracurricular reading, writing, drawing), MVPA.
Andrade et al., 2014, 2015 Ecuador Registered RCT	<i>n</i> =20 schools <i>n</i> =1370 IG – <i>n</i> =684 CG First stage: <i>n</i> =1224 IG - <i>n</i> =608 CG Second stage: <i>n</i> =1078 IG – <i>n</i> =531 CG <i>M</i> _{age} =12.8±0.8 years Duration: 3 years	Baseline, 18 months, 28 months Validated ST self-report Q. (Mark & Janssen, 2008) Assessment on TV, playing videogames, using computer (Van Royen et al., 2015) BMI-z scores, socio-economic status of household (as covariates) % of adolescents not meeting ST recommendations (American Academy of Pediatrics, 2001)	ST, PA, healthy diet	Overall intervention effect: TV time on a weekday ($\beta = -14.8$ min/d, <i>p</i> =0.02), ST on a weekend day ($\beta = -25$ min/d, <i>p</i> =0.03), proportion of adolescents that did not reach the recommended ST ($\beta = -6$ % points, <i>p</i> =0.01). First stage (0-18 months) (<i>n</i> =1224; <i>n</i> =608 CG): Less increase for IG vs CG, TV time on a weekday ($\beta = -15.7$ min/d; <i>p</i> =0.003) or weekend day ($\beta = -18.9$ min/d; <i>p</i> =0.005), total ST on a weekend day ($\beta = -25.9$ min; <i>p</i> =0.03) and the proportion of adolescents that did not meet the ST ($\beta = -4$; <i>p</i> =0.01) Second stage (18-28 months) (<i>n</i> = 1078 adolescents; <i>n</i> =531 CG): effects were not maintained in the second stage (targeted only PA and healthy diet). A significant

Manjumdar et al., 2013 "Creature 101" USA	<i>n</i> =8 schools <i>n</i> =590, <i>n</i> = 359 IG, <i>n</i> =172 CG <i>M</i> _{age} =11.3±0.74 years, low socio-economic status (SES) Duration: 7 sessions	Pre-post intervention study The Eat-Move Q., adapted instrument for food, ST and other behaviours from the Beverage and Snack Q. (BSQ) (Neuhouser et al., 2009) and other studies (Contento et al., 2010)	Frequency and amount of: sweetened beverages, water, processed snacks, fruits and vegetables, recreational ST, PA	intervention effect for TV on a weekday ($\beta = -13.1$ min/d; $p=0.02$) in CG – increase in TV time on weekday ($\beta = 21.4$ min/d; $p=0.03$) 0-28 months: No intervention effects No significant intervention effects for ST or the other behaviours ($F=0.99$, $p=0.32$) for frequency and ($F=3.32$, $p=0.69$). Significant intervention effects were observed only for the frequency and amount of consumption of sweetened beverages and processed snacks.
Bagherniya et al., 2018 Iran Registered RCT	<i>n</i> =172 overweight and obese girls, <i>n</i> =87 IG, <i>n</i> =85 CG <i>M</i> _{age} =13.53 ±0.67 years CONSORT guidelines (Campbell et al., 2004) Duration: 7 months	PA questionnaire and SCT constructs (self-efficacy, social support, outcome expectations (i.e., perceived benefits) and expectancies (i.e., values placed on benefits), intention and perceived barriers. Perceived. Type and time of PA, duration of SBs (hours of watching TV and hours of playing computer games per day) (Bagherniya et al., 2015; Dewar et al, 2013; Taymoori et al., 2010)	Primary: BMI and WC Secondary: self-efficacy, social support, outcome expectations (i.e., perceived benefits) and outcome expectancies (i.e., values placed on benefits), intention (i.e., proximal goals) and perceived barriers, SBs	Intervention effects for hours of TV watching and computer playing IG ($M=3.2$ vs. 2.8, $p<0.001$), PA and psychological outcomes (self-efficacy, intention, social support).
Wadolowska et al., 2019; Hamulka et al., 2018 Poland	<i>n</i> =464 adolescents, <i>n</i> =216 boys - <i>n</i> = 248 girls Age=11–12 years Duration: 5 topics	4 time points: baseline, 3-weeks (IG only), 3 months post follow-up, 9 months follow-up 3 weeks x 4 hours/topic The Food Frequency Questionnaire for Polish Children (SF-FFQ4 – short form; diet, sedentary and active lifestyle, nutrition knowledge and sociodemographic characteristics) (Hamulka et al., 2018): Nutrition Knowledge (Whati et al., 2005), healthy/non-healthy diet index, body weight (kg), height (cm) and WC Three-factor eating questionnaire (TFEQ-13) (Dzielska et al., 2009) Attitudes towards nutrition (Dzielska et al., 2009) One frequency question to assess ST (duration of TV and/or computer time) Socio-demographic assessment was based on the Polish adaptation of the Family Affluence Scale (FAS) (Mazur, 2013) developed for the Polish Health Behaviour of School-aged Children (HBSC) study (Worsley, 2002)	Nutrition knowledge, attitudes toward nutrition, diet quality, SBs, body composition	No intervention effects for ST between groups in the post-9-month period: ($M=-0.01$, ns), No effects for IG ($M=0.12$ change; 95% CI, -0.02-0.23, ns), or CG ($M=0.13$ change; 95% CI, -0.03- 0.29, ns). Tendency for an increase in ST was observed for both the IG and CG post-intervention. Intervention effects for nutritional knowledge, and adherence to nutrition for both pro-healthy and non-healthy dietary intake group, decrease in PA and other physical measures.

<p>Barbosa Filho et al., 2018 Multicomponent intervention on lifestyle factors Brazil Registered cluster RCT</p>	<p><i>n</i>=6 schools total: <i>n</i>=3 IG, <i>n</i>=3 CG <i>n</i>=1,085 adolescents, <i>n</i>=548 IG, <i>n</i>= 537 CG) Age=11–18 years CONSORT guidelines (Campbell et al., 2004) Duration: 4 months</p>	<p>PA measure (Barbosa Filho et al., 2016) The Youth Risk Behavior Survey Questionnaire (Guedes & Lopes, 2010) Eating habits questions adjusted from previous studies</p>	<p>Primary: PA + ST (TV and computer/video games) Secondary: different health factors (e.g., nutritional status, health behaviour, quality of life, and other lifestyle components (e.g., eating habits, substance use), psychological (e.g., self-rated health, body satisfaction) and biological (general and abdominal obesity) aspects, academic performance For obese students: depressive symptoms, eating disorders, sleep quality, objectively-measured PA, and sedentary time</p>	<p>Intervention effects for % of adolescents who reported watching less than 2 hours of TV (6.4% change; 95% CI, 1.9-10.8, <i>p</i>=0.004), and % using the computer less than two hours per day (8.6% change; 95% CI, 3.8-13.4), <i>p</i><0.001). Also increase in % meeting PA recommendations. Intervention effects were sustainable only for PA.</p>
<p>Singh et al., 2006, 2007, 2009 The Dutch Obesity Intervention in Teenagers programme (NRG-DOiT) RCT</p>	<p><i>n</i>=1,108 adolescents – <i>n</i>=10 schools IG – <i>n</i>=8 schools CG <i>M</i>_{age}=12.7±0.5 years prevocational secondary schools, in their first year Duration: 11 lessons</p>	<p>Baseline, 8, 12 and 20 months Objective measures for body composition The short food frequency questionnaire (FFQ) (van Assema et al., 2001; van Assema et al., 2002) SBs (playing videogames, watching TV etc) and parental accounts of ST based on previous obesity prevention study (Robinson, 1999) Process evaluation (of content, attractiveness, intervention materials)</p>	<p>Primary: Body composition (height, weight), WC, skinfold thickness measurements Secondary: consumption of sugar-sweetened beverages/snacks, SB, PA, aerobic fitness</p>	<p>Significant intervention effects for ST for boys only in the 20-month follow-up [<i>M</i>=−25 min/d; 95% CI, −50 to −0.3), and reductions in ST observed also in 8- and 12-month follow up. Also, intervention effects for body composition and reduction of sugar-containing beverages for boys at 8- and 20-month follow-up. No intervention effects for consumption of snacks and active commuting to school</p>

<p>Tarro et al., 2019 EYTO-Kids project - A peer-led, social marketing and youth-involved intervention Spain Registered cluster RCT (pilot)</p>	<p>$n=8$ primary schools, $n=4$ high schools, $n=375$ students, $n=94$ peer leaders $M_{age}=9.22\pm 0.57$ years (children), 13.1 ± 0.59 years (adolescents) CONSORT (Campbell et al., 2004), standard protocol items: recommendations for interventional trials (SPIRIT) (Chan et al., 2013), template for intervention description and replication protocol guidelines (TIDier) (Hoffmann et al., 2014) Duration: 10 months</p>	<p>The EnKid questionnaire (fruit/vegetable and fast food frequency)(Serra Majem et al., 2003) The AVall questionnaire (PA) (Llangués et al., 2009) The Health Behaviour in School-aged children (HBSC) questionnaire (<i>Health behaviour in school-aged children (HBSC) study protocol: Background, methodology and mandatory items for the 2009/10 Survey</i>, 2010) The HABITS questionnaire (sugary drinks consumption) (Wright et al., 2011)</p>	<p>Fruit/vegetable/sugary drink consumption, fast food, PA, SBs</p>	<p>Intervention effects in % of male children in the intervention group who followed the recommendations of ≤ 2 hours/weekday of (8.2% change, $p=0.003$) compared to the control group. Also increase for PA and reduction of sweets, soft drinks and fast food but no increase for recommended food consumption.</p>
<p>Aittasalo et al., 2019, Jussila et al., 2015 'Kids Out' Protocol + Registered RCT</p>	<p>$n=14$ schools- $n=36$ classes IG, $n=41$ classes CG, $n=696$ IG, $n=860$ CG, teachers $n=14$ $M_{age}=13.9 \pm 0.5$ years CONSORT guidelines (Campbell et al., 2004) + TIDieR checklist (Hoffmann et al., 2014) Duration: 3 lessons</p>	<p>Pre-intervention and 9-month post-intervention Evaluation based on RE-AIM (Reach, Effectiveness, Adoption, Implementation and Maintenance) (Glasgow et al., 1999) World Health Organization (WHO) HSBC (Health behaviour in school-aged children (HBSC) study protocol: Background, methodology and mandatory items for the 2009/10 Survey, 2010) Objective assessment (accelerometer)</p>	<p>Primary: PA, SBs Secondary: Psychosocial factors (family norm, short-term behavioural intention, confidence to execute the behavioral intention) related to walking or cycling to school, leisure PA and ST</p>	<p>Intervention effects in proportion of students reporting that their family sets limitations for ST (5.4% change; 95% CI, 3.3-7.4, $p<0.05$), number of days intending to engage in leisure PA, parental knowledge in ST recommendations higher but not significant.</p>

Foley et al., 2017 SALSA program on peer leaders' energy balance related behaviours (EBRBs) Australia (retrospectively) Registered RCT	Adapted from prior intervention on asthma (Al-Sheyab, Gallagher, Crisp, & Shah, 2012) <i>n</i> =22 secondary schools, <i>n</i> =519 Year 10 SALSA peer leaders who trained <i>n</i> =3,800 Year 8 peers Age=13-14 years 96 University student SALSA trainers Duration: 4 lessons	Baseline and 2-week post assessment Online self-report assessment based on a short food frequency questionnaire (Dewar et al., 2013; Flood et al., 2005; Gwynn et al., 2011) The motivation to limit screen-time questionnaire (MLSQ) for adolescents a single-item PA measure for adolescents (Scott et al, 2015) Process evaluation (i.e., lesson delivery dates, number of peer leaders)	Food/beverage, PA, and recreational ST, intentions to change	No significant intervention effects for meeting recreational ST recommendations (1.4% change; 95% CI, -3.8-6.6, <i>p</i> =0.59). Meeting ST recommendations was moderated by socio-economic status: decreased for above average SES communities by -2.9% while it increased for lower SES communities (6.0%). Effects in peer leaders' intentions for reduction of recreational ST (9.7% change; 95% CI, 3.2-16.1, <i>p</i> <0.05)
Leme & Philippi, 2015 - The "Healthy Habits, Healthy Girls" - H3G program Brazil Registered RCT	<i>n</i> =10 public technical schools, <i>n</i> =253; <i>M</i> _{age} =16.3±0.06 years adolescent girls CONSORT guidelines (Campbell et al., 2004) Duration: 6 months	Baseline, 6 and 12 months BMI-z score, WC The Godin- Shephard Leisure-Time Physical Activity Questionnaire for use - Brazilian adaptation (São-João et al., 2013) A validated food frequency questionnaire (FFQ) for adolescents (Martinez et al., 2013) Modified measure from another obesity prevention study on adolescent girls (Neumark-Sztainer et al., 2010) Process evaluation	Primary: BMI Secondary: BMI-z score, waist circumference, and various sedentary and dietary health-related behaviours SBs: the time spent during the weekdays and weekends in the following activities: watching TV/video/DVD and computer use for leisure activities and reading/homework.	Significant intervention effects for computer ST on the weekends (<i>M</i> = -0.63 min/d, <i>p</i> =0.015), total sedentary activities on the weekends (<i>M</i> = -0.92 min/d, <i>p</i> < 0.01), WC and vegetable intake.

IG, intervention group; CG, control group; TG, target group; RCT, randomized controlled trial; SES, socio-economic status; SB, sedentary behaviours; ST, screen-time; PA, physical activity; Q., questionnaire; BMI, Body Mass Index; MVPA, moderate to vigorous physical activity; CONSORT, consolidated standards of reporting trials; SPIRIT, standard protocol items: recommendations for interventional trials; (TIDier), template for intervention description and replication protocol guidelines; *M*_{age}, mean age; BCTs, behaviour change techniques; SES, socio-economic status; Kg, kilos in body weight; Cm, height; EBRBs, energy balance-related behaviours

Table 1.2 Intervention principles, components and risk of bias of studies reviewed

Study	Theory/Evidence-based	Eligibility Screening	Intervention components	Behaviour change strategies	Hypothesized mediating processes	Risk of bias	Study Contribution
Babic et al., 2015, 2016	Self-determination theory (SDT) (Deci & Ryan, 1985): Emphasis on goal content and autonomous motivation to limit ST	ST eligibility reporting of ≥2 hours/day recreational (exceeding recommendation)	<p>Individual level: Q: 60' interactive seminar (consequences of exceeding limits, benefits and barriers of reducing ST, solutions to barriers, use of interactive polling) ST Choice of personalized e-health social media messages for self-monitoring and goal setting: 50 prompts/six months, bi-weekly Behavioural contract Appropriate replacement behaviour Creation of a list of potential ST rules Consequences of exceeding ST limits</p> <p>Environmental level: Monthly parental newsletters (1 x 6 months): on household ST rules, consequences, strategies to manage parent/child conflict for ST rules, home challenges to reduce recreational ST Assessment workshop for research assistants Protocol manual/instructions for assessments</p>	Provide information on consequences & behaviour health link Provide instruction & general encouragement Prompt intention formation Prompt self-monitoring and barrier identification Specific goal setting Identification of a role model	Motivation to limit ST, PA (school sport) - Perceived autonomy, competence, relatedness	Randomization: Allocation: (matched pairs) by independent researcher and assessors blinded. Potential issue of ecological validity due to sample (Catholic secondary schools and a greater representation of female students)	Incorporated a social media component for ST reduction Adjusted strategies according to SDT tenets to focus on autonomy and support contrary to rewards
Hankonen et al., 2016, 2017	Comprehensive needs assessment, acceptability + feasibility trial for reducing SB and increasing PA Preliminary research on target group evidence synthesis (systematic literature review)	Low /moderate baseline PA by self-report Inclusion and exclusion criteria applied for schools, classes, students, teachers Attendance in a compulsory education Baseline Q	<p>Individual level: 6 hourly group sessions (PA motivation + self-regulation skills) 45'-60' each activity breaks workshops (workbook + online, email newsletters) booster session for maintenance (i.e., encourage programmes' social media use with tips) poster campaign for retention of content (based on specific BCTs from assessment phase) reminders in various venues (i.e., school canteens)</p> <p>Environmental level:</p>	Key BCTs from BCT Taxonomy v1 (Michie et al., 2013): Self-monitoring Info about consequences and emotional impacts Goal setting Action planning Feedback on behaviour Intervention facilitators continually trained with role play and revisions, self-	Manage PA motivation Self-regulate Classroom environment Encouraging for more PA & new ways of PA Knowledge, outcome expectations	Randomization: blinded, school is the unit of cluster randomization Allocation: (student groups-matched pairs) Performance bias addressed with strict protocol procedures	A comprehensive feasibility study for reduction of SB and increase of PA Addressed both individual and environmental features Provided evidence regarding the causal mechanisms and implementation (linking intervention

<p>of interventions effectiveness/practices in health contexts (Hynynen et al., 2016)</p> <p>Based on prior intervention on PA (Andrade et al., 2014)</p> <p>SDT (Deci & Ryan, 1985): (Emphasis on autonomous motivation) self-regulation (control theory) and planning theories (Carver & Sheier, 1982; Deci & Ryan, 2000; Hagger & Luszczynska, 2014; McEachan, Conner, Taylor, & Lawton, 2011), motivational interviewing principles (Howard, Naar-King, & Suarez, 2012)</p>	<p>Bio-impedance measurements</p> <p>Practiced all components 3x 90-minute workshops</p>	<p>Two-hour training teacher workshops (i.e., benefits of sitting reduction, how to perform sitting reduction and goal setting strategies, practical tips to increase motivation)</p> <p>Increased opportunities to access PA facilities and other environmental opportunities (altering class architecture, equipment for light-intensity exercise, gym balls instead of chairs and standing desks)</p> <p>Partnerships with community organizations</p> <p>6 online exercise videos to encourage home-based training</p> <p>Teacher led activity breaks</p> <p>Other SB reduction practices</p> <p>Active teaching methods, activity equipment, online exercise videos</p> <p>Maintenance/boosters across the three components (email newsletters, workshop, booster session)</p> <p>Materials for teachers:</p> <p>62-page booklet with strategies, online materials with strategies and BCTs and video-led sitting reduction activities</p> <p>Posters promoting activity breaks</p> <p>Provision of light PA equipment in classrooms</p>	<p>assessment for quality of delivery.</p> <p>Emphasis on use of self-motivational strategies rather than on self-regulation strategies</p> <p>Information about health, social, environmental, emotional consequences and salience, information about others' approval, framing/reframing, problem solving, information about antecedents of behaviour, social support, identification of self as role model</p>	<p>autonomous motivation (integrated regulation), self-efficacy (i.e., perceived benefits) and outcome expectancies (i.e., values placed on benefits), intention (i.e., proximal goals) and perceived barriers</p>	<p>Contamination bias</p> <p>Recruitment and completion rates informed the RCT power calculations and the RCT design</p> <p>Low recruitment success of one of the classes led to further adjustment in the procedure groups</p>	<p>components to hypothesized mediating processes and their relation to outcomes)</p> <p>Small group dynamics of class cluster</p> <p>Stakeholder participation in the creation of content with high potential for dissemination</p> <p>Use of BCT as methodology for acceptability and feasibility testing</p> <p>identification of most and least used BCTs</p> <p>and identification of weak points before the implementation of the full phase trial</p>
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<p>Smith et al., 2014, 2016 Lubans et al., 2016</p>	<p>Social cognitive theory SCT (Bandura, 1986), SDT (Deci & Ryan, 1985), the trans-contextual model of motivation (Hagger et al., 2003): increasing motivation for PA will have a spill over effect to other contexts (i.e., home), Reach, Effectiveness, Adoption, Implementation and Maintenance (RE-AIM)</p>	<p>At-risk of obesity based on Australian guidelines (i.e., ≥ 2 hours of ST/day and/or seven days per week of MVPA of at least 60 min duration per day) - information sent to eligible students</p>	<p>Individual level: Enhanced school-sport sessions 20 x 90' sessions Researcher-led seminars 3 x 20' Lunch-time PA mentoring sessions 6 x 20' sessions Pedometers for self-monitoring - 17 weeks Provision of equipment to schools Smartphone application and website - 15 weeks Environmental level: Teacher professional development to ensure students' psychological needs are met: Two 6-hour workshops, one fitness instructor session Four parental newsletters Adjusted components (modified from original for scalability): increased focus on resistance training, removal of parent newsletters, removal of pedometer component; and 10-week structured PA programme from 20 weeks to fit within one school term.</p>	<p>Provide information on consequences & behaviour health link instruction & general encouragement Prompt intention formation prompt self-monitoring & barrier identification Specific goal setting Identification of a role model Plan social support or social change Provide feedback on performance Behaviour contract</p>	<p>Autonomy need satisfaction: Competence Relatedness - motivation for PA and school sports PA behaviour strategies Household ST rules Motivation to limit ST</p>	<p>Recruitment and baseline assessments preceded randomization Randomization: by independent researcher through a computer-based randomizer Allocation: (matched pairs), SES index and geographic location</p>	<p>First study to target adolescent boys (apart from a pilot study, screening for eligibility) + to target strength and muscular fitness (leading to enhanced self-esteem in young males)</p>
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Vik et al., 2015	Socio-ecological framework (Sallis, Owen, & Fisher, 2008): changing SB determinants (i.e., awareness, attitude, self-efficacy) to promote self-efficacy (required due to increasing unsupervised time spent in older adolescents) Five steps of the Model of Planned Promotion for Population Health (Brug, Oenema, & Ferreira, 2005) Intervention Mapping Protocol (Bartholomew et al., 2016) CONSORT guidelines (Campbell et al., 2004) BCT use (Michie et al., 2013) Part of an EU prevention programme	Teacher training + manual	<p>Individual level: Registering sitting time Counting steps with a pedometer Making a list of fun non-sedentary activities Writing and evaluating personal goals to reduce ST Difficulties regarding achieving their goal and proposing solutions Writing down rules about ST + examples Discussing family ST rules Brainstorming ideas for non-sedentary recess activities and making a poster Two-minute activity breaks per sitting lesson Motivation to try the activity breaks at home and encouragement to practice active transportation to school.</p> <p>Environmental level: 1 or 2 x 45-minute lessons/six weeks (Week 1: introduction to programme; Week 2: Increasing awareness about SBs; Week 3: goal-setting related to SB; Week 4: Influence of the home environment on ST; Week 5: Breaking up prolonged ST and practicing active transportation to school; Week 6: Summary of the intervention) Six newsletters - one per week/theme</p>	Increase awareness Goal setting Encourage break up of sitting time at home Register sitting time Write and evaluate personal goals Solutions for difficulties Encourage dialogue for ST within the family Write down ST rules Discuss family time Motivate to take activity breaks outside of school	50 determinants were included in the analysis (but not explicitly discussed in the study)	Randomization: Allocation: (schools- matched pairs) independent from evaluating country Poor to moderate test-retest reliability of items developed for breaking up sitting time and its determinants - a threat for the representativeness and the accurate representation of the data or whether intervention effects were detected	Systematic development of intervention with large cross-cultural sample across Europe
Cui et al., 2012	Peer-to-peer leaders approach based on evidence for efficacy SCT (Bandura, 1986)	Peer leader's manual School doctors or class teachers had a meeting with peer leaders to clarify	40 peer educ. lessons to students/4 weeks integrated to existing health education courses students encouraged to maintain healthy habits Four components: food choice, PA, SB, carbonated drinks, goal setting	Student personal goals	N/A	Trained medical students to administer questionnaire	A manualized peer education programme with minimal interference in school activities

	An empowerment educational approach (Wallerstein & Bernstein, 1988)	each peer leader's responsibility	Lessons included: presentation, video watching, group discussion, games, experiments, lifestyle practice, skit playing, quiz show			Blinded to the assignment of the intervention Only two schools in each arm/ potential confounders	
Andrade et al., 2014, 2015	Intervention Mapping Protocol (Bartholomew et al., 2016) Comprehensive Participatory Planning and Evaluation protocol (CPPE) (Lefevre, Kolsteren, De Wael, Byekwaso, & Beghin, 2001)	N/A	<p>Individual level: Key messages re PA and ST Strategies to reduce ST An educational package for classroom use (textbook for teachers and workbook for adolescents)</p> <p>Environmental level: Parental workshop Modifications of the school environment Two key messages regarding PA and ST behaviour: (i) be active for at least 60 min/day, and (ii) spend maximum 2 h/day on watching TV Pep talks with famous young sportsmen (encouraged adolescents to be active and answered questions of the adolescents about their lifestyle) Second stage (addressed PA only): Strategies to overcome the barriers of being physically active both for students and parents set-up of a walking trail that was drawn on the floor of the schools</p>	<p>Individual: Introduce notion that more than 2 hours on TV/day is not healthy Create awareness re the importance of an adequate PA throughout adolescence Increase knowledge and enhance decision making skills</p> <p>Environmental: Increase parental awareness for need to decrease TV time and of regular PA for adolescents Support healthy behaviour regarding PA and TV time of adolescents at home Encourage PA through the positive influence of social models Encourage students to be active and eat healthy Give ideas on how to deal with barriers to be physically active at home Increase availability and accessibility to opportunities for PA inside the schools Motivate the students to walk more during recess</p>	N/A	Randomization, exclusion criteria, sample size calculation, allocation, blinding procedure based in previous intervention for PA (Andrade et al., 2014)	First intervention targeted to low-or middle income in Ecuador

Manjumdar et al., 2013	SDT (Deci & Ryan, 1985) and SCT (Bandura, 1991), BCTs (i.e., Autonomy support, outcome expectations, competence) (Michie, Johnston, Francis, Hardeman, & Eccles, 2008)	Schools from low-income areas of NYC Matched pairs based on free lunch, reading and math scores and ethnicity distribution	<p>Intervention Group: 9 sessions x 30 minutes 2 x week – 1 month 'Creature 101' Game with health science curriculum: Completion of game levels attaining energy balance of their creatures, reporting on game levels, essays on learning outcomes</p> <p>Control group: Different online game with neutral knowledge outcomes (arts and sciences)</p>	Knowledge acquisition / Information about outcomes/behavior Action planning Rewards/points Personal consequences	Motivational messaging Problem solving Self-monitoring Skills mastery	Not a randomized controlled trial only pre-post design, moderate psychometric quality of instrument, varying intervention dose in conditions (IG – 7 sessions, CG-2 sessions)	Gamification and educational games appear promising in promoting healthy dietary behaviours among middle school adolescents, offering possibilities for wide implementation in school or home contexts and with limited resources required.
Bagherniva et al., 2018	SCT (Bandura, 1986)	Overweight and obese adolescent girls	<p>Individual level: Sports workshops, private physical-activity consultation sessions, practical and competitive sports sessions</p> <p>Environmental level: family exercise sessions, text messages, newsletters, SMS text alerts for parents and students, parental newsletters, increasing facilities of PA in the school</p>	Knowledge acquisition / Information about outcomes/behavior Action planning Rewards/points Personal consequences	Psychological skills (i.e., self-efficacy) Social support Intention and perceived barriers Outcome expectancies	Lack of randomization at baseline between intervention and control group Self-report measures except from antropometric measures – potential measurement bias	Effective intervention in increasing the duration of PA and reduction in the duration of ST overweight and obese adolescent girls. BMI and WC decreased but not statistically significant

Wadolowska et al., 2019 Hamulka et al., 2018	The integrated theory of health behaviour change (Jezewska-Zychowicz et al., 2017; Ryan, 2009)	Location and proximity, school agreement, parental consent, age 11 or 12 years. Exclusion: disability and at school-level previous participation in other nutrition-health education programmes	3-week education-based intervention, 5 topics (15 hrs) – delivered by researchers - talks and seminars on: nutrition, dietary, sensory-consumer, hygiene, culinary issues, health consequences, recommendations for healthy eating and PA. Brochures, puzzles, crosswords, website	Nutrition knowledge Sensory and interactive learning Observation Testing Discussions	N/A	Sample size justification Lack of randomization Self-report assessment – measurement bias	A cross-behavioural approach (clustering) of health and lifestyle behaviours for Polish adolescents and identification of dietary and lifestyle habits
Barbosa Filho et al., 2018	The socioecological theory (Sallis et al., 2008) and SCT (Bandura, 2004) and the concept of health promoting schools (Guedes & Lopes, 2010)	Adolescents, Age, full-time attendance in public schools in Fortaleza, Brazil and in the School Health Programme	Environmental level: provision of specific PA training to PA teachers, health education, environmental changes (banners, health messages, provision of additional PA classes) in the formal school curriculum, health values, attitudes and opportunities promoted within the school, and schools seeking to engage with families, outside agencies and the wider community	Education on implications of lifestyle factors (i.e., excessive ST, overeating) for health, academic performance, school relations, environmental changes	IP: intrapersonal mediators (e.g., knowledge, types of PA or ST, risks and benefits, self-efficacy, perceived barriers); EP: interpersonal mediators (e.g., peers, teachers and parents modelling, support and norms); ENV: environmental mediators (e.g., family environment, school environment and environmental)	Self-report assessment, potential measurement bias, no blinding of participants/controls, potential confounders (national diet programme)	Multicomponent programme highlighting difficulties in school interventions addressing health behaviours

Singh et al., 2009	The diffusion of innovations theory (Rogers, 1995) IM protocol (Bartholomew, Parcel, Kok, & Gottlieb, 2001) The self-regulation theory (Zimmerman, 2000) Needs assessment/lit review/focus groups with teachers	Prevocational secondary schools Adolescents from low SES School provision of three classes devoted to the programme, appointment of contact person for the duration of the trial, stick to the same lessons during the trial period for the control group, and provision of IT support/computer provision for the lessons	Individual level: adapted curriculum for 11 lessons in biology and PA and environmental change options. Environmental level: i.e., suggestions for more availability of PA and school snacks options	Knowledge enhancing Awareness raising (self-monitoring and feedback) Skills development (guided practice) Social support (social/peer modelling/social comparison) Habit breaking (automatic stimulus-response, awareness of habitual behaviour) Self-efficacy (goal setting), Reinforcement	Provision of written and verbal information Evaluation of understanding Self-monitoring Skills training feedback Info provision Environment changes Prompts Personalized feedback provision Change process evaluation Facilitation of healthy behaviours	Self-selection bias	Evidence of an interdisciplinary school-based programme grounded in theory for obesity prevention
Tarro et al., 2018, 2019	Health promotion and social marketing principles	Adolescents in the first and second year of Spanish secondary high school (age: 12–14 years) and belong to one of the randomly selected high schools	(1) customer orientation: aiming the intervention towards younger school peers in primary schools (by the researchers); (2) behaviour: focusing on encouraging healthy lifestyles (by the adolescents); (3) theory: usage of youth involvement strategies in peer-designed sessions (by the researchers); (4) insight: designing activities for the younger school peers by considering the things that children enjoy (by the adolescents); (5) exchange: evaluation of the costs and benefits of healthy lifestyle changes (by the researchers and adolescents); (6) competition: identifying the difficulties of younger school peers in adhering to a healthy lifestyle while considering which stakeholders could be involved in the intervention (by the adolescents); (7) segmentation: selection of the specific population (by the researchers) and (8) methods mix: usage of different methods to transmit healthy lifestyle messages	Encouraging healthy lifestyles using knowledge-based theories Involvement of adolescents in the projects, evaluate the costs, to motivate the younger students, identify difficulties and involve stakeholders, communicate healthy messages Employment of a mix of activities, visual material, and products tasting	N/A	No allocation concealment	The role of peer to peer interventions to promote healthy lifestyles

(activities designed as funny games, visual material for support and food product tasting by the adolescents)

Aittasalo et al., 2019 Jussila et al., 2015	The health action process approach model (Schwarzer, 2008)	All schools in the area of Tampere	3 x one-hour teacher training and a manual to deliver the lessons Lesson 1: 'Orientation' Lesson 2: 'Me, peers & PA': feedback views based on the school-specific responses and discussion on views Lesson 3: Goal setting and action planning	'RE-AIM': Reach, Adoption and Implementation strategies: orientation, motivational (intention building), volitional phase (action planning) Homework Internet-based self-assessment Action-plans Visibility of actions taken	Self-efficacy Intention to change Confidence in execution Family support	High drop-out rate may have affected effect sizes and risk of ecological validity Use of non-validated questions for ST and parental norms	Comprehensive evaluation procedure, identifying critical intervention components on self-reported PA and intention to do PA, alerting family norm of setting limits for ST.
Foley et al., 2018	SCT (Bandura, 1986), Freier's empowerment education approach (Wallerstein & Bernstein, 1988), World Health Organization's Health Promoting Schools Framework (Langford et al., 2014)	Year 8 secondary school students (13–14 years) Year 10 students (15–16 years) trained as SALSA peer leaders	1-day peer leaders' training workshop 4 x 70-minute SALSA lessons	Modelling Self-efficacy in implementation, Peer pressure and environmental changes	Modelling Group process facilitation Encourage inquiry and reasoning skills in younger students	Quasi-experimental design – no randomization of schools or students	Positive shift in ERBRs for boys and recreational ST of SALSA peer leaders for above average SES adolescents

Leme & Philippi, 2015	SCT (Bandura, 1986)	10 schools match paired (based on location, size, and demographics)Girls at risk of obesity	Enhanced PE classes – 40x45 min PA during recess/school break - 14x15 minutes Weekly nutritional and PA key messages - 10x20 minutes Nutrition and PA handbook - 10 weeks Interactive seminars - 3x60 minutes Nutrition workshops - 3x90 minutes Parents' newsletter - 4 total Text health messages (via WhatsApp) - twice/week (Term 2 & 3) Dietary/ PA diaries -Term 3	Goal development and setting, self-monitoring, health information provision, efficient intention formation, instructions on the health behaviors, overcoming barriers, general motivation, progressive tasks, motivation, peer modelling behaviours, performance feedback, family support on healthy behaviours	Self-efficacy, social support, intentions, home environment, outcome expectations	School randomization only (no participant randomization).	Highlighted the need for multiple targeting of health behaviours both at the individual and environmental level to enhance motivation and support healthy eating and increase of PA for girls of low SES in developing countries.
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RCT, randomized controlled trial; SES, socio-economic status; SB, sedentary behaviours; ST, screen-time; PA; physical activity; Q., questionnaire; BMI, Body mass index; MVPA, moderate to vigorous physical activity; EBRBs , energy balance-related behaviours; CONSORT, consolidated standards of reporting trials; SPIRIT, standard protocol items: recommendations for interventional trials; (TIDier), template for intervention description and replication protocol guidelines; BCTs, behaviour change techniques; SES index, socio-economic status index; BCT Taxonomy v1, Behaviour Change taxonomy v1; Kg, kilos in body weight; Cm, height; SCT, Social cognitive theory; SDT, Self-determination theory; Q, Questionnaire; RE-AIM, Reach, effectiveness, adoption, implementation and maintenance ; CPPE, Comprehensive participatory planning and evaluation protocol; IM protocol, intervention mapping protocol; TV, television

3.3.1 Objectives

The studies' objectives focused on increasing PA and decreasing SB simultaneously while increasing health knowledge outcomes. Based on eligibility criteria for adolescents exceeding ST recommendations, with low PA engagement or at risk for obesity, the studies aimed to assess the effect of the intervention on adolescents' television time, videogame time, computer time, and total ST and/or changes in MVPA, energy balance-related behaviours (EBRBs), (PA, SB, diet/nutrition), and other physical measures [i.e., body mass index (BMI), waist circumference (WC)] or fruit and vegetable intake. Objectives were further developed and informed in three studies (Andrade et al., 2015; Hankonen et al., 2016, 2017; Vik et al., 2015) by systematic literature reviews, previous quantitative study findings in their respective cohorts, qualitative/stakeholder views (focus groups), and the application of evidence-based behaviour change protocols or theory-driven applications (e.g., increasing motivation, intention to change).

3.3.2 Methodological quality/assessment of risk of bias

In terms of methodological quality, all studies indicated adequate designs, with exclusion criteria, and sample sizes determined by power calculations for adequacy. All studies presented high risk of bias in one or two domains, with an overall medium to high methodological quality. To account for the quality of risk of bias assessment and reporting, eight studies utilized the Consolidated Standards of Reporting Trials (CONSORT; Campbell et al., 2004) to ensure comprehensive reporting. More specifically, the studies provided descriptions of the blinding procedures for participants and assessors and for the methods of randomization (i.e., use of computerized random number generator) to assign control and intervention groups, allocation concealment procedures for student recruitment with pairing to avoid baseline differences, and attrition rates across intervention periods. Outcome data were reported per assessment period and as overall intervention effects (in Table 3.2). However, the samples were not representative in terms of gender, socio-economic status, and general education: for gender (Bagherniya et al., 2018; Leme et al., 2016; Smith, Morgan, Plotnikoff, Dally, Salmon, Okely, Finn, & Lubans, 2014); low socio-economic family status (Andrade et al., 2015; Babic et al., 2015; Leme & Philippi, 2015; Singh et al., 2009; J. J. Smith, Morgan, Plotnikoff, Dally, Salmon, Okely, Finn, Babic, et al., 2014; J. J. Smith, Morgan, Plotnikoff, Dally, Salmon, Okely, Finn, & Lubans, 2014), use of a vocational school, not representing general secondary education (Hankonen et al., 2016, 2017; Singh et al., 2009); use of Catholic schools only (Babic et al., 2015), and potential biased parental involvement due to their children's participation status and lower socio-economic status that has been found to be a predictor of heavier recreational ST use (Babic et al., 2015). posing a threat to ecological validity, with the exception of Vik and colleagues' (2015) international study with a large cohort. There was no reference to attribution of intervention components to outcomes or of identification of the most effective behaviour change mechanisms, with the exception of Hankonen and colleagues (2016) study that identified behaviour change techniques with higher uptake than others. However, studies included process evaluations at post-intervention to assess strategies and methodological shortcomings. Self-report measures for ST were utilized in all studies that present social desirability and recall biases. In Filho et al.'s study (2018), no blinding procedures of participants were reported

with potential contamination of the subjective outcome measures (Page & Persch, 2013). Self-selection bias was reported in Singh et al.'s study (2009) and lack of randomization in Wadolowska and colleagues' study (2019).

3.3.3 Outcomes and assessment

Primary outcomes for the studies were MVPA, PA and related physical outcomes, and recreational ST, with various activities specified within the construct (i.e., video game playing, TV viewing and limits, and ST recommendations). Other outcomes assessed in the studies were combinations of psychological, physical, dietary consumption-related, and home rule-setting: body fat percentage, psychological distress, pathological video game use, aggression, psychological wellbeing, physical self-concept and PA, household ST rules; fruit and sugar-sweetened beverage consumption, nutrition knowledge, attitudes, dietary behaviours and lifestyle choices; muscular fitness, resistance training skill competency, body mass index (BMI) and waist circumference (WC); daytime sleepiness; psychological outcomes (i.e., self-efficacy, intention, and subjective wellbeing), and hypothesized mediators were examined for their impact on the assessed behaviours: motivation to limit recreational ST, in school sport, psychological needs satisfaction, and PA behavioural strategies.

To evaluate the ST effects of the intervention, a variety of quantitative measures including self-report and objective (accelerometer-based) measures were employed (outlined in Table 1). Tools used assessed: recreational ST, pathological video gaming, ST rules within the family home, ST of TV/DVD and computer/games playing and breaks per hour sitting at school and at home, number of hours spent on TV watching, videogames playing and computer use during a usual weekday and during the weekend, and total amount of ST on weekdays and on a weekend day, media multi-tasking, multiple screen devices used for recreational purposes and proportion of adolescents exceeding the daily recommendation on weekdays and weekends. Feasibility and acceptability of the intervention were the outcome measures for the feasibility study by Hankonen and colleagues (2017). PA was measured with accelerometers across all studies in activities (except from water sports in the main), and during sleep time for seven consecutive days. These have been found to provide a reliable estimate of PA with potential higher compliance (Babic et al., 2015). Additionally, weight, height, BMI measures, and BMI-z scores were calculated in studies in order to assess differences post-intervention. Process evaluation was part of the assessment procedures for five interventions and was conducted by direct observation, focus group discussions or questionnaires, student retention, adherence, feasibility, satisfaction data, and identification of successful intervention components.

3.3.4 Intervention components/strategies/mode of delivery

Twelve studies employed strategies grounded in behaviour change with the use of hypothesized intrapersonal, interpersonal and environmental mediators, providing a structured framework for an objective assessment of intervention effectiveness. Social cognitive theory (SCT) (Bandura, 1986), self-determination theory (SDT) (Deci & Ryan, 1985), and motivational and self-regulatory theories (Carver & Sheier, 1982; Deci

& Ryan, 2000; McEachan et al., 2011) were the theoretical frameworks of choice, as is frequently encountered in the PA interventions literature (Bagherniya et al., 2018). Two of the studies (Babic et al., 2015; Hankonen et al., 2016, 2017) utilized the Behaviour Change Technique Taxonomy (BCT) (Michie et al., 2013) and Wadolowska and colleagues used the integrated theory of health behaviour change (P. Ryan, 2009). A detailed account of the behaviour change techniques (BCTs) and the accompanying mediating strategies are presented in Table 2. A BCT is defined as “an observable, replicable, and irreducible component of an intervention designed to alter or redirect causal processes that regulate behaviour; that is, a technique is proposed to be an ‘active ingredient’ (e.g. feedback, self-monitoring and reinforcement)” (Michie et al., 2013, p.82). In Hankonen and colleagues’ study (2017), BCTs were combined with the new guidelines by the UK Medical Research Council for developing and evaluating interventions (Danner et al., 2008), and empowerment educational approaches (Ruiter et al., 2013) were utilised in two studies (Cui et al., 2012; Foley et al., 2017). Other studies (Andrade et al., 2015) were based on behaviour change protocols, such as Intervention Mapping (IM) (Bartholomew et al., 2016), and the Comprehensive Participatory Planning and Evaluation approach (CPPE) (Lefevre et al., 2001). The IM protocol (Bartholomew et al., 2016) provides a theory and evidence-based methodology to building effective health promotion interventions and prevention initiatives across stages of planning, implementation and evaluation, following a systematic procedure of behaviour change processes (Ruiter et al., 2013). The CPPE (Lefevre et al., 2001) refers to an approach involving community participation and empowerment in the engagement of significant stakeholders in the planning and evaluation of health initiatives. Additionally, two studies embraced whole school health promotion approaches in addition to theoretical frameworks (Barbosa Filho et al., 2015; Foley et al., 2017). Social marketing principles were utilized by Tarro and colleagues (2019) based on segmentation, insight, youth engagement, and a mix of communication methods to convey lifestyle messages.

Ten studies comprised of a synergy of individual-based strategies (i.e., educational package, key messages regarding PA and ST behaviour delivered via textbook curriculum) and environmental strategies (i.e., modifications in the school environment, and parental workshops) (Cui et al., 2012; Hankonen et al., 2016, 2017), for the delivery of health information (Cui et al., 2012). Strategies also involved psychological and cognitive mechanisms of behaviour change and other potential mediators: motivation to reduce ST and engage in school sport, parental mediation, ST rules, PA, psychological needs satisfaction, motivation to limit ST, ST rules, and PA behavioural strategies accompanied by muscular fitness enhancement.

An innovative intervention component in the study by Smith and colleagues (2014) was the development of a smartphone application that provided fitness and ST measurements: (i) PA monitoring through recording daily step counts from pedometers; (ii) recording and review of fitness challenge results; (iii) peer assessment of resistance training skill competency; (iv) goal setting for ST and PA; and (v) tailored motivational messaging. Other strategies were enhanced school sport sessions, lunchtime leadership sessions, parent/caregiver strategies, and assessing behaviour change via specific psychological and cognitive mediators. Eight studies employed a combination of self-monitoring, knowledge, self-efficacy and intention enhancement.

3.3.5 Effectiveness

The included interventions reported a mix of results, from small, yet significant, effects in four studies (detailed results are presented in Table 1), to mixed effects in eight studies – reporting effectiveness in specific time-points during or post-intervention or effects in specific segments of the target group (Andrade et al., 2015; Barbosa Filho et al., 2019; Foley et al., 2017) to three reporting no intervention effects for ST at any time points. More specifically, Vik et al. (2015) reported a school-based, family-engaged intervention aimed at reducing sedentary behaviour and involved 3,147 adolescents from five European countries. No significant intervention effects were observed, neither for self-reported TV/DVD or computer/game console time, nor for objective total sedentary time and number of breaks in sitting time. However, positive effects for self-reported attitude (beliefs and preferences) were reported, showing a positive shift in relation to introducing breaks in sitting down times. Similarly, no significant difference in ST was observed in the period post nine months in Wadolowska et al.’s study (2019).

Andrade et al. (2015) conducted and evaluated a school-based health promotion intervention on screen-time behaviour among 12- to 15-year-old adolescents. In the first stage of the intervention, the intervention group presented with a lower increase in television-time on a week and weekend day than the control group, and in total screen-time on a weekday, compared to the control group. Contrary, in the second part of the intervention that involved only PA strategies (e.g., healthy dieting, and PA), reductions in ST were not maintained. During this phase, screen use increased (Andrade et al., 2015). Peer-led education in Cui and colleagues’ study (2017) appeared to be a promising strategy with positive results in the reduction of SBs. No differences were observed for time spent on SBs initially at three months. At seven months, a significant reduction was observed in total SBs of 20 minutes per day in the intervention group, mainly attributed to a decrease in computer use in the intervention group of 14 minutes per day (for weekdays). There was a non-significant difference in total SBs by 22 minutes per day for time spent on other SBs, including television and DVD, video game, extracurricular reading, writing, drawing and listening to music, passive commuting and sitting to talk. However, the intervention was tested across two schools on each arm (intervention-control) only, with potential confounding factors limiting the generalizability of results.

The feasibility study of Hankonen and colleagues (2017) had high acceptability rates, and feasibility for data collection with increased use of BCTs (Michie et al., 2013) that correlated with PA measures, showing criterion validity. However, uptake of BCTs, despite the acceptability of the intervention, was considered moderate and BCTs related to motivation (self-monitoring) were found to be used more often than BCTs involving self-regulation (coping planning, and graded tasks), identifying a gap between perception and action. Teacher and student evaluations were positive for the increase of sitting reduction strategies in the classroom.

3.4 Discussion

The study of Smith and colleagues (2014) exhibited only significant intervention effects for ST, with

an approximate 30-minute reduction per day for recreational screen use, but not for the other intervention targets (body composition, and PA). The opposite was found in Manjumdar et al.'s study (2019), with significant effects for the other intervention objectives (sweetened beverages and snacks) and no changes for ST. Positive intervention effects with increased percentages in those meeting daily recommendations for duration of watching TV and computer use, was found in the studies by Filho et al. (2019), Tarro et al. (2019). The Singh et al. (2009) study reported ST reduction for boys 20-months post intervention.

Sedentary behaviour and screen-based activities are potential determinants of obesity (Phan et al., 2019). Research in this field is expanding along with a demand for impactful interventions that contribute to public health improvement (Vik et al., 2015). The present systematic review critically summarized the evidence for the effectiveness of school-based intervention strategies that targeted reduction of ST in adolescents in addition to time spent watching TV. A total of 30 papers analysing 15 intervention studies were identified that met the inclusion criteria, signalling a relative scarcity of interventions targeting adolescents and assessing ST use within SBs/PA/obesity studies, in line with previous review findings and despite evidence suggesting a need for differential treatment for PA and ST (Babic et al., 2015; Hynynen et al., 2016; Mark & Janssen, 2008; Sedentary Behaviour Research Network, 2012). Studies presented evidence-based designs, with four studies demonstrating effectiveness, eight partial effectiveness, and three no effectiveness in achieving the expected outcomes of ST or maintaining the effects, raising issues for the challenges and the long-term impact of these interventions (Huffman & Szafron, 2017).

There are many potential explanations for the partial effectiveness in the findings. The first concerns the heterogeneity of online activities within the construct of ST, because reduction in one activity but not in others suggests that specific intervention strategies were not effective for some behaviours, in line with previous research (Hynynen et al., 2016; Tremblay et al., 2011). Second, this could reflect a potential inadequacy of the interventions alone to sufficiently challenge long-held habits and lead to behaviour change. It has been claimed that where screen behaviours are habitual, these are inherently more difficult to change and when they involve simpler actions, require constant targeting to produce effects (Bayer & LaRose, 2018). Third, effectiveness and long-term sustainability of results may be impeded by the choice of reduction only in time spent on media, as a main outcome variable in these interventions. Additionally, it is increasingly recognized that PA interventions should target screen-based activities concurrently in order to limit SBs amongst children and adolescents (Chen et al., 2018). However, ST has not been sufficiently studied and operationalized to date and the evidence base for its determinants, correlates, and interventions is weak in determining the optimal mix of strategies to curb this behaviour.

The first limitation has to do with the operational definition of ST as a construct, because it only focuses on the manifestation of the problem – the excessive amount of *time* that the adolescent devotes to the activity – and does not account for the specific content consumed or activity engaged in and lacks specificity (Hietajarvi et al., 2019; Nie et al., 2002). Gaming and social media share commonalities, but also present significant differences (i.e., key motivations, correlates, structural characteristics, risk factors, and clinical image) (Kuss &

Billieux, 2017; Marshall et al., 2006). Equally, SBs include both an array of passive (TV viewing) and more active behaviours (i.e., computer games), because adolescents may seek out more sensation-rich and arousing experiences to fuel the increased risk taking and novelty seeking needs of adolescence (Kuss & Billieux, 2017) and more socially-driven behaviours responding to peer culture (i.e., engagement in social media) (Garcia et al., 2017). Evidence has supported that *context* (where, how, when, impacts), *content* (what is accessed or used), and *relationship formation* (i.e., type and quality) may be more critical factors than *time* (Griffiths & Szabo, 2014; Livingstone & Helsper, 2008). These factors were not addressed within the reviewed interventions. Contrary, the focus was on behaviour change and the hypothesized mediators relating to motivation, self-regulation, and intention to change the behaviour.

Second, reduction objectives may be conflicting with adolescent developmental needs and milestones (i.e., for autonomy and interpersonal communication) that have been found to be facilitated by the online environment (Borca et al., 2015). The developmental trajectory from early childhood to late adolescence demonstrates a decline in PA (Dumith et al., 2011) and an increase in recreational screen behaviours in the transition from early to mid-adolescence (Hardy et al., 2007; Raudsepp, 2016; Todd et al., 2015) and spending increasingly unsupervised time at home (Vik et al., 2015). As a result and due to the lengthy follow-up assessment periods of these interventions (few lasted more than two years), ST reduction objectives are potentially not being met, because during this period, adolescents are known to increase their ST addressing a normative need. Unlike other mental health issues (i.e., in suicide or eating disorders) where the health outcomes can be detrimental or even life-threatening for the adolescent, gaming or internet use is not perceived as inherently harmful and is an enjoyable activity. Perceived enjoyment is amplified by the context-specific characteristics (i.e., in games: discovery/novelty, levelling up, wealth acquisition, formation of gamer social groups; in social media: the 'likes', nomophobia, FOMO. etc.) that tap into powerful key motivations, reinforcing the salience and maintenance of the behaviours (Hussain et al., 2015; King et al., 2018; Kuss et al., 2012; Kuss & Griffiths, 2011a, 2017).

Similarly, assessing sedentary vs. non-sedentary time does not account for content, activity engaged in, or level of intensity of use. Studies followed the principle of triangulation (Adams et al., 2015) with objective and subjective outcome evaluation and process evaluation measures. However, self-report assessment tools used result in underreporting of time spent online also failing to account for differences in the content or context of adolescent engagement (Katapally & Chu, 2019). Additionally, objective measures only provide an accurate measurement of sedentariness and PA, but do not report how this sedentary time is distributed (Sigerson & Cheng, 2018), leading to an incomplete assessment of these diverse activities. Potentially, other methods should complement interventions to provide more accuracy and specificity, similar to the use of experience sampling in time-use research or the use of instant emotion detection sensors (Kanjo et al., 2017; Sonnenberg et al., 2012; Twenge & Park, 2017). The incorporation of push prompt messages used were evaluated via a smartphone application only in the study of Smith and colleagues (2015) and were considered a positive strategy to reduce ST in adolescents. These types of data can act as a self-monitoring tool, providing some feedback and offering a degree of control over the behaviour, serving two functions: that of assessment and of an intervention

component. Lessons can be learned from gambling research, where behavioural tracking data have been used to capture actual and real time behaviours (Griffiths & Whitty, 2010) and to evaluate the degree of responsiveness to personalized behavioural feedback, that has been found to lead to reduced gambling activity (Auer & Griffiths, 2015).

Reduction objectives may also potentially be perceived by adolescents as an external regulation that compromises their gradual autonomy, afforded by electronic media that provide them with opportunities for recreation, socialization, validation, and achievement (Boyd, 2014; Livingstone, 2008; Loos et al., 2012). However, three studies (Andrade et al., 2015; Hankonen et al., 2016, 2017; Vik et al., 2015) assessed needs and stakeholder perspectives (i.e., students and parents) to inform the development of the respective interventions – a critical step in ST intervention development (Kidd et al., 2003; Kok et al., 2017; Prochaska et al., 1992; Rodda et al., 2018). BCTs were then used to link determinants to intervention components. However, tailoring BCTs (i.e., “goal-setting”, “self-monitoring”, and “thinking about one’s own motives”) is crucial not only at intervention level, but also at activity level (Schaalma & Kok, 2009), justifying BCT use and testing their uptake and effectiveness prior to a full extent trial (Altenburg et al., 2016; Greaves, 2015). Hankonen and colleagues (2017) followed this approach and identified the most effective BCTs for participants in their feasibility study in order to optimize intervention content, a factor that enhances further the evaluative intervention process (Greaves, 2015; Pesseau et al., 2015). With the exception of this study, there was no reference to attribution of intervention components to outcomes or of identification of the most effective behaviour change mechanisms, which was also reported by the studies as a limitation. This appeared to be a common methodological weakness underpinning all interventions examined in the present review which was partially addressed in process evaluations to assess the methodological shortcomings. Additionally, health knowledge dissemination – a long-held strategy employed in health interventions – appears to be a weak strategy to achieve ST reduction objectives and needs to be reconceptualized given the positive and functional aspects of online engagement (Lafrenière et al., 2013).

All studies presented high risk of bias in one or two domains. However, most studies were of overall medium to high methodological quality. To account for the quality of risk of bias assessment and reporting, studies utilized internationally recognized standards of reporting trials (i.e., the CONSORT statement [Campbell et al., 2004]) to ensure comprehensive reporting and the majority were prospectively registered clinical trials, following stringent guidelines as to risk of bias assessment. Self-report measures for ST were utilized in all studies that present social desirability and recall biases. Additionally, representativeness was not assumed in the majority of studies (with sample size, geographic, socio-economic or gender-specific restrictions), limiting further the generalizability of the results, with the exception of Vik and colleagues’ study (2015) which was an international study with a large cohort.

Finally, the studies reviewed stressed the association of potential physical risks, neglecting significant research conducted on psychosocial impacts of online use. Following evidence concerning the increase in prevalence of problematic/addictive use (Kuss et al., 2014), an interdisciplinary integration of research evidence

(Colder Carras et al., 2017; Tremblay et al., 2011) is required. This should examine (i) the way these separate activities interact (Presseau et al., 2015), (ii) the way they contribute uniquely to the physical and psycho-emotional impacts experienced by adolescents, (iii) understand the motivations that potentially lead to an increase of sedentary lifestyles (Griffiths, 2010b), (iv) apply longitudinal research and updated assessment tools per activity (Altenburg et al., 2016; Brug et al., 2010), (v) assess the contribution of the different intervention components in effecting change (Smith et al., 2014), and targeting attitude and breaking habit strength (Chinapaw et al., 2008), and (vi) reflect on normative developmental tasks facilitated by online affordances (Huffman & Szafron, 2017). Primarily, the construct of ST requires re-definition because the time investment refers and addresses only part of the problematic use involved in obesity and other non-communicable diseases, which in order to address effectively in interventions needs to target the content, the context, the motivations driving excessive involvement, and the provision of alternative screen-free sources of satisfaction holistically (Griffiths et al., 2018; Throuvala et al., 2019b; Throuvala, Chourmouzoglou et al., 2018).

Additionally, it appears that school-based interventions require a more systematic implementation with follow-up periods or an integration into the school programme to achieve long-term effectiveness (Nie, Hilygus, & Erbring, 2002). Targeting specific behaviours with the involvement of family and friends/peers has been found to aid reduction of ST levels (Biddle et al., 2014; Garcia et al., 2019) with evidence-based parental mediation (Bleckmann & Mößle, 2014; Livingstone & Helsper, 2008) and was emphasized in the studies examined. The role of gender and SES is another aspect that requires further investigation, because it appeared that a differentiation based on these factors is critical for the success of such interventions (Dong et al., 2018; Leme & Philippi, 2015; Milani et al., 2018; Smith et al., 2014).

A major limitation of this review was the relatively small number of studies (compared to the wealth of interventions addressing obesity/PA prevention, which do not cover ST as part of the SBs) meeting the inclusion criteria, and the heterogeneity in the type of studies, assessment periods, and outcomes reported in the studies that did not allow for a direct comparison between the intervention effects. Additionally, the lack of longitudinal data does not allow the drawing of conclusions with regards to the longer-term maintenance of the effects. In Andrade et al.'s study (2015), ST reduction was not maintained in the absence of the intervention component targeting ST exclusively. This suggests that these habitual behaviours need to be further investigated in terms of how they interact within the mix of SBs, and to determine how and under which conditions an adolescent engages in excessive use. Addressing the specific activities differentially, their structural characteristics and the social processes that determine them, supported by whole school approaches and regular booster sessions within the school curriculum (and not as one-off interventions) may be conducive to achieving ST outcomes.

Overall, the present systematic review highlights a scarcity of adolescent ST interventions that target online activities and suggests a pressing need to reconceptualise adolescent ST health promotion in future prevention designs (Morton et al., 2017). The acquisition of a developmental and ecological approach addressing psychosocial and maturational processes and mediators (Hesketh et al., 2017; Smith et al., 2017)

and communication challenges arising from use can potentially address the correlates and lead to higher adolescent commitment to calls for behavioural change (Brug et al., 2010).

3.5 Conclusion

SBs are implicated in a variety of serious physical health problems – primarily in the context of obesity – and psychopathological conditions. Given the increasing prevalence of severe obesity and time spent gaming (Phan et al., 2019), and the increasing recognition of the role of screen based activities as a major contributor to the obesity epidemic (Sánchez-Oliva et al., 2018; Tang et al., 2018), the need to address prevention measures and evaluate the efficacy of respective interventions is timely. The purpose of the present review was to identify interventions on screen-based SBs and to elucidate the role of recreational screen behaviours and the way these are targeted within the interventions. The review highlights that the mix of ST behaviours has changed, yet interventions have not yet effectively accounted for this change in terms of definition, objective-setting, assessment, and intervention components that target these behaviours differentially. In addition, sustainable ST reduction can only be achieved by addressing the variables associated with excessive use, the content, context, and motivations underlying excessive involvement at the expense of other recreational alternatives. Partial effectiveness in the reviewed studies with no sustainable findings could reflect, among other factors, the potential failure to understand and embed the adolescent perspective that is facilitated by the online environment or the setting of appropriate goals in the interventions.

There is a pressing need for more integrated, health promoting prevention programmes in school environments and targeting of problematic/excessive use, differentiating between content and activity rather than just frequency of ST being a primary or secondary intervention outcome in obesity, PA, and/or ST school-based programmes. Intervention effectiveness research can provide evidence on best practices that can be used by policymakers to develop guidelines for schools, parents and practitioners for dealing with digital technologies, and the competing online activities that contribute to sedentary lifestyles and pose health risks for adolescents. These guidelines should be integrated in school settings and complement school-based initiatives. The design of more effective interventions can in turn help target key health epidemics related to these behaviours, such as obesity or physical inactivity related to multiple health risks. The following chapter discusses research methodological choices of the present thesis.

Chapter 4. Thesis Methodology

4.1 Introduction

This chapter provides an evaluation of the research methodology used in the studies comprising this thesis. Given the purpose of this research was to generate information on a previously unexplored issue, namely the conceptualization of online harms and recommendations to combat these harms, qualitative methodology was considered most appropriate. The first half of the thesis comprises of four qualitative studies across various stakeholders (i.e., student, parent, teacher and experts) and is followed by two quantitative studies, a psychometric study and a randomized controlled trial. Therefore, the thesis employed a mixed methods to answer the respective research questions and provide a more comprehensive investigation of psychological phenomena. Use of mixed methodology allowed an exploratory investigation of student, parental, teacher and expert views and concerns about screen time with a primary focus on social media and gaming. Stakeholder engagement (Vallentin-Holbeck et al., 2020) is considered critical across all stages of research initiatives and in assessing the efficacy of interventions (Morton et al., 2017; Rogers et al., 2017)

The present chapter will address the research questions and how these will be answered using a mixed methods approach and will offer general and study-specific justification for the methodological choices in each study. Additionally, it will analyse the epistemological position underpinning the research studies.

4.1.1 Thesis research questions

The following research questions were developed:

- What are the key uses and motivations for screen time in adolescence?
- What are the perceived challenges and potential online harms that adolescents are facing, what is a key area of concern and what are key recommendations for school-based prevention as conceptualized by students, parents and teachers?
- What is smartphone distraction and how can it be measured in a psychometric tool?
- What are the psychometric properties of a new instrument developed to assess smartphone distraction in a UK sample of young adults?
- To what extent does an online intervention utilising mindfulness, self-monitoring and mood tracking reduce smartphone distraction in young people?

The initial investigation utilised focus groups with adolescents and interviews with parents and teachers in the UK. The qualitative studies highlighted online distraction as a major concern for young people. Following this and given the absence of a psychometric instrument to measure distraction, a scale was developed and tested for its psychometric properties. To answer the final research question, an experimental intervention in the form of a feasibility online randomized controlled study was conducted to assess its effectiveness in

combating smartphone distraction in young adults. A mixed methods design was employed to facilitate the investigation of these multifaceted research questions and to provide breadth and depth to the key research asks. Therefore, an overview of the various methodologies utilized by the studies in this thesis are presented below.

4.2 Methodologies and Epistemological framework

Research methodology refers to the scientific approach, design, method and procedure used in an investigation (Keeves, 1997). It mainly defines how to formulate a research objective, obtain the results and analyse a research study and is driven by the underpinning epistemological stance (Bryman, 2008) or paradigm. Paradigms are overarching philosophical systems (Gupa & Lincoln, 1994). Epistemology defines the kind or the nature of knowledge, its sources and its limits (Crotty, 1998). In social sciences there are two prevailing epistemological positions: ‘Positivism’ is mainly the paradigm of choice for quantitative research studies and ‘Interpretivism’ for qualitative research studies (Howe, 1992). Other scholars argue that despite the different epistemological positions of the two approaches these could be viewed as a continuum rather than as a dichotomy with their use being sequential – one providing the foundational points followed by the other (Newman & Benz, 1998). A critical realist epistemological framework was utilised in the understanding and methodological approach of the studies in the present thesis.

Critical realism (CR) is an epistemological paradigm between interpretivism (focus on hermeneutics) and positivism (law-governed realities), claiming an independent reality, however with no absolute knowledge of it (Archer et al., 2020). This realist philosophical perspective combines a realist ontology (the belief that social phenomena exist independent of the researchers’ reality) with a constructivist epistemology, claiming pre-existing knowledge defined by subjective views (Maxwell, 2012). Therefore, no ‘objective’ account exists and knowledge is partial and fallible and theory-laden and therefore more than one methodology can conceptually derive to reality and explain the implications of phenomena and the ways these are understood. This paradigm guides research which acknowledges participants’ personal accounts and perceptions which are interpreted and understood within the individual’s personal and social context (Scott, 2005).

4.2.1 Quantitative research

Quantitative research refers to the empirical or statistical understanding of data to derive knowledge (Morgan, 2013). This type of research is determined mainly by a positivist epistemology providing objective measurement to derive at general laws governing phenomena and an explanatory framework or theory development (Bryman, 2008). Thus, quantitative research approaches knowledge in an objective and deductive manner with the use of predetermined designs of how data will be collected and analysed and aims to test, validate or explain causes to effects (Tariq & Woodman, 2013). Therefore, standardized ways of data collection are used in order to generalize the findings and to be feasible to be replicated by other researchers (Howitt & Cramer, 2017). Quantitative research aims to replicate, establish, validate, predict or explain relationships

between variables through the elimination of biases and confounding variables, contributing to theory development or application across settings (Howitt & Cramer, 2017).

4.2.2 Qualitative research

Qualitative research can help understand how and why behaviours occur and understand the meaning individuals ascribe to their experiences or to a social or individual problem (Howitt & Cramer, 2017). This method is used primarily to develop a deep understanding of complex psychological phenomena and is very useful when there is ambiguity regarding the research questions (Patton, 2002) and when there is lack of research in an area (Howitt & Cramer, 2017). Qualitative research is typically inductive, building from particulars to themes, flexible in its formation, accounting for the complexity of the situation or the context (Newman & Benz, 1998). It is also widely used when there is lack of clarity regarding an issue or when there is little or no knowledge into a topic. Qualitative research aims to provide an in-depth exploration of views, experiences and concepts, capture meanings and understand perspectives but can also aim to generate theory (Willig, 2013). To do so, researchers can be active agents in the analytical process by applying reflection and reflexivity in qualitative research (Attia & Edge, 2017).

Qualitative methods of data collection were chosen for the purposes of the present thesis to account for the multiple contextual and subjective perspectives (Morgan, 2013) explore the perceptions of key stakeholders regarding online harms and to suggest recommendations. The present thesis utilised focus groups and in-depth interviews for data collection. Although generalizability may not be possible with qualitative data, it has been considered a misconception that qualitative data cannot inform public policy: first, this is because it is misperceived that transferability (findings channelled to similar settings or contexts) is not equated to generalizability and may establish a level of similarity and second, because the researcher can ensure a precise outline of the conditions (Harper & Kuh, 2007).

4.2.3 Mixed methods: Combining qualitative and quantitative approaches

Utilising both qualitative and quantitative methods has been acknowledged as capitalizing on the strengths of each approach while minimizing their limitations and this can be conducted at various stages of the research process (Coyle & Williams, 2000). Mixed methods in a research study may be combined to highlight different aspects of the research project and provide findings from different types of data (Hanson et al., 2005). When one approach cannot fully address the research questions and there is a need for additional exploration of the topic then mixed methods are considered an optimal option for researchers (Wisdom & Creswell, 2013). Using mixed methods research (Greene et al., 1989) also offers possibilities for triangulation (providing greater scope, consistency and depth to the results), complementarity (i.e., furthering knowledge), initiation (i.e., spotting false assumptions and inconsistencies which may lead to altering the research asks), development (i.e., one approach informing the development of another); and (v) expansion (i.e., broadening and diversifying the scope of the research) (Punch, 1998). There are two critical choices for the mixed methods approach: (i) concurrent or sequential (for data collection purposes) (ii) the method having the dominant position (qualitative

or quantitative) in the study (Johnson & Onwuegbuzie, 2004; Morgan, 1998). The present thesis followed a mixed method research design within a sequential approach (the qualitative data collection proceeded the quantitative): understanding perceptions around online use for adolescents and online harms and how these are conceptualized across stakeholder groups and identifying a common concern, informed the latter quantitative studies.

4.2.4 Triangulation

One aspect that was critical in this thesis was triangulation, which involves a combination of different methods as a way to validate results, increasing the scope and the depth of the findings (Flick, 2002). Triangulation is used where data are collected from more than one data source to strengthen the external validity of the study (Greene et al., 1989) by allowing the exploration of a social phenomenon across different groups to reinforce the trustworthiness of data (Fusch, 2018). External validity is defined by the degree of generalisability of the findings to other studies independent of population used, timing or settings (Bekhet & Zauszniewski, 2012). For the purposes of this thesis triangulation took part with the recruitment of multiple informants (i.e. adolescent students, parents and teachers) to explore concerns and recommendations from different perspectives (Adams et al., 2015a) and to identify a critical concern to address with the design of an intervention and testing its efficacy.

4.3 Methods of qualitative research

4.3.1 Methods of data collection

4.3.1.2 Focus groups

Focus groups are guided discussions to a purposefully selected group facilitated by the researcher addressing questions to elicit responses as a way of understanding of social issues (Oates, 2000). Group interaction is the most significant feature of focus groups and through group discussion and ensuing dynamics, it generates insights on the topic in question (Morgan, 2012), differentiating it from other qualitative research methods (Shamdasani & Stewart, 2014). Focus groups are primarily used in exploratory research, in early stages of a research study to identify the critical aspects to be further studied and in gaining insight into how the stakeholders view the problem or the setting or to complement quantitative findings (Bryman, 2008; Tariq & Woodman, 2013) usually based on a semi-structured guide (Sagoe, 2012). In assessing how many focus groups are sufficient to be conducted to generate an adequate range and depth of data, it has been proposed to recruit until ‘saturation’ is reached (the point where no new ideas or insights are generated) (Guest et al., 2006). Various recommendations have been made of how to conduct effective focus group research (Krueger & Casey, 2015; Sagoe, 2012) including: a carefully chosen purposive sample, conducting focus groups until no further insights about the topic emerge, the specificity of the topic and a clear focus on participants’ perceptions and attitudes (Harper & Kuh, 2007; Krueger & Casey, 2015; Morgan, 2019).

4.3.1.3 In-depth Interviews

Interviews with an unstructured, semi-structured or focused nature, form a typical qualitative method controlled by the researcher with the aim to gather in-depth information (Jamshed, 2014). Interviews vary in type and structure according to their epistemological orientation with questions used to elicit an individual's views, attitudes or perceptions and evaluate the understanding of a phenomenon (Ryan et al., 2009). In depth interviews are more than a conversational interaction requiring knowledge and skill in handling rapport development, self-disclosure and difficult emotions and the interview process may be influenced by level of trust established with the participant (Dickson-Swift et al., 2016; Ryan et al., 2009). Guided by the research aims, questioning and listening skills, the establishment of rapport, the nature of the questions and other salient techniques are used to elicit rich and detailed information about the participant, however, interpretation is based partially on the researchers' meaning making (Ryan et al., 2009; Serry & Liamputtong, 2013).

Focus groups and interviews were conducted to address the gap in the knowledge of online harms and the potential recommendations from key stakeholder groups. The results of the focus groups findings would identify a primary area of concern across stakeholder groups and inform the aims and hypotheses of the quantitative research to follow.

4.3.2 Methods of data analysis

Thematic analysis is amongst the most widely used methods to conduct a qualitative analysis (Howitt & Cramer, 2017). The qualitative studies in the present thesis used thematic analysis and grounded theory as methods of qualitative analysis.

4.3.2.1 Thematic analysis

Thematic analysis (TA) is a theoretically flexible qualitative method used to identify, analyse and interpret patterns of meaning leading to the development of key common themes (Braun & Clarke, 2006). It is a useful method to explore different participant perspectives or to decipher newly emergent issues and may provide rich and complex insights (Braun & Clarke, 2018). TA's flexibility allows for an application across epistemological approaches (Braun & Clarke, 2006) whether essentialist/realist (claiming an uncomplicated viewpoint to discourse and experience) or constructionist, which argues for a human exchange that is socially determined and co-produced (Burr, 1995). However, it is not necessary to have any preconceived ideas established from theories, frameworks or existing knowledge. Various approaches to thematic analysis (Alhojailan, 2012; Boyatzis, 1998; Javadi & Kurosh, 2016) have been proposed [i.e., with different strategies for theme generation (Guest et al., 2012)], however, for the analysis of the studies in the present thesis, the Braun and Clarke six-step framework was followed (Braun & Clarke, 2006; Clarke & Braun, 2013). This is the most widely used approach that provides a method of analysis rather than a methodology and is not tied to any epistemological or theoretical perspective (Nowell et al., 2017).

Braun and Clarke (2006) proposed six steps of thematic analysis to be followed: (i) familiarizing oneself with the data by transcribing, reviewing and annotating the data to reflect on initial ideas, (ii) generating initial codes, (iii) searching for broader level themes by sorting and grouping the codes, (iv) reviewing themes by cutting, collapsing, or breaking apart initial themes, (v) defining and naming themes by capturing the essence of what each theme is about, and (vi) producing the report with extracts embedded in an analytic narrative. Coding may involve transcription by different authors to support data analyses and triangulation (Maguire & Delahunt, 2017). This method of analysis allows for a reflexive approach, which acknowledges that themes do not passively emerge from the data; instead it is an active process of interpretation produced by the researcher reflecting and engaging with the analytical process (Braun et al., 2019). Specifically, data is analysed following a systematic process which leads to newly conceptualised findings (Bogdan & Biklen, 2007).

Qualitative analysis in the present thesis (Chapters 5,6,7,8,9) was based on semi-structured interviews and focus groups which allowed participant accounts and experiences to emerge (Vossler & Moller, 2019) allowing triangulation (Merriam & Tisdell, 2015). Interviews were first transcribed and then analysed using TA and Nvivo with the use of reflexive memos and analytic notes. Braun and Clarke (2006) make a distinction between the semantic and latent level of themes, and between a top-down vs. a bottom-up, more data-driven approach. Themes in the present thesis were developed at both a semantic level – analysing the content of the data on a surface level, looking at what the participants have explicitly mentioned - and a latent level – identifying and interpreting underlying ideas, assumptions and meanings within the data, allowing for a deeper understanding of the perceived relationships, with the final formulation of themes thus being at a latent level. Both of the analytical choices - (i) semantic and latent, and (ii) social constructivist epistemological (bottom-up) approaches - were justified in the individual studies' rationales. For example, in examining student motivations, following theme consolidation, a major motivational theme, '*Digital omnipresence related to need for control and loss of control*', appeared to be an underlying process across the themes identified (Chapter 3). This finding was supported and it was suggested how this may impact adolescents along with other inner control (FoMO, nomophobia, maintenance of snap streaks), social (social disinhibition effect) and environmentally-driven processes (push and pull design platform strategies)(Chapter 4).

To avoid duplication, the methods sections in the subsequent qualitative chapters will refer to this section of the thesis as this was a common methodological approach across all qualitative studies with the exception of the study in Chapter 6, where data were analyzed with Grounded Theory.

4.3.2.2 *Grounded theory*

Grounded theory provides a systematic protocol for data collection and analysis guided by inductively driven analysis of the social or psychological processes grounded in the data (Tweed & Charmaz, 2012). Unlike other methods grounded theory is primarily used to lead to fresh insights and develop theory (Glaser & Strauss, 2006). Main differences with other methods of data analysis include starting from the internal to understand participant actions and meanings, examining details of data to create the social scientific meaning rather than looking at the whole and then analysing its parts and aiming to move beyond description into constructing

theory (Charmaz, 2006; Oktay, 2012). Grounded theory is particularly useful to study processes and make underlying or invisible processes transparent (Charmaz, 2017), which was highly relevant to one of the studies of this thesis to assess the psychological uses and processes underlying social media interactions and the kind of impacts these experiences generated.

There are three prevailing traditions in grounded theory: the classic (Glaser & Strauss, 2006), Straus and Corbin's more structured approach (Strauss & Corbin, 1990) and the constructivist approach (Charmaz, 2017), which share common methodological techniques, but follow different philosophical underpinnings (Kenny & Fourie, 2015). According to the authors, these differ also on the coding procedures, on their divergent use of the literature and on its uses. Constructivist grounded theory (used in the current thesis) is differentiated from classic grounded theory in that instead of arguably following traditional positivism (following an objective reductionist approach to the data) or post-positivism (employing a critical realist perspective) (McCann & Clark, 2003), it employs an open-ended coding framework, use of the literature at every stage of the research process and the use of constructivism and symbolic interactionism as its underlying philosophy (Jeon, 2004; Kenny & Fourie, 2015). Symbolic interactionism is a philosophical viewpoint which explains how interaction amongst individuals and social behaviour has a subjective understanding and meaning through symbols (i.e., words, rules and roles) and language (Becker & McCall, 2009). The researcher therefore, observes how individuals make sense and interpret their individual experiences across a multiplicity of contexts (Aksan et al., 2009). Both data and the researcher interact in constructing the emerging theory, which in turn influences how the researcher interprets the data driven also by societal structures (Levers, 2013).

Grounded theory was a good fit for the construction of theory, and was utilized as a method in Chapter 6. Findings could not easily fit into pre-existing theories and the aim was to develop a comprehensive theory to that would provide an explanatory framework for the complex psychological and social processes that adolescents experience in their smartphone and social media use. Contrary, thematic analysis was deemed more appropriate as a methodology to explore motivations, harms, concerns and recommendations and provide some taxonomical system via the creation of meaningful categories.

4.5 Methods of quantitative research

Quantitative research aims to produce objective and generalizable findings and utilizes surveys (i.e., a data gathering method to collect, analyse and interpret information for descriptive or predictive purposes) and questionnaires (i.e., surveys that contain items examining the constructs of interest) (Goddard & Villanova, 2005), both of which were used in this research, as they allow for a large population of interest to be assessed in an inexpensive way (Jones et al., 2013). The present thesis utilised two main analytical methods of quantitative research, an experimental design in the form of an online randomised controlled trial and a cross-sectional or correlational design (Howitt & Crammer, 2016) with psychometric work undertaken for the development and validation of the first scale on smartphone distraction. Cross-sectional and correlational studies, refer to research that is non-experimental and involves the association between variables to investigate

associations between risk factors and the outcome of interest, or to find the prevalence of a social phenomenon, generate hypotheses for future research or implement an intervention (Howitt & Cramer, 2017).

4.5.1 Factor Analysis and Measurement Invariance

Factor analysis is an analytical method utilised in instrument development to reduce a large number of variables to its most critical and relevant factors (DeVellis, 2012) utilising either exploratory (EFA) (exploring the dimensionality of a construct) or confirmatory factor analysis (CFA) (a theory testing approach). In this study, both methods were performed in order to test the newly conceptualised construct, the SDS. CFA involves the analysis of covariance structures of a predefined set of observed variables, their underlying constructs and examining the degree of relationship amongst them analysed with structural equation modelling (SEM) (Schreiber et al., 2006). This thesis utilised EFA and CFA to identify a set of factors and define their interrelationship to measure the construct of SDS in a consistent manner.

4.5.2 Randomised controlled trial (RCT)

A randomised controlled trial (RCT) is an experimental study considered the gold standard in intervention effectiveness research (Cartwright, 2007) to assess the efficacy of a treatment to achieve a desired outcome (Connelly & Woolston, 2016). RCTs employ a deductive approach as should the assumptions of the test work, a positive outcome is associated with the intervention at hand, displaying high internal validity (Vader, 1998). RCTs have been employed to assess pharmacological effectiveness, psychotherapeutic effectiveness or the efficacy of psychosocial interventions aiming to reduce specific disorders/problems or to improve an aspect related to the disorder (e.g., improved quality of life) (Nezu & Nezu, 2015). For an effectiveness study to be characterized an RCT, it must involve a controlled manipulation (to assess difference in effects) of a variable and a random assignment of participants (Connelly & Woolston, 2016; Vader, 1998) to a control or an intervention group in order to assess intervention effects (NICE guidelines, 2020). Participants are randomly assigned in a given group (experimental or control group) using a randomised process (Connelly & Woolston, 2016). RCTs are increasingly used to assess the efficacy in psychosocial interventions (Michie & Abraham, 2004) and a new generation of pragmatic trials in routine mental health context has been proposed (Ruggeri et al., 2013).

4.6 The present sample

Students

Participants ($N = 42$) aged 12-16 years ($M = 13.5$ years, $SD = 2.3$) were sampled in collaboration with three local secondary schools in the East Midlands area of the UK, including a mix of an all-female school and two co-educational schools. Students were primarily white (63%), black (22%) and East Asian (15%), with an

almost even gender split (48/52 female/male) and from diverse socio-economic communities: upper socio-economic (20%), middle (54%), and lower (26%). This study targeted adolescents due to the: (i) high online usage this age group exhibits, and the vulnerability to peer evaluations and risk behaviours (Helms et al., 2014), (ii) heightened vulnerability to excessive online use, leading potentially leading to addictive symptoms (Kuss et al., 2013), and (iii) development of body-image concerns and an overemphasis on peer comparisons that may be associated with the development of eating disorders, obesity and dysfunctional exercise (Meier & Gray, 2014; Voelker et al., 2015).

Parents

Participants ($N = 9$), aged 39-53 years ($M_{\text{age}}=44.78$, $SD=5.04$), were parents of adolescent children selected in collaboration with three local secondary schools in the East Midlands area of the UK, including a mix of an all-female school and two co-educational schools. Participants were primarily white ($n=5$), black ($n=3$) and Asian ($n=1$), with a gender split (six females and three males) and from diverse socio-economic communities: upper socio-economic group ($n=4$), middle ($n=4$), and lower ($n=1$). This study targeted parents due to: (i) the need to identify parental concerns as a critical source of input regarding adolescent problems arising from use, (ii) a lack of studies reflecting the parental perspective of intervention needs for adolescents in relation to problems from online use, (iii) adolescents being a critical cohort due to their developmental stage, which presents with vulnerable online behaviors and a major influence from peers (Helms et al., 2014; Kuss, van Rooij, Shorter, Griffiths, & van de Mheen, 2013), and (iv) a growing need for family-based prevention strategies (Wu et al., 2016).

Teachers

Participants ($N = 9$), aged 29-52 years ($M_{\text{age}}=39.2$, $SD=7.74$), were teachers in UK secondary education (Year 8-12) of three local schools in the East Midlands area of the UK, including a mix of an all-female school and two co-educational schools. Participants were primarily white ($n=7$), black ($n=1$) and Asian ($n=1$), with a gender split (five females and four males) and from middle ($n=5$), and lower ($n=4$) socio-economic background. This study targeted teachers due to: (i) the need to identify teacher perspectives and concerns regarding online adolescent problems, (ii) a lack of studies reflecting teacher views for prevention purposes (Dennen et al., 2020) (iii) evidence of higher efficacy of intervention effects when teachers were greater teacher commitment was displayed (Orpinas & Home, 2004), (iv) a growing need for school-based prevention strategies (Throuvala et al., 2019a).

4.7 Conclusion

Research with the use of mixed methods provides a comprehensive investigation of a phenomenon or construct. Both methods complement each other offering an in-depth investigation to the research question. Qualitative methods were used to gain a deeper insight into perceptions of potential online harms and identify concerns and recommendations from a multiple stakeholder perspective. Quantitative methods followed the

qualitative investigation and enabled the testing of a construct which arose as a key concern among stakeholders. Both methods lead to stronger validity of outcomes.

4.8 Ethical considerations

Ethical approval was sought from Nottingham Trent University (NTU). Specifically, two ethics application forms were prepared and submitted to the NTU College of Business, Law and Social Sciences Research Ethics Committee (CREC) for ethical approval of the research studies proposed. The applications entailed all aspects of study design, implementation, data collection and analysis, as well as research-related ethical issues: study aims and objectives, protocol, procedure and materials, requirements for Data and Barring Service (DBS) check, issues relating to minors, anonymization and confidentiality, security and retention of research data, informed consent, risk of harm, capacity to give valid consent, voluntary recruitment of participants or any form of monetary compensation, online and internet research or any other ethical risks. Examples of participant information sheets and consent/debrief or opt-out forms were also provided as part of the application. Ethical approval was granted for all the present studies forming this thesis from the CREC: (No. 2017/109) for the qualitative research studies and for the second application (No. 2018/226) to the CREC on 12 November 2018 requesting ethical clearance for the quantitative studies (psychometric study and intervention study). Specific ethical procedures are addressed in the subsequent individual chapters. The most difficult ethical issue encountered pertained to schools promoting an opt-out option rather than active consent, which left them open to a potential influx of questions on behalf of the parents regarding the nature of this research. However, sufficient information was offered to the schools to share with the parent/teacher community regarding the nature of the research and the contact details of the researcher and supervisor to address any further queries.

The following five chapters examine: (i) key uses and adolescent motivations for social media use (Chapter 5) (ii) a theoretical model which emerged from the data (Chapter 6), (iii) impacts and potential harms encountered from engagement (Chapter 7), (iv) along with parents' and teachers' perceptions concerns and recommendations for school-based prevention (Chapter 8 & 9).

Part 2: Understanding underlying mechanisms of engagement and harms

Chapter 5. Motivational processes and dysfunctional mechanisms of social media use among adolescents: A qualitative focus group study

Throuvala, M.A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2019b). Motivational processes and dysfunctional mechanisms of social media use among adolescents: A qualitative focus group study. *Computers in Human Behavior*, 93, 164–175. <https://doi.org/10.1016/j.chb.2018.12.012>

5.1 Introduction

Generation Z (born between 1995-2012) and Generation Alpha (born between 2013-2025) are the first generations to become immersed in technologies with active engagement in the production of digital media content, especially since the introduction of smartphones (Bobkowski et al., 2016; Twenge et al., 2018). Social networking sites (SNSs) constitute a new social milieu for adolescents that provide numerous opportunities and ways for diverse interaction (Kuss & Griffiths, 2017). Smartphones have facilitated access to SNSs, which account for a large part of overall adolescent screen time. Recent data indicate that 95% of US adolescents (aged 13-17 years) have access to smartphones and more than half have access to a tablet, with 45% reporting access almost constantly, and 44% several times a day (Pew Research Center, 2018a). In the UK (where the present study was conducted), 83% of 12-15 year olds have their own smartphone, 99% go online daily, and 26% mainly use a smartphone to go online, while also reporting that this is the device they would miss the most out of all devices (Ofcom, 2017).

Social media use is a complementary and indispensable part of everyday adolescent life with an active engagement of versatile tools and applications, offering a wide range of services and functions for their users (Giannakos et al., 2013; Kuss & Griffiths, 2017). Social media is operationally defined as the sum of blogs, social networking sites (i.e., *Facebook*), micro blogs (i.e., *Twitter*), content sharing sites (i.e., *Instagram*, *Snapchat*), Wikis, and interactive video-gaming sites (i.e., Massive Multiplayer Online Games, e.g., *World of Warcraft*) that allow users to co-construct and share content (Kuss & Griffiths, 2017). Adolescents present a different usage profile from adults, where *Facebook* is no longer the platform of choice: recent usage data has showed that *YouTube* (85%), *Instagram* (72%) and *Snapchat* (69%), followed by *Facebook* (51%) are the platforms with the highest usage rate, with 35% of US teens reporting using *Snapchat* more often than all the other major social media platforms (Pew Research Center, 2018b). *YouTube* is the most recognized and the most preferred platform for access for all types of content amongst UK adolescents aged 12-15 years (Ofcom, 2017) and presented with the highest use change for those aged between 3-11 years (Ofcom, 2017). In the UK, *Snapchat* use has doubled the number of adolescent users who view it as their main social media profile (32% in 2017 vs. 16% in 2016; Ofcom, 2017). Technological affordances and key industry trends inevitably impact usage and functionality. Amongst current trends reported are the re-prioritization of interactions over passive

media consumption, the replacement of text messaging by live video chatting and short recorded videos, the augmented reality interactions in live video conversations, and the integration of more real world-settings (i.e., live messenger support and payments; ‘Digital in 2018’, 2018). The technological landscape inevitably influences usage, but also ensuing psychological processes. For example, the transient and self-destructive nature of *Snapchat* appears to provide a more congruent communication, but it also creates relational challenges (Vaterlaus et al., 2016).

The use of social media has been found to play a critical role in fostering positive youth development and future civic engagement (Lee & Horsley, 2017) and it is used primarily for socializing and leisure, as well as for public life interests (Boyd, 2014). For adolescents, a key developmental task that is related to online usage is identity development (Ragelienė, 2016) facilitated through the interaction of self with others to clarify identity development versus role confusion (Erickson, 1968). SNSs facilitate friendship formation and maintenance and provide social support for the development of behaviours, goals, and attitudes. These are fuelled by modelling and/or social pressure (Borca et al., 2015; Poulin & Chan, 2010). At the same time, adolescents distance themselves from primary attachment figures (Fuligni & Eccles, 1993; Papini et al., 1991). By modelling an identity via a social media profile, adolescents expose themselves to peer review that facilitates identity formation, social reality, and status negotiation (Boyd, 2007; Balakrishnan & Griffiths, 2017). However, adolescents are a vulnerable population when it comes to online use (Kuss & Griffiths, 2011a). During early adolescence, the emotional state is characterized by less positivity and more instability (Larson et al., 2002). Furthermore, self-regulatory processes and emotional control are still developing (Berthelsen et al., 2017), and internet use is increased (Rideout et al., 2010). However, adolescents lack a fully developed self-regulatory capacity to control its use (Pokhrel et al., 2013). Additionally, there is evidence of susceptibility to self-image perceptions and peer comparisons that may lead to a low self-worth and potentially to the development of eating disorders, depression, and obesity (Voelker et al., 2015). Since SNS use constitutes a salient activity in everyday life and with concerns about excessive screen time on a physical and psychosocial level (Asare, 2015; Atkin et al., 2014), and a small minority of adolescents may develop maladaptive behaviours potentially leading to addiction or other disorders (Griffiths et al., 2018), it is vital to understand adolescents’ key motivations driving SNS usage.

Different motivational factors for social media use have been proposed in the psychological literature (for reviews, see Kuss & Griffiths [2011, 2017]). Recent empirical studies share commonalities in their findings concerning the key motivational factors including entertainment, information-seeking, personal utility, and convenience, with social interactive gratification and mobile convenience exhibiting the highest impact on all other forms (Al-Menayes, 2015). Other motivations include online communication and online-self-disclosure, psychological need satisfaction (Ang, Abu Talib, Tan, Tan, & Yaacob, 2015), need for popularity (Utz et al., 2011), social competition in trying to get the most ‘likes’ (Balakrishnan & Griffiths, 2018), identity formation, enhancing personal values and sense of connectedness, social interaction, and mobile convenience functions (Ha et al., 2015). The need for constant availability and validation, perceived enjoyment, social relationship formation, mood regulation, entertainment, and a need to conform with group norms, have been also identified

(Chen et al., 2017).

Various theories and models have been proposed to explain adolescent motivations of using SNSs. Two of the most prominent theories are the (i) *Self-Determination Theory* (Deci & Ryan, 2000; Deci & Ryan, 1985), with three main psychological needs (autonomy, relatedness and competence), and (ii) *Uses and Gratifications Theory* (Blumler & Katz, 1974; Katz et al., 1973), where gratifications drive mobile SNS use by emphasizing the hedonic, integrative and mobile dimensions of adolescent motivations. Based on these theories or a combination of them, scholars have proposed various motivational categories for SNS use (Al-Menayes, 2015; Ang et al., 2015; Ha et al., 2015; Kircaburun et al., 2018; K.-Y. Lin & Lu, 2011). Other theories relating to motivations of SNS use refer to identity development or social identity deficits. The *social enhancement hypothesis* (or ‘rich get richer’) proposes that individuals with larger offline social networks engage in more extensive online network building to strengthen relationships (Kraut et al., 2002). *Social compensation theory* claims that online communication is likely to be used for social compensation and social facilitation in order to offset lack of social skills or difficulties with peer face-to-face interactions and peer disengagement (Valkenburg et al., 2005). Personal identity (the personal characteristics that are unique to the individual), social identity (stemming from awareness of membership in a social group along with the value ascribed and the emotional attribution of this membership), and self-esteem building (Tajfel, 1978) have also been proposed to underlie SNS use (Griffiths & Kuss, 2011). Based on *the Sociometer Theory* (Leary & Baumeister, 2000), self-esteem is a function of the relational value and the degree of social acceptance within a social environment. This relational value in SNS use has been confirmed empirically (Valkenburg et al., 2017), but is influenced by many other individual factors (e.g., a strong purposeful life, self-esteem, etc.; Burrow & Rainone, 2017).

Various factors mediate the relationship between motivations and SNS use, such as age, gender, and introversion (Valkenburg et al., 2005), high intensity, and bonding social capital (Piwiek & Joinson, 2016), as well as different motivational factors for specific features versus general use of social media platforms (Smock et al., 2011). Additionally, external (i.e., the parent-adolescent relationship) and personal antecedents (i.e., deficient self-regulation, habit strength) play an important role in time spent on SNSs and have been found to relate to dependence on SNSs for identity development in adolescents (Lee et al., 2017). Therefore, engagement with the online environment is dynamic and evolving, and requires empirical investigation that can shed light on fresh perspectives and insights behind adolescent use.

More recent psychological phenomena emerging from SNS use, such as the ‘fear of missing out’ (FoMO) – the need to be online to avoid feelings of apprehension when one is absent from rewarding experience that others may have (Przybylski et al., 2013) – has been associated with a reinforcing use of social media and prompting a vicious cycle of engagement (Buglass et al., 2017). Empirical evidence has demonstrated that FoMO and preoccupation with feeling unpopular or isolated leads to higher *Facebook* use and stress responses (Beyens et al., 2016). Similarly ‘nomophobia’ (no mobile phobia) – feelings of anxiety and distress for not being able to communicate and access information, losing connectedness and giving up convenience (Yildirim & Correia, 2015) – is associated with problematic smartphone use and endorses a habitual checking state that

is further reinforced by ‘informational rewards’ (Oulasvirta et al., 2012).

A growing body of literature provides evidence of stress, anxiety, compulsive and depressive symptomatology associated with excessive social media use (Barry, Sidoti, Briggs, Reiter, & Lindsey, 2017; Griffiths, Kuss, & Demetrovics, 2014; Griffiths et al., 2018; O’Keeffe, Clarke-Pearson, & Council on Communications and Media, 2011; Reid & Weigle, 2014; Royal Society for Public Health, 2017; Weinstein, 2018). Young people present with a paradox. Despite the high use and popularity of specific social media platforms, young people consider these same platforms as having a high net negative impact in terms of mental health (Royal Society for Public Health, 2017). Nomophobia, FoMO, and habitual checking behaviours are becoming more prevalent and have been associated with anxiety, depression, and problematic smartphone use (Elhai et al., 2016), raising a need to explore the process that relate social media use and motivations to these mechanisms. Despite these concerns, the process of how these maladaptive psychological states are related to adolescent motivations has been far less explored.

Additionally, adolescent motivations should be regularly evaluated. First, due to the constant evolving nature of SNSs, their perceived value may be shifting (i.e. *Snapchat* and *Instagram* have grown at considerably faster rates than *Facebook* use), reflecting a diverse user experience (Pew Research Center, 2018a). Second, the proliferation of platforms offers a multiplicity of new features and services that promote use and offers additional incentives for user engagement (from online social games, to instant messengers, video chats, news feeds, etc.). Motivations for use may shift, be intensified and/or skewed towards any of these SNS tailored services that may be driven by the need for satisfaction of specific needs (i.e., need for one-to-one or smaller group communication on instant messengers [IMs] rather than public posts or need for achievement in online social games). One such feature is the introduction of streaks on *Snapchat*, which highlights the number of consecutive days in a row that one individual has sent at least one photo to another individual – that appear to account for more frequent and compulsive involvement with the platform (Griffiths, 2018). Third, smartphones facilitate access and the increasing provision of free Wi-Fi services, reinforce frequency of use, and provide further incentives for adolescent online engagement.

Contemporary research examining the underlying motivations of social media use highlights mainly positive motives. However, the processes of how latent needs and motivations are related to prolonged engagement, higher checking behaviours, FoMO, nomophobia, and potentially more compulsive use, is much less explored. Consequently, the present study attempts to fill this gap in knowledge by identifying motivational factors underlying current usage and attitudes and highlight their associations with anxiety-inducing phenomena experienced by adolescents (i.e., FoMO and nomophobia). The present authors believe that adolescent internal control processes, FoMO and nomophobia do not occur in vacuum but rather underpin adolescents’ use and motivations, in addition to social and functional needs. It was therefore, hypothesized that adolescent motivational factors would be underpinned by (i) dysfunctional mechanisms of FoMO, (ii) nomophobia, and (iii) peer pressure for constant presence and interactivity online and (iv) need for checking. This hypothesis is extending research evidence suggesting that FoMO mediates need satisfaction, mood and engagement, which

may lead to a cyclical process reinforcing use (Buglass et al., 2017; Przybylski et al., 2013; Wegmann et al., 2017), and nomophobia, peer pressure and habit-forming checking behaviours potentially involved in higher usage (Guyer et al., 2014; Guyer et al., 2012; King et al., 2013; Olivencia-Carrión et al., 2018; Oulasvirta et al., 2012). Findings can help: (i) educators and parents develop their understanding and communication skills with adolescents on digital issues, (ii) public policy to embed research concerning motivations in prevention or intervention initiatives against excessive social media use, and (iii) clinicians who deal with adolescents to gain insight into processes driving adaptive and maladaptive SNS usage in the overall life context of the adolescent.

5.2 Methods

5.2.1 Design

A qualitative study was conducted to explore adolescent students' views and attitudes on SNS, reflect on personal experiences, and understand the processes underlying and driving use. The aim of the study was to investigate the uses, motivations, and values that are ascribed to screen time and SNS use among adolescents. Focus groups were the chosen method to provide a breadth of accounts from participants. Accounts of the uses and motivational factors were investigated with qualitative methodology and analysed with the use of thematic analysis (TA; Braun & Clarke, 2006; Clarke & Braun, 2017). The steps followed are reiterated in Table 5.1.

The respective questions and design were informed by previous research on SNS usage and motivations (Al-Menayes, 2015; Barker, 2009; Boyd, 2007; Liu et al., 2016; Przybylski et al., 2013; Valkenburg et al., 2005, 2017). A total of six focus groups, comprising 6-8 students in each group, were conducted in three secondary school settings in the UK. More specifically, the present study assessed the: (i) students' SNS use, and (ii) the main drivers of online engagement with SNSs. The focus groups were semi-structured, lasted approximately 60 minutes in duration, and were audio-recorded. A number was assigned to each participant to maintain confidentiality. Each focus group included open-ended questions based on a semi-structured focus group guide, centred on the experience of social media use in the daily context and within relationships and the primary motives for use. Questions specific to SNSs were used in the present study (e.g., "Which social media apps are you mostly using?", "Why do you think you are using [name of platform mentioned]?", and "What are your peers' reasons for using social media?"). Participants offered descriptive accounts, and with further probing (i.e. "Why is this your least favourite platform?") additional narratives emerged.

For a detailed description of Methods, Participant section, Design and Procedure see the Methodology Chapter 4.

5.2.2 Data analysis

Codes were initially developed by the first author and another member of the research team. These were then discussed with the remaining members of the research group as coding developed. Braun and Clarke (2018) do not recommend second coding and inter-rater reliability (IRR) to be undertaken in data analysis, because TA

assumes a flexible, organic and reflexive approach that should not necessarily be guided by positivist/realist assumptions. However, to ensure rigor and trustworthiness of data (Nowell et al., 2017) and the consistency of the analytical procedure, inter-rater reliability was conducted to assess the level of agreement (Armstrong et al., 1997). The first author and one of the research team members independently engaged in separate analyses to identify themes across transcripts (Miles & Huberman, 1994). A high level of agreement was observed when results were discussed and differences in opinions were resolved through discussion. Different conceptualizations of the subthemes were discussed and justified amongst researchers. Following discussion of the different accounts, they were either merged or excluded from the analysis. Following assessment, there was an 80% agreement between the coders on 93% of the codes.

Themes were identified at both a semantic and a latent level to develop a more in-depth understanding of adolescent usage and key motives suggested (i.e., convenience and connectivity). Therefore, the final formulation of the themes was latent, following a social constructivist epistemological approach to TA (Braun & Clarke, 2006), given research questions related to perceptions of social media use and motives underlying use that refer not only to explicit motives (i.e., communication with peers), but also implicit meanings (i.e., peer comparison and validation) in a socially constructed experience. The coding system made reference to which of the six focus groups the selected quote was from (i.e., ‘FG2’ means the second focus group), followed by a reference to gender (M=male, F=female) and participant number (i.e., M3). Consequently, the code ‘FG5F2’ refers to a quote from female participant number two in the fifth focus group.

Table 5.1

Defining phases of thematic analysis followed

Phases of thematic analysis	Detailed account of processes in phases
Phase 1: Data familiarization	Engage repeatedly with the data, document reflective thoughts and impressions about potential themes
Phase 2: Generating initial codes	Start line-by-line coding, document team meeting debrief, use reflexive diary – note keeping per code,
Phase 3: Searching for themes	Combine codes, render themes, develop hierarchies of concepts and themes, hierarchically structured codebook, keep notes on development of semantic and latent themes
Phase 4: Reviewing themes	Team members examine codebook of themes and sub-themes of both two team members against transcripts, look for recurring patterns and differences
Phase 5: Defining and naming themes	Discuss final discrepancies in theme generation, critical assessment, reach research team consensus
Phase 6: Consolidation of themes/Analysis justification	Describe the process of coding and analysis, report on reasons for methodological and analytical choices, findings illustrated with quotes

5.3 Results

Adolescent perceptions for online uses, attitudes and platforms of choice

5.3.1 Social media platforms of choice

Social media use was viewed by adolescents as indispensable for communication with friends and family, a source for information, learning and validation, and a source of inspiration for one's interests. The platforms of choice for participants were *Instagram*, *Snapchat*, and *YouTube*, and the least favourable platform was *Facebook* due to it being perceived (i) as a complex platform in design, offering more complicated features (i.e., uploading of videos), (ii) the platform of choice for adults and older generations, and (iii) filled with adverts and pop-up advertising messages that were viewed as negative and intrusive. *Snapchat* and *Instagram* were considered as complementary platforms with complementary functions and as necessary platforms to engage with. However, all platforms were perceived as gradually converging and losing their distinctiveness by introducing successful competitor features or services within their own platforms (*Facebook* added live stories, which was seen as copying content from *Instagram*; *Instagram* added news features, etc.).

5.3.2 Social media with values and norms

Each platform was perceived as serving a different purpose. *Instagram* was viewed as an idealistic picture-sharing, slice-of-life application that was a source of inspiration for an individual's life activities and interests. The majority of adolescents reported having a second account on *Instagram*, called *Finstagram*, that was a private account, shared only with very close friends and where communications were exchanged in a more intimate fashion. Adolescents held this account to maintain privacy and to relate more closely with their inner circle of friends. The second more private account was preferred and considered to be free from social comparison and scrutiny, with posts that were perceived as fun, relatable, "normal, more of an inner circle thing" (FG2F6) and easier to follow. Similarly, *Snapchat* was the "inner-circle" platform, where more humorous, self-sarcastic, and fun aspects of everyday life were shared among close friends. *YouTube* was mainly used by adolescents to watch television series and movies, instead of typical television viewing, as well as to search for music videos or other interests.

Negative issues arising from use were with *Instagram* and the negative and aggressive comments posted (i.e., "nasty") or when another family member (usually the mother) were also members on the platform (i.e., on *Facebook*). Other explicit and implicit uses, rules, and attitudes towards specific platforms were raised (i.e., the urgency for *Snapchat* streaks maintenance, how *Snapchat* could become annoying if used too frequently, and content that was politically correct to be posted online and varying according to platform).

5.3.3 Specific social media apps use

Use of social media was reported by adolescents to be serving as a filler between other activities and to counteract boredom or make up for the lack of after-school activities. Use was reported to be more pronounced over weekends or during holidays when the daily program was less structured and where access to

friends offline was limited. SNS platforms filled this void and offered the possibility to connect with friends regardless of geographic location.

Snapchat. Adolescents perceived *Snapchat* as an “inner circle” platform that provided the opportunity to communicate personal matters to each other. By design, *Snapchat* was perceived as encouraging the exchange of more personal information that would otherwise not be easily shared in any other SNS. This sense of privacy facilitated the exchange of private information, like a shared diary with closest friends. It was therefore considered more fun, via the sharing of entertaining messages that participants would not share on other platforms (i.e., *Twitter*), and it was favoured for its simplicity and directness. A crucial finding was that *Snapchat* was viewed as having a more discursive nature where adolescents perceive their actions as “talking” rather than using it. Given the pervasiveness and the popularity of the platform among adolescent populations, on *Snapchat* oral and text communication appeared to be equated and collapsed into a single form of communication. News features were viewed positively because they were perceived as expanding by offering new features, but at the same time were viewed as less reliable and trustworthy.

Instagram. *Instagram* (along with *Snapchat*) was considered the most popular app, involving the sharing of daily life moments, with more visuals, and self- presentation opportunities for content creation and deliberation. Choice and flexibility were seen as given to users, who could tailor the app as to how private or public they wanted their account. Students of private schools preferred to have a private status, whereas the students of state schools had a mixture of both public and private statuses with acquisition of ‘friends of friends’ being considered positively. *Instagram* was viewed as copying content from *Snapchat*. The photo feature was dominant, less so than direct messages (DMs) and videos that were perceived mainly as *Snapchat* features. Captions complemented the message of the photo and were seen as “telling the story behind” the photo. Selfies were not accompanied by comments, but if it was a group photo, it was typically accompanied by a positive comment for the experience. *Pinterest* – although less frequently mentioned – was used for inspiration (as well as *Instagram*) on topics of artistic interest rather than communication (“...on everything, fashion, bedroom ideas, hair, make-up, and dresses”). Other applications (i.e., *Twitter*, *Vine*) were mentioned as less frequently used.

Finstagram (commonly referred to as ‘*Finsta*’) – a combination of the words ‘fake’ and ‘*Instagram*’ – refers to a second, more private account, that was perceived to be a more entertaining and personal platform relating to more casual, fun, and everyday moments. *Finstas* were reported by adolescents to feature unfiltered photographic material (unlike the edited counterparts that appear on *Instagram*) that represented a platform for sharing more realistic daily adolescent experiences.

5.3.4 Motivations for SNS use

Six main motivational themes driving adolescent online use emerged from the data analysis: (i) symbiotic relationship with peers online via social media and smartphone attachment, (ii) digital omnipresence related to control and loss of control, (iii) emotion regulation and enhancement, (iv) idealization versus normalization of

self and others, (v) peer comparison and ego validation, (vi) functionality-facilitation of communication functions. A summarized outline of the themes with their respective subthemes and verbatim examples is provided in Table 5.2.

Table 5.2

The perceived motivations of SNS use in adolescent students: Results from a qualitative study with the use of thematic analysis

Themes and Subthemes	Frequency	Verbatim Examples
Theme 1: Symbiotic relationship with peers online via social media and smartphone attachment		
Peer attachment and enrichment of relationships	15	<i>"...because everything is on social media nowadays, I mean people meet in real life but when you don't know somebody that's like the first time you meet them is on social media."</i> (FG4F3)
Pressure for availability	20	<i>I would prefer to put it aside until I am done with homework, but when you see a notification popping up, you just go on immediately..."</i> (FG1F7)
FoMO	8	<i>When you can't reply, it makes you feel really agitated, get really angry, and you're like 'I need to reply. I have to reply'..."</i> (FG6F3)
Smartphone attachment and nomophobia	15	<i>"I don't take it out of my hand unless I have to."</i> (FG4M4)
Theme 2: Digital omnipresence related to need for control		
Use=confidence and control	10	<i>"People just have this new sense of confidence online where they think they can do whatever they want."</i> (FG2F2)
'Always on' – No geographical limits	20	<i>"I live far away from my friends. I'd speak to them on Snapchat instead of texting...we are across the world from each other, we still can talk."</i> (FG5F2)
Difficulty to control	20	<i>"I do feel like people spend a lot of time on it. I don't really know how you can stop people just like from doing that, for me it carries on until I get bored."</i> (FG3M4)
Streak maintenance and checking as habit	17	<i>"I go to check my streaks first thing in the morning so I don't lose them."</i> (FG3M3) <i>"I need to check or I feel bad"</i> (FG5M3)
Phubbing	13	<i>"I feel it is just like a nice filler, social media...when you can't be bothered to speak to someone..."</i> (FG2F6)
Maintaining privacy	12	<i>"The second account is a more private account."</i> (FG1F6)
Surveillance	8	<i>"...then I would want to know what she was doing there and like investigate, do you know what I mean?"</i> (FG2F1)
Theme 3: Emotion regulation and enhancement		
Counteract boredom	12	<i>"Like when you're bored, you just slip it out your pocket let's be honest."</i> (FG4F1)
Mood booster	8	<i>"It's just a way to make me feel better."</i> (FG1F2)
Escapism/Distress	7	<i>"Personally, it's like an escape route and when you've got a lot on your plate, it helps me distress."</i> (FG3M4)
Enjoyment/Learning	3	<i>"I friend because they have fun stories or jokes or because of history I quite like history, so some teach history."</i> (FG3F5)
Theme 4: Idealization versus normalization of self and others		
Identity construction/self-presentation	10	<i>"I don't know anything else but to be on my phone. I don't quite know what to do with myself."</i> (FG6F3)
Impression management	15	<i>"It doesn't matter if everybody looks awful and I look amazing I'm still going to post it."</i> (FG2F7)

Compensation for perceived deficits or lack of social skills	6	<i>“Especially with filters and make up they can be sort of hiding things like mental illness, presenting a better self to show people that they’re fine.” (FG5F5)</i>
Realistic perspective taking	6	<i>“At social media displaying a perfect body being very skinny, you still get that, you get more obscure models, and especially with models there’s a lot of influence with normal models, what you see at social media, you don’t really see in magazines.” (FG2F4)</i>
Plurality in representation and inclusion	5	<i>“...whereas on social media it’s just everyone who is deciding what they wanna post and it’s better you’re not forced to say it is ok to be the skinny model, if you wanna look like a plus size model, companies are trying to use the internet, minority models, there is more representation on social media, but there is a real image you need to appeal to.” (FG2F5)</i>
Drawing Inspiration	12	<i>“...and for like Instagram and Pinterest, inspiration and stuff... everything, fashion, bedroom ideas, hair, makeup, dresses.” (FG6F3)</i>

Theme 5: Peer comparison and ego validation

Peer influence	6	<i>“...or like trends, so like if nobody in the first place hadn’t got the idea that Snapchat was a cool thing to use, then nobody else would have started using it.” (FG4F3)</i>
Peer comparison/Judgement passing	5	<i>“Even when you’re with your friends you’re like ‘oh look what she posted’...” (FG1F5)</i>
Fear of being judged/avoiding value judgment	10	<i>“I get scared that someone will post a really ugly photo of me, I feel that people are so judgmental.” (FG2F5)</i>
Need for validation and popularity	15	<i>(On Finsta) “That is way preferred, free from social comparison and scrutiny, where the posts are considered as fun, relatable, normal, more of an inner circle thing, better to follow.” (FG2F6)</i>
expectations for collective positive peer feedback	10	<i>“I expect nice comments, people to like it. ...(selfies) just taking and putting it online for popularity.” (FG2F3)</i>
Sharing/self-disclosure & discovery of common interests	20	<i>“Snapchat a lot more, because it gets more personal, you can talk to your friends and say something more personal, private...” (FG2F4), “You can see their interests...” (FG4M5)</i>

Theme 6: Functionality - facilitation of communication functions

Ease/convenience/variety/appeal/ mobility prolongs access	30	<i>“It’s easier and more appealing to be on social media; it’s more usable, less effort, and available, you’re reading a book but then you just can change that, there’s variety in social media” (FG1F8)</i>
Facilitation of interpersonal communication	30	<i>“When you have been talking to someone online for quite a while and then you meet them, then it is less awkward.” (FG3M3)</i>
Filler for lack of activities	20	<i>“If somebody doesn’t have anything after school, they get bored and they go on it.” (FG3F2)</i>
Research and explore	16	<i>“To research and to find things out, like you can just Google anything, rather than having to go through to find stuff...you can also watch strong tutorials analyzing sensor weathering something you wouldn’t be able to see; it is like a window to the world.” (FG2M2)</i>
Saves time	20	<i>“Comparatively to talk to someone you can text them and they would reply whereas if you would go and meet them, it would take half an hour.” (FG3M7)</i>
Facilitates homework	18	<i>“Personally when I’m on the Internet it makes the textbook almost irrelevant..it is easier to go on social media when you’re on the Internet doing homework for school it’s easy to sidetrack but it’s definitely useful with your work.” (FG5F5)</i>
Multitasking	25	<i>“It is not just the phone, it the fact that you can be in something and continue with something else” (FG3M4)</i>
Appealing innovation of platforms’ services	10	<i>“Snapchat, Instagram, they’re making it better every week...stories of professional gamers, so bit of news, stuff you wouldn’t be reading in a magazine, so that’s quite cool, that’s a benefit of it. Snapchat, it is quite good because it’s broadening; it’s interesting, it’s adding new stuff.” (FG4M4)</i>

5.3.4.1 Theme 1: Symbiotic relationship with peers online via social media and smartphone attachment.

One major theme arising from the analysis on motivations driving SNS use was the symbiotic relationship with peers that was facilitated by the engagement with social media and smartphones that provided instant access to peer interaction. Three sub-themes were identified: (i) peer attachment and enrichment of relationships with friends supported by the constant online peer presence, (ii) pressure for constant

Peer attachment and enrichment of relationships with friends, supported by the constant online peer presence. Constant communication online (the ‘always on’ culture; Kuss & Griffiths, 2017) with current friends and making new friends was perceived as a key driver of adolescent use of SNSs. Contact with current friends was initiated, maintained, and nurtured via social media, and the first point of contact and impressions about new friends came from their online presence. Therefore, social media profiles served as a source of an individual’s biography, offering information about the adolescent’s life and activities. A preference for online communication as a first point of contact was expressed rather than for face-to-face contact, as it was experienced by adolescents to be a more secure way of interaction. Therefore, new contact initiation was viewed as facilitated when conducted initially online. Meeting new friends was accomplished by befriending ‘friends of friends’, which was not perceived by adolescents as a threat, as long as there was no financial or sexual solicitation involved. However, meeting online first and then offline was often accompanied with experiences of disappointment due to the discrepancy between online and offline appearance because the offline image was often not found to match up the online, due to the use of filters and other enhancement mechanisms. Therefore, the expectations regarding appearance formed prior to meeting was met with disappointment that led to an expressed overall preference for online contact.

Pressure for constant availability and FoMO. Online presence was accompanied by expectations for constant availability by peers which was experienced by adolescents as a form of pressure when unable to do so. The peer pressure experienced to be constantly checking online messages and notifications was also reported as frustrating and causing distress, but ultimately as a source of temptation that they were unable to control, which consequently caused disruption, especially when doing homework: When messages were not reciprocated, the senders perceived this as a sign of being ignored. Similarly, FoMO drove adolescent social media use and was experienced by adolescents who reported feelings of anxiety when (i) they were missing out on opportunities to spend time with friends, (ii) there was a need for awareness of what their friends were doing, and/or (iii) there was a need to follow friends’ activities. FoMO was amplified by peer pressure for constant availability and via nomophobia that was associated with smartphone attachment, because adolescents experienced anxiety if their smartphone was not within their immediate reach. However, when discussing FoMO, few adolescents were critical of this emotional response, because they perceived it as exaggerated and lacking realistic grounds due to their experiences suggesting that nothing important was ultimately missed. However, they expressed an apparent compulsion to check their social media accounts and an obsessive preoccupation (“*I need to check, or I feel bad*”, FG5M3). Others expressed practical considerations if they were unable to have access, such as

missing out on opportunities for last minute arranged outings with peers.

Smartphone attachment and nomophobia. Smartphones were viewed as significant others and there was a strong attachment developed and a reported interest and investment in the devices. This was expressed from facilitating online access to peers to providing identity, was imbued with powerful capabilities that were transferred to the adolescent. However, this attachment was often perceived as being at the expense of offline social interaction. When access to a mobile was not possible, this was followed by a negative mood and behaviour towards others.

5.3.4.2 Theme 2: Digital omnipresence related to need for control

Theme 2: Digital omnipresence related to need for control and loss of control. This theme comprised the following sub-themes: (i) use grants confidence and control, (ii) ‘always on’ - no geographic boundaries, (iii) difficulty to control, (iv) streak maintenance and checking as habit, (v) phubbing, (vi) maintaining privacy, and (vii) surveillance.

Use grants confidence and control. Online use was perceived as providing additional confidence to the adolescent and a feeling of omnipotence that related to a sense of control. This confidence was facilitated by various affordances (i.e., likes, followers) and the use of communication enhancement features (i.e., airbrush, emojis), which empowered adolescents to control impressions, relationships, content and self-expression in order to maintain this positive emotion, however, this was perceived as an act to control popularity.

‘Always on’, no geographic boundaries & difficulty to control. For adolescents there was a need for being constantly online, interacting with friends and relatives, maintaining online contact by offsetting geographic boundaries, thus exhibiting control over their social interactions. At the same time, adolescents reported difficulty in resisting the pressure for constant online presence and unsuccessful efforts to set limits in online communications.

Streak maintenance and checking as a compulsive habit. Adolescents reported the urge to maintain their streaks, which was given first priority in their daily schedules and was reported as being a compulsive habit of high importance to the individual (urgency, prioritized, and performed every day). This need appeared to be facilitated by ease of accessibility and habit formation that maintained a vicious cycle of need for constant use.

Phubbing. Behaviours like phubbing – snubbing another person by concentrating on one’s device while in the presence of that individual (Karadağ et al., 2015) – were reported and viewed as a way to exercise control in unwanted social interactions. Adolescents considered phubbing as an impolite and uncivil behaviour. However, it was legitimized as behaviour when in the presence of undesirable peers.

2.5 Maintaining privacy and surveillance. Maintaining a second, private account to share with close friends satisfied their needs for privacy and ease of self-expression. Online presence was driven also by a need to be aware of what peers are doing at any given moment, which guided their own actions.

5.3.4.3 Theme 3: Emotional regulation and enhancement

Social media platforms were perceived to facilitate regulation and enhancement of emotions. Three sub-themes were identified: (i) counteracting boredom, (ii) mood boosting and escapism to relieve distress, and (iii) enriching entertainment and learning.

Counteracting boredom. Turning to social media use was seen as an automatic response to overcome boredom or lack of other activities. This was made possible through mechanisms of passive exposure to content and via more active methods, such as self-disclosure, encouraging reciprocity, or self-affirmation through content creation.

Mood boosting and escapism to relieve distress. SNS use was expressed by adolescents as enhancing their emotional state. Additionally, it was perceived as an outlet when under pressure that aided the adolescent in escaping from distress and negative emotionality.

Enriching entertainment and learning. Adolescents reported that both entertainment and learning from online content and each other was perceived as a driver of SNS involvement and was seen as a positive emotional experience of enrichment. *Theme 4: Idealization versus normalization of self and others.* This theme comprised the following sub-themes: (i) idealized identity construction for self-presentation, impression management, and compensation for perceived deficits or lack of social skills, (ii) realistic perspective-taking, plurality in representation, and inclusion, and (iii) drawing inspiration.

5.3.4.4 Theme 4: Idealisation vs normalisation of self or others

Adolescents appeared to engage in social media use because these platforms offered many opportunities for idealized identity construction and/or to make up for other perceived inefficiencies. Selfie-taking was the consequent behaviour for such self-promotion. Adolescents reported investing time and energy in constructing and presenting an enhanced version of their self, via meticulous manipulation of selfies (with the use of filters, airbrushes, etc.) and/or selective uploading of photographic material. Consequently, self-presentation on SNSs was a major part of identity construction that was facilitated by SNS tools and was reflected in the choice of images uploaded, satisfying the standards of beauty or competence for peer acceptance. Adolescents discussed this tendency to portray a less accurate image online in favour of a more idealized identity profile online. This was deliberate and viewed as necessary because the profile was visible to closer friends, but also simultaneously to more distant affiliations. In the case of one female adolescent, social media was viewed as providing her with an identity: “*I don’t know anything else but to be on my phone. I don’t quite know what to do with myself.*” (FG6F3). Compensation for perceived deficits (i.e., having a mental illness or lack of social skills) was another driver for social media engagement.

Realistic perspective-taking, plurality in representation, and inclusion. Adolescents perceived that representation on social media was more normalized, inclusive, and representative of general population characteristics of colour, race, ethnicity, and standards of beauty than those appearing in traditional media. This inclusive representation was viewed in a positive way and was suggested as further reinforcement for the choice

of digital versus traditional media. Need for normalization was also expressed via the use of the second accounts, the '*Finstagrams*', where self-representation was casual and ordinary contrary to the ideal images depicted on '*Instagram*'.

Drawing inspiration. SNSs, primarily *Instagram* and *Pinterest*, were perceived as the platforms that adolescents found inspirational because of being presented with ideas on various topics from home décor to personal grooming that they could then utilize in their own daily lives.

5.3.4.5 Theme 5: Peer comparison and ego validation

Theme 5: Peer comparison and ego validation. Social comparison and validation was suggested as a key motivation of social media use for adolescents. This theme comprised the following sub-themes: (i) peer/social comparison, peer influence, and inevitable value judgement, (ii) fear of being judged and need to avoid value judgement (iii) need for validation, popularity and expectations for collective positive peer feedback, and (iv) sharing, self-disclosure, and discovery of common interests.

Adolescents engaged in social comparison on various levels (i.e., appearance and performance) and was considered an innate human need. Peer comparison was viewed as an inevitable process taking place on SNSs. This comparison led to the need to promote the most favourable personal photos, disregarding others' appearance on the photos. Judgement and criticism towards others were perceived as inevitable and were accompanied with fear of how they are perceived themselves by others.

Need for validation, popularity, and expectations for collective positive peer feedback. The act of content enhancement was underlined by a need for popularity that fuelled expectations for endorsement and validation through the generation and accumulation of 'likes', 'comments', 'followers' and/or a high number of 'friends'. The higher the number of likes and collective peer feedback, the higher the perceived acceptability was considered to be.

Sharing, self-disclosure, and discovery of common interests. Sharing and self-disclosure were endemic in adolescent communication via specific social media channels that were considered more appropriate for private communication and free from peer scrutiny. Through the process of sharing and disclosing, common interests were identified that served as additional incentive for SNS use.

5.3.4.6 Theme 6: Functionality – facilitation of communication functions

This theme comprised seven sub-themes: (i) facilitating everyday communication, ease, convenience, variety and appeal, (ii) social facilitation of interpersonal communication (iii) being a filler for lack of activities, (iv) research and exploration, (v) saving time and facilitating homework, (vi) multitasking, and (vii) appealing innovation of platforms. Adolescents reported communicating via SNSs for various functional reasons and to complement offline communication (e.g., to make plans to meet with friends offline or talk online, to share

news with friends that live further away, to find information and promote learning through exploration and research). Additionally, they reported social media could be used to assist with homework assignments and to be informed about schoolwork they had missed. Adolescents spoke of schoolteachers' expectations to catch up on schoolwork via contact with friends. Moreover, the ability to multitask was viewed as saving time. Furthermore, novel services offered by social media platforms were considered an additional benefit to users, in spite of their questionable quality.

5.4 Discussion

The present qualitative study explored adolescents' personal views and attitudes towards uses and key motivational factors for social media use and identified control processes related to motivations for SNS use in adolescence. Adolescents reported that SNS use formed a dominant part of their lives, offering both positive and negative affect experiences from use, and confirming previous findings (Weinstein, 2018). SNS use is part of a new youth culture with shared beliefs, rules, and meaning that is distinct from adult interaction (Vaterlaus et al., 2016). Consistent with previous research (Tulane, 2012), adolescents talked about uses, rules, and attitudes towards specific platforms. Findings suggested that SNSs were perceived as offering distinct functions and features, but also to be converging with the adoption of successful competitor services. The diversity of platforms appeared to serve a different functional use of entertainment and communication between the adolescents serving a larger public or private network of friends, or the smaller group of friends closer to the adolescent.

Social media use therefore appeared to be influenced by the context and affordances of SNSs and motives via the dynamic interaction with peers online, similarly to gaming (Kuss, Louws & Wiers, 2012). *Instagram* and *Snapchat* were found to complement each other and were used in tandem by adolescents. *Instagram* was perceived to offer an enhanced 'slice of everyday life' to be shared either in a public or in private status. Adolescents perceived *Snapchat* as an "inner circle" platform to share more personal, entertaining personal stories, confirming prior research demonstrating that *Snapchat* is primarily used for communication with close friends and family as an 'easier and funnier' alternative to other instant messaging services (Piwek & Joinson, 2016). *Facebook* was the least preferred SNS by adolescents for reasons of complexity of design as well as being viewed as the platform of choice for 'older generations', reflecting the migration to other platforms (*Snapchat*, *Instagram*) observed in usage rates.

Apart from uses, the present study mainly explored motivations for SNS use that have been found to be critical in the pursuit of goal-oriented behaviour and to facilitate or inhibit psycho-emotional development (Council on Communications and Media, 2016), partially determining effects on identity, intimacy, and sexuality (Valkenburg & Peter, 2011). The key themes identified – related to smartphone and peer attachment, need to control identity portrayal, content and relationships, use for emotion regulation and need to define self and social reality (others) on an idealization versus normalization spectrum – offered an in-depth account beyond motivational factors proposed in the current literature. These findings highlighted control mechanisms,

namely the need to control and exert peer influence on content, relationships, self-presentation, and impressions. The need to exert control represents a human psychological and biological necessity (Leotti et al., 2010) that may be more relevant to adolescents since they are particularly sensitive to the reward-sensitizing effects of social stimuli that further undermine their capacity to withhold impulsive responding (Albert et al., 2013). This motive of control in the context of social media was found to be reinforced by FoMO, smartphone attachment, and nomophobia, which fuelled the need for constant presence. Furthermore, digital omnipresence to control led to prolonged engagement and perceived loss of control over use.

These findings may be explained by Perceptual Control Theory (PCT; Powers, 1973). According to PCT, all behaviours are driven by individuals' need to control their perceptual experience. Behaviour is therefore organized around the control of individuals' own perceptions and the reduction of the discrepancy that potentially arises. Discrepancy occurs when two competing goals are conflicting or may be mutually exclusive. This causes conflict that leads to distress and the behaviour is then continually re-adjusted to reduce that discrepancy. According to this model, which acts on perception, comparison and action providing a feedback loop, it could be hypothesized that adolescents are motivated to behave on social media in a way that is consistent with their perceptions and through peer comparison leads their actions and constantly re-organizes their behaviour to reduce distress. High urgency and intensity of need for control may drive specific maladaptive SNS-related behaviours, such as compulsive checking, a cause of clinical and developmental concern (Barry et al., 2017), or FoMO, and may lead to problematic use of SNSs and potentially to SNS addiction. Additional motives for connectedness, validation, self-expression, enhancement and utility to facilitate communication functions were also identified, confirming previous findings (Al-Menayes, 2015; Barker, 2009; Beyens et al., 2016; Boyd, 2007; Burrow & Rainone, 2017; Chotpitayasunondh & Douglas, 2016; Helms et al., 2014; Kwak et al., 2014; Mascheroni et al., 2015; Przybylski et al., 2013; Toma & Hancock, 2013; Utz et al., 2011).

Justification for the first motivational theme, i.e., symbiotic relationship with peers online via social media and smartphone attachment, may be found in psychodynamic perspectives and more recent scholarly work. During adolescence, there is a primary need for personal expression, feedback, and validation from peers, similar to the one expressed towards primary attachment figures (Choi & Toma, 2014). It has been hypothesized that this need has been amplified due to the erosion of the family function, which has been displaced by identification models increasingly met in the digital realm (Ermann, 2004). Adolescents experience smartphones as part of the self, connected to the devices in a unique personalized way as an object that offers a connection between the self and the world (Konok et al., 2016, 2017). These objects are emotionally invested with qualities of omnipotence and become "a reassuring extension of motivations, personality and inner psychological life" (Suler, 2016, p. 135). Object attachment has been regarded by previous scholars as a mechanism for anxiety reduction (Litt, 1986) and recent evidence has supported this (the 'adult pacifier hypothesis'; Melumad, 2017). Therefore, smartphone use, which is intertwined with SNS use, arguably nourishes this symbiotic relationship with peers and the object-device.

Digital omnipresence in order to exercise and maintain control of the online environment and

relationships and the potential loss of control over this formed the second motivational theme. The symbiotic relationship and attachment to the online community was expressed as the need to be constantly online (omnipresence) and was reinforced by peer expectations for constant access and availability. The need to belong and fear of ostracism have been identified as key motivators for online behaviour and have been positively associated with perceived expectations and obligation for immediate online reciprocity (Mai et al., 2015). IMs have been found to enhance connection in existing relationships (Vaterlaus et al., 2016). However, FoMO has been found to mediate the relationship between increased SNS use and decreased self-esteem, potentially reinforcing a detrimental vicious cycle of use, leading to feelings of inadequacy (Buglass et al., 2017). FoMO was expressed in the present study as a driver of SNS engagement and could be interpreted as an expression of the peer attachment dynamic, reflecting potentially the fear of disruption of this attachment. In a recent study on *Facebook* use, FoMO was found to make the single largest contribution to SNS addiction (Pontes et al., 2018) and can therefore be considered to be a maladaptive mechanism leading to increased unconscious motivation for SNS engagement.

The third theme was emotional enhancement and mood modification. Adolescents reported using SNS to change or enhance their emotional state. This finding has received prior empirical support (Myrick, 2015; Utz et al., 2011) and appears in the literature, as achieved by asking for help (Zaki & Williams, 2013) or social sharing of emotion (Hidalgo et al., 2015; Rimé, 2009), posting socially positive emotions or personally relevant emotions (Bazarova et al., 2015) or curation of a personal profile that can boost perceptions of self-worth (Toma & Hancock, 2013). Overcoming or avoiding boredom has been suggested as another motivation for SNS use (Ryan et al., 2014; Waheed et al., 2017). Boredom is associated with purposeless browsing and loss of time, and boredom proneness is a risk factor in the development of internet addiction (Chou et al., 2018; Lin et al., 2009) and internet communication disorder (Wegmann et al., 2018). However, recent evidence suggests that boredom also has positive functions and may aid creative thinking and redefine life goals and purposeful behaviour (Bench & Lench, 2013; Caldwell et al., 1999; Mann, 2017; Throuvala et al., 2018; Tilburg & Igou, 2017).

The fourth theme reflecting motivational factors for SNS use was the need to define and critically evaluate behaviours (of others versus the self) along the continuum of idealization to normalization. First, the need for popularity expressed by adolescents has received empirical support as the strongest and most consistent motivational factor (Utz et al., 2011). A powerful need to present an ideal image online via SNSs along with need for its validation was expressed by adolescents in the present study. Simultaneously, there is increasingly an expressed need for more normalization and authentic, realistic and entertaining self-expression amongst the closer circle of friends on platforms such as *Snapchat* and the creation of '*Finstagram*'. Evidence suggests that SNS use allows for self-presentation and peer comparison to occur (Mascheroni et al., 2015) and these influences interact and co-construct ideal standards of beauty, which have a critical role in self-perception, self-esteem, and identity development (Boyd, 2007; Meier & Gray, 2014).

The fifth theme – need for peer comparison and ego validation – is in accordance with the

developmental goals of adolescence to achieve identity formation, and SNSs provide the opportunities for adolescents to do so via self-presentation that is subject to peer judgment (Walther et al., 2011) while adolescents strive for a balance between ideal and real representation (Chua & Chang, 2016). Previous research has identified a gap between teenage girls' self-beliefs and perceived peer standards of beauty, with low self-esteem and insecurity driving edited self-presentation and pursuit of peer recognition (Chua & Chang, 2016). Positive self-presentation is therefore a need to be realized that has been associated with feelings of anxiety about peer evaluation (Guyer et al., 2012, 2014). Peer positive appraisal leads to positive self-evaluation – a psychic condition termed as ‘extimacy’ (Tisseron, 2016). A study that examined the number of ‘likes’ individuals received on their *Facebook* profile pictures was positively associated with self-esteem, but influence was moderated by a greater sense of purpose (Burrow & Rainone, 2017). Finally, the sixth theme of functionality highlighted the utility aspect of social media use and has received prior empirical support (Al-Menayes, 2015).

Furthermore, evidence suggest that specific structural characteristics (e.g., *Snapchat* streaks) and key features of SNSs (i.e., live videos, the placement of filters for the enhancement of photos prior to posting) reinforce the motives for use (Griffiths, 2018). Specific behaviours (constant checking), if not performed, resulted in anxiety and negative emotionality. These behaviours involve the performance of habitual or ritualistic actions that amplify engagement. The present study identified a control motive as driving adolescent social media that may be reinforced by FoMO, nomophobia and powerful emergent structural characteristics of SNS. Similarly to games, where the acquisition of artefacts or rewards reinforce the gamer into prolonging the gaming experience (Griffiths & Nuyens, 2017; King et al., 2018), SNSs exhibit a plethora of structural features that engage adolescents further in habitual behaviours (Griffiths, 2018; Turel & Osatuyi, 2018). SNS intensity and network size have been found as significant predictors of mobile SNS applications which are associated with smartphone addiction (Salehan & Negahban, 2013). These features potentially shift users from a connecting experience that adds value, to one with emphasis on the quantity of interaction (i.e., number of streaks, number of likes on selfie-postings, etc.). Urgency and intensity of habit and need to control content can define these as adaptive or maladaptive processes (i.e., the need for belonging versus FoMO). FoMO has been suggested as one of the predictors of smartphone addiction and smartphone addiction to phubbing (Chotpitayasunondh & Douglas, 2016; Kuss & Griffiths, 2017). Together with peer pressure, these tendencies may lead to compulsive or addictive behaviours that are a cause of clinical or developmental concern (Balakrishnan & Griffiths, 2018; Barry et al., 2017; Bij de Vaate et al., 2018; Stead & Bibby, 2017).

Finally, the present study also found a perceived merging of oral and text/instant messenger (IM) communication on SNSs. Adolescents’ oral communication was found to be equivalent with text communication in the minds of adolescents. Availability and access to SNSs via smartphones have facilitated the passage from traditional verbal and face-to-face communication methods to text-based IM communication. This finding partially reflects the simultaneous use of diverse live communication features (i.e., text, photo, video, stories, emojis, filters etc.) and is in line with previous research that purports that IMs complement more traditional forms of communication for relationship maintenance in everyday communication (Ramirez &

Broneck, 2009). Although there is evidence that SNS and IMs reinforce communication, intensified by the use of smartphones (Kwak et al., 2014) as well as enhancing life satisfaction (Dienlin et al., 2017), this perceived merging of oral and text communication has neurophysiological and potential psycho-emotional and communication implications that are in need of further investigation (Colgin, 2013; Gindrat et al., 2015; Tatum et al., 2016).

The small purposive sample was appropriate for this exploratory study, but findings in terms of generalizability should be replicated with larger and more diverse adolescent samples and by using different methods to collect data concerning these themes in future research. Focus groups were the primary source of data collection and are sensitive to biases of group setting, such as focusing more on a selective topic of discussion, which may influence the group decision-making. Second, the sample was homogeneous in terms of ethnic background (UK adolescents). Third, the recruitment strategy itself involved the voluntary choice of students by the school administrators that could potentially include students who do not face any problems with their online use or the deliberate choice of students who may be experiencing problems with internet use as a way to encourage the respective students to discuss their experiences. Additionally, generalization of findings should be viewed with caution in terms of their temporal validity, given the rapid changes in technological advancement and developments in the provision of social media services, which may direct motivational factors to other aspects or forms of social media engagement, potentially altering usage behaviours (i.e., preference for short live video features versus text chats).

This line of research can aid the design of interventions that address parental mediation strategies and the understanding of the adolescent perspective in forming effective communication approaches towards moderate use. Motivations research may contribute to prevention efforts of maladaptive tendencies that may lead to psycho-emotional problems by focusing on targeting compulsive tendencies before they escalate and reach a level of clinical significance. By re-evaluating the role of motivations, intervention strategies may then incorporate activities that address these motivations for peer attachment dynamics, identity formation, and self-presentation, providing alternative channels of self-worth. These findings may also be utilized in schools and community settings, as well as help inform public policy and clinical practice to target screen overuse (Altenburg et al., 2016), and smartphone and social media addiction (Kuss & Griffiths, 2017; Throuvala et al., 2019a). Individual and peer processes (i.e., deficient self-regulation, and strong habitual use) or mediating variables (i.e., peers' time spent on SNSs) may influence adolescent motives and dependence on SNS use and are in need of further investigation (Chua & Chang, 2016; Lee & Cheung, 2014; Thadani, 2011).

Future research should further examine the role of control in the acquisition, development, maintenance, and recurrence of problematic smartphone and SNS use. Additionally, research should examine the context in relation to motivation, gender differences, and platform-specific and feature-specific motivations and preferences (i.e., Instant Messenger for relational maintenance and sustaining involvement) (Marino et al., 2018; Ramirez & Broneck, 2009). Exploring mediating factors, such as the role of educators, parents, and peers (Ragelienė, 2016), may facilitate a greater understanding and address with specificity maladaptive behaviours in prevention and treatment.

5.5 Conclusion

Adolescence is a developmental period of increased emotional and cognitive changes with key developmental tasks being served by the engagement with social media. Motivations are key in understanding major drivers to adolescent SNS use which is increasingly forming a major component of adolescent screen time. Their study should be regularly updated given the evolving adolescent communication needs and trends developed by the technological affordances of new social media products and services that encourage new uses.

The present study addressed participants' current uses and perceptions of motives that underpin SNS preferences and identified potentially dysfunctional mechanisms that reinforce motives for online engagement in SNSs. Key motivations for social media use were social, psychological, and functional and were based on six motivational themes, reflecting constant interactivity and a symbiotic relationship with peers via smartphones, the need for control of content and relationships and to construct social reality along the idealization-normalization continuum. To our knowledge, the motives of peer symbiotic relationship, smartphone attachment, use for emotion regulation and spectrum of idealization versus normalization have not been yet identified as motivational factors in the literature. Additional motives that emerged were their use for emotion regulation, enhancement, peer comparison, ego validation, and for utility. Adolescents equated texting with talking on specific social networking sites, a finding that needs to be further investigated along with its implications. Control motives amplify use of platform features (i.e., *Snapchat* streaks) and the occurrence of anxiety-inducing mechanisms (i.e., FoMO), which potentially reinforce compulsive patterns of social media use.

Addressing motivational drivers and perceptions of use offers the adolescent perspective and a window of opportunity to use these insights in interventions for dysfunctional smartphone use, suicide prevention, or eating disorders (Meier & Gray, 2014). Additionally, it may provide an understanding of the dynamics of the eager embracement of the social media environment and its psychological risks in adolescence.

Chapter 6. A ‘control model’ of social media engagement in adolescence: A grounded theory analysis

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6.1 Introduction

Adolescents benefit from the use of social media applications (‘apps’) and features (i.e., ability to customize content) on major platforms, but empirical evidence suggests a minority also struggle to use them in moderation (Kuss & Griffiths, 2011a). The difficulty in controlling frequency of engagement has partially been attributed to the habitual nature of use, and the constant automatic feeding and structural mechanisms of media platforms, which reinforce use (Griffiths, 2018). Adolescents experience peer pressure to have a constant online presence to participate in the offline and online environment, to produce content that is likeable and distinctive, and to curate images online in a way that appeals and is acceptable to their peers (Throuvala et al., 2019b). Balanced use is inherently difficult to sustain due to individual, social (peer), and environmental factors (i.e., design characteristics), which determine the frequency and severity of the interaction (Griffiths et al., 2018). Growing evidence has acknowledged the impact of persuasive design in initiating and prolonging user engagement (Creswick et al., 2019), similar to the way structural characteristics in games have been associated with a longer duration of play and immersion experience in gamers (Griffiths & Nuyens, 2017). In the UK, academic and charity initiatives advocate the development of regulations and a framework to shield young people against the impact of persuasive design strategies (i.e., auto-play, likes, re-tweets), such as the ‘Age appropriate design code’ framework by the 5Rights Foundation (5Rights Foundation, 2019) and research-driven advocacy projects aiming to promote policies and practices that maximize online benefits while minimizing the harms to children’s wellbeing (Livingstone & Third, 2017).

Adolescent social media use is associated with major psychological processes underlying use. Psychological processes are operationally defined as cognitive, social, or behavioral mechanisms relating to an individual’s pattern of thoughts, emotions, experiences, and/or behavior, and are critical in increasing the vulnerability for developing a disorder, or are involved in its etiology or maintenance (Harvey et al., 2004), with impacts on perception, learning, language, thought, attention, memory, motivation, and emotion (Crocker et al., 2013). A process is fluid and transitory, usually running on a continuum, which is modifiable and dependent on context (Tay & Jebb, 2018).

Main user functions of social media share three crucial processes: Cognition, communication, and cooperation. The sharing of content produces communication and may result in a form of collaborative work within the community of users (Fuchs et al., 2010). These three functions are defined further by social roles and

systems (i.e., public and private), which are integrated in personal profiles with different forms of data (i.e., personal or public) and social roles and activities converging, offering self-presentation and surveillance on different facets of life. *Self-presentation*, *disclosure of personal information*, and *surveillance*—the act of watching and being watched (Andrejevic, 2002)—constitute pronounced processes during adolescence because they facilitate the developmental task of identity formation, which constitute powerful motivational factors (Throuvala et al., 2019a). Evidence suggests that apart from intimate, positive, and entertaining updates, self-disclosure fosters more connected relationships (Utz, 2015) and induces more likeness (Kashian et al., 2017), while *supportive interactions* and *social connection* enhance positive affect (Oh et al., 2014).

Research suggests that user functions may therefore offer positive outcomes. However, usage may also induce processes, which may incur either problematic or pathological engagement for a minority of adolescents (Kuss et al., 2018). This occurrence could be triggered by habituation, which may reinforce compulsive tendencies and create an environment for the development of problematic conditions or addictions (Osatuyi & Turel, 2018). Other psychosocial factors involved in habitual social media use include *fear of missing out* (FoMO), *reciprocal liking*, and *social competition* (Griffiths, 2018). Studies have found that FoMO mediates the relationship between social media use and online vulnerability (Buglass et al., 2017), and also accounts for a high percentage of variance in social media addiction (Pontes et al., 2018). Similarly, nomophobia (no mobile phone phobia) has been considered a contributing factor in impulsive smartphone use and the potential for developing social media addiction (Lin et al., 2019). Another major process underlying adolescent engagement and the exhibition of *electronic aggression*—defined as aggressive acts enacted in the digital environment, such as mocking, making insulting or threatening comments, spreading rumors (David-Ferdon & Hertz, 2009)—is related to the mechanism of disinhibition and termed the *online disinhibition effect*.

This is operationally defined as conscious and subconscious reactions to online experiences fueled by the absence of face-to-face communication and the anonymity or distance afforded by online communication (Suler, 2016). Mobile communication can facilitate incivility and impoliteness with amplification of content that may elicit hostile communication (Groshek & Cutino, 2016) with little fear of retaliation. This in turn could trigger various levels of overt and covert aggression associated with social media use (Kumar et al., 2018): From a more nuanced role, such as *trolling* (the act of promoting a pseudo-membership in an online group, with the real intention to disrupt, distract, or trigger tension with the use of inflammatory, irrelevant, or offensive content for amusement purposes (Hardaker, 2010) or *banter* (an elusive form of discursive exchanges testing social boundaries, negotiating status, group inclusion, and exclusion (Whittle et al., 2019) to more severe manifestations of aggression, such as *online harassment* and *cyberbullying*—defined as bullying through digital media “intended to hurt (by the perpetrator) and perceived as hurtful (by the victim);...part of a repetitive pattern of negative offline or online actions; and performed in a relationship characterized by a power imbalance” (Vandebosch & Van Cleemput, 2008, p. 499).

Current empirical evidence concerning social media addiction emphasizes uses, antecedents, impacts, and risk factors conducive to social media use (typically via smartphones and often conflated with the concept of

'smartphone addiction'; (Kuss & Griffiths, 2017)). However, there is a scarcity of studies identifying those psychological processes and their interrelationships, which may lead a minority of adolescents from normative engagement to a problematic state of social media/smartphone use. To date, the relationship amongst these processes lacks definition and has received minimal attention in the literature, albeit influencing adolescents' emotional states. Depending upon their severity and frequency, these processes may act as precursors or as a prodromal state to addictive tendencies. Given: (i) The major neurophysiological and behavioral changes that take place in adolescence (Mills, 2014), (ii) the increase in emotional mental health problems in this age group (Fink et al., 2015), (iii) the addiction vulnerability (Foulkes & Blakemore, 2016), and (iv) the technological environment and structural characteristics that are implicated in addiction among vulnerable individuals (Griffiths, 2018; Kuss & Griffiths, 2017), the psychological processes of online communication are crucial in identifying and understanding how a functional and versatile tool like social media may also pose a risk to mental health, and undermine personal wellbeing (Mitchell & Hussain, 2018). In order to identify the mechanisms of how social media use may invoke problematic engagement, it is critical to explore and understand the main psychological processes that are implicated in adolescent online interaction. Consequently, the present study explored these dynamic processes utilizing a qualitative investigation with adolescents.

6.2 Methods

6.2.1 Design

The present study applied *grounded theory*, a qualitative methodology most appropriate for research concerned with understanding phenomena (Glaser & Strauss, 2006) and producing a conceptual framework of interactions and processes (Strauss & Corbin, 1990). More specifically, the study employed *constructivist grounded theory* (Charmaz, 2006), which is particularly appropriate for the present study because its relativist epistemology allows for co-construction of theory and meaning by researcher and participants (Mills et al., 2006), while studying processes and linking the individual with the social context and encouraging a deep analysis of the phenomenon (Charmaz, 2017). This epistemological approach was particularly relevant in the present study because it attempted to co-construct the underlying psychological processes of social media use and the phenomena online. Problems and concerns with social media interaction were explored to: (i) decipher the psychological processes underpinning use and, (ii) generate novel theory regarding the interrelationships between the processes and their association to problematic and/or compulsive use. At the commencement of the research, there was no substantive theory to explain the nature of processes in social media use, and theory generation was therefore a highly appropriate outcome for the proposed study. The present study examines psychological processes (cognitive and emotive) associated, influenced, and/or facilitated by social media use. Additionally, it highlights the ways these processes are interrelated and influenced by group dynamics and the media environment itself and how these may be implicated in potential negative impacts of social media use during adolescence.

For a detailed description of Methods, Participant section, Design and Procedure see the Methodology Chapter 4 (p. 92-96).

6.2.2 Data analysis

Coding took place initially using open coding, followed by axial and selective coding. The analysis was conducted simultaneously to coding the data, starting off with concepts which were the basic units of analysis and gradually built up as new data emerged with repeated concepts grounded in the data. For example, one participant mentioned: “*Some people post anything, and they don’t care, to be fair. I wish I could be more like that...and I don’t judge them for that, I am just overthinking...*” (FG2F4). This was labelled “*preoccupation*”. Subsequent similar iterations were compared to the initial incidents and through the process of constant comparisons formed categories such as ‘*cognitive salience*’. These categories were higher in level and more abstract and formed the building blocks for the theory development and integration. These categories were then formed into higher order categories with more abstract headings based on their functions and interactivity with the other processes. Memo writing was constantly updated as the analytical process evolved. Theoretical sampling was met through the meaning the adolescents attached to those interactions and examining representativeness and regularity of the categories in the subsequent focus groups. Hypotheses about relationships amongst categories started to be formed and checked against new data, and broader structural conditions emerged and were integrated in the analysis (structurally-led processes) until reaching saturation (Charmaz, 2006). This continuous and systematic process of data collection and analysis allowed a comprehensive construction of a theoretical formulation of inter-related processes taking place when adolescents engage in communication on social media. Participant identifiers were constructed by the number of the focus group they participated in, their gender and their participant number.

6.3 Results and preliminary discussion

The study’s findings highlighted several complex and inter-related processes underlining adolescent social media engagement and embedded in adolescent social media user functions, comprising three types of processes (Table 1): (i) individual, conceptually divided into *cognitive and emotional* processes and termed as ‘*engagement to control*’ content, relationships and self-presentation (ii) socially-constructed, termed as ‘*controlling the relational self*’ and (iii) structurally-led processes (driven by the platforms’ designs encouraging a specific repertoire of behaviours), termed as ‘*hooking and hunting*’. Social processes were based on group responses and were empowered by group dynamics, whereas structurally-led processes were platform-related mechanisms aiming to reinforce engagement (Table 6.1).

Table 6.1

Individual, social, and structural processes in social media engagement

Concepts	
Individual—Cognitive Processes: ‘Engagement to Control’	
▪	<i>Higher self-consciousness, cognitive salience, online vigilance and arousal</i>
▪	<i>Distractibility/procrastination</i>
▪	<i>Social comparison and critical appraisal</i>
▪	<i>Exhibitionism</i>

Individual—Emotional Processes ‘Engagement to Control’
<ul style="list-style-type: none"> ▪ <i>Relational closeness</i> ▪ <i>Separation anxiety to fear of loss of self-control</i> ▪ <i>Mood modification</i>
Social Processes: ‘Controlling the Relational Self’
<ul style="list-style-type: none"> ▪ <i>Deindividuation of self and conformity to group norms</i> ▪ <i>Diffusion of responsibility and ensuing social disinhibition</i> ▪ <i>Relational aggression on the continuum</i> ▪ <i>Interpersonal surveillance and mirroring</i> ▪ <i>Social disruption</i>
Structurally Induced Processes: ‘Hooking and Hunting’
<ul style="list-style-type: none"> ▪ <i>Habituation, automaticity, novelty, limited time content</i> ▪ <i>Triggering activation</i> ▪ <i>Preoccupation with constant checking and anticipation of reciprocation</i> ▪ <i>Psychological investment</i> ▪ <i>Reward and reinforcement seeking/Wanting more and tolerance</i>

6.3.1 Cognitive processes: ‘Engagement to control’

Heightened self-consciousness, cognitive salience, and vigilance. Students reported experiencing a state of higher self-consciousness (awareness of oneself and actions) and alertness (“*Makes everybody a lot more self-conscious*” (FG2F6), instilling arousal as a result of their presence and engagement in social media. Participants attributed this to the photographs and content that adolescents posted and to expectations for feedback to their posts, either in the form of ‘likes’ and/or comments. This elevated state of preoccupation with personal appearance was viewed as magnified via the photo-sharing culture of platforms, and judgmental peer attitudes on social media leading to a constant need for enhancement of photos and content. Additionally, peer expectations for instant availability created pressure for checking. Leaving notifications or messages unattended was perceived as a sign of being ignored, which created communication complications. Adolescents therefore reported experiencing a state of constant salience and vigilance for new content: “Users’ permanent cognitive orientation towards online content and communication, as well as their disposition to exploit these options constantly” (Reinecke et al., 2018, p.1).

Exhibitionism, social comparison, and appraisal. Adolescents exhibited specific friendships on social media as evidence of time spent together or as a way to garner support and approval from peers:

“They do it to show how close you are and that you have a funny relationship but at the same time it might be embarrassing for the person.” (FG4F3).

This was often conducted by contemplating peers’ considerations regarding a physical feature, while others chose to disregard others’ perceived insecurities for appearance when posting a group photograph, which was a common cause of concern and misinterpretation amongst peers. Therefore, a state of arousal and overthinking was expressed also about the level of self-disclosure. Similarly, the practice of sexting—the act of sending and/or receiving sexually explicit texts and images (Döring, 2014)—was often shared without the knowledge or agreement of the individual depicted, which was referred to as another common practice amongst male adolescents particularly. Social comparison is a process of comparing oneself with others in order to

evaluate and to self-enhance (Festinger, 1954). Adolescents engaged in constant self-comparison and critical evaluation of others' social media practices, and was viewed as a harsh practice that all adolescents were involved in:

"It's like you scroll through Instagram and automatically I don't mean to be but I'm like the most judgmental person." (FG2F1).

To balance out the highly critical environment of the more public social media platforms (i.e., Instagram), relational closeness was sought through exchanges of intimate day-to-day experiences that were free from social comparison and scrutiny.

Distraction and procrastination. Distraction refers to the removal of attention away from a negative situation to a neutral or positive one and is considered a cognitive strategy to regulate emotions (Moyal, 2014), which may be adaptive or maladaptive, depending on whether it is combined with acceptance or avoidant strategies (Wolgast & Lundh, 2017). A majority of adolescents referred to the constant distraction experienced from major tasks (i.e., homework) attributed to: (i) External interruptions due to notifications or direct messages. or (ii) internal interruptions, in the form of preoccupation with (and expectations to) receive comments and messages:

"When I'm doing homework, it is very distracting, one question might take me like an hour, because I chat on my phone" (FG1F1);

"So even if I put it in my bag say if I have Maths, then I am like: Oh, maybe that person might be texting me, I am going out to check my phone." (FG6F3).

This mental shift was viewed as impacting focused engagement in schoolwork and as a detrimental process in social media engagement. Additionally, adolescents experienced feelings of procrastination, using social media to delay tasks:

"Snapchat it is quite an easy way out, it's accessible for people who want to procrastinate a bit." (FG4M2) and viewed as influenced (at least partially) by their ability to control their distractibility.

6.3.2 Emotional processes: *'Engagement to Control'*

Relational closeness for social facilitation. Students reported a need to have both a public and a private discourse online with Instagram as the main public platform and *'Finstagram'*—a second more private Instagram account and Snapchat to serve as platforms for the exchange of intimate, informal moments and experiences amongst an inner circle of friends: *"...people now have created second accounts, because they are so self-conscious"* (FG2F3).

In social situations, adolescents experienced social facilitation in two ways: (i) Using social media as a means to overcome social discomfort or social anxiety by replacing ordinary moments of waiting (e.g., on the bus), and (ii) as offering a boredom-reducing solution when in the presence of 'unwanted' others.

Separation anxiety to fear of loss of self-control. Adolescents experienced anxiety and negative mood states when not having their mobile devices, when unable to contact or access content (nomophobia). Self-control was viewed as compromised due to FoMO and the constant pressure for availability. Adolescents preferred to

keep devices physically away during homework yet they experienced a difficulty resisting attending to notifications or direct messages: *“I made my brother hide it while I was revising. It was so like addicts.”* (FG2F4). A difficulty was also expressed where sleep time routines were violated, and sleep compromised either due to reading notifications or purposeless scrolling through feeds.

Mood modification. Adolescents experienced volatile emotions as a result of online interaction. Mood was often dictated and altered by (i) negative peer responses, (ii) inability to access devices, and/or (iii) feeling unable to communicate with friends:

“What I do is when someone says something and uses sarcasm, I just feel okay but if they keep on saying it, especially, if it’s my friends, I just take it hard and then I need to calm down, it does have an emotional impact.”(FG5F5)

However, participants also reported an inflated sense of self and entitlement for liking and approval in relation to self-presentation. The curation of personal identity online was raised as a critical daily task, fulfilling users’ needs to gain acceptance and enhance one’s social status within the online community. Therefore, in response to the increased effort to identify, upgrade, and post the preferred image were reciprocal expectations for liking and approval. However, the practice of enhancement often took extreme forms beyond identification in real life, viewed as causing disillusionment, distrust, and higher aggression as a result.

6.3.3. Socially induced processes: *‘Controlling the Relational Self’*

Adolescents also discussed processes they experienced as a result of belonging to various online groups. These processes were identified as: (i) *Deindividuation of self to conform to group norms*, (ii) *diffusion of responsibility and ensuing social disinhibition*, (iii) *relational aggression on the continuum*, (iv) *interpersonal surveillance and mirroring*, and (v) *social disruption*.

Deindividuation of self to conform to group norms. Loss of personal will and the tendency to follow and agree with other in-group opinions or actions was experienced by adolescents as either passive tolerance or indifference. Peers often expressed succumbing to the common spirit of the moment despite personal disagreement

“It’s like a trend other people are doing it so if they want to be with those people they’re trying to do it themselves; they might not necessarily think it’s a pretty good thing to do, but since other people do it they do it themselves.” (FG3F5).

To an extent, this process was facilitated by conforming to group norms and by passively tolerating bad behavior through inaction, indifference, and/or aggressive acts. Adolescents experienced a high degree of group influence in group chat situations, where peers tended to exhibit social desirability rather than supporting a peer who was in distress. *Diffusion of responsibility and ensuing social disinhibition.* Adolescents experienced a loss of responsibility and conforming to the group dynamic was expressed as inactivity or tolerance of bad behavior towards other peers,

“In group chat, if someone says something, it’s a lot easier for people to agree with them rather than back the other person up: If they tell you, ‘you’re fat’ or whatever, then it’s a lot easier to agree, rather than saying—that’s not right!” (FG4M2).

“I think on social media it is a lot easier to physically move your fingers and type in words and actually say something to someone because you can write anything but would you say that on their face?” (FG4F1). “It’s easier to say anything, you’re more brave online, not scared.” (FG5F1).

Diffused responsibility stemmed from group dynamics and perceived peer pressure [(fueled by a degree of cyberstalking (Lowry et al., 2016)] and a lack of awareness of the impact of consequences of online actions on others. Adolescents viewed the absence of face-to-face communication and facial expression as facilitating uncivil ways, causing considerable distress to the recipients of the messages. Social disinhibition was experienced as a great degree of freedom online and a greater sense of confidence and feeling less fearful online, without consideration for the consequences:

“I wanna look at what other people are doing... When you don’t want to talk in person, people would say things they would not dare say to their face, and they do it online.” (FG2F2).

“They can’t see you, can do whatever you want to, it feels like there is less consequences, whatever you’ve typed...because they’re behind a screen. You’re shielded.” (FG3M4).

Social disinhibition was viewed as taking different forms and was expressed in various degrees of severity with behaviors online perceived at times as evolving into some form of cyberbullying. Lack of physical cues or facial expressions led to an almost automated mindless empowerment and taking the step to articulate a negative comment, not shared otherwise in a face-to-face conversation:

“And even if you have an argument with one friend, you can just screenshot it and then there is so much going on: ‘why did you screenshot it?’—they send you the argument, the text messages, people are more touchy finding out things on social media” (FG6M2). “Some people text you, who you don’t even know and judge the pictures that you have posted. But you just say something back and block them, just like, ‘Bye you are blocked’ but sometimes it can get quite nasty, like bullying.” (FG5F5).

“The fact that you don’t see them if you are talking about a problem, you can’t see them and is easier and you can say something mean that you would not say to someone’s face.” (FG1F1).

Misinterpretation of intention escalated to larger issues and a spiraling of events magnified out of proportion, spilling over to offline relations and vice-versa. Additionally, feeling forced to participate socially was viewed as another source of frustration, which activated social disinhibition. *Relational aggression on the continuum*. The expression of hateful comments was a common adolescent experience. The online environment was viewed as facilitating the exhibition and attraction of relational aggression. Being able to freely express themselves without face-to-face contact facilitated harsh attitudes towards others. Such behavior appeared to be observed more on specific content transient platforms (i.e., Snapchat), which reinforced the degree of indifference or aggression:

“With social media people don’t quite know if you are saying a joke because they don’t see the sarcasm, something might start up as a joke it might spiral into other things and people might end up hating each other with just a few words on Instagram. It happens quite often.” (FG6F6).

“Especially with Instagram, there have been certain circumstances where people can be very manipulative or bullying...people would say things they would not dare say to their face.” (FG5M7).

In the case of fallouts, adolescents criticized the practice of screen-shooting the arguments and sharing the screenshots amongst friends. Online sext-shaming was another expression of relational aggression. Sexting images with inappropriate content was viewed as a frequent practice for adolescents with an emotional impact:

“People do things that shouldn’t do. People texting other people and screenshots and sharing again, it happens quite often.” (FG2F6).
“It feels horrible, when you give someone trust and then they back down on that trust –it really upsets you.” (FG2F3).

Another form of social disinhibition was ‘phubbing’, which has been operationally defined as a persistent engagement in smartphones by checking emails and social networks, playing games, listening to music, or other activities as a way of avoiding face-to-face communication (Chotpitayasunondh & Douglas, 2016). Adolescents employed smartphone use to ‘phub’ unwanted or less accepted peers by persistent engagement with their smartphone.

Interpersonal surveillance and mirroring. Surveillance of peers’ activities online was acknowledged as a common practice related to FoMO. Social media celebrities and other famous individuals were viewed as influential amongst the teenage population:

“I’m very nosy, it’s a way to see what others are doing and get some feedback on what is going on.” (FG6M2).
“Those people you follow, you see their hobbies, interests, fun videos and you end up spending loads of time on it.” (FG3F5).

Mirroring influencers’ body images and setting goals based on these standards was common yet was contradicted by perceptions of unrealistic and unhealthy standards of beauty, which were being promoted online. Despite the initial enthusiasm expressed about the ideal standards, adolescent participants advocated against the promotion of unhealthy practices of individuals promoting negative mental health and peers who mirrored unhealthy types of views, behaviors, and appearances. Additionally, adolescents expressed concerns that private actions enacted online may arrive in the public domain, with ensuing feelings of embarrassment and shame.

“I think with celebrities and models, when posting a selfie and they put their body and we think it looks amazing! so we are like OMG, I need to get my body like that, but this is wrong.” (FG3F2).

Social disruption. Adolescents experienced peers as being antisocial in offline social situations (i.e., school breaks, parties) as initial peer gatherings were eventually turned into online interaction in the presence of others,

“These people are all on their phones, they are unsocial, but that happens a lot ...it is cutting up the social aspect of life.” (FG1F6).

This differed from phubbing because it was not an intentional act to avoid an unwanted peer. Social disruption incurred due to the common practice amongst adolescents in many offline social situations to drift off and eventually withdraw to their smartphones, exhibiting a preference for online interaction, despite the initial interest to interact. This practice was extended to school break-time or other social instances, with peers exclusively engaged with their smartphones, disregarding the presence of schoolmates or friends. Disruption was also being experienced by distraction and the inability to impose self-control by ignoring smartphone notifications. Overinvolvement with smartphones was considered a disruption of naturally occurring social interaction and lack of balance:

“I think people are trying to have a balance between social life and their social media life.” (FG4F3).

6.3.4 Structurally induced processes: ‘Hunting and Hooking’

‘Hunting’ was experienced during the acquisition of strategies to achieve a higher reward potential, such as actively seeking to maximize opportunities for reward and reinforcement, while ‘hooking’ entailed strategies which endorsed habit-forming behaviours and processes among adolescents.

Habituation, automaticity, limited time content, and psychological investment. Adolescents experienced social media use on their smartphone as an automatic process with constant smartphone checking. Use was not ceased even during school lesson time, homework, or sleep routines. Adolescents reported always carrying their devices with them, except for mealtimes due to family or school rules out of fear that the device might be taken away. This habitual use was associated with a state of high self-consciousness and preoccupation regarding new interactions and/or new content. Additionally, if unable to check or perform specific routines (i.e., Snapchat streaks—number of consecutive days of active interchange of photos amongst two friends on the platform (Throuvala et al., 2019a), adolescents experienced negative emotionality. Content available for a limited time only as in Snapchat encouraged further online disinhibition:

“Also, especially on snapchat, people can say stuff and think that it’s okay because it doesn’t save and even if you have an argument with one friend you can just delete it.” (FG5F8).

Adolescents experienced psychological investment and a bond with their peers on social media, and no adverse effects would motivate them to give this up:

“Nothing comes in the way of having your streaks, your life depends on them, maintaining those streaks.” (FG5F2).

Triggering activation and anticipation of reciprocation. Adolescents often expressed their social media use having been triggered by environmental cues (i.e., social media notifications): *“I find it quite hard when somebody messages you and it is personally directed to you, it leads you to open it and then get distracted. It is a temptation.” (FG3F1).* Expectations of instant attendance to notifications was expressed as a key behavior, which led to a constant state of alertness. Not answering back and delaying reciprocation was experienced as a sign of ignoring and neglect by the other individuals and viewed as requiring an apology. Cue activation was also internal and hypothetical, denoting preoccupation about inability to instantly interact. Similarly, an inability to reply instantly was associated with feelings of anger, agitation, and/or compulsive tendencies.

“So even if I put it in my bag say if I have Maths, then I am like: Oh, maybe that person might be texting me, I am going out to check my phone.” (FG6F3).

Reward and reinforcement seeking. A key process for adolescents was reward-seeking in the form of followers, ‘likes’, and/or ‘streaks’. Adolescents devised strategies to increase their popularity levels (*“If I’m with a friend that doesn’t have many friends, I don’t get many likes, but if I am with a friend that’s got loads of friends, then I get loads of likes as well” [FG6F5]*), and photos judged as not good enough determined adolescents’ emotional state and state of self-confidence. Enhancement and enrichment were experienced by adolescents due to novelty, innovation, and variability in social media, which further reinforced engagement. Novelty in platform content was considered a positive feature benefiting and providing adolescents with increased opportunities for exposure (i.e., daily news feeds). This practice differed from any other traditional media but was viewed also

with some skepticism due to its questionable quality. Fake news or poor quality of news was normalized as part of the reality of exposure to social media.

Wanting more and tolerance. Higher reward-seeking led adolescents to constant strategies to correct and upload new photos with higher ‘approval’ potential. The number of friends was a direct measure of popularity “*People think like if you’ve got more followers then you get more likes because more people will follow you*” (FG2F2) and being associated with peers with a higher number of friends was considered a successful strategy to reach a higher number of likes in their uploaded photos. Another strategy used was the application of enhancement techniques (i.e., make-up and filters). However, use of filters was perceived as reaching hyperbolic levels, altering appearance to the extent of deception. Additionally, adolescents perceived a discrepancy between what companies defined as the norms of beauty and what adolescents decided to promote. Social media were perceived as an arena where although various possibilities of norms can co-exist (i.e., thinness vs. plus size representation), ideal image standards of beauty dictated adolescents’ choices. This led to a constant negotiation of reaching the ideal versus the normal, and reinforced interaction: “*And it makes you want to change yourself. If for example, I shade it differently, and I put something different from what I last put on, I don’t get as many likes, so clearly, I’m not good enough. Makes your self-confidence go down. You wanna take another one and try to make up for it*” (FG4M5).

6.4 Discussion of the emergent model

The psychological processes evidenced comprised three core categories and formulated a theoretical model termed ‘the control model’ of engagement, highlighting control mechanisms and processes on three levels involved in social media engagement (Figure 6.1): Individual processes occurring at an intrapersonal level, socially-induced processes forming via social interaction, and structural-level processes evoked from platform design deliberations, which influenced adolescent engagement levels. Findings corroborated a dynamic transition from a state of initial controlled engagement to define content, relationship formation and self-presentation, driven by anxiety mechanisms (anxious preoccupation, salience and vigilance, fear of peer evaluations, exhibitionism) to a reduction of control initially with a loss of attentional focus and of time spent online with implications for academic achievement. Loss was further experienced through group-led dynamics of deindividuation and/or conformity: Group processes (i.e., disinhibition and mirroring) led to either submission to group norms or deindividuation and diffusion of responsibility. This resulted in lessening the degree of personal responsibility and allowing for more aggressive relational phenomena to take place. Aggressive responses may be further intensified by separation anxiety (FoMO and nomophobia) and fear of social exclusion, which reduces sense of control and ability to respond (Freedman et al., 2016).

Structurally induced processes (i.e., *reward* and *triggers*) further reinforce individual processes (i.e., *cognitive salience* and *vigilance, distractibility*), and increase opportunities for social processes to take place (i.e., *interpersonal surveillance, mirroring, and social disruption*). Continued use was encouraged and facilitated through habituation, reinforcement, and further investment in the medium, content, and relationships.

Therefore, loss of control was experienced at an individual level with a gradual change from a self-referential state and preoccupation with controlling perceptions of personal identity and representation online, to control of group interactivity with structural processes partially determining, facilitating, or reinforcing psychological and emotional outcomes. For example, the process of preoccupation appeared to lead to higher online vigilance, which could be related to checking and habitual enactment, associated in the literature not only with time investment but with psychosocial problems (i.e., anxiety, depression, and loneliness) (Bayer & LaRose, 2018). Depending on how salient and intensive these processes are within the individual, they may exacerbate potential negative impacts of use (i.e., escalation to higher relational aggression) and may dictate the interpersonal (i.e., relationships with peers) and the intrapersonal (i.e., self-concept) context of the adolescent and lead to potential psychopathological symptoms (i.e., anxiety and/or compulsive use).

The emergent '*control model*' of engagement identified: (i) The inter-relationships between individual, social, and structurally induced processes in defining social media engagement; (ii) the gradual transition from a state of individual controlled use to a state of reduced control through the interaction of processes, determining attitudinal and behavioral outcomes; and (iii) control of self-concept, content, and relationships as a principal agent of online engagement—which goes beyond uses and gratifications in social media use.

On an individual level, the findings highlighted separation anxiety as a psychological process underlying adolescent user engagement associated with (i) an increased state of *self-preoccupation* with adolescents' online identity, (ii) *cognitive salience* of the online environment, and (iii) *vigilance* in adolescents (Reinecke et al., 2018). The extant literature suggests that negative psychological and physiological outcomes are associated with smartphone separation and the inability to answer calls during cognitive tasks (Clayton et al., 2015; Han et al., 2017). *Social comparisons* and *fear of critical appraisal* and evaluation by peers also led to *heightened self-consciousness*. Preoccupation with online identity signaled a state of constant alertness and arousal manifested in more frequent and intense engagement, which appeared to interact with *cognitive salience* and *vigilance* of the online content (Cheever et al., 2014). It is plausible that both processes are associated with constant checking (Reinecke et al., 2018), decreased wellbeing, and reduced mindfulness (Johannes et al., 2018), and with parental reports of hyperactivity/impulsivity, anxiety, depression, loneliness, and FoMO in children (Barry et al., 2017).

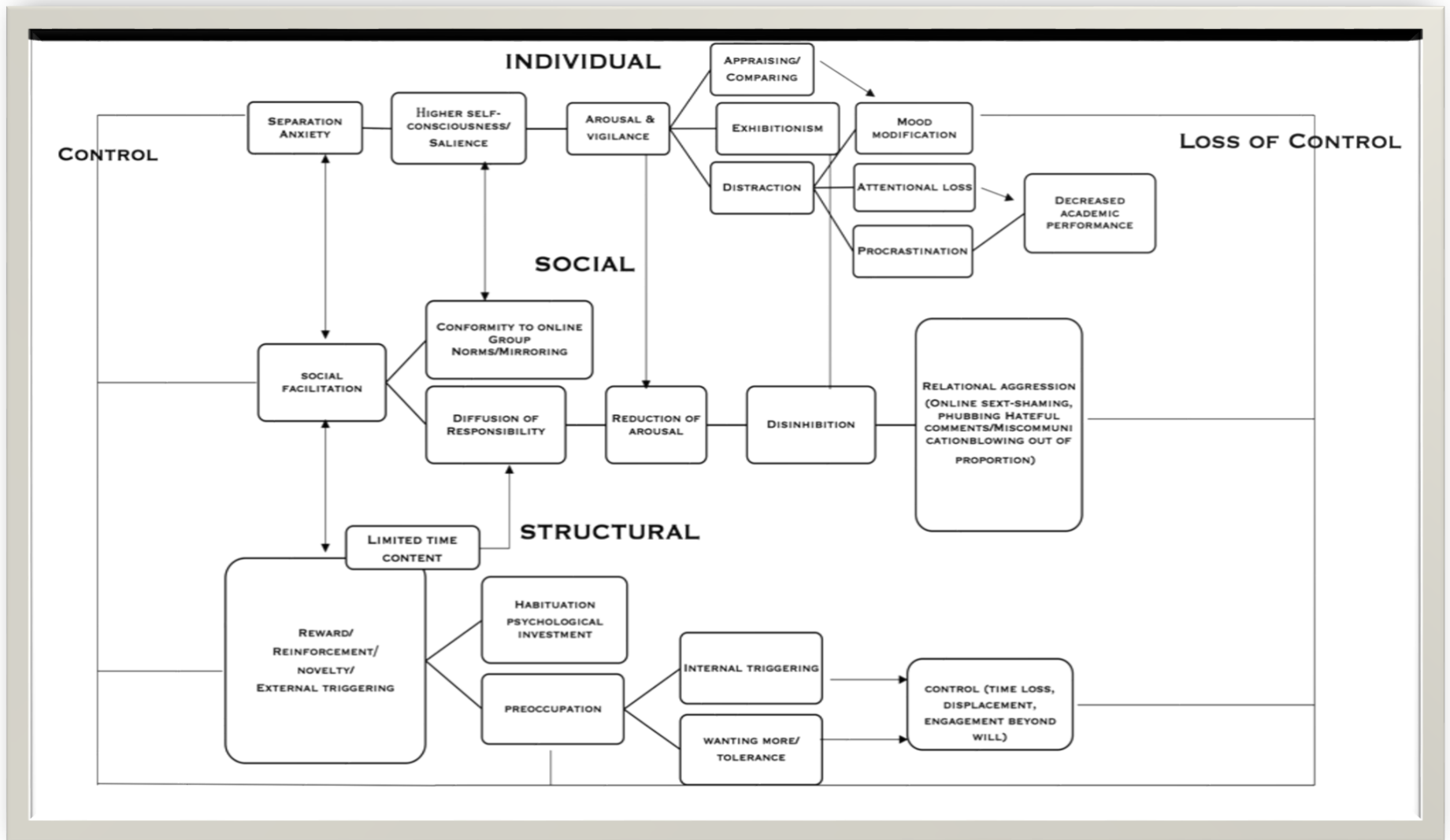


Figure 6.1 The control model of social media engagement

Additionally, checking behaviors appear to have a cognitive impact due to the repeated external interruptions and attentional micro-disengagements or internal interruptions due to vigilance, leading to *distractibility* (Gazzaley & Rosen, 2016). *Distraction* is an emotion regulation mechanism of moving attention from negative emotions to non-negative issues (Webb et al., 2012), and a more adaptive coping strategy in reducing depressive mood relative to rumination (Nolen-Hoeksema et al., 2008). Despite its regulating function, distraction produces an attentional conflict (offline vs. online, platform switch), causing arousal and effort for attentional focusing leading either to *facilitation* (Baron et al., 1978; Baron, 1986) or shallow processing with impacts on productivity and academic achievement (Thornton et al., 2014).

The present study's findings highlight the existence of social processes relating to a negotiation of control due to group dynamics. This involved the transitioning from a state of controlled engagement to a gradual loss of control within online group membership. This model of engagement draws from two psychological models with their key processes of *deindividuation*, *social facilitation*, and *diffusion of responsibility*. First, *social facilitation theory* (Triplet, 1898) explains how (in the present study) the online presence of others may energize online performance and encourage diversion from offline tasks. Second, *deindividuation theory of aggression* (Zimbardo, 1969) denotes how being part of a group facilitates the release of inhibition with ensuing diffusion of responsibility. Overall, the presence of others induces social facilitation and increases arousal, while reducing responsibility, self-awareness, and accountability (Triplet, 1898; Zimbardo, 1969). External attentional cues and external stimulation from peers or social media feeds gradually induce deindividuation because they distract from internal thoughts and rumination (Nolen-Hoeksema et al., 2008), while reduced self-awareness or preoccupation with self-concept or impression management (Rosenberg & Egbert, 2011) reduces control and may disinhibit aggression (Lowry et al., 2016; Prentice-Dunn & Rogers, 1982).

Alternatively, adolescents perceived users exhibiting greater conformity to social norms, despite personal disapproval, which may act congruently or antagonistically to deindividuation, and possibly reduce antisocial tendencies (Pryor et al., 2019). Additional group processes, socially facilitated and amplified by diffusion of responsibility, were related to *aggression* (i.e., *online sext-shaming*) and *social disruption*. This confirmed evidence highlighting increase in adolescent loneliness (Twenge et al., 2019). An *inflated sense of self*, which emerged as a process afforded by social media, might contribute to impulsive behaviors, potentially in the form of more aggressive interactions. The present findings highlight that *relational aggression* online ranged on a continuum from online disinhibition to various forms of cyberbullying, potentially implicated in psychopathology (e.g., (Kircaburun et al., 2019)). As an example, *phubbing* has been found to reflect a dependency on smartphones and to be associated with smartphone addiction (Karadağ et al., 2015) and problematic social media use (Balta et al., 2019; Franchina et al., 2018).

Social comparisons and appraisals were other social processes, which appeared to partially underlie cognitive preoccupation and vigilance with potential mental health impact (Kelly et al., 2019). Negative *social comparisons* on social media negatively affect mood, emotions, appearance, and physical health perception

(Dibb, 2019; Fardouly et al., 2015), disordered eating (Holland & Tiggemann, 2016), and mediate wellbeing (Reer et al., 2019). The use of ‘Finstas’ was reportedly an alternative way to mitigate peer pressure for ideal online presentation within the platform, which is prevalent in the main Instagram account (Throuvala et al., 2019a). Related to self-presentation was the process of *exhibitionism*, manifested through (i) showcasing high-profile friendships—boosting the reputation of the adolescent amongst the in-group—(ii) sexting, and (iii) sext-image sharing. The photographic image was evidence of time spent together with socially influential peers and uploading became a continuous act. This process may be underlying a behavior that has been termed ‘*selfitis*’—the constant act of selfie-taking with its compulsive nature (Balakrishnan & Griffiths, 2018; Bij de Vaate et al., 2018). Sexting appears to be an increasingly common practice amongst adolescents, with a mean prevalence for sending and receiving sexts in one study of 14.8% and 27.4%, respectively (Madigan et al., 2018). Additional processes included *mirroring of behaviours of influential others* and *interpersonal surveillance* confirming increased engagement (Tokunaga, 2011) and a contribution to body dissatisfaction issues (Brown & Tiggemann, 2016).

The present study’s findings also highlight the emergence of platform-related, structurally induced processes, and identified two types of mechanisms depending on their function. Social media activities per se have been suggested to be potentially addictive (Alter, 2017), with embedded structural mechanisms that reinforce prolonged engagement and addiction vulnerability (Griffiths, 2018). ‘*Hooking*’ processes (i.e., cue-activation, anticipation of reciprocation, limited time content, and psychological investment) aim to attract and retain adolescent attention and engagement through mechanisms encouraging habituation and constant checking (Griffiths, 2018). For example, ‘reciprocal transparency’ (awareness if a notification has been viewed or screenshotted, etc.) is a structural characteristic that adds transparency to the online communication, yet if unattended or ignored may cause ‘response latency’ (Lew et al., 2018), potentially reinforcing preoccupation and checking, thus endorsing a more habitual engagement with continued usage becoming less goal-oriented and performed without a purposeful cognition (Lally & Gardner, 2013).

Additionally, adolescents experienced a state of *psychological investment* in social media activity and devices, which provide access to content and are related to separation anxiety (Clayton et al., 2015). Psychological investment appeared as a related process in studies reporting body and facial dissatisfaction (Tiggemann & Barbato, 2018), and increased browsing and depressive mood (Frison & Eggermont, 2017). Excessive investment may reflect compulsive tendencies in managing the relational self. ‘*Hunting*’ processes (i.e., reward-seeking) comprised active manipulation for higher reward acquisition, triggered primarily by the variable reward reinforcement similar to gaming, acting as potential antecedent to problematic use due to reinforcement sensitivity (Griffiths & Nuyens, 2017; Vargas et al., 2019) and neurobiological activation in neural regions implicated in reward processing, social cognition, imitation, and attention (Sherman et al., 2016). However, behavioral reinforcement factors have not been sufficiently studied to date (Andreassen & Pallesen, 2014), particularly in relation to their interaction with individual and other situational factors.

The associations proposed were grounded within the particular set of data, which highlighted an indicative pathway. However, given the heterogeneous nature of use, these could not be considered exhaustive or comprehensive as they depend on a host of factors, which could influence outcomes differentially and may not be addressed within the framework of this research study. Additionally, the model can neither prescribe how transient or longer lasting these processes are nor their specific impact on adolescent mental health. Limitations of the present study also pertain to issues of generalizability due to the study's exploratory nature using small homogeneous focus group samples. Additionally, self-reporting concerns and problems may be inaccurate due to social desirability and selective memory.

The present study's theoretical and prevention implications are important in terms of understanding problematic processes and embedding mechanisms to control them either by substituting them with positive ones or stopping their escalation. The theoretical implication refers to mapping inter-related processes, which may lead to problematic or addictive social media use and adds to understanding a process-oriented model of problematic social media use, which accounts for a more systemic view of processes. This highlights the interplay between the individual and the situational environment, which has been overlooked in the cyberpsychology literature. In terms of practical implications, one key research area recommended to further investigate is relational aggression, which may be addressed by interrupting the process of deindividuation and promoting empathy and personal responsibility online or by providing information on how to respond to harmful social media content effectively and foster reinforcement for prosocial behaviors and support provision to others. Additionally, the study provides insights that may be embedded in media education, such as conflict-resolution skills and perspective taking (Throuvala et al., 2019b). Further studies could examine the current model and delineate the relationships between these processes in a quantitative manner and establish associations with user experiences, dispositional traits, and situational characteristics within the social media environment, and provide clarity in terms of mental health impacts and long-term effects.

6.5 Conclusion

The findings of the present study highlight the existence of control mechanisms and processes involved in social media engagement, which led to a theoretical model defined as the '*control model*' of social media engagement. The model emphasizes the psychological process of control as a key mechanism, moving beyond uses and gratifications, and designates a gradual transition from a state of controlled engagement at an individual level, into a potential gradual loss of control when the social and structural processes come into interplay. Additionally, it describes the interrelationships between the three levels of processes, which may take on different power positions depending on the relation between the parameters and the level of engagement. Based on the current literature, these major psychological functions merit further investigation, as given a conducive context (i.e., a trauma or a hostile family or peer environment) may act as antecedents of or risk factors for problematic smartphone use for a minority of individuals. Depending on the quality of engagement, the meaning attached to the interaction, and the frequency of use, a minority of adolescents may be predisposed to engage in social media use in a problematic or addictive way.

Equally, the above study highlighted an emerging area of research—the importance of design mechanisms within the social media environment, which play a significant role in the initiation and maintenance of online engagement. More research should be encouraged to understand how persuasive design elements capture young peoples’ attention and reinforce both active and passive social media use. Critical to this endeavor is the engagement of young people in the research process and in providing them with a voice that raises their concerns and promotes their recommendations for improving their online experiences (Creswick et al., 2019; Vallejos et al., 2019). This could in turn be translated into effective policy making and intervention by social media operators. More specifically, the identification of these design elements can help in (i) prevention by educating young people on how platforms and tech designers endorse habitual and problematic use, policymaking (by prohibiting potentially exploitative design characteristics), and theory-building (by demonstrating ways that specific persuasive design elements are implicated in problematic use). The recent announcement by Instagram to test globally the banning of likes on its platform, by temporarily disguising them from its users, is a long-awaited corporate response to the growing concerns regarding the impact of social media use on young people’s mental health (Griffin, 2019). However, unless access to user data for research purposes is granted by social media platforms, providing researchers with behavioral tracking data following the gambling industry’s example (Bonello & Griffiths, 2019), research findings will still be presented with methodological limitations and arguable associations between user behavior and potential harms. Therefore, public policy, educators, and parents should advocate for a more transparent and socially responsible industry approach, which would reflect genuine interest in the protection of young people’s rights in a rapidly evolving digital environment.

The following chapter refers to a qualitative study analysing perceptions of online impacts with an emphasis on the analysis on challenges and harms experienced by adolescents from online engagement as conceptualized by students themselves, teachers and parents.

Chapter 7. Perceived challenges and online harms: a psychological perspective to social media use impacts on a severity continuum – A thematic analysis

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2021b). Perceived challenges and online harms from social media use on a severity continuum: A qualitative psychological stakeholder perspective. *International Journal of Environmental Research and Public Health*, 18(6).
<https://doi.org/10.3390/ijerph18063227>

7.1 Introduction

A sharp rise in children and adolescents in the UK being treated by NHS mental health services has been observed (from 9.7% in 1999 to 12.8% in 2017 - including the up to 19 year olds to) with emotional disorders rising from 4.3% in 1999 to 5.8% and one in six (16.9%) 17 to 19 year olds having a mental disorder (NHS Digital, 2018). This rise in mental health needs is fuelled, in addition to large socio-economic and individual factors, by exposure to media images contrasting lived experiences to young people's aspirations (World Health Organization, 2018a). Prevalence of social media has generated a growing interest to understanding of the development of problematic use among adolescents (Lee et al., 2017). Problematic social media use presents with both cognitive, emotional and behavioural symptoms, which manifest as harms in the form of negative consequences in an individual's life (Kuss, 2017). This should be distinguished from addictive use – which includes symptoms of preoccupation, tolerance, withdrawal, loss of control and relapse (Griffiths, 2005). Despite social media addiction not being a legitimate clinical entity and to date a debatable psychological construct, there are conceptual similarities (Andreassen & Pallesen, 2014) with problematic media use and symptoms acting potentially as precursors to problematic use. Additionally, a recent systematic literature review and meta-analysis involving data from 41,000 individuals indicated a high level of problematic smartphone use (one in four children and adolescents) and an association with mental health symptoms (depression, anxiety, high levels of perceived stress and poor sleep) (Sohn et al., 2019). Therefore, impacts from social media use are compounded by the constant accessibility through smartphones, which has fuelled a proliferation of research on smartphone use. However, evidence is conflicting, with research also suggesting that frequency of social media use may not be associated to anxiety and depression (Rozgonjuk et al., 2020).

Psychological harm can be defined as impacts on an individual's well-being and psyche (Agrafiotis et al., 2018). Literature has identified a wide variety of psychosocial harms and impacts associated with excessive social media and smartphone use which can arise beyond use (González & Orgaz, 2014): poor academic performance and classroom hostility in adolescents (Cao et al., 2018; Stavropoulos et al., 2016), sleep, ADHD and family problems (Becker & Lienesch, 2018; Boer et al., 2019), cyberbullying (Hamm et al., 2015) interpersonal relationship difficulties (Yang, 2003; Lee, 2009), psychological issues such as anxiety, depression and ADHD (Thomé, 2018), anxiety, conscientiousness, openness, emotional stability, the amount of time spent

on smartphones, and age (Hussain et al., 2017). Increased screen time has been suggested as a factor contributing to shorter sleep duration among adolescents (Twenge et al., 2017). However, social media use may be conferring subtle changes on a physiological/social/emotional levels, such as retention of information and recall (Ferguson et al., 2015) and emergent literature on neurophysiological changes (He et al., 2018). Still, impacts have been reported to be beyond a binary conceptualization presenting with both positive and negative effects (social interactions may promote closeness and distance; self-expression may promote growth and social comparison; Weinstein, 2018). Cognitive impacts have been also suggested. Both adolescents (54 percent) and 72 percent of parents have reported that mobile devices are a daily source of distraction for adolescents while parents are being reported as similarly distracted by devices daily (50 percent of parents and 44 percent of adolescents) (Robb et al., 2018).

Rising concerns over online harms have given rise to a number of governmental and non-governmental bodies' responses. For example, in the UK, concerns over children's vulnerability to harmful content (Ofcom, 2018) iterated initially in the 'Internet Safety Strategy Green Paper' (HM Government, 2017) led to a governmental response for an open call for evidence and recommendations for a new regulatory framework to inform online safety regulation and address the negative impacts of social media and screen time on young people (Griffiths et al., 2018; House of Commons Science and Technology Committee, 2019b). This process then led to: (i) the development of an 'Online Harms White Paper' (HM Government, 2019) outlining an extended range of online harms and legislative and non-legislative ways to address these amongst social media operators, parents and carers and other stakeholders, and, (ii) the development of an age-appropriate design code of practice (Information Commissioner's Office, 2019). The latter report outlined a code of practice for providers of online social media platforms as a guideline and a general approach to age-appropriate content, defining social media operators' duty for robust provision of age verification systems and age-appropriate services and ways operators can involve and support parental involvement in the process (Department for Digital, Culture, Media & Sport, 2019). Ofcom, the UK's telecommunications' regulator, was also given interim power to regulate activity of social media operators (i.e., to impose fines or even suspend operations) if they fail to comply with legislation regarding harmful content online (i.e., violence or child abuse) (The Independent, 2019). These governmental approaches for stronger intervention have been complemented by charities' and non-profit organizations' initiatives to support educators, schools and other stakeholders on media literacy efforts with a governmental intention to coordinate all these activities, assess areas of duplication and overlap and coordinate a country-wide media literacy strategy and an overarching statutory duty of care (House of Commons Science and Technology Committee, 2019b).

Despite the notable impacts highlighted in the extant literature, children and young people's voices are often overlooked in terms of how these impacts are conceptualized and how proposed changes regarding recommendations are implemented (Creswick et al., 2019). Adolescence is a developmental period with high vulnerability to mental illness (Blakemore, 2018) and most mental health disorders have their onset. Additionally, this period is one of the most critical times since adolescents are laying down the foundations for their academic and professional choices while it is a period of risk-taking behaviours with difficulties in emotion

regulation ability. Risk-taking behaviours may be used as a coping mechanism and contribute to poor mental health jeopardising adolescents' mental and physical well-being (World Health Organization, 2018). Risky behaviours and poor mental health initiating in childhood can define future development (Sohn et al., 2019). Recent findings using objective Facebook data have confirmed a direct association between frequency and intensity of positive feedback in the form of likes with perceived well-being (Marengo et al., 2020). Adolescents, who experience a higher vulnerability to peer evaluations may similarly experience the rewarding aspects of social media but may also present with overreliance or excessive reassurance seeking behaviours which could be the gateway to problematic smartphone use (Elhai et al., 2020; Foulkes & Blakemore, 2016). Therefore understanding challenges and harms in adolescence may facilitate prevention measures which address at a school level expectancies and cognitions related to rewards.

To better understand the needs and concerns of stakeholders, it was necessary to develop an understanding of current harms experienced by adolescents in relation to their online use. The present study will attempt to provide a conceptual taxonomy of online challenges and harms for adolescents from social media and gaming experiences to facilitate the development of an assessment of the nature of harm-related issues beyond safety, adding to the growing evidence base. Understanding stakeholder conceptualizations - student, parent, teacher- for online-related harm for adolescents may aid in developing a more coherent understanding of harms for research, policy formation and treatment provision.

7.2 Methods

Three different stakeholder groups were used in the current study, which involved student focus groups and parent and teacher interviews to obtain consensus from these stakeholder groups on concerns and challenges experienced. Triangulation of data sources was sought to explore commonalities and differences in the conceptualisation of harms (Carter et al., 2014). Therefore, multiple informants were recruited (students, parents, teachers) so the construct of harms could be explored from different perspectives. The current study utilised thematic analysis to analyse its data. Design, participant section and procedure are covered in the Methodology Chapter 4. Emphasis was placed primarily in the perceived challenges and harms rather than the benefits of online engagement.

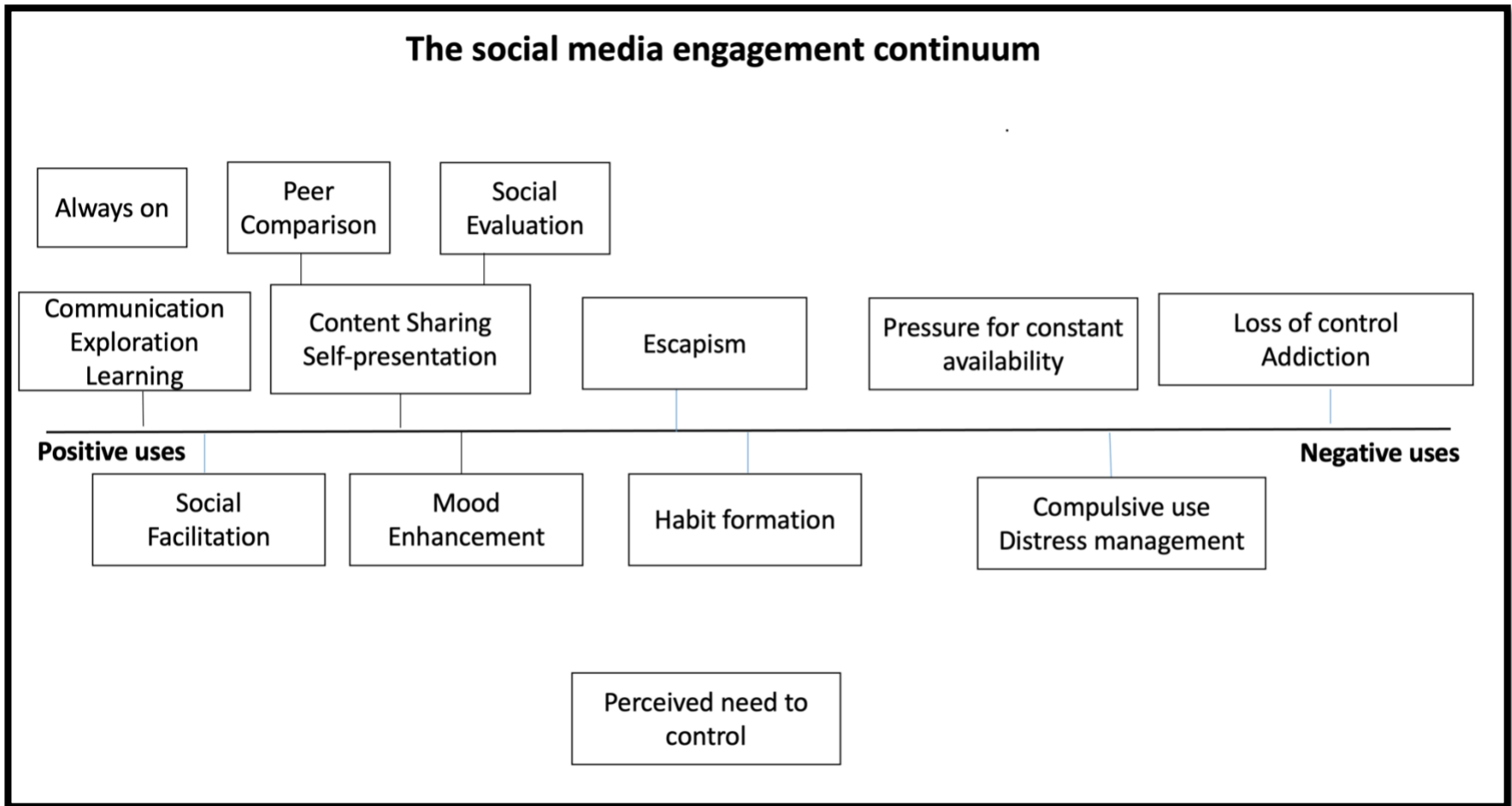


Figure 7.1. Continuum of perceived impacts from online engagement

7.3 Results

Stakeholders' perceptions of concerns

Social media, gaming and streaming emerged as the key screen time activities for adolescents in student, parent and teacher narratives. Screen time impacts were conceptualized similarly across stakeholder group, but varied in perceptions of severity and quality according to specific online activity (i.e., gaming or social media). Stakeholder groups appeared to share primarily common concerns about the harms or risks (i.e., privacy and over-disclosure), however benefits were also experienced and acknowledged (i.e., social capital). Commonalities were identified and presented summarized in Table 7.1. Differences in severity and quality were also analysed below. Four key themes were identified: (i) *a continuum of perceived impacts with positives and harms*, (ii) *stakeholder consensus on perceptions of harms*, (iii) *increased vulnerabilities associated to poor mental health*, and (iv) *impacts dependent on context and meaning attached*. Perceptions of harms (Theme 2) formed the following sub-themes: *time displacement impacts*, *peer judgement-related impacts*, *sensory overload leading to hyperactivity*, and *context-related impacts*. Across stakeholders, the following key themes for impacts were identified:

7.3.1 Theme 1: A continuum of perceived impacts with positives and harms

Impacts were conceptualized by students, parents and teachers as experienced on a continuum reflecting a broad range of positive to negative consequences with individual, social and contextual aspects governing where an individual lies on the continuum (Figure 7.1). Impacts were therefore defined by both benefits and potential harms and the balance between them defined the level of normative or potentially problematic use, ranging from social facilitation and learning to compulsive use. Overall stakeholders acknowledged multiple positive impacts – an opportunity for information seeking, vicarious learning and exploration, fun and enjoyment, real time communication, peer relationship initiation and maintenance, emotional support, sharing of common interests, citizenship, self-expression and creativity. These appeared in agreement with student conceptualisations of usage and key motivations for engagement (Chapter 5).

Online communication was acknowledged as forming a major part of students' daily communications whether at school or at home. However, the type of engagement was viewed as having significantly changed from own (parental and teacher) standards, powered by an endless stream of communication that appeared symbiotic and consistent with the 'always on' culture as described by students (Chapter 5). Texting or phoning was viewed as replaced by a constant flow of chat functions:

"We do not need to view technology as something that will destroy our lives or our children's lives because the benefits that we see are significantly greater than the potential pitfalls" (I5F, 44 years, Parent).

“I think they communicate on social media rather than ringing, texting. So the way they are communicating they are sending pictures or comments on pictures, or have threads of conversations, whether that is through Instagram or Snapchat or whatever but it is almost ‘a constant being in touch with each other’, so it is not the end of the school, ‘I will see you tomorrow’, but ‘I’ll chat with you later’ (IF1, 43 years, Teacher).

Participant views were largely common across groups with nuanced differences in the perceptions of the severity of the impacts. Parental accounts expressed the benefits of connectivity and how this was overshadowed by the negatives, however, parental views were found also to be polarised according to teacher perspectives:

“A lot of mixed views so if you look at parental views, some are along the road “I wish you had not given it to them” other parents on the road “actually I want my daughter to engage” (I2F, 52 years)

Teachers acknowledged the value of online uses for education however, it was also experienced as partially disruptive due to difficulty to monitor how devices were used and the lack of boundaries between access for educational purposes or for recreation, in line with parental views for learning in home environments.

“Students have the ability to research very quickly, so obviously there is a lot of time saved. I tend to direct it, give them a sheet with links for specific things I want them to look at” (I8F, 33 years, Teacher).

Teachers also referred to social media affordances of creating social spaces where adolescents expressed themselves and exercised autonomy, free from parental supervision:

“So some of the girls thrive on it and love it and that is an integral part that they really enjoy, the social side of life online, they do a lot of daily communications online and if they are happy with their friendships, are comfortable with that sort of environment then great, I guess that is what I get from my role, but I probably have a very different role.” (I1F, 43 years, Teacher),

“..they (the students) can use it wherever they are, without the parents knowing what they are doing. But when I was a kid, doing a bike ride, I had to say where I had been. So there is probably an element of creating their own space a little bit.” (I8F, 33 years, Teacher).

Games on the other hand, were viewed as offering positive outcomes overall for adolescent normative and atypical development and learning and for children faced with developmental challenges.

“...these kind of games can improve your hand eye coordination and have some positive learning games” (I5M, 42 years, Teacher),

“For introvert girls, gaming can be quite positive, the girls who are a bit autistic, we have used games like Minecraft, we have used the DS game, brain training, there is a place for that. But this is not like gaming with strangers or stuff like that. That has helped some girls who are introverts, because they don’t do social things, school can be very noisy for them and lonely, and it is hard for them getting the balance. Some things may work for some girls and not for others” (I2F, 52 years, Teacher).

However, apart from benefits, all stakeholder groups expressed negative impacts for adolescents on all domains of life, interpersonal, social and academic. Therefore, challenges and harms formed the second theme.

7.3.2 Theme 2: Stakeholder consensus on perceptions of harms

The second theme focused specifically on harms, which were conceptualized forming four main sub-themes: (i) *time displacement impacts*, (ii) *peer-judgement impacts*, (iii) *sensory overload causing hyperarousal*, and (iii) *context-related impacts*. Impacts were perceived as having functional (performance, task switching, use of multiple devices), cognitive (loss or deterioration of attentional focus, attention deficit), or emotional consequences (stress, anxiety, obsessive-compulsive/checking behaviours) experienced both on an intrapersonal (i.e., self-esteem issues) and an interpersonal level (poor communication, lack of empathy due to asynchronous communication and lack of visual/auditory cues, egocentrism, narcissism). Specifically, perceived harms identified were primarily psycho-emotional and less safety-related (Table 7.1) with a small minority of teachers and parents holding extreme positions: ‘*Phones have replaced the booze and drugs*’ (I6F, 30 years, Teacher).

Time displacement impacts. Excessive time spent online was a primary preoccupation amongst parents and teachers. Students admitted spending more time online than they thought or planned for, but did not share the same preoccupation with parents and teachers over the loss of time spent on social media.

“Before I used my phone way more than I do now, until it was taken away. I still do now but I now notice how much I am using it. I had not realized how much I was using it, I thought I truly need it but I do not actually need it that much, it is a bit of a hassle when people send you stuff and get more catty about it and then you get it back and you are on the same pattern again...” (FG1F5),

“I literally use it excessively, like I do not go off my phone” (FG6F3).

Teachers perceived that time spent online was displacing time spent on learning (Theme 1) and therefore as potentially detrimental to academic achievement and counterproductive but also at the expense of fun face-to-face engagement:

“It is taking time from other activities that they could have been doing, the motivation for doing other things that are fun is really gone down” (I7M, 41 years, Teacher).

Similarly, constant stimulation from the platforms (‘pull’ and ‘push’ environmental strategies in the control model-Chapter 6) was viewed as depleting students’ intrinsic resources for learning:

“Where there is something more interactive, to the field doing some research, you can see some of them, not all of them, they are just soooo bored and it is because they are not getting that instant gratification, there is nothing really dramatic happening... So they need these intense experiences. I have to be like an entertainment system, I had to change the tasks to make them work better but still their concentration is eroding” (I7M, 41 years, Teacher).

Time displacement concerns raised by stakeholders related to distraction “*They are so distracted in the classroom*” (I9F, Teacher), either in the form of internal cues (thoughts regarding online content preoccupying an adolescent) or external triggers (receiving a notification or an alert). Concerns were expressed for the role of smartphones in distraction and the loss of focus being driven by increased social media use levels, FoMO, NoMO, online vigilance:

“It is (smartphones) a cause for distraction. I have been looking at a lot of stuff to help them with revision, helping a lot with the studying and the best thing is ‘put your phone away, disconnect, come offline, have it timetabled in. As a parent preparing for GCSEs there was a difference with their mood, taking their gadgets away, it was still vibrating and it is the FoMO, so it does cause a lot of distraction and anxiety they have FoMO” (I4F, 49 years, Teacher).

Parental accounts of distraction leading to loss of time from refraining from other more productive activities (i.e., homework and sports) and concurrent use while doing homework was viewed as both facilitating information search, but at the same time leading to loss of productivity. Parents believed there is a lack of knowledge and emotional readiness to block out distractions:

“I find it irritating that I have to say to my son, ‘you have to put this down and do your homework’ and he says ‘I want to have a quick look at my messages’, so that is an issue and I suspect that is an issue for parents of girls as well” (I6F, 39 years, Parent).

Additionally, late sleep onset due to access to devices and poor sleep quality along with lack of physical activity and displacement of sports were primary concerns amongst adult stakeholders but not student groups. Students instead perceived that lack of extracurricular activities was leading to more social media use to alleviate boredom. According to teachers, lack of sleep caused by use of devices prior or during bedtime was viewed as impacting daily performance in school. This appeared particularly difficult to control because adolescents seemed adept at deceiving parents utilising devices during bedtime.

“Some students are really lethargic at times, and I don’t know if that is linked, probably it is linked to their phones, they’re not eating or sleeping properly” (I7M, 41 years, Teacher).

“When we have meetings about achievement we ask, ‘do you have your phone with you when you do your homework or when you go to bed?’ and a lot of the time it is because the girls are underachieving and when we ask the parents if the girls have the phone with them when they are doing homework, they have access to it and at night” (I4F, 49 years, Teacher).

A key parental concern with social media was the difficulty to self-control and the struggle to use social media in moderation, which formed also an adolescent concern. Issues relating to overuse were prominent in all accounts, acting as key drivers for adolescent engagement such as FoMO, or nomophobia, constant checking of content and overreliance on reward-seeking behaviours. Addiction was considered by adults as only affecting a minority of students.

Peer judgement impacts. These were both intrapersonal and interpersonal in nature. A major intrapersonal impact was related to anger/aggression and exposure to negative peer evaluation, social rejection or exposure to varying degrees of hateful content. Fall-outs within friendship groups were perceived to be a regular phenomenon arising from heated interactions leading to miscommunication on chats or from lack of social skills online resulting in inappropriate or insulting language. Teachers responded to hostile behaviours by encouraging students to be reflect on such behaviours:

“I think it is already an issue and we address it from as early as year 7 and we had discussions: the kind of let’s put you in that person’s position.’ If you say something online and it is not very kind, how would you feel if that person said it to you? And I don’t know whether that calmed things down or not but we did have a situation, we also sent out letters to parents along those lines and explained that we had got some issues and I needed to be talking about this because there were students that were really upset about things that were happening to them” (I2F, 52 years, Teacher).

Teachers referred to social media as being ‘an echo-chamber of emotions’ (I6F, Teacher) which in late adolescence was perceived as also being amplified by substance and alcohol use. However, teachers reported observing backlashes when students viewed hurtful comments. In certain instances, aggressive behaviour was

treated with students deleting their own accounts in response. Deletion from group chat was viewed as highly taxing particularly to female adolescents.

“In a chat situation, you have girls who might have sent the message but thinking that is really nasty and think ‘I am really glad that is not me’it is bullying no matter how you look at it, so there is an emotional side to it, ..in fact emotions drive all of it, anger wanting to be ‘leaf of the pack’ all those sorts of things, I think it is driven by emotions, like on Facebook people put emotional comments, statuses, and obviously as the girls get older, it can be driven by alcohol, so for example, Y 11,12,13 is a whole different thing going on, so then they are driven by substances as well.” (I2F, 52 years)

“There were some issues of these groups on Messenger, taking people off (the group chat) because they did not like them” (I5M, 42 years, Teacher).

Therefore, various forms of aggressive behaviours emerged as a theme from milder to more prevalent and direct. Friendship fall-outs and aggressiveness on social media was viewed as relating to online disinhibition, the anonymity and lack of direct face to face communication granted in the online environment unleashing a negative attitude on individuals but also by constant checking and cyberstalking. Hostile behaviours were perceived being highly prevalent also in gaming.

“Young people playing, saying obscenities, horrible things with the characters and laughing about it – I can see a bit of that bullying over in the schools” (I3M, 34 years, Teacher).

“I think girls take things quite personally, so if somebody puts a picture on their wall or says something and the problem with texting is that it can be misinterpreted.... there are natural problems with girls anyway, a lot of fallouts, once a girl takes a photo and puts it on Instagram, and that makes the person upset, if it’s not the flattering photo, so it’s actually like bullying, well I suppose it is a form of bullying and bullying is kind of gone outwards now, in that it is going on the internet” (I8F, 33 years, Teacher)

“It is quite explicit what they send online and once a young girl masturbated for a boy online and he asked for a video, there was a lot of awareness, it was a big thing” (I6F, 30 years, Teacher).

An additional common concern amongst stakeholders related to self-representation on social media. Images were perceived as particularly impactful on adolescents with unhealthy and perfectionistic strives and pressure for flawlessness causing distress, low self-esteem, low mood and negatively influencing body image. Preoccupation with image curation for popularity and potential body image concerns/dissatisfaction were expressed. Additionally, an excessive emphasis on selfie-taking and the “*loss of focus on the experience in the moment*” (I7F, 49 years, Parent) was perceived as being at the expense of the experience. Parents and teachers suggested that children were overly concerned with capturing the moment rather than living it, stripping experiences from emotional investment and having ‘a blocking effect’ similar to drugs.

“I think anxiety, depression, eating disorders, all that is a big thing and if you look at mental health and young people through the internet, online use can contribute to that to perform in a certain way, to be clever, to be beautiful, all that” (I7M, 41 years, Teacher).

“Phones and technology have the same kind of blocking effect to mental health like drugs and alcohol do, if someone is feeling anxious that might take some drugs or drink, whereas children might feel anxious and might want to take their phone; obviously (the internet) is not so sinister like drugs and alcohol but it has the same kind of effect, a blocking effect.” (I9F, 29 years, Teacher).

Finally contact risks involving risks of disclosure of personal information and exposure to pornographic or other harmful content (i.e., fake news) was discussed primarily by parents and teachers.

Sensory overload/hyperarousal. Constant connectivity was also considered as leading to social and information overload and hyperarousal by all stakeholders, but primarily by adults partially influenced by multitasking. Adolescents did perceive the constant flow of information and communication but lacked experiences to make a comparison given they have grown up in the digital era. This was viewed as forming a vicious cycle.

I think there is this flood of (...) a stimulus... when I was home that exposure was not there (...) when I was young it was like don't walk out in the dark, but now it comes to you in your home" (I8F, 33 years, Teacher).

"We are the anxious ones, trying to protect them, give them time off it, just for their brain when they get in a difficult situation at school, that still happens. When we were younger, you went home, you may have told your mum, then the next morning you still got a bit frosty, whereas now something happens everyone thinks it is their own business, they tell and then they fabricate and then someone from the school across the road says something else, and then from another school and no one knows what is happening, and the young person does not have time to reflect on what is going on, it is just a constant thing" (I4F, 49 years, Teacher).

Context-related impacts. The most prevalent context-related impact perceived by parents and teachers was the constant checking of devices, which appeared to interfere with homework. In pursuit of instant gratification, adolescents experienced loss of sustained and uninterrupted periods of concentration and focus. The use of devices to facilitate or execute homework was a reality for many of the students, however, social media interactions were perceived as task interference that adolescents were unable to avoid or resist.

"In the meetings with girls, if the phone is there in front of them and of course they cannot leave it, they have to have it because of those strikes because they need to maintain them, so many dares, to buy likes, who likes me or my picture so they are afraid to lose sight. I have had to take off phones from girls at school time to put them away because they are not allowed" (I1F, 43 years, Teacher).

Overreliance on online communication at the expense of offline, lack of physical activity or gradual displacement of sports or activities, and gradual loss of offline social skills were primary concerns amongst parents and carers, including sedentary lifestyle (poor diets, risk of obesity). Constant availability and access to new content and feeds, the multiplicity of social media channels and the presence of 'online audiences' were discussed by parents and teachers as increasing the social pressures placed on adolescents and leading to lack of balance: Given the increasing accessibility and use of iPads as educational tools, boundaries between education and recreation were viewed as blurred. Another context-related impact was the rigid expectations for instant reciprocation and emotional ambivalence or experience of distress over delayed responses, difficulty in setting boundaries in online relationships and lack of confidentiality and privacy.

"I think there is no balance, just generally, children sleep with their phones next to them without realizing, this is one of the first things they do when they wake up so I think just in general there is a lack of balance" (I6F, 30 years, Teacher).

7.3.3 Theme 3: Increased vulnerabilities associated to poor mental health

Psychosocial correlates associated to online challenges and harms comprised three categories. First, internalizing/externalizing behaviours with mood shifts because of media feeds. Second, stress, anxiety and rumination (worry over posts, preoccupation with content) and third, depressive symptoms arising from social comparison to experiences of others, self-blame, internalization of poor self-image resulting in low self-esteem

and compromised self-identity. These vulnerabilities were perceived as triggered via social media and online features (i.e., likes) and being associated to mental health.

“Being online they ruminate a lot and they get quite low mood and girls tend to empathise and sympathise so I would say there are a lot of positive things but also a lot of negative feelings” (I2F, 52 years, Teacher)

“My big thing is the emotional side, and what it does to their body, there is anorexia, bulimia, everything how they perceive themselves and the world...these things have affected and worsened their emotional health and well-being” (I9F, Teacher)

“I don’t think it gives poor mental-health I think it triggers it” (I2F, 46 years, Parent).

“Actually, I think it impacts self-esteem negatively. The irony is with likes it should boost self-esteem, but actually it has the opposite effect on it. So it brings low self-esteem also lots of games and apps are designed to release the endorphins, it’s like a high, so you’re potentially giving these to children, all these highs constantly, and you are matching that by continuing it. So, it is like they’re addicted to it unfortunately” (I4F, 49 years, Teacher).

Striving for perfection in own-generated content and images (airbrushed photos, thinspiration, reassurance of likes) was considered a key behaviour on social media generating unhealthy and maladaptive perfectionistic strives and pressure for flawlessness. These maladaptive cognitions were viewed as prompting an “echo-chamber of emotions”, triggering anxiety or other emotional and mental health problems. Self-harm, body image concerns, and eating disorders were viewed as being on the rise exacerbated by the use of social media, creating a vicious cycle of fall-outs. Habitual usage behaviours were also viewed as difficult to break in late adolescence:

“Self-harm, a lot of copy cat behaviour; it is a big problem changing this, or have a problem with the sexual orientation, you don’t know there is so much, just complete overload, they self-harm and this makes them feel better temporarily and then they feel guilty and then goes a consistent cycle” (I6F, 30 years, Teacher).

“The older students still having that lifestyle of playing too long and not sleeping properly and letting it affect their relationships, that is when they get in the deep because with A levels that is much harder to do” (I7M, 41 years, Teacher).

7.3.4 Theme 4: Impacts dependent on context and meaning attached

The fourth theme comprised of impacts, which could impact adolescents’ psychological state both positively or negatively depending on context and meaning attached. One such example was *self-expression*. Self-expression was reported as a source of positive emotion for the majority of the participants but also associated to fear about negative comments or negative peer evaluation. Another domain was expectancies related to online activities could be rewarding but transferred to offline contexts and life domains (academic, social) could lead to frustration. Increased freedom and possibilities for connection to unknown others was viewed by children as a source of opportunity to make new friends, however, characterized as high risk behaviour by parents. Also interacting socially online could be a source of support and connectedness but could result also in the experience of negative emotions from feeling left out or disconnected. Dependent on those situations and the perception/interpretation of the situation, was viewed as resulting to mood shifts, elevation or deterioration of mood. Additionally, there were gender-related differences (in users’ behavioural responses) and gender-sensitive reactions to communication online, which impacted differentially the genders.

Table 7.1

Stakeholder perceived impacts and harms

Theme 1: A Continuum of perceived impacts with positives and harm	
<p>A host of positives overshadowed by the negatives</p>	<p>Learning/skills acquisition</p> <ul style="list-style-type: none"> ▪ For research purposes ▪ Use as a collaborative tool ▪ Important skills for future life/ Brain training <p>Community/Social</p> <ul style="list-style-type: none"> ▪ Social and personal development space ▪ A personal space, freedom of expression ▪ Gaming positive outcomes ▪ Benefits to introverted or vulnerable children (i.e., autistic) ▪ Major part of daily communications and social spaces ▪ Friendship maintenance and acquisition <p>Identity development</p> <ul style="list-style-type: none"> ▪ Threads of communication/ “A constant being in touch with each other” ▪ New modes of communication rather than ringing or texting
Theme 2: Stakeholder consensus on perceptions of harms	
<p>Time displacement-related impacts</p>	<ul style="list-style-type: none"> ▪ Excessive time spent online ▪ Counterproductive impacts (academic underachievement, poor time management, distraction, compromised ability to focus, lack of deep work, procrastination, boredom/lack of activities, loss of focus on the experience) ▪ Displacement/sedentary lifestyle impacts (poor diets, risk of obesity, displacement of sports/activities, poor academic performance, gradual loss of offline social skills, overreliance on online communication at the expense of offline interactions, later sleep onset/sleep deprivation/poor sleep quality)
<p>Peer judgement-related impacts</p>	<ul style="list-style-type: none"> ▪ Display of aggression/ abusive communication (Explicit language, harmful/racist/hateful/violent content, cyberbullying, friendship fall-outs arising from misinterpretation of intentions and behaviours, negative influence when gaming) ▪ Low inhibition to online disinhibition ▪ Expression/acceptance/rejection (friendship fall outs, peers’ judgement on self-expression, social rejection, manipulation of peer influence and popularity, preoccupation with image curation, body image concerns/dissatisfaction, sexting influencers/celebrities as role models, chasing flawlessness) ▪ Addiction correlates (preoccupation, FoMO, constant checking, rumination, loss of control, reward seeking behaviours, A ‘blocking effect’) ▪ Cognitive biases/rigidities (rigid expectations for instant reciprocation, emotional ambivalence or experience of distress over delayed responses, expectations for immediate reward/instant gratification pursuit, dependency on likes as a reward, Celebrity following, back and white thinking – i.e., account deletion as a growing backlash to hurtful comments) ▪ Risks of disclosure of personal information, cyberstalking, social surveillance

	<ul style="list-style-type: none"> ▪ Risks of exposure [pornographic, gambling-like or other harmful content (i.e., fake news, connection to unknown others, grooming/ data security risks, sexting/sext-sharing, impact on sexuality, false feeling of trust)] ▪ Rumination (Emotional responses get amplified, apathy/less emotional reactivity)
Sensory overload/hyperarousal	<ul style="list-style-type: none"> ▪ Social, Information and sensory overload ▪ Constant exposure ▪ Lack of downtime/self-reflection time ▪ Amplification of insecurities ▪ Dumpening of critical capacity/discernment
Context-related impacts	<ul style="list-style-type: none"> ▪ Boundary-setting (online/offline relationships, online problems carried offline, private life/disclosure confidentiality/breaching, double standards - having a separate life online, diffused boundaries between activities-gambling/gaming/social/streaming, homework/leisure, online/offline balance, digital trace long-term) ▪ Patterns of use with perceived negative impact (i.e., increased multitasking, habitual use, distraction)
Theme 3: Increased vulnerabilities and associations to poor mental health	
For children with emotional difficulties or vulnerabilities	<ul style="list-style-type: none"> ▪ Stress/anxiety/compulsive symptoms (worry over posts, preoccupation with content) ▪ Depressive symptoms (social comparison or lack of similar experiences to others) ▪ Internalizing/externalizing (mood shifts as a consequence of browsing, self-blame, self-harm, body image concerns, reinforcing self-harm, eating disorders, internalization of poor self-image resulting in low self-esteem and compromised self-identity)
Theme 4: Impacts dependent on meaning attached to content	
Perceptions and expectancies defining impacts	<ul style="list-style-type: none"> ▪ Self-expression could be a cause for negative comments but also a source of positive emotion ▪ Increased freedom but also possibilities for connection to unknown others is viewed by children as a source of opportunity to make new friends, but as a source of risk exposure ▪ Mood shifts as a consequence of browsing could be related to elevation or deterioration of mood ▪ Relational interactions could cause negative emotions from feeling left out or disconnected or could be a source of support, inspiration and social capital ▪ Instant gratification expectations from online activities could be rewarding but damaging if transferred to offline contexts (academic, social etc.). ▪ Games offering positive and negative outcomes (fun, social spaces, hand-eye coordination) but when displacing learning then deemed negative

7.4 Discussion

The present study examined stakeholders' perceptions on impacts experienced by adolescents from their digital use. Findings corroborated to harms and consequences evidenced in the literature (Abi-Jaoude et al., 2020; Barry et al., 2017; Weinstein, 2018) however, the qualitative nature of this study allowed for a comprehensive account across all three stakeholder groups and an assessment of commonalities and differences in perceptions. The first theme comprised impacts across a continuum of positives and negatives by all three stakeholder groups, highlighting perceptions and reflections on engagement and the severity of these consequences. The second theme comprised stakeholder consensus on perceptions of challenges and harms forming three main areas relating to time spent, content and context and their cognitive-emotive and behavioural dimensions, while a third theme comprised psychosocial impacts (i.e., stress) and mental health correlates. Impacts which could have both a positive or a negative outcome depending on context and meaning for the adolescent formed the fourth theme.

The first theme comprised the conceptualization of online user experience as fluid and non-hierarchical across adolescent, parent, and teacher perspectives with positive, neutral and negative experiences. User experience fluidity was a result of individual, social and environmental forces (see Chapter 6 - control model of engagement). Therefore, data designated multiple benefits and impacts as emerging across a continuum of benefits and harms, which are context-dependent with varying degrees of quality and severity. Findings suggested that adolescents have some concern of the risks, but mostly perceive the benefits of social media such as social capital and self-development. Positive impacts were identified by all stakeholders and these pertained to identity development and self-expression, consistent with the literature (Barker, 2019; Bessi re et al., 2007) and negative impacts depending on adolescents' motivations for online engagement (Beyens et al., 2016; Chen et al., 2013; Kim & Kim, 2018; Klobas et al., 2018; Liu et al., 2016; Stockdale & Coyne, 2020; Toma & Hancock, 2013) or individual factors such as self-control and emotion-regulatory capacity (Est vez et al., 2017). Other factors suggested as influencing the experience of harms could be personality factors, peers, parental mediation, parental own behaviours and provision of alternative activities of self-worth (Kim & Rohner, 2002; Kim et al., 2019; Kircaburun et al., 2019; Mares et al., 2018; McHale et al., 2009; Throuvala et al., 2019d).

The second theme referred to stakeholder agreement on the nature of the impacts. Accounts were organized in a taxonomy of time displacement (time), peer judgement (content) and context-related impacts reflecting cognitive, emotional and behavioural dimensions, consistent with prior evidence (Agrafiotis et al., 2018). *Time displacement-related impacts* referred to a perception of excessive time spent on social media and the level of distraction arising from use, with loss of attention on the primary task and primarily related to displacement of offline activities, which has been highly debated in the literature (Dienlin et al., 2017; Przybylski & Weinstein, 2017; Radesky et al., 2016). However, a longitudinal study conducted in the US indicated a trend towards less time spent on non-digital activities in adolescence and less in person social interaction, suggesting displacement to online activities (Twenge et al., 2019; Twenge & Spitzberg, 2020). Spending more time online has been associated to problems in delivering daily activities and social interactions (Gonz lez & Orgaz, 2014). Distraction (an avoidance mechanism of focusing on less significant issues to avoid

attending to the most crucial ones), and overstimulation were common experiences, consistent with previous findings (Hadar et al., 2017). Social overload has been found to mediate the relationship between social media use and reduced well-being levels with FoMO moderating this relationship (Chai et al., 2019). Establishing the relationship between time spent and psychological harms has important implications for allowing social media use in schools and home environments, and during task/homework completions as it affects an individual's overall performance levels and well-being.

Peer judgement-related harms referred to aggressive and abusive communication, issues of self-representation and social rejection, cognitive rigidities associated to harms and addiction correlates, consistent with previous evidence (Machimbarrena et al., 2018). Gaming was associated with aggressiveness and deterioration of behaviour with the use of bad language, which has been empirically investigated while social media with misinterpretation and verbal aggressiveness, both empowered by online disinhibition (definition provided in Chapter 6). Aggressiveness and cyberbullying was identified as a frequent and relevant problem. This could take the form of overt action or manifest in more covert ways by means of account deletion or sext-sharing (Vaghefi et al., 2020). Account deletion was a reaction perhaps in an effort to better manage their time (Cheng et al., 2019) or as an emotional response to shield from emotional turmoil. Additionally, sexting, reported to increase significantly over the course of adolescence (Gámez-Guadix & de Santisteban, 2018), appeared to be a risk factor for sext-sharing and therefore incurring harm.

Self-representation problems and cognitive rigidities, such as rigid expectations for instant reciprocation and perfectionistic tendencies and forming unhealthy expectations of themselves and their social status, emotional ambivalence or experience of distress over delayed responses, expectations for immediate rewards and instant gratification pursuit, were also prevalent in stakeholders' narratives. Research on self-representation and negative comparison has highlighted associations of social browsing on emotion with differential responses whereas awareness of image curation may act as a protective factor (Weinstein, 2017). Additionally, maladaptive cognitions in the form of perfectionistic tendencies and social hopelessness have been associated with problematic social media use (Balıkcı et al., 2020; Fioravanti et al., 2020). Investment in self-representation is associated to body image concerns across genders and disordered eating with photo-based activities being particularly salient and internalization and appearance comparison mediating the relationship (Holland & Tiggemann, 2016). Sexy self representations on social media predisposed engagement in sexting in adolescent girls, unlike exposure to sexy self-presentations of others (van Oosten & Vandenbosch, 2017).

Similarly, psychopathological symptoms and negative consequences of social media via smartphones have been influenced by FoMO and intensity of social media use (Oberst et al., 2017) whereas decreased self-esteem is linked to a potentially detrimental FOMO-inspired SNS use (Buglass et al., 2017). Phubbing was another impact experienced undermining face-to-face communication with research suggesting it is associated with problematic and addictive tendencies (Chotpitayasunondh & Douglas, 2016; Karadağ et al., 2015). Evidence suggests that social media use may become addictive for a small minority of individuals (Griffiths et al., 2018; Griffiths & Kuss, 2017; Kuss & Griffiths, 2011), therefore, this harm appeared less frequently in stakeholder accounts. Mechanisms which could drive problematic social media behaviour appear to be peer

pressure, poor self-regulatory mechanisms, habitual behaviour and psychosocial factors associated with it, such as fear of missing out (FOMO), social connection, reciprocal liking, and social competition (Griffiths, 2018).

Context-related impacts related to effects of difficulty to set boundaries in online engagement or inability to find a balance between offline/online activities and patterns of use (i.e., distraction, procrastination) leading to sedentary lifestyles. Issues related to sedentariness, such as poor diet, less exercise combined with higher frequency of accessing devices and content, appear as contributing to the development of physical and mental health problems (Chinapaw et al., 2008; Walsh et al., 2018). Distraction and procrastination have been associated with reduced academic performance (Aagaard, 2015; Amez & Baert, 2019). Rumination and expectancies for distress reduction have also been found to be positively related to the more problematic smartphone users (Elhai et al., 2020).

The third theme discussed the correlates of those impacts, such as anxiety or depression or internalizing behaviours, emphasizing the scope of digital impacts and potential associations with mental health disorder symptoms, however, the direction of the relationships remains unclear (Derevensky et al., 2019; Mitchell & Hussain, 2018), as are the strengths of the associations with suggestions for weak associations with negative outcomes (Ferguson, 2017). FoMO and nomophobia based on their frequency and severity could trigger or act as precursors of problematic online use (Alt & Boniel-Nissim, 2018) or smartphone use (Rozgonjuk et al., 2019). Research has suggested that experiences of social rejection - intensified by youth's narcissistic tendencies to maintain a desired self-image were found to be associated with increased time spent and problematic social media use (Meng et al., 2020). There is a consistent relationship across studies between cyberbullying and depression among children and adolescents (Balta et al., 2020; Hamm et al., 2015). Short sleep duration has been associated with increased digital time among adolescents (Twenge et al., 2017) and social media overuse to poor sleep outcomes: (i) sleep disruption (melatonin suppression) and desynchronization of body clock – hormone imbalance and brain inflammation and lower levels of deep sleep, (ii) desensitization of the brain reward system (reward, focus and motivation), (iii) exposure to light at night has also been associated with risk of depression (Adelantado-Renau et al., 2018; Becker & Lienesch, 2018; Garmy et al., 2018). Effects of excessive or problematic social media or smartphone use have been evidenced. PIU has been found to be mediating the relationship between parental monitoring and low academic achievement, sleep quality, substance use, anxiety, and depression (Diez, 2018). Finally, impacts were conceptualized as having the potential to be non-binary, depending on context and meaning attached to the online interaction, consistent with research on motivations, such as self-expression, increased freedom and possibilities for exposure and relational interactions (Al-Menayes, 2015; Throuvala et al., 2019).

There were no stark perceived differences in the conceptualization of harms across stakeholder groups; rather differences pertained to the extent, severity and quality of those impacts. Context-related impacts were the least mentioned by adolescents given the lack of alternative perspective (i.e., life context without online engagement). Themes therefore appeared common in adolescent, parent and teacher accounts. Parents and teachers presented a more generalized concern for the impacts and potential harms and stressed the contextual (online vs offline balance) and time displacement aspects of adolescent online activities (i.e., psychosocial

impacts) due potentially to the most tangible nature and particularly given the heightened expectations during adolescence for academic achievement and its implication for occupational attainment (Eccles & Harold, 1996). Teachers stressed both concerns relating to displacement, however, emphasised the content-related impacts (i.e. aggression) reflecting school experiences and the increased prevalence in schools (Gaffney & Farrington, 2018). Literature on time spent for learning activities has been found to be negatively related to PSU whereas time spent for entertainment associated positively with PSU and displacing time for communication unlike time spent for self-expression (i.e., gaining acceptance, image curation) (Meng et al., 2020).

The present study assessed online impacts and focused on harms experienced by adolescents from a combined stakeholder perspective, providing insight and highlighting the commonalities and the differences in the perspectives. Drawing away from binary conceptualizations and embracing a spectrum perspective of impacts may have important policy and prevention implications in the design of media literacy education programmes, school policies and parental mediation. There is a need for theoretical synthesis and development of theories that account for negative impacts in normative and at-risk use, as current explanatory models focus primarily on the addictive potential of social media and on cyberbullying, but do not account for other behaviours along the continuum, such as cognitive or metacognitive impacts potentially responsible in problematic online engagement (Balıkçı et al., 2020; Carr & Stewart, 2019; Spada et al., 2008, 2015). Continuum beliefs could also facilitate problem recognition and help seeking (Morris et al., 2020). Assessing the relative contribution of each activity within an overall screen time engagement context could account for the relative contribution of each activity in the overall adolescent screen time.

7.5 Conclusion

Research suggests that adolescents greatly benefit from the online environment and engage in three main activities: social media, gaming and streaming. The findings of the present qualitative study identified positive and negative impacts for adolescents experienced from online engagement forming a continuum of impacts. Present study findings focused primarily on harms on a psycho-emotional, cognitive and behavioural level relating to time spent, content, context of online engagement and its mental health correlates, embracing a broader definition of gaming and social media-related harms for adolescents. There were no stark perceived differences in the conceptualization of harms across stakeholder groups; rather differences pertained to the extent, severity and quality of social media use. The harms experienced and conceptualized by stakeholders was the first step in developing an understanding of the concerns and ways of addressing those concerns. The next step involved identifying ways of preventing these harms within a school-environment. One strategy identified by parents and teachers was skill development nurtured in schools. Additionally, skill development was suggested by stakeholders as a key component of school-based prevention (Chapter 10, 11). Skill development was identified in both systematic literature reviews (Chapters 2 and 3) as one of the most critical strategies to guard against PIU, PSU, PSMU, gaming disorder and problematic screen time. The following chapter therefore, refers to skill development as identified across stakeholders as a major strategy for primary prevention.

Part 3: Addressing concerns/recommendations - Stakeholder perspectives

Chapter 8. Policy recommendations for school-based prevention of online challenges and harms in adolescence: Parental perspectives

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2021). Policy recommendations for preventing problematic internet use in schools: A qualitative study of parental perspectives. *Int. J. Environ. Res. Public Health*, 23. <https://doi.org/10.3390/ijerph18094522>

8.1 Introduction

Social networking, gaming, and streaming constitute the primary and most preferred online activities of adolescents worldwide (Ofcom, 2017; Pew Research Center, 2018; World Health Organization, 2015). Existing research suggests several benefits from such online communication including sharing common interests and creativity, accessing volunteer opportunities, engaging in political activism, accessing health information, and providing digital health resources and support networks (Rideout et al., 2018; Royal Society for Public Health, 2017). Regular gamers have been shown to exhibit better problem-solving skills, spatial skills, and enhanced creativity along with arguably higher performance levels on a variety of perceptual and cognitive measures (Boot, Blakely, & Simons, 2011; Nuyens, Kuss, Lopez-Fernandez, & Griffiths, 2019). However, social media and gaming also present psychological challenges in healthy adolescents that may act as precursors to problematic use, be conducive to or co-occur with other mental health problems, and/or pose risks that young people are often unaware of or are emotionally ill-equipped to cope with, such as cyberbullying and unwanted sexual solicitation (Griffiths et al., 2018; Hussain & Griffiths, 2018; Kuss & Billieux, 2017; Kuss & Griffiths, 2011; Valkenburg & Peter, 2011; Wąsiński & Tomczyk, 2015). Problematic use of gaming has also been increasingly recognized as an issue of public health concern (Király et al., 2017) and gaming disorder has been included officially in the eleventh revision of the International Classification of Diseases (ICD-11) of the World Health Organization ([WHO] 2018). Given that social media and gaming constitute the two primary entertainment activities for adolescents, the present study focuses on parental perceptions concerning problematic aspects of these two activities and the way these are experienced as concerns along with proposed recommendations for their amelioration.

According to parental accounts, adolescent use of technologies has been considered the most critical issue for adolescents, with parental concerns about adolescent technology use raised by 53% of parents, followed by cyberbullying (45% of parents), while less concern expressed for issues such as drugs, alcohol, school performance and questions of sexual identity (Karpowitz & Pope, 2018). Previous research has noted 33% of parents reporting a concern or a problem with their child's technology use (Duggan et al., 2018). Main parental concerns include safety and security, cyberbullying, and exposure to violent or pornographic material

(Duggan et al., 2018). These concerns depend on the developmental stage of the child and appear to guide parental mediation strategies, with evidence suggesting parents of older children presenting more indulgent parenting (permissive, non-directive with few controls) or neglectful parenting and a tendency to set fewer limits (Rosen et al., 2008; Symons et al., 2017). Still, a discrepancy has been observed between what parents perceive as threatening and what children experience: for example, digital grooming – a high parental fear - is a much less likely occurrence than its perceived risk (O’Neill & Staksrud, 2014). In addition, adolescents report being more affected by pornography, violent content, aggressive communication, and unwanted contacts (O’Neill & Staksrud, 2014). However, the focus to date has been primarily on online safety rather than on the psychological risks and impacts experienced by adolescent children (i.e., cyberbullying, aggressive behaviors, hate or self-harm content, beauty ideals and standards; Throuvala, Griffiths, Rennoldson, & Kuss, 2018b). This apparent mismatch between perceptions of problems and actual problems experienced by adolescents creates increasing tension and conflict within families (Appel et al., 2012; Barry et al., 2017; Bonnaire & Phan, 2017).

Provision of advice to parents has been scant and its communication has not been endorsed systematically by governments (Blum-Ross & Livingstone, 2016; Picherot et al., 2018). Recommendations for screen time have been provided since 1999 primarily by the American Academy of Pediatrics (AAP; Council on Communications and Media, 2016), which have been considered the gold standard. These recommendations have undergone adjustments in recent years and the latest guidelines advocate for a move away from social restrictions (i.e., time limits) and towards employing a mix of active approaches (evaluating problems of privacy, risk, and safety together) and restrictive approaches (time-based or conditional rules), and a limit of one hour or less per day for children between the ages of two and five years. However, the AAP time limit guidelines have been challenged by scholars with evidence not supporting their use (Przybylski & Weinstein, 2017, 2019). Five simple messages have been recently proposed by the French Academy of Pediatrics (Picherot et al., 2018): (i) understanding without demonizing; (ii) screen use in common living areas, but not in bedrooms; (iii) preserving time with no digital devices (morning, meals, sleep, etc.); (iv) providing parental guidance for screen use; and (v) preventing social isolation (Picherot et al., 2018). Similar approaches employing a mix of active and restrictive mediation strategies along with healthy management, positive and balanced parental modelling and an increase in physical activity are amongst the most recent recommendations (Bozzola et al., 2019; Ponti & Digital Health Task Force, 2019)

There is currently no equivalent European body to the AAP (Livingstone et al., 2017). However, a host of governmental and non-governmental or scientific organizations have been involved in advice provision for parents (i.e., *EU Kids Online*). In the UK, organizations such as the Royal College of Psychiatrists (RCP) (Dubicka & Theodosiou, 2020), the Chief Medical Officers (CMOs) (Chief Medical Officers, 2019) the Royal College of Paediatrics and Child Health (RCPCH) (Royal College of Paediatrics and Child Health, 2019), have built on recent recommendations from the House of Commons Science and Technology Committee (STC) , the All Party Parliamentary Digital, Culture, Media and Sport Committee (APPG-DCMS) report (House of Commons Science and Technology Committee, 2019), and the World Health Organisation (WHO) report on sedentary behaviour in young children (World Health Organization, 2019). The UK government following up on an ‘Internet Safety Strategy-Green Paper’ in 2017 (HM Government, 2017, 2018), has also published the

'Online Harms White Paper' (HM Government, 2019), which outlined a new regulatory framework for online safety, including accountability and oversight of operators by an independent regulator and clarification of users' rights to safe content and activity – moving beyond individual self-regulation. The UK Government has also conducted an evidence inquiry on the impact of social media and screen use on young people's mental health (House of Commons Science and Technology Committee, 2019, 2019). Additionally, it introduced 'Relationships and Sex Education' (Department for Education, 2019) in its Personal, Social, Health and Economic Education (PSHE) in schools with plans on introducing further education on social media and mental health aligning with work of the DCMS and the CMO (Department of Health - Department of Education, 2017; Department of Health & Social Care - Department for Education, 2018; House of Commons Science and Technology Committee, 2019). A framework of 'Age appropriate design code' and a code of practice for social media operators have also been developed (5Rights Foundation, 2019; Department for Digital, Culture, Media & Sport, 2019). Further initiatives have been undertaken by academic institutions and not-for profit organizations and research and advocacy initiatives to protect minors from harms and promote positive outcomes of the digital environment (Livingstone & Third, 2017).

Still, a gap exists in a European-wide regulatory body to coordinate scientific efforts and translate these into policy action channeling early intervention and prevention measures. Despite problematic gaming becoming a worldwide problem for a minority and increasing concerns about excessive and problematic use of social media, policy responses are still scant and inconclusive with the exception of specific programmes in East Asian countries that have been more extensively evaluated (Throuvala et al., 2019c). However, given the cultural differences, comparisons or transfer of practices require caution (Chung, Sum, & Chan, 2018; King et al., 2017). Parental education has been proposed as a complementary approach to ameliorate problematic use in children and adolescents and public health approaches have been proposed in recent years to be considered by governments.

Parental mediation has been previously explored (Ding et al., 2017; Glatz et al., 2018; Van Petegem et al., 2019), yet research in parental needs and perception of priority problem areas has been scant. Research in problematic gaming has relied primarily on adolescent self-reports and has largely ignored parental or caretakers' accounts to understand family dynamics (Schneider et al., 2017), with the large majority of studies on parental mediation being quantitative in nature (Symons et al., 2017). Moreover, family dynamics appear increasingly influenced by digital media (Dalope & Woods, 2018) and gradually, the challenges of control and limit-setting have become central in parenting. Despite various recommendations made for effective control of screen time, and research concerning parental perceptions for adolescent technology use, there are no studies exploring needs and priorities for interventions in this area. Many scholars have considered policy approaches to prevention, primarily in the context of gaming (Chung et al., 2018; King et al., 2017; Király et al., 2017; Lim, 2012; Throuvala et al., 2018b) and concerns regarding problematic use of social media and smartphones is rising.

The present study undertook a systematic exploration of parental views and perceptions regarding identification of areas where intervention should occur - also in relation to the school context, where children spend the majority of their daily time and where interventions are more likely to occur - along with specific recommendations for how these could be achieved. Given the need for evidence-based public policy level

recommendations, the present study extends the literature on parental perceptions and mediation strategies by exploring intervention needs and priorities to focus on what would support the parenting role and ameliorate adolescent impacts from screen use. The current study will therefore examine the parental perspective of digital parenting needs and potential intervention priorities, which may complement the parental efforts to endorse a more balanced digital use for their children.

8.2 Methods

Methods, Participant section, design and procedure is presented in Chapter 4 Methodology.

8.3 Results

Three key themes emerged from parental accounts as perceived needs in relation to adolescent online use and recommendations to address them: (i) *reliance on schools to serve as digital education providers and prevention hubs*, (ii) *provision of mental health literacy* comprising three levels: *raising awareness*, *resolving ambiguity regarding impacts*, and *mitigating excessive use*, and (iii) *target areas of concern and upskill*. Parents identified a need to promote digital education both at a student and at a parental level as a key priority. Responses were grouped, based on frequency of mention. To offer a perspective on the frequency of themes, moderate reference to a subtheme was considered a count of three to six similar responses by different participants, with a verbatim example per sub-theme included in Table 8.1. There was no theme with more than six mentions in the dataset and responses with two or fewer mentions were considered of minimal reference and therefore not included in the table. Themes are presented below.

Table 8.1

Parental recommendations for prevention needs relating to gaming and social media addiction

Themes and subthemes	Verbatim examples
Theme 1: Schools as digital education providers and prevention hubs	
<p>Digital education: a new role for schools</p> <p>Schools should report more on use and content</p> <p>Conduct research on students' self-awareness of use, time spent on devices and digital learning needs</p> <p>Evidence on use of iPads and academic achievement and positive impact from use</p>	<p><i>"It is probably a new role for the school but I think that is the way we are going as a society."</i> (I2F, 46 years)</p> <p><i>"An information point for the parents...any research that has come recently, lectures, or any new evidence how it affects their learning or their mood."</i> (I5F, 44 years)</p> <p><i>"A need to know more about electronic media, maybe lectures from professors who know more about it."</i> (I6F, 39 years)</p> <p><i>"School should conduct a study to ask the students 'do you think you spend too much time on and what kind of things do you want to know?' would be interesting to see what they say."</i> (I7F, 49 years)</p> <p><i>"I think they should be doing more analysis as to whether things are improving or not related to academic achievement. Is having an iPad improving their educational achievement?"</i> (I8M, 50 years)</p> <p><i>"They can use the one device (iPad) and would be good as part of that how much time they are on it and what they are accessing."</i> (I1F, 42 years)</p>
Theme 2: Provision of mental health literacy	
<p>A priority with equal weight to drugs/alcohol prevention</p> <p>Include prevention in formal education system across year groups</p> <p>Mental health literacy for parents via schools</p> <p>Prevention with interactive delivery</p> <p>External advisors to lead training/education</p>	<p><i>"But I think they have to bring in a programme about the usage of their devices because it is another addiction."</i> (I2F, 46 years)</p> <p><i>"I would really like to have a professional body deliver a programme because there are teachers who don't understand the implications, perhaps are older, have grown up children, and have not really lived in this world of having apps."</i> (I1F, 42 years)</p> <p><i>"You should educate adults."</i> (I3M, 39 years)</p> <p><i>"An interactive type of approach, doing a lesson type wouldn't do it, like when they are covering drugs: 'don't do drugs' they kind of know that, and I think that is the big problem, they switch off, well first of all because they think they know about it."</i> (I4M, 53 years)</p>
Theme 3: Psychoeducation and upskilling	
<p>Time-related impacts (time spent online, bedtime/sleep Impacts, offline/online balance)</p> <p>Content-related impacts: (i.e., interpersonal communication problems, hostility, peer influence and popularity, emotional impacts)</p> <p>Context-related impacts: (i.e., discuss consequences, balance evidence on positives-negatives, between privacy/disclosure, home/public use, gender differences)</p> <p>Skill development</p>	<p><i>"I think having that overview of use, even though I don't know how much I am using either, so I would also be interested in my own usage."</i> (I6F, 39 years)</p> <p><i>"Comments that you think that are quite hurtful in a chat situation, or bullying, inappropriate pictures, being posted things like that"</i> (I7F, 49 years).</p> <p><i>"We have not gotten to sexting, where is the next thing, when boyfriends come in their lives, that is another thing, handling their relationships online and how to play that out."</i> (I8M, 50 years)</p> <p><i>"...so it is difficult to say because girls can get offended if not answered: 'well why did you not answer me?'"</i> (I2F, 46 years)</p> <p><i>"I think self-realization is a key skill, if they don't realize, possibly other things that they can do and get involved in. For example, they don't get involved in conversations, or they are too isolated to make friendships more easily"</i> (I4M, 53 years)</p> <p><i>"I think it would be quite good if they talk about what would happen if you are on it too much, or if you are not sleeping, like the consequences."</i> (I3M, 39 years)</p> <p><i>"Empower them with the skills to be able to filter, 'oh I don't respect what they are saying or I disagree with that' and to have the skills to do that."</i> (I9F, 41 years)</p>

8.3.1 Theme 1: Schools as digital education providers and prevention hubs

Schools were viewed by parents as critical in delivering education and facilitating communication with the child regarding screen time issues. Digital education was perceived as a new challenge for schools, but also a new opportunity and as a necessary new educational territory. More specifically, it was proposed that schools could serve as information and training hubs both for children and the parent community and complement parental efforts on online use in moderation in adolescence. It was suggested that schools should provide a more systematic approach to media and health literacy and the problems arising from online use. Additionally, parents expressed a need for research to be conducted assessing a variety of areas: (i) impacts of social media and gaming on various domains: these ranged across a variety of subjects, from neurobiological findings (i.e., impact on brain activity and neurophysiology), psycho-emotional and behavioral (i.e., on anger and aggression), (ii) impacts on academic performance arising both from recreational use, but also the increasing use of technology for educational purposes (i.e., use of school iPads on academic performance).

Another research area suggested was an exploration of students' own concerns regarding screen time and adolescent views and perceptions of time spent on smartphones. In this context, parents recommended that schools should monitor students' use and access to online content more closely and to provide an accurate estimate of duration and content accessed. Research on assessing both the content and time spent on various activities and how metacognition (i.e., thinking about using) could consequently impact use appeared to be timely. Strategies, such as the school smartphone ban, were viewed as facilitating parental efforts for reduction in use of devices. A need was expressed to work with adolescents on content created and encountered online, on helping them to achieve a balance between short-term needs for recreation and longer term goals, and help navigate the challenges encountered online. Training of the school staff was suggested to be conducted by expert academic and professional bodies.

8.3.2 Theme 2: Provision of mental health literacy

Parents perceived adolescent digital education as a “*massive priority*” (I2F, 56 years) to be included in formal education across different age groups. Mental health literacy was viewed by parents as of a high priority to be included in Personal, Social and Health Education (PSHE) and to cover psychoeducation beyond safety. Need for prevention of online challenges and harms was viewed as of equal importance to drugs and alcohol prevention due to potential detrimental consequences on adolescents' lives:

“Traditional things they did, in terms of dangerous stuff, was smoking, alcohol and drugs, so these are the three things they did...worse-case scenario it ruins their lives, addiction to the internet means it can ruin their education, they are not engaging trying to find jobs, they cannot pass their exams, they are not engaging in proper social connections. So, there is a potential massive consequence in their life chances, if they don't use it (the internet) wisely, so there should be proper programmes devised to help and support the children through that.” (I2F, 46 years).

A second set of recommendations pertained to the need for schools to introduce parental education as a way of conferring systemic, coordinated changes. It was suggested that schools undertake parent education as well, rather than random, one-off seminars that do not allow for consolidation of knowledge and the development of

parenting skills. Parents with negative experiences could be aided to embrace benefits rather than hold imbalanced perceptions of mainly harms.

“I think the school should include proper education about that, you know they will invite parents to an evening but I don’t think that is sufficient at all, you know, the voluntary thing ‘come in parents’, they really need to enforce it, they need to have discussions, and a proper programme, just as they devise a nationally recognized programme for drugs and alcohol.” (I7F, 49 years).

Parents expressed a preference for academics to be involved in the professional training of school teachers and school interventions to be implemented under the guidance of knowledgeable professionals and experts on screen time. Content was suggested to be developmentally informed with a balanced presentation of positive and negative uses of technologies to counterbalance the current biased negative approaches to media use. Therefore, health communication as part of digital education was viewed as a means for prevention and mitigation of impacts.

8.3.3 Theme 3: Psychoeducation and upskilling

Intervention needs pertained not only to the provision of health communication but psychoeducation and upskilling. Parental concerns regarding online engagement related to: (i) *impacts from time spent on screens (time displacement)*, (ii) *content-related impacts*, and (iii) *context-related impacts* (as analysed in Chapter 7 along with teacher and student conceptualisations). The primary *time-related* concerns raised by parents was adolescent time spent on devices displacing other important functions (i.e., sleep resulting in deprivation) as well as issues relating to striking an online-offline balance. Associated to this need with current parental experiences of lack of self-control in the workplace relating to screen time management, raising concern for how this issue may be handled by future generations. Lack of self-control and self-regulation experienced with online use was viewed as impacting adult professional life and future employment by interfering with work-related priorities and inability to concentrate and produce deep work.

“They got to build their strategies now, because it is an issue in the workplace, massive time, they access the internet, people can’t manage it. So, I think they got to learn it from an early stage, parents need to have those skills as well, isn’t it?” (I9F, 41 years).

Associated to this need were the parents’ own current experiences from the workplace, where perceptions of inability to self-control or strike an offline/online balance. Therefore exercising self-control in relation to online use was viewed as a topic of concern for future generations. In addition to poor self-control, constant exposure to quick rewards and multi-tasking and an inability to immerse in a single task for sustained periods of time was perceived as lowering the threshold of tolerance for single tasking or for longer-term gains.

Content-related impacts included sexting – the electronic transmission of explicit sexual content – and handling romantic relationships online, body-image questions, aggression and cyberbullying, distractibility, and online safety and data security. Sexting was viewed as a common high-risk practice amongst adolescents and as having immediate and longer-term negative repercussions in the adolescent’s image and reputation. The impact of manipulated images on social media was viewed as resulting in body-image concerns and thinness ideals stemming from social validation needs. Subsequently, the impact of mechanisms encouraging likes and

followers were viewed as a vulnerability in human psychology and a potential cause for addiction to smartphones and social media. Abusive communication and expressing anger and aggression, were also seen as acting out for attention. *Context-related* impacts included raising awareness for consequences of overuse, providing evidence on benefits and negative impacts and balancing disclosure and social sharing with privacy and security issues. Adolescents were viewed as not understanding the limits of sharing and how this could be detrimental if limits were exceeded. Gender differences in posts and in emotional reactions to posted content were also discussed by parents and the need to raise awareness for gender differences.

Therefore parents raised the importance of skill development relating to containing difficult emotions, emotion regulation and meta-cognition as a means of avoiding all-or-nothing thinking in relation to their engagement on social media (i.e., instead of responding with account deletion). Additionally, social and interpersonal skills' deficits were viewed as partially explaining the hostility and interpersonal communication problems arising. Skill development, such as raising insight into frequency and duration of use or loss of social skills were perceived as critical to develop and enhance. Finding appropriate replacement behaviors for hours spent online and providing opportunities for more offline contact were also referred to as key priorities by parents. Training was viewed as requiring reliance on evidence and on skill-building and empowerment.

“If you had a problem at school, you went home, shut the door and that was it. Now it is in your home, in your bedroom, it is hard to leave it behind, unless you make a conscious choice about ‘I don’t want to be part of that’, but then you become isolated and although I feel my daughter has decided to delete those apps, I think within the next few weeks those apps will reappear.” (I1F, 42 years)

Another set of skills emphasized by parents was related to privacy concerns and adolescents' ability to protect their personal data, privacy rights, and security. However, parents reflecting on their children's reactions on the the topic of safety covered in PSHE lessons was considered as being over-emphasized to students, with repetitive themes across years, similarly to teacher perceptions. This was viewed as being displacing of important psychoeducation that adolescents could engage with. Adolescents were viewed as lacking emotional readiness to handle communication problems or other challenges (privacy breaches) that arise online prematurely, resulting in distress, anxiety or depression. To best manage such issues a key skill was discussed by parents such as the ability to focus, concentrate and eliminate distractions. These cognitive skills were suggested to be included in formal education and were considered of higher priority to drugs and alcohol regarding policy priority, due to the fact that they are pervasive and have a wide impact on the majority of youth rather than affecting a small minority of vulnerable youth:

“the concentration, especially before exams...because I don’t know if they are teaching them how to be concentrated, focused. I think that is something they need to be good at, not only when they are doing homework. I think it is a skill that they need to build.” (I3M, 39 years).

8.4 Discussion

The present study explored parental perceptions of negative impacts from online use experienced by adolescent children and corresponding needs and priority intervention areas. Findings suggested that parents viewed adolescent digital education and prevention as an area of high priority and importance in order to respond to negative consequences of social media and gaming on multiple domains of adolescent life. Digital education was therefore proposed to be included in the formal education system across year groups. Need for parental training – in addition to student education – was also highlighted as a major priority to enable evidence-informed and responsible digital parenting. Intervention needs identified were time (i.e., wasting time), content (i.e., sexting), and context-related (i.e., balance private-publicly disclosed information). Three major themes emerged in the results: (i) schools as digital education providers, research and prevention hubs, (ii) recommendations for public policy implementation were viewed as critical to raise awareness, resolve ambiguity regarding impacts and mitigate excessive use and problem impacts, (iii) intervention needs to address three levels: time-related, content- and context-related impacts and skill development. Parental themes reflected a triadic relationship between students, parents and schools, endorsed media education and underscored the need for a systematic collaboration between significant stakeholders - adolescent children, schools, academia, the parent community and government - to address the multiple concerns and issues arising from online use and prevent problematic use.

The *ecological framework* (Bronfenbrenner, 1979; McHale et al., 2009) may support the present study's findings and digital use-related problems in adolescence (Dalope & Woods, 2018), which highlights the direct and indirect bi-directional influences of the various systems (family, schools, and policy) and media on the individual. The present study's findings underscore the interactivity and interdependence of the micro (individual and devices/applications and online content), meso (family/peers), and macro systems (societal/public policy) in shaping potential vulnerability if needs and impacts remain unattended. Similarly, the same systems may serve as protective factors to potential problem behaviors within the social media and gaming context (Nie et al., 2019; Schneider et al., 2017). Similarly, findings emphasized a collaborative approach of the systems coordinated by evidence-based and stakeholder-informed public policy in areas of concern for effective attitude and behavior change and provided specific recommendations for the institutional support they envisage to complement the parental role.

The first and second theme of parental perceptions discussed the growing role of schools in digital student and parent education (Kimbell-Lopez et al., 2016). The need for digital education to be included in formal education and the need for parental training were the key recommendations, in line with a reported gradual change in the education systems, overall facilitating the change from an industrial-based to an information-based economy (Griffin et al., 2012). Various challenges for educators have been presented in the literature in the roadmap to this transformation: (i) the challenge of potential risks and irrelevant use while encouraging better access to information and knowledge, and (ii) a growing need for time management and rule-setting to allow for autonomous learning (Jouneau-Sion & Sanchez, 2013). Parents in the present study envisaged an additional role for schools, serving as information and prevention hubs with an increasing involvement of educators in raising awareness, in assessment and prevention of excessive use and ensuing

problems. This new role of schools conceptualized by parents implied adequate training of school staff that may support the needs of students both in terms of digital literacy and by responding to evolving socio-emotional issues. School support may be provided in the following ways: (i) identification of early signs of problematic use, (ii) providing assessment tools for an accurate and rapid evaluation of potential risks for gaming or social media addiction, and (iii) becoming informed about and liaising with referral sources for mental health services or support groups for high-risk students to be readily available to school counsellors, staff and parents (Caldwell & Cunningham, 2010).

In turn, the second theme underscored the further systemic changes (i.e., digital training should be embedded in the formal training curriculum of teachers) which are required to accommodate this change in the curriculum. It was suggested that training requires the collaboration of professionals (i.e., primary care physicians, mental health professionals, addiction experts, and school counsellors) to establish guidelines and support training needs for digital education and mental health promotion, which has also been emphasized in the literature (Blum-Ross & Livingstone, 2016; Király et al., 2017). Additionally, the second theme underscored an evidence-based systematic parental education as a complementary strategy to support the parental role of limit-setting and protection from risks and problems. To accomplish this, parents prioritized raising awareness of short and long-term impacts and to be provided with guidance regarding monitoring or restricting online use, informed by evidence. Lack of evidence was viewed as creating current ambiguities and biased perceptions regarding impacts and consequences of online use. Parents perceived the positive aspects of technology use for children as often ignored or overlooked at the expense of the negative impacts and the need to be alerted to both beneficial aspects of technology use that contribute to positive development, learning or enhancement and detrimental consequences of digital engagement (Blum-Ross & Livingstone, 2016; Vaterlaus et al., 2015). This negative bias against the use of technology has implications for limiting exposure, against evidence suggesting that a balanced use of technology may be advantageous for adolescents (Przybylski & Weinstein, 2017), and provide evidence-based sources of advice to parents.

The collaboration between schools and families is in line with previous findings for the role of home and school in health education (Sormunen et al., 2013) and parenting interventions to reduce mental health problems in children (Kato et al., 2015). Current empirical evidence suggests that schools are increasingly being viewed as offering opportunities to develop strategies in various domains of mental and physical health: for obesity and sedentary behaviours prevention and encouraging physical activity engagement (Hankonen et al., 2017; Smith et al., 2014; Story, Nannery, & Schwartz, 2009), in gambling prevention and bullying (Ang, 2015; Holt et al., 2013; Morgan, 2013), substance use and multiple risk behaviors (Das et al., 2016; Shek et al., 2016), internet and gaming addiction (Throuvala et al., 2019c; Vondráčková & Gabrhelík, 2016), excessive screen time (Babic et al., 2015; Smith et al., 2017), and engagement in health behaviours (Busch et al., 2013; Shek et al., 2016). This trend reflects an increasing role of schools to adopt well-being approaches (Layard & Hagell, 2015). The public policy recommendations made by parents have been supported by scholars as necessary steps for primary prevention for excessive screen time, internet and gaming addiction (Griffiths, Benrazavi, & Teimouri, 2016; Griffiths & Kuss, 2011; King et al., 2017; Livingstone & Helsper, 2008;

Throuvala et al., 2018). Similar systemic approaches have been implemented in East Asian countries and the United States with comprehensive and longitudinal interventions promoting positive development and reduction of risk behaviors (Catalano et al., 2004; Shek & Wu, 2016; Shek & Yu, 2011).

The third theme pertained to intervention needs tapping into parental concerns. Parents proposed specific topics addressing a variety of psychosocial and communication problems arising from adolescent online use that go beyond the long-held focus on risk and safety online. Parental concerns primarily focused on time spent on devices and the children's inability to impart control over duration and frequency of use, reflecting increasing self-regulatory demands and difficulties in behavioral emotion regulation, typical of this developmental stage (Albert et al., 2013; Foulkes & Blakemore, 2016; Pokhrel et al., 2013). Lack of self-control has been evidenced as a risk factor in internet and gaming addiction (Griffiths, 2014; Griffiths, Kuss, Billieux, & Pontes, 2016; Kim, Namkoong, Ku, & Kim, 2008; Kuss & Griffiths, 2012; Rho et al., 2017). Additionally, online activities' structural characteristics were perceived as reinforcing online use and potentially leading to addiction in line with current empirical research evidence (Griffiths, 2014; Griffiths & Kuss, 2011; Griffiths & Nuyens, 2017; Kuss & Griffiths, 2012; Wood, Griffiths, Chappell, & Davies, 2004).

Other impacts identified by parents were content- and context-related. These included handling romantic relationships online and 'sexting' (Rice et al., 2012), a behavior that is increasingly approaching the norm and is considered part of risky sexual behaviours in adolescence (Rice et al., 2012; Symons et al., 2018). The expression of anger and aggression was another topic of concern with evidence of its association to problem gaming (Lemmens et al., 2006). In the context of social media, aggression has taken the form of 'online social disinhibition' (i.e., lack of restraint as a result of online communication), 'phubbing' (i.e., snubbing through smartphone use), or exposure to online hate content (Chotpitayasunondh & Douglas, 2016; Kumar et al., 2018; Oksanen et al., 2014; Suler, 2016). Cyberbullying – the electronic form of bullying inflicting harassment – has been associated with problematic social media use, depression and suicidal ideation (Brailovskaia et al., 2018; Kircaburun et al., 2018; Zsila et al., 2018). In addition to manipulation of images online conferring body image concerns are key psycho-social problems experienced by adolescents, conducive to eating disorders (Meier & Gray, 2014; O'Keeffe et al., 2011; Reid & Weigle, 2014; Thomée, 2018; Van der Velden et al., 2019).

Distraction from devices, a growing area of concern, was a key area in parental narratives. Distractibility has been associated with decreased academic performance, lower enjoyment in social situations and diminished memory for experiences (Dwyer et al., 2018; Felisoni & Godoi, 2018; Ferguson, 2011; Fox et al., 2009; Gazzaley & Rosen, 2016; Giunchiglia et al., 2018). Safety and data security were also expressed concerns. Skill development was therefore proposed as a buffer against time spent, content and context-related impacts in line with previous interventions' literature (Shek & Wu, 2016; Shek & Yu, 2011; Smith et al., 2017).

The aforementioned areas for intervention have been examined in the literature, particularly due to their potential association with psychopathological phenomena (i.e., anxiety, depression, bullying, problematic online use, and gaming addiction) (Barry et al., 2017; Glover & Fritsch, 2018; Griffiths et al., 2018; Kuss,

Griffiths, & Binder, 2013; Machimbarrena et al., 2018; O’Keeffe et al., 2011; Reid & Weigle, 2014; Strasburger, Jordan, & Donnerstein, 2010; Zsila, Urbán, & Demetrovics, 2018), yet not systematically addressed at a school level (Forman et al., 2009).

Parental concerns tap into emergent problematic online conditions as prevalence rates demonstrate. In spite of variability in PIU and Internet addiction prevalence rates for conceptual and methodological reasons (Kuss et al., 2014), prevalence rates have been assessed to be 4.4% for PIU in European adolescents (Durkee et al., 2012) and 4.5% for problematic smartphone use in Hungary (Bányai et al., 2017). Prevalence rates have ranged significantly amongst Europe and East Asian countries with double digit figures in non-nationally representative samples (Hussain & Griffiths, 2018; Tang & Koh, 2017).

In conclusion, parents suggested a framework of collaboration with schools to tackle impacts experienced through social media and gaming use, similar to governmental policies for other addictive behaviors (Department of Health and Social Care, 2015; French interministerial mission for the fight against drugs and drug addiction, 2008). Such policies highlight an economic benefit from harm-reduction and place a high value on policies encouraging self-regulation in combination with the amelioration of environmental cues (i.e., limits in advertising; Bernheim & Rangel, 2005). Employing an integrative approach as early intervention was viewed as timely to aid children develop the necessary skills to deal with the constant online challenges.

Extending the findings of the present study recommendations are made in relation to prevention provision in schools, for media operators and regulators. In relation to schools, as suggested by parents, media literacy awareness is critical across all school stages that go beyond e-safety to address psychological harms, create insight and awareness of personal engagement, and encourage agency. These should include content within PSHE that goes beyond awareness-raising to focus on skill enhancement (i.e., self-control, self-regulation, and empathy), case studies, scenarios, and experiential, interactive activities (Shek & Wu, 2016; Throuvala et al., 2019c). Of critical important to the success of media literacy programmes within the schools is to employ (i) a developmental lens accounting for motivations and processes shaping engagement (Davis et al., 2020), (ii) a personalized (tailored to the adolescent) approach, where students can map their own personal digital footprint (focused primarily on which activities they engage with online), to be regularly updated, acknowledging best practices, talents, contributions, and potentially problematic uses. This could include screen time and activity-specific measurements and objective setting, or reduction-self-improvement goals and comparisons to time spent on physical or outdoor activity. Schools could also be trained to identify problem signs that may otherwise go undetected (when there is a sustained negative change on functional domains of life, such as school, academic work, activities or hobbies and/or relationships with significant others and provide peer support networks for children at risk, and liaise with families, charities and special services [i.e., the Child and Adolescent Mental Health Services (CAMHS) in the UK] at an early intervention stage – prior to referral. Within schools, environmental changes (i.e., engagement with short physical activity exercises during breaks, charity support work with after school activities) could be encouraged, which have been found to be beneficial in interventions tackling obesity (Martin, 2017; Throuvala et al., 2020).

Schools could implement evidence-based psycho-education to help children develop life skills, such as effective communication and conflict resolution, reduce maladaptive coping and adopt positive coping and exhibit emotional, cognitive and behavioral competence (Horwitz et al., 2011; Strauss, 2007). For example, adolescents could practice within school workshops positive cognitive reappraisal (reframing emotional events to reducing their intensity) with regards to negative or habitual behaviours (i.e., reframing sleep routine by not discussing impacts of sleep deficits due to exposure to screens, but emphasizing the contribution of sleep to beauty and health) (Mauss et al., 2007). Looking at the wider prevention literature, there are examples of relevant successful practices. Gordon, Biglan, and Smolkowski (2008) redesigned antismoking interventions by (i) not associating smoking with fun, excitement, and social acceptance, and (ii) minimizing messages about the negative health effects of tobacco and instead utilizing anti-tobacco norms, which was an effective way to prevent smoking among adolescents utilizing parental influence (Gordon et al., 2008). Additionally, use of celebrity endorsement to convey positive messages regarding healthy digital footprints and practices (Knoll & Matthes, 2017) could model positive behaviours (Bergkvist & Zhou, 2016), which adolescents would be more likely to follow. As proposed by parents, undertaking regular meetings with the parent community to address concerns, which arise and discuss potential solutions regarding digital uses could also help parental awareness and parental skill building (Griffiths, Lopez-Fernandez, Throuvala, Pontes, & Kuss, 2018). This could be further supported by embedding a regular educational component to periodically train school staff and parents on developments and new digital products popular with children and adolescents (Griffiths et al., 2018). However, reported difficulty of parents to commit to such education needs to be carefully considered (Stanley et al., 2017).

Likewise, platform/game operators have a duty of care to protect minors from online emotional harms (HM Government, 2019). Social media and gaming platforms have started to work with charities and non-profit organizations in response to growing public concerns (Stewart, 2019). However, health promotion interventions need to be encouraged both on digital environments and in school interventions (i.e., address risky content and offer free support for at-risk or vulnerable individuals) (Stevens et al., 2019). It would be helpful if companies were obliged (as food companies are obliged to list ingredients on food labels) to make publicly available and disclose their marketing practices and business models and engage with relevant grass roots organizations prior to marketing new products. Social media and gaming operators could also engage in collaboration with local mental health charities and conduct campaigns to support vulnerable young people (Dubicka & Theodosiou, 2020). This could also take the form of a levy on mental health support services and funding of the development and maintenance of public units to treat addictive use of technology. Furthermore, operators in the context of corporate social responsibility should facilitate and fund independent platform-specific research and provide access to real time behavioural data beyond self-report (Dubicka & Theodosiou, 2020; Yousafzai et al., 2014).

Systematic initiatives in Europe have been commissioned by the German and UK governments (House of Commons Science and Technology Committee, 2019; Rehbein & Rumpf, 2017) following expert calls for evidence. Regulators exercising duty of care to minimize harms could place more pressure on the gaming and social media industries to regulate specific activities. In relation to gaming, there is a need to encourage international collaboration for a global videogame addiction policy framework, additional to any efforts for

self-regulation, school or community efforts, and to create universal design recommendations (King, Delfabbro, & Griffiths, 2010; King et al., 2017; Kottalgi, 2019; Ottosson et al., 2019). Such approaches would require monitoring of operators' business models and practices which psychologically hook users – i.e., practices based on intermittent reinforcement (i.e., likes and rewards) and train children and adolescents to recognize and understand the impact of such practices on their behaviour. Research commissioned could go beyond impacts and risks into best practice and innovative interventions on emotion regulation and focus on effectiveness measures (Király et al., 2017; Rehbein & Rumpf, 2017). Policy formation on harm-minimization in relation to the digital environment in gaming and social media platforms could follow evidence-based gambling industry practices and tools to reduce financial or psychological harms (Griffiths & Pontes, 2019). Platforms could designate with a sign on content which photos have been enhanced (e.g., use of filters, etc.) (Royal Society for Public Health, 2017) and assess the effectiveness of such measures, thus assisting prevention initiatives.

Increased gamblification of the gaming and social media environments are an emerging problem (Griffiths, 2019; Kaakinen et al., 2019). According to the UK Gambling Commission (2018), the prevalence of problem gambling has almost doubled in 2018 (to 1.7% from 0.9% in 2017), which is partly attributed to videogames with gambling-like activities (i.e., buying loot boxes) (Griffiths, 2019). The acquisition of loot boxes or other virtual in-game items primarily targeted at children offers customization options for a player's avatar or faster progression in the game and requires real money exchange, and many operators allow the trading of in-game items for real money (Zendle et al., 2019). Exercising pressure to reconsider the evidence regarding loot boxes and the regulation of microtransactions [i.e., banning loot boxes or prohibiting sale to secondary markets outside the game (Chansky & Okererg, 2019)] while placing age limits (restrictions to over 18 years of age) is another critical action towards prevention. These actions ought to be addressed following other countries' provisions (i.e., Belgium, Holland, and Japan) – which, unlike the UK, have taken measures to regulate the purchase of loot box items (Griffiths, 2019).

The present study's findings contribute to the growing call for evidence for prevention of online harms arising from adolescent interaction with the digital environment by offering the parental perspective on intervention needs and recommendations of ways to address them. These recommendations may be utilized in shaping new digital education policies. However, these should be viewed with caution as they cannot be representative of whole population needs, given the qualitative nature of the study design and the limited, selective pool of participants residing in the UK. Recommendations serve as indicative proposals and may be further tested quantitatively with a nationally representative sample to inform public policy for the needs experienced by families and caretakers. Additionally, parents were self-selected following a school call for participation, and therefore, parents who may be more concerned with their children's digital use or may be biased due to problems faced with their own children's media use, may have participated. Future studies should focus on investigating parental needs across the developmental span and across different cultural contexts on the various online uses to identify specific aged-related problems, given the evidence of the merits of early intervention (American Psychological Association, 2014; Conroy & Brown, 2004). Research efforts should focus on ways to empower and best support parents in their new digital parenting role and focus also on

educators' views of intervention needs and strategies as a complementary source of accounts (Hollis et al., 2018; Jackson et al., 2012; Romano, 2014). The examination of family dynamics appears to be increasingly influential in treating gaming addiction (Day, 2017; Li et al., 2014; Schneider et al., 2017; Throuvala et al., 2018a, 2018b), highlighting a need for the nascent prevention field in behavioral addictions to follow a similar systems treatment approach.

8.5 Conclusion

Social media use forms a large part of the psychosocial development of adolescents away from the traditional socializing agents. Positive family communication has been found to serve as a protective factor against psychological difficulties, as well as excessive screen use, gaming addiction, and other psychopathological conditions. Parental mediation regarding the online environment is characterized by insecurity and difficulty in limit setting due to the lack of clarity in media recommendations and lack of own experiences which would aid understanding of the online needs of their children. Most parents are not prepared or trained to deal with the challenges of digital parenting and are striving to clarify the ambiguity regarding the overall impacts on their children and ways to handle them. The present study highlighted parental perceptions of intervention needs for supporting the digital parenting role and suggested how changes in the educational system may facilitate adolescent digital citizenship. Parents/carers identified media education and prevention of negative social media and gaming impacts as a priority topic in pastoral education. Promotion of a systemic approach to prevent screen time problems is timely and suggests a collaboration between the three main stakeholders – adolescents, parents, and schools – led by public policy implementation with the collaboration of academic and non-governmental institutions to support evidence-based preventive efforts for problematic use of social media and gaming.

Chapter 9. ‘An echo-chamber of emotions’: Teacher recommendations for school-based prevention of online harms in adolescence

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9.1 Introduction

Rising mental health disorder prevalence in children and adolescents in the UK (NHS Digital, 2020) has triggered a need to support children’s mental health and to expand the school’s role in identifying and supporting young people with resources and faster access to health services (Department of Health - Department of Education, 2017). School-based interventions for behaviour change are increasingly becoming a dynamic source for prevention of potential mental health disorders with mental health literacy as a key part of mental health promotion (Kutcher et al., 2016). Mental health literacy has been defined as a form of health literacy comprising four pillars: seeking and obtaining good mental health, understanding mental disorders and its treatment and help-seeking efficacy (Kutcher et al., 2016). Promoting mental health in schools has been found to render small to moderate effect sizes with large practical impacts and the most effective strategies are the ones employing teaching skills, positive mental health, a balance of universal and targeted approaches with an early start, and whole school approaches, amongst other factors (Weare & Nind, 2011).

Education has been found to be a powerful determinant of adolescent health and interventions investing in adolescent well-being incur large benefits for future adult life (Patton et al., 2016). Use of social media has been assessed for its pedagogical and recreational value within the school context (Dennen et al., 2020). In recent years, educational settings are faced with the challenge to embrace the positive outcomes for students in terms of learning and engagement while reducing the negative uses of the Internet and smartphones (Rach & Lounis, 2021; Subhash & Cudney, 2018). Educators acknowledge the value of incorporating social media in the delivery and assessment of courses and its impact on learning and engagement, however they argue for the need to ensure relevance of social media use (SMU) and usage levels (Stathopoulou et al., 2019).

In China, which has the highest number of smartphone users (Newzoo, 2020), various school policies on smartphone use (SU) have been implemented which differ on content, purpose and effectiveness however, studies on the topic have revealed the complexity in handling SU issues at school highlighting low effectiveness of SU policies and similarity in teachers’ policy improvement recommendations across elementary, lower and upper school (Gao et al., 2014). However, evidence also suggests that SU within the classroom setting is a sign of non-engaging teaching which leads students to distraction (Green, 2019). In South Korea, approximately 65% of schools prohibit SU in the classroom (by collection of smartphones before lesson start) with 91% prohibition rates in middle school and 46% in elementary school (Cho, 2016), where Internet addiction counsellors are trained and employed to help prevent and reduce incidence of Internet addiction (IA). This training is provided in both offline and online modalities and consists part of the core curriculum. The offline course training length is 30 hours (over five days) and the online course is composed of 30 lectures. Both

courses give teachers two credits, which count as continuing education credits required for teachers (Cho, 2016). A literature review on youth internet safety education indicated there are advantages to integrating online harms to current offline harm intervention programmes (i.e., bullying or sexual abuse prevention) due to considerable overlap in nature and risk factors in both types of harms, the greater prevalence and more robust evidence base of offline harms (Finkelhor et al., 2020).

The salience of smartphones and mobile devices for educational purposes has become mainstream in Western societies but may mask problems and harms arising from overuse. Understanding risks and raising societal awareness of PSU could trigger discussions about harms in families and schools and ways these could be addressed (Sohn et al., 2019). To be able to support schools in providing evidence-based and developmentally sensitive approach to these subjects, the present study examined UK school teachers' views and perceptions about the nature of concerns and recommendations for harm prevention in adolescence (Brennan, 2011; Sammons et al., 2014).

9.2 Methods

The present study was analyzed with constructivist thematic analysis and involved teacher interviews from 3 different schools in the UK. Design, participant section and procedure for this study are covered in the Methodology Chapter 4. Emphasis was placed primarily in teacher concerns regarding adolescent online use and recommendations proposed to overcome challenges and harms in adolescence.

9.3 Results

Teacher concerns and recommendations formed the following themes: (i) *schools in transition*, (ii) *redefining expectations*, (iii) *a modular approach to digital literacy*, (iv) *encourage dialogue and foster skills*, and (v) *support a mentoring Teacher role*. Teacher perceptions acknowledged embracing technologies and viewed defining limit-setting to safeguard children and adolescents as a primary objective. Perceived benefits from online engagement were: (i) platforms as a major and effective learning tool (for research purposes and use as a collaborative tool), (ii) games offering positive outcomes (entertainment, brain training, use beneficial for introverted or autistic children), (iii) social media forming major part of daily communications for friendship maintenance and acquisition and communication, and (iv) the acquisition of important skills for future professional life. However, teachers perceived that negative views of technology overshadowed the positives and expressed concerns regarding a greater use of social platforms by students for entertainment purposes rather than learning:

"...they (students) have lost sight that they can use it for learning purposes, and not just for fun, there is educational videos, information that they take for their lessons, so if there was a programme to bolster that area, that would be useful." (I3M, 34 years)

Teachers also acknowledged that recreational digital use is a massive part of school life with students being in constant sync with each other and with exposure starting from a very young age presenting with challenges. Perceptions of devices and online use to regulate emotions were also expressed (see Table 1) and viewed online communities as an '*echo-chamber of emotions*' (I6F, 30 years, Teacher) triggering anxiety and emotional problems but also with calming effects (see continuum of positives/negatives in Chapter 7). The

following themes in terms of perceptions and recommendations emerged from the teacher accounts to support media literacy and emotional wellbeing.

Table 9. 1

Teacher Perceptions, concerns and recommendations

Themes/ Sub-themes	Example verbatim comments
Theme 1: Schools in transition	
<p>Pervasive use</p> <p>Parental ambivalence and ignorance</p> <p>Diffused responsibility</p> <p>Authority dynamics</p>	<p><i>“Online is a huge danger it is underrated because I think about drugs it is much more obvious. The drugs they have to get them from somewhere and they’re expensive but the online it is open and it’s available all the time.” (I8F, 33 years)</i></p> <p><i>“They will say things online that they would not say to their face. Totally taken in by what they see, they take anything they see online as gospel.” (I4F, 49 years)</i></p> <p><i>“I think this is getting significantly worse, students with many followers must have a correlation with anxiety...it is damaging and quite underestimated.” (I6F, 30 years)</i></p> <p><i>“It is relatively easy, it does not require much effort, physical or mental. It is not expensive, so if they have a device in their room they can do the social thing and they can do it without the parents knowing what they are doing.” (I7M, 41 years)</i></p> <p><i>“We hear about things when they get reported to us but where is that line when the students are reporting about things that happened outside of school, because it is hard balance to monitor absolutely everything, the fall outs, so even if it happened at home, the ramifications are carried over in the school and it is quite hard to address that as a teacher because that comes clearly to parenting at home.” (I1F, 43 years)</i></p> <p><i>“As a teacher you say put it away and they do it, as a parent you say put it away and they don’t. So it is a different relationship. I think control is the main issue for parent.” (I2F, 52 years)</i></p> <p><i>“Those few parents who had some experiences and they backlash-they take over and we have experienced that a lot...I think (parents) should be a part of this, one of the problems with parents is that they are quite anti..., so you end up with a very one-sided perspective.” (I6F, 39 years)</i></p>
Theme 2: Redefining expectations	
<p>Capturing students’ attention</p> <p>Pastoral care and network support</p> <p>Adoption of more interactive teaching methods</p>	<p><i>“It is attention deficit, with some of them, if something is not screaming or flashing and demanding their attention, mobile games in particular, which are exactly designed to do that, so it is hard to compete as a teacher with those amazing interactive activities to keep their attention because otherwise you lose them.” (I7M, 45 years)</i></p> <p><i>“Sometimes the students would talk to us more than they would talk to their parents, they feel that the parents are the cause of the anxiety and the problems and therefore, they talk to us more but certainly if I was worried about the student and the personal safety, I have other avenues that I can explore, so i.e. we have our school counsellor, we work with SHARPS, the self-harm charity, we refer directly to CAMHS, we would always involve the parents but I think keeping the priority and the safety of the student at heart of what we do, is a difficult balance.” (I4F, 49 years)</i></p> <p><i>“I think case studies and interactive sessions, do active learning, learning they can collaborate, learn from each other, do research - not a lecture saying, you shouldn’t do this - looking at case studies, have a few video clips, look at the impact that it has on other people, so in a way they then will be able to think that would have impact “oh, if I did that, than saying don’t do this, don’t do that”. Often teenagers do the opposite things, so exploring those concepts and issues through debates through discussions in that safe environment, I think it is probably best.” (I7F, 41 years)</i></p>
Theme 3: Assume a modular approach to digital literacy	
First school years should address safety, later	<i>“It is different for different years and depending on their age and apps they are using: it has got to start with the basics the dangers of sharing information, things like logging</i>

<p>school years image/anxiety</p> <p>c</p>	<p><i>into other people's accounts, sharing each others passwords, but I think it is not only in the context of social media, it is a social media issue partly but it is also about friendships and about "is it acceptable to be having those conversations and if you were in a room with somebody, what if the next day you fell out and that person went out and told everybody all the secrets that were told, so you link it to the picture, passwords and security of information, the dangers, the image they portray, their online profile, the anxiety caused by those pressures that they get online, almost like modules to have to focus on those areas" (I8F, 33 years)</i></p> <p><i>"It has to be integrated in all - Form time, PSHE, in lessons, in in-person contacts" (I5M, 42 years)</i></p> <p><i>"PE is not considered as important, but then you go to countries like Taiwan where it's not even in the curriculum, they are constantly studying, there is anxiety in kids at the age of four. PE is not taken as seriously as a subject but it is very important, to put more of an emphasis on getting outside, providing some alternatives." (I6F, 30 years)</i></p> <p><i>"It is down to how to increase awareness around what anxiety is and how does it make you feel, there isn't enough emotional education about emotional well-being, even like sex education, what it feels like, as opposed to what ages should be having sex, so it is actually down to how you feel and I think that's what's missing? If we just say oh you are getting anxious and feel addicted, how does this feel? So it's about the emotional well-being and discussing." (I3M, 39 years)</i></p>
<p>Theme 4: Encourage dialogue and foster skills</p>	
<p>Interpersonal skills and self-reflection</p> <p>Balanced, responsible and safe use</p> <p>Discernment, critical ability and metacognition</p> <p>Perspective taking, empathy and compassion</p> <p>Resilience and self-esteem enhancement</p> <p>Time management & enhancement of time perception</p>	<p><i>"To enhance dialogue if you wanna know from students - not just a bit of dialogue about how much time they spend. What kind of games they are playing it also what impact they think games are having because there are students that I worry about because they might have lost some friends because they are gaming in their isolated rooms and get involved in other things that might not be sensible for themselves, so dialogue would be the first thing to have and then from that more things could build on" (I3M, 34 years)</i></p> <p><i>"For responsible and safe use and I don't just mean the safe bit, chat rooms without grooming; I mean safe in terms of balance of all of your life, not to be overtaking anything else, so the nutrition that you need to exercise, interact, an educational thing to remind students really, especially the younger ones who don't know anything different, that this is part of your life not your whole life!" (I9F, 29 years)</i></p> <p><i>"Interpersonal skills we are having those skills discussed in lesson, building on those relationships that they can establish I've heard the children wargaming with others and they do it for bonds with people from Russia, China if you are trying to catch that aspect and help them to use that with people that they work with on an every day basis and the intrapersonal self-reflection about certain behaviours 'why am I doing this?' 'this is actually beneficial, this is something I could be doing better or use my time wisely that kind of thing" (I5M, 42 years)</i></p>
<p>Theme 5: Support a mentoring Teacher role</p>	
<p>Teacher training component</p> <p>Emotional wellbeing content in media literacy</p> <p>Contain student aggression, anxiety peer pressure</p> <p>Leverage positive experiences</p>	<p><i>"Teachers could have more formal training and awareness for online things, we all could do with that, I am not really savvy technically, I can go online and text, I literally just went on Facebook, I am 52, my Headteacher, told me you have to get on this and see what the students are following. I am not on twitter and so on, I am not that savvy, my children are, not like other teachers that tweet, I don't have time to tweet." (I2F, 52 years)</i></p> <p><i>"What about the emotional impacts? The anxiety, the FoMO?" (I2F, 52 years)</i></p> <p><i>"Get the teachers to be trained on Instagram, what to look out for, ways we can help and things we can do to support some positive online experiences. If we could have some people coming in and showing these are the things it could help at every level." (I8F, 33 years)</i></p>

9.3.1 Theme 1: Schools in transition

The first theme related to the perception of the transition within schools to embrace technologies and adopt digital learning but also acknowledge impacts, ranging from positive to negative and posing challenges and harms (for a detailed account of teacher perception of harms, see Chapter 7). It was emphasised that there is a need to have stricter rules regarding smartphone use in school hours, which to date was not uniform. It was suggested that a higher degree of compliance to school rules could help set boundaries. Teachers discussed structural mechanisms driving higher engagement both in gaming and social media use and high exposure to aggressive marketing initiatives by companies online, as interfering and defining students' values, motivations and posing a further digital divide with low SES students in the use of expensive devices. Children and adolescents were perceived as not being in a position to critically evaluate the commercial messages, which influenced student choices while compromising their agency and self-regulation, and endorsing use beyond the students' control. This therefore led to the need for consistent rule setting re smartphones in schools.

Absence of clear boundaries for limit-setting and problem-solving formed school teachers' perceptions of parents as being ambivalent and partially ignorant of their children's specific uses. This was coupled with a tendency to diffuse responsibility in relation to supporting adolescent challenges and harms. Additionally, teachers perceived parental knowledge and attitudes towards their childrens' online engagement as technophobic and controlling or encouraging use as a reward. Teachers discussed parental expectations of schools to handle the challenges faced by their children while viewing students being more trusting towards teachers than parents. Teachers, however, perceived themselves as being able to enforce control over students' use more than parents. Parents were viewed as polarized and partially unaware of the extent of use or the emotional problems experienced by their children.

9.3.2 Theme 2: Redefining expectations

The second theme related to ways the online activities pushed for new expectations of the school experience and revolved around new classroom and lesson experience. Teachers experienced a greater pressure to provide more entertaining content to emulate social media's fast pace and impressive presentation of content. This placed a great degree of pressure on teachers who felt they were losing their pupils' attention if they did not manage to provide this recreational dimension. As a result of this and the proliferation of media use and online delivery for teaching purposes, it was discussed that schools are in a digital transformation phase and consequences should be addressed (i.e., diffused boundaries between online learning and recreational use). Additionally, online issues which involved students with emotional difficulties appeared to be significantly more complex to be handled and in relation to balancing the relationships with parents:

"I think the parents are aware that she doesn't find school appealing and they know she spends time online, and because she also faces emotional difficulties, they don't realize the severity of that and my difficulty is the balance of gaining her trust and also managing the parents as well. So I think they are aware to a certain extent but perhaps not to the same extent because she is very open with me." (11F, 43 years).

9.3.3 Theme 3: Assume a modular approach to digital literacy

The third theme referred to overall recommendations for prevention. Adopting a stepwise developmental approach for digital issues in schools, prioritizing Years 7-8-9 for groundwork to serve as a gateway for Years 10-11-12 where the majority of the issues arise. Teachers proposed for the early school years to address safety and later school years to address psycho-emotional issues, such as image and anxiety-related issues arising from social media use. To support mental health literacy within schools and more positive online experiences, a new pastoral and educational role relating to harms or negative impacts of digital engagement (see Chapter 7 for challenges and harms). This was viewed as needing a more holistic approach (i.e., to encompass also physical activity and encourage balanced nutrition).

Additionally, teachers raised an issue of students' expectations to generate more engaging teaching experiences and school lessons, mediated by their extensive exposure to speedy and entertaining social media content. Teachers reported that current strategies for delivering physical, social and health education (PSHE) required updating: (i) PSHE was currently geared towards topics about safety - with no emphasis on psycho-education content, (ii) suggested that media literacy in school settings should be given equal priority to drugs if not more due to the pervasive nature and the degree of online engagement, and (iii) establish rules in relation to smartphone use during school hours. The latter referred to a dominant perception that smartphones in schools displace the need for face-to-face school peer interaction. Therefore, embracing technological change and engaging in digital literacy and emotional wellbeing topics was viewed as a priority to attend to learning outcomes and students' daily reality:

"It is a massive priority, more of a priority than some of the things they are learning in PSHE, we go on and on about sexting, don't do this, don't do that, make sure you have the privacy settings, but we don't sort of address things appropriately." (I2F, 52 years)

"To get some value out of it and then you would need to work with different year groups, different years from Y5 onwards." (I5M, 42 years)

9.3.4 Theme 4: Encourage dialogue and foster skills

The fourth theme pertained to applying discursive approaches rather than didactic and skill development where students would benefit from engaging in discussion about their experiences online extending it beyond time spent and applying critical evaluation. Teachers expressed a need for skill development in order to endorse mental and physical health balance pertaining to four major areas: (i) *emotional wellbeing* – driven by awareness, self-reflection and acceptance of negative emotions; *reinforcement of positive emotions* and *mindset*; perspective taking; empathy, handling/resisting peer pressure; meta-cognition on emotional responses; (ii) *self-regulatory/control skills* - educating about value of long-term gratification vs. short-term pleasure; (iii) *discernment* - reinforcing balance and positive use but also priorities; and (iv) *time management* and *time perception enhancement*.

"From an educational point of view, it is about education not about banning things particularly." (I8F, 33 years)

"When to use is important to know. I think that would be useful, because 'Oh not again safety' there is a bit of that going on..." (I6F, 30 years)

Digital literacy with emphasis on emotional wellbeing was viewed as developing an understanding on key issues such as the value of long-term gratification vs. short-term pleasure; the use of self-reflection on the rights of children online, commercial interests, or structural characteristics, understanding of gaming

operators' hooks and time lost in activities when gaming or using social media. Such discourses could elicit responses regarding students' body image perceptions and other important topics in relation to social media and gaming. Additionally, promoting the value of physical activity and of PE lessons as a healthy alternative to technology use was viewed as fundamental. Parents were also viewed as needing support regarding communication with their children in relation to online engagement, harmful content and effects (i.e., pornography exposure) via parental seminars.

9.3.5 Theme 5: Support a mentoring Teacher role

The final theme involved the challenging transition to an increasing pastoral role of teachers towards pupils to support more positive student online experiences while attending and providing support to the parent community. Teachers expressed concerns with issues in terms of what they wanted their students to access and what was age appropriate. Providing audiovisual methods to help with student understanding and engagement was deemed useful when discussing internet related topics. Specialized teacher training for school teachers was emphasized to support the tutor role in promoting emotional well-being beyond mere safe and responsible use. Specifically, a teacher training component on helping students deal with aggressive acts online and on training PE teachers to facilitate body confidence messages and enhance adolescent-parent communication on online issues and extend dialogue beyond time spent online.

"We try and help support the parents through that, with the parental seminars we are organizing, and safety talks. It is finding the balance with supporting them with the knowledge we have as a school and then on a more personal basis with the individual." (I4F, 49 years).

"I think the most powerful ad, ever seen about safe internet use, was when strangers were knocking at your door; walking in front of your front door and the stranger was walking up the stairs into your child's bedroom and in effect that is what we are doing with the unchecked use, we allow to use, anybody to come to their bedroom." (I7M, 41 years).

Teacher training was viewed also as useful in detecting students who display problematic internet use or present with signs which may signal an alert for at risk students. According to teachers, for example gamers or students spending too much time gaming were easily spotted as they are usually sleep-deprived due to playing late hours. Further to the initial teacher training component, teachers suggested to have an ongoing training adapting to the technological advances and affordances as well as, changes in popularity and preference of platforms and services.

9.4 Discussion

Schools in recent years are trying to leverage positive outcomes from online engagement for students while reducing negative influences (Subrahmanyam & Greenfield, 2008). The current study examined teacher perceptions of adolescent uses and recommendations to alleviating concerns and minimise negative impacts while maximizing positive uses. Main themes regarding teacher perceptions pertained to (i) *schools in transition*, (ii) *redefining expectations*, (iii) *a modular approach to digital literacy*, (iv) *encourage dialogue and foster skills*, and (v) *support a mentoring Teacher role*. Findings therefore suggested an increasing need for evidence-based training of professionals and education providers to support training needs in children's digital education and mental health promotion, confirming previous evidence (Blum-Ross & Livingstone, 2016).

Schools were perceived as being in a digital transition process with students facing new challenges and harms due to online use, which formed the first theme. Challenges and harms in relation to adolescent digital use were conceptualized by teachers beyond online safety, with cognitive, emotional and behavioural dimensions, encompassing mental health correlates. These were viewed as needing to be addressed in media and mental health literacy (Kutcher et al., 2016) in line with recent policy changes in the UK supporting mental wellbeing in schools (Department for Education, 2020). School teachers recommended skill development and training to strengthen adolescent responses against PSU and SMU and problematic mental health challenges. Evidence suggests that activating universal traits like cognitive or affective empathy enhance willingness to assist in preventing cyberbullying (Barlińska et al., 2018) and interventions investing in the relationship of child-teacher have demonstrated a decrease in teacher–student stress, a greater understanding and categorization of child behaviours and reflection on their own level of ability to perceive, understand, and generate emotions (Opiola et al., 2020). Considerable research has looked at key predispositions, skills and personality traits, which become protective factors in interventions and school contexts, including digital literacy and school atmosphere (Casas et al., 2013). Therefore, combined self-driven and systems-driven approaches in interventions could be promising as they have incurred benefits in the treatment of mental health disorders (i.e., self-harm) (Iyengar et al., 2018), which could be applied to school-wide policies and practices.

The second theme reflected a need for a redefinition of the school experience and culture to facilitate the provision of digital and mental health literacy. Schools were viewed as needing to embrace mental health literacy topics requiring an expanding tutor and school role as prevention hubs. Teachers suggested instead of ad-hoc/one-off interventions a more comprehensive media literacy programme embedded in the school curriculum. Skill development such as resilience, self-control enhancement and self-regulation (i.e., time management) were recommended to be part of the curriculum provision in line with findings from GD prevention and treatment (Antons et al., 2020). Given that brief interventions present with mixed effects compared to assessment-only controls (Carney et al., 2016), the strong habitual nature of online uses and the environmental context that provides constant attraction and reinforcement for engagement, which potentially weaken the effects of such intervention initiatives, an approach embedded in the school curriculum and life provides a more appropriate intervention measure. Therefore, a more longitudinal and systematic framework was suggested by teachers, reflecting principles of the ‘whole school’ approach. Whole school approaches engage except from students, their parents, teaching staff and the wider community (Anna Freud National Centre for children and families, 2018) and have provided initial positive results in Europe and in East Asian countries where such approaches have been implemented and evaluated (Busch, 2014; Busch et al., 2013; Shek et al., 2011).

In the UK despite the scarcity of educational resources, initiatives have been implemented in this direction: a mandatory digital citizenship programme for all schools in the UK for ages 4-14 years has been recommended by the UK Children’s Commissioner (The Children’s Commissioner’s Growing Up Digital Taskforce, 2017), calls for evidence and recommendations (Griffiths et al., 2018) and mental health provision through the Teaching and Leadership Innovation Fund to support training for the delivery of whole school approaches (Department of Health - Department of Education, 2017). In the UK, since September 2020, Relationships and Sex Education (RSE), along with Health Education, became compulsory in all schools

providing a new curriculum in secondary education across the UK, including independent schools (fee paying private schools), in response to urgent calls for media literacy and prevention of online harms. Topics covered included ‘*Respectful relationships, including friendships*’, ‘*Online and media*’, ‘*Being Safe*’, ‘*Intimate and sexual relationships including sexual health*’, ‘*Mental wellbeing*’, ‘*Internet safety and harms*’ and ‘*physical health and fitness*’, going beyond safety and security topics to cover issues relevant to adolescent mental health and wellbeing (Department for Education, 2020). Such initiatives can raise awareness for adverse online experiences and help adopt strategies to cope with challenges. Teacher perceptions expressed suggested that a supportive school environment with the collaboration of external mental health services are the pathways to primary prevention (Throuvala et al., 2019, 2020).

To enable teachers and staff to transition to such a role, knowledge of the online environment and skills are a necessary condition. Educational/counselling psychologists could be trained to deliver support to teaching staff about online issues, based on student experiences by enabling collaboration with local mental health charities (Bowskill, 2017). Given the ubiquitous nature of digital media, teachers but also other educators in the school system (i.e. school nurses) could influence the prevention of risky online behaviours. The level of training and preparation is key in detecting and supporting adolescents but also liaising with designated mental health services, similarly to supporting other mental health disorders (Yager & O’Dea, 2005). Digital technologies have been proposed to augment intrapersonal (i.e., resilience, self-control) and interpersonal skills (i.e., empathy, perspective taking) through feedback, social and game-based learning, amplified by teacher guidance (McNaughton et al., 2018). Successful provision depends on shifting from a top-down, authoritative style of schooling with prohibitions to a collaborative model enabling open and difficult conversations in small groups about impacts of young people as a way of reflecting on experiences and developing the skills to exercise agency (Weare & Nind, 2011).

Overall, findings supported positives in educational online uses and addressed specific challenges in recreational activities in terms of emotional readiness and provided recommendations in supporting adolescents. Teachers suggested that teaching staff at all levels require further training to support emotional wellbeing and mitigate negative emotions from social media pressures, consistent with previous literature (Dennen et al., 2020). The literature suggests there exists a gap between educators and other school personnel and the necessary training, knowledge, and expertise needed to effectively combat problematic behaviours, mental health issues, and other contributing factors, which negatively impact the safety of the learning environment. Mental health professionals who are trained in these areas can provide direction and instruction to administrators and teachers on evidence-based detection and intervention with at-risk students (Döring, 2014; Lo et al., 2018). An effective partnership between mental health providers and educational staff aimed at providing support and education to the teachers on effective identification of at-risk students could be the key to instilling teachers with a new set of skills in this area.

Teachers’ perceptions are currently underrepresented in research and the present study is the first study to solicit teacher views on harms and recommendations for their amelioration from a qualitative perspective contributing to a scant literature on harm reduction. However, results are not generalisable given that the sample was self-selecting from one geographic area in the UK and so their views are not necessarily representative. Future quantitative research could follow up and confirm the validity of these views as well as,

investigate school teachers' management of harms across the various school years. Findings provided recommendations which can help guide teacher training courses and school online harms prevention curricula enhancing student safeguarding and wellbeing.

9.5 Conclusion

Teachers emphasized primary prevention measures in trying to minimize psycho-emotional difficulties amplified by the online environment and possibilities of risky behaviours (i.e., gaming disorder) or severe cyberbullying prevention from occurring, which are usually addressed in tertiary prevention – focusing on eliminating risky behaviours. Findings corroborated the need for an increasing health promotion role of teachers and counsellors and contribution in students' cognitive and emotional development and identified specific recommendations in providing school support for mental health challenges experienced by adolescents. Implications are discussed for the role of educational settings in the prevention of online harms, while preserving the significant benefits of digital media for education and social connection, and for the prompt identification and referral of problematic users to adolescent mental health services. Need for parental education was also viewed as necessary to support students:

In order to offer a comprehensive account of concerns and recommendations beyond adolescent, parent and teacher accounts an additional qualitative investigation was conducted with experts from academic institutions and clinical settings to enhance understanding of concerns relating to adolescent online interactions and deliver recommendations for school-based prevention. The following chapter therefore, presents expert perspectives who designate priority areas in structuring prevention activities within school environments.

Part 4: Acting on recommendations – The case of smartphone distraction

Chapter 10: Smartphone distraction – An emergent construct in the smartphone literature

10.1 Defining Smartphone Distraction

Attentional focus is one of the most fundamental resources and a key to successful and high-order work (Ashinoff & Abu-Akel, 2019). In the attention economy (Atchley & Lane, 2014), multiple online and offline activities compete for an alternative share of attention (Falkinger, 2007). This trend is expected to grow in the face of increasing communication complexity and information overload (Lee et al., 2016), which is becoming even more prevalent partially due to the vast online accessibility, immediacy and convenience of smartphones, acting as a major motivational pull for engagement (Throuvala et al., 2019) and prompting constant multitasking and frequent attentional loss (Rosen, 2008). There are currently more than 3.5 billion smartphone users (Statista, 2020) and smartphone use is an emergent area of research (Busch & McCarthy, 2020; Kuss et al., 2018; Montag et al., 2019). Emerging evidence on cognitive function has shown that smartphone availability and daily interruptions compete with higher-level cognitive processes creating a cognitive interference effect (Beuckels et al., 2019; Fitz et al., 2019; Marsh & Rajaram, 2019; Thornton et al., 2014; Ward et al., 2017), associated with poorer cognitive functioning (Canale et al., 2019; Hadar et al., 2017; Hartanto & Yang, 2016; Wilmer et al., 2017), performance impairments in daily life (Duke & Montag, 2017) and potential supplanting of analytical thinking skills by “offloading thinking to the device” [21] (p.473).

In spite of such initial evidence, there are cognitive correlates within the smartphone context, such as distraction, which has been less explored in the literature. Studies report that students use their smartphones for more than 25% of effective class duration, and smartphone distractions occur every 3–4 minutes, for over a minute in duration (Kim et al., 2019). Student focus on any single task is reported to last 3–5 minutes (Rostain, 2019) with excessive smartphone use hindering academic performance as a result of allowing goal-irrelevant information to compete with goal-relevant tasks (Mendoza et al., 2018; Uncapher et al., 2016). Therefore, examining the processes involved in the occurrence of distraction as well as protective strategies for its containment is timely. Thus, the present investigation aims to evaluate the efficacy of evidence-based mediating strategies in reducing distraction employed in an online randomised controlled trial.

Distraction is an emotion regulation coping strategy used to deflect attention from the task at hand in order to relieve emotional distress, reflected as difficulty in concentrating and maintaining goal-focused behaviour, with an adaptive function in negative affect situations (Gross, 1998; McRae et al., 2010; Moyal, 2014; Nolen-Hoeksema et al., 2008; Sheppes et al., 2011). Smartphone distraction constitutes an emergent concern, operationally defined as the disruption in attention due to: (i) external cues received (i.e., notifications), (ii) cognitive salience (i.e., internal cues) of the smartphone and social media, or (iii) cognitive avoidance (i.e., coping mechanism) for emotion regulation (Gazzaley & Rosen, 2016; Rosen et al., 2011; Stothart et al., 2015; Wilmer et al., 2017). Checking behaviours, frequently engaged in during smartphone use,

are associated with repeated external or internal interruptions, leading to attentional micro-disengagements and distraction (Duke & Montag, 2017; Gazzaley & Rosen, 2016; Peña-Sarrionandia et al., 2015). According to the control model of social media engagement (Throuvala et al., 2019), preoccupation with online content may occur as need to control online content, relationships and self-presentation producing an attentional conflict (offline vs. online or platform/activity switch), arousal and distraction. Constant access is either facilitated (by the presence of online others) (Baron et al., 1978; Baron, 1986) leading to heightened engagement or to shallow processing, when the individual is engaged in parallel cognitively demanding tasks. Therefore, constant disruptions may cause a rise in attention problems and hyperactivity levels (Montagni et al., 2016) as a result of allowing goal-irrelevant information to compete with goal-relevant tasks (Mendoza et al., 2018; Uncapher et al., 2016) with impacts on wellbeing, productivity and academic achievement, particularly amongst young people (Baumgartner et al., 2017; Felisoni & Godoi, 2018; Giunchiglia et al., 2018; Kim et al., 2019; Kuznekoff & Titsworth, 2013). A large contributor to this effect is excessive social media use, which has been suggested as a vulnerability factor for problematic smartphone use (Csibi et al., 2019; Kuss, 2017; Lopez-Fernandez et al., 2017). To date, current research suggests that the effects of smartphone use on student outcomes may still be small (Kates et al., 2018) yet affecting academic performance (Grant et al., 2020; Liu et al., 2020).

10.2 Distraction and Its Relation to Other Psychological Constructs in the Smartphone Literature

Online vigilance. Distraction by smartphone use appears to be activated by internal thoughts or external cues interfering with other tasks, which may be driven by online vigilance—a constant preoccupation with online content, leading to salience, monitoring and prompting urges to check (Reinecke et al., 2018), resulting in strong habitual behaviour (Oulasvirta et al., 2012; van Deursen et al., 2015). Salience of online content has been found to be negatively associated with affective wellbeing and life satisfaction, particularly when thoughts are negative (Johannes, Meier, et al., 2019).

Attention impulsiveness and habitual smartphone use. Attention impulsiveness has also been implicated in smartphone distraction, reinforced by rewarding, habitual checking behaviours (Oulasvirta et al., 2012), and has a significant relationship with problematic smartphone use (Billieux et al., 2007). Recent evidence also suggests symptom severity of problematic social media use to be mainly associated with attention impulsiveness and difficulties with inhibitory control or executive control functions (Wegmann et al., 2020), task performance (E. X. W. Wu et al., 2020) and chronic media multitasking (Uncapher et al., 2016). This is intensified in a low interest academic context, reducing lecture comprehension (Gupta & Irwin, 2016), motivation levels, and fluid intelligence (Unsworth & McMillan, 2017).

Fear of Missing Out (FoMO) and Nomophobia (NoMO). FoMO—the fear of being excluded from rewarding social experiences – and NoMO – the fear of no access to a mobile device—have both been evidenced in the smartphone literature as triggering a need to be in constant contact and reinforcing use (Buglass et al., 2017; Cheever et al., 2014; Clayton et al., 2015; Eide et al., 2018; Elhai et al., 2016, 2020; Franchina et al., 2018; Lai et al., 2016). Therefore, FoMO could be a main driver of distraction due to the propensity to be present in the positive experiences others are thought to be having as depicted in online content. FoMO has been associated

with depression, smartphone addiction, anxiety, mindfulness and wellbeing (O'Connell, 2020), negative affectivity, problematic smartphone use, and high levels of online social engagement (Elhai et al., 2020). *Stress, anxiety, emotion regulation and problematic use.* Socio-emotional correlates of FoMO have included negative affect, rejection sensitivity, and high stress levels (Browne et al., 2018), and reviews have suggested a small-to-medium association between smartphone use and stress and anxiety (Vahedi & Saiphoo, 2018). Therefore, negative emotional states may be a precursor to smartphone distraction and its use may be motivated by emotion regulation. Relief of negative emotions and psychological states along with emotional gains from smartphone use have been found to be significantly higher for Generation Z (individuals born between 1995 and 2015) (Zhitomirsky-Geffet & Blau, 2016) and could be an outcome due to difficulties with emotion regulation, creating a vicious cycle sustaining overreliance for coping (Marino et al., 2020) and dysfunctional metacognitive beliefs among problematic users (Balıkcı et al., 2020). Smartphone unavailability and intolerance of uncertainty have been evidenced in problematic smartphone use (Kneidinger-Müller, 2019; Rozgonjuk, Elhai, Täht, et al., 2019), and affect perceived stress and mental wellbeing (Rasmussen et al., 2020). Concerns for the emotional and behavioural consequences of excessive smartphone and social media use have been addressed (Griffiths et al., 2016, 2018; Kelly et al., 2019; Kuss et al., 2018; Kuss et al., 2013). However, what constitutes problematic online behaviour needs constant conceptual and methodological re-evaluation (Ellis, 2019) as engagement with new products/platforms emerges.

Mindfulness, self-monitoring and mood tracking. Self-monitoring of social media activity, self-exclusion from specific platforms, and the practice of mindfulness are considered successful wellbeing practices (Bentley & Tollmar, 2013; Johannes et al., 2018). Mindfulness, defined as the purposeful, non-judgemental awareness of the presenting experience (Kabat-Zinn, 2003), facilitates the sustaining of on-task behaviours (Kasson & Wilson, 2017), affecting attention, affect regulation, body awareness, and self-perception (Begun & Murray, 2020; Broderick & Jennings, 2012; Hölzel et al., 2011), and has been used in gambling harm-reduction and substance use disorders, with intervention effects reducing cravings, post-traumatic symptoms, and negative affect (Auer & Griffiths, 2015; Bennike et al., 2017; Bonello & Griffiths, 2019; Cavanagh et al., 2013; Gainsbury, 2014; Glück & Maercker, 2011; Ophir et al., 2009). Mindfulness has been negatively associated with distraction, suggesting that one's awareness of own thought wandering (meta-awareness) may decrease the frequency of distraction (Wilmer et al., 2017) and aid academic attainment (Bakosh et al., 2018). Self-monitoring of mood (also defined as mood tracking) has been found to boost overall emotional self-awareness (Kauer et al., 2012), which can in turn lead to improvements in emotional self-regulation (Hill & Updegraff, 2012). Therefore, these strategies could be trialled to help diminish attentional bias occurring within the context of social media and smartphone use (Gibb et al., 2016; Zhang et al., 2019).

To conclude, distraction is an emotion regulation mechanism of moving attention or mentally distancing oneself from negative emotions to non-negative issues (Senn & Radomsky, 2015) and is considered one of the key negative impacts experienced from excessive media use by young people (Bozzola et al., 2019). In the context of social media and smartphone use, distraction is an emergent phenomenon and reflects the disruption in attention due to: (i) external cues (notifications received), (ii) internal cues (cognitive salience related to social media content), (iii) cognitive avoidance to emotionally regulate, and (iv) multitasking (Throuvala et al., 2020). New longitudinal evidence supports the notion that young people who widely adopt online strategies to

cope with daily stressors, find support and self-distract, and present with more difficulties in recovering from negative emotions (Duvenage et al., 2019).

The current study

Given the high degree of distraction in the online environment its psychological function should be further examined since distraction is not a unitary process, but rather a multidimensional construct associated with adaptive and maladaptive components. However, the lack of psychometric instruments to assess distraction due to smartphone use, renders its development timely before assessing the efficacy of any interventions aimed at reducing smartphone-related distraction. The following two chapters cover (i) the development and psychometric evaluation of a smartphone distraction scale, and (ii) an online randomized controlled trial measuring the efficacy of an intervention with the aim to minimise smartphone distraction.

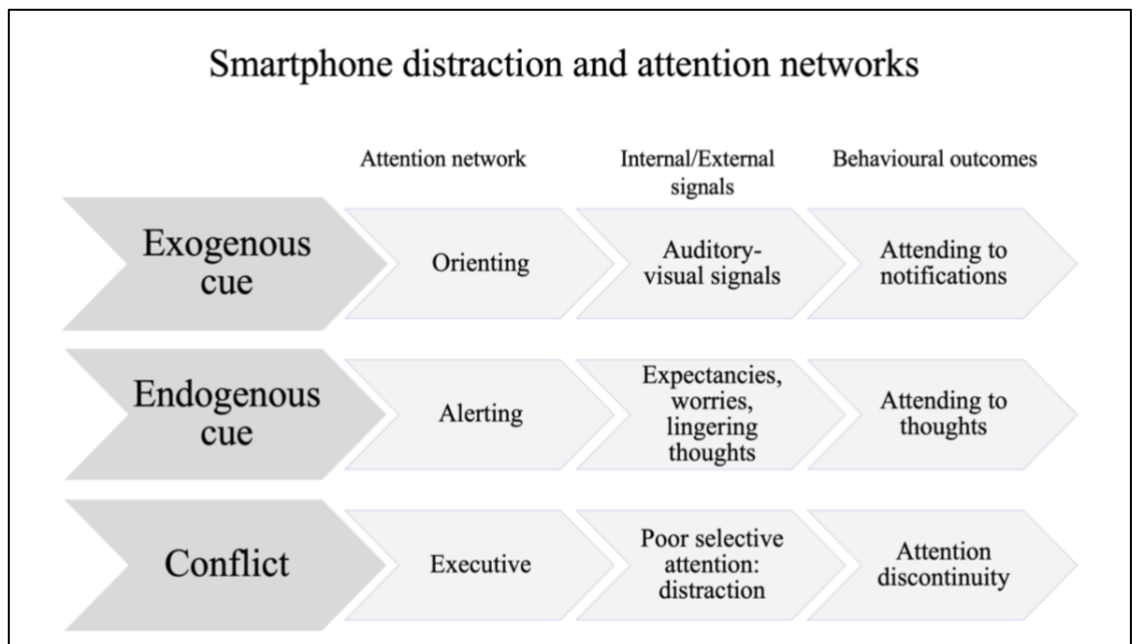


Figure 9.1. Posner’s attention model (Posner, 1980) adapted by Wu and Cheng (2019) and further adapted for the present thesis on smartphone distraction

One of the most prominent models for attention and its orientation has been proposed by Posner (1980), viewing the attentional system as having the possibilities to shift, orient and disengage and attention as a response bias. Based on Posner’s attention networks (Posner, 1980), and adapted by Wu and Cheng (2019) (see Figure 9.1), smartphone distraction is conceptualised in the current thesis as the result of reaction to exogenous (orienting system) and endogenous cues (alerting system) or as the result of conflict amongst these two networks competing for attention. The exogenous (orienting system) leads to auditory/visual signals, which in smartphone use take the form of smartphone notifications. The endogenous cues (alerting system) are the bottom-up signals of the alerting system in the form of expectancies, worries and lingering thoughts leading to distraction or daydreaming. The executive system is implicated when conflict arises between the exogenous and endogenous cues leading to attention discontinuity and therefore poor attention deployment. Distraction appears to be the result of disruption in the three attention networks mediated by smartphone use. The proposed adapted for smartphone use theoretical model will be further explored following the submission of the present thesis.

Chapter 11. Exploring the dimensions of smartphone distraction: Development, validation, measurement invariance and latent mean differences of the Smartphone Distraction Scale (SDS)

Throuvala, M. A., Pontes, H. M., Tsaousis, I., Griffiths, M. G., Rennoldson, M., & Kuss, D. J. (2021). Exploring the dimensions of smartphone distraction: Development, validation, measurement invariance and latent mean differences of the Smartphone Distraction Scale (SDS). *Frontiers in Psychiatry*, 12, 642634. <https://doi.org/10.3389/fpsy.2021.642634>

11.1 Introduction

Research on distraction and its association with problematic smartphone use is still scarce and there is no available psychometric assessment tool within the smartphone and social media literature that assesses this cognitive and emotive process parsimoniously. Subscales within attention scales, executive function scales, and problematic internet use scales partially assess the use of distraction as a mechanism in the digital environment. However, many of these scales are limited to a few items only, and therefore are neither comprehensive nor representative of the frequent attentional loss and associated processes experienced by smartphone users. Distraction from daily smartphone use leading to academic and productivity impacts is becoming increasingly prevalent, particularly among young people. Despite some of its positive functions documented in the literature (i.e., emotion regulation), it appears timely to revisit this construct and its impact within the context of smartphone use. Given the ubiquity of smartphones, the function of distraction has become frequent and endemic to smartphone use (as have checking behaviours and FoMO), potentially reinforcing more habitual or compulsive smartphone use, and therefore the frequent attentional loss has been reported to affect executive functions areas, critical for paying attention, decision-making, planning, organisation, higher-order thinking, and regulating emotions (Hilty & Chan, 2018; Pluck, 2020). The present study aimed to develop and empirically validate a psychological scale for smartphone distraction, the Smartphone Distraction Scale (SDS), identify its latent dimensions by using theory and prior literature on general distraction, while accounting for the smartphone context and the extant empirical evidence. Therefore, the present study aimed to fulfill the following primary objectives:

- (i) Examine the factorial validity and reliability of the SDS using a confirmatory factor analysis
- (ii) Investigate the convergent and divergent validity by examining the relationship between the SDS and problematic social media use, mindful attention, stress, metacognition, and smartphone-related psychological constructs
- (iii) Explore the measurement invariance (configural, metric, and scalar) of the SDS across gender
- (iv) Investigate gender-related latent mean differences across all SDS latent factors

To achieve the aforementioned objectives, it was hypothesised that: (i) the SDS would show adequate psychometric properties in the sample recruited; and (ii) those with higher levels of distraction within the

sample recruited would present higher scores of problematic social media use, stress, and other relevant psychological (i.e., rumination) and smartphone-related constructs (i.e., FoMO, NoMO).

11.1.1 Scale development

Scale development is a necessary step for the assessment of psychological constructs (Boateng et al., 2018; DeVellis, 2012). Given the paucity of adequate instruments to assess smartphone distraction and the lack of an integrated theoretical framework to explain this complex psychological construct, the goal was to develop a psychometric test based on the current literature on attentional loss due to smartphone use and two theoretically-relevant frameworks, the *perceptual control theory* (Powers, 1973) (see Chapter 1) and the control model of social media engagement (Throuvala et al., 2019) (see Chapter 6). This psychometric test is aimed primarily at young adults who are the most frequent users of smartphones and therefore the most likely to experience subsequent attentional losses due to smartphone use (Kim et al., 2019; Kushlev et al., 2016; Mendoza et al., 2018).

The scale development process included: (i) item generation, (ii) exploratory factor analysis, (iii) confirmatory factor analysis, (iv) gender-related measurement invariance, following the initial eight steps suggested by scholars (DeVellis, 2012; Warner, 2008):

1. Determine what is needed to be measured
2. Generate an item pool
3. Determine the response format for measurement
4. Provide an expert review of the initial item pool
5. Consider inclusion of validation items
6. Administer items to a sample to test
7. Evaluate the items
8. Evaluate and decide on the scale length

The initial steps in the present study entailed reviewing the literature in order to clarify how distraction is conceptualised and to create a pool of items representative of the construct of smartphone distraction (SD). It was deemed critical to capture the conceptual dimensionality of SD and to carefully differentiate it from similar constructs (i.e., mind-wandering, interruptions), which partially but not fully reflect its psychological function. Distraction has been assessed so far as a coping mechanism, reflecting primarily distraction caused by external interruptions, which allows individuals to engage in concurrent multitasking while remaining engaged in the primary task (Jett and George, 2003; Speier et al., 1999).

Theory and extant literature informed the scale development and the specification of the hypothesised factors. Therefore, the following psychological dimensions of SD informed the item pool reflecting these dimensions: (i) behaviours related to attention impulsiveness due to notifications or even the mere presence of a smartphone, (ii) preoccupation with online content, frequent checking, FoMO and NoMO, fear of being unable to access the smartphone, (iii) use of a smartphone to regulate distress or boredom, and (iv) multitasking and interference in daily activities and face-to-face interactions (see Table 6). The context for the scale was

also clarified in terms of the target population (i.e., university students) due to the academic interference caused by smartphones (Kuznekoff & Titsworth, 2013; Mendoza et al., 2018; Zarandona et al., 2019)

An initial pool of 36 items was generated with attention to double-barrelled items, leading questions, reverse-scored items, and clear short item presentation (Hinkin, 1998). Items were reviewed for conceptual relevance, coherence, linguistic clarity and adequacy, by: (i) a panel of expert psychologists in the field of cyberpsychology, behavioural addictions, clinical psychology, and psychometrics, respectively, and (ii) pilot-tested among 35 university students for face validity, comprehension and relevance of the items. A final pool of 33 items (in Appendix 8) formed the scale with each statement rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), which corresponded to four hypothesized factors. Following this step the scale's dimensionality, validity and reliability was assessed.

11.1.2 Factor analysis

A factor analysis was conducted to determine the relationships amongst the set of observed variables in order to determine a smaller number of latent constructs, by testing the scale's validity and grouping the items most strongly associated together into sub-scales, i.e., factors (Tabachnick & Fidell, 2001). Given the absence of other relevant scales assessing the specific construct within smartphone use, an Exploratory Factor Analysis (EFA) was performed to assess item factor loadings, and ensure the latent dimensions of the factors through the specification of the number of factors, which would best define the SDS. A Confirmatory Factor Analysis (CFA) (Anderson & Gerbing, 1988) followed to estimate the fit of the latent factors to the empirical data based on the EFA outputs, as the multivariate statistical procedure that could best test the factorial validity of the SDS, determining the degree of association between factor loadings (with higher factor loadings being more representative of the hypothesised factor), and the convergent and discriminant validity of the measures (reflecting the degree of similarity or difference with other constructs). Since the purpose was to develop a theoretical model and a respective instrument assessing SD, utilisation both of EFA and CFA is recommended (Nunnally & Bernstein, 1994). This was decided because even though items of the SDS being tested were defined *a priori* (based on the literature review of general distraction, the smartphone literature, and the expert comments), the lack of any relevant scale assessing this construct demanded an exploration of hypothesised factors, which would be further tested for their validity.

Generally, acceptable models do not have definite cut-off points (Kenny, 2015). To assess the quality and fit of the measurement model tested in the CFA, the following fit indices were used for psychometric validation: χ^2/df , Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Comparative Fit Index (CFI), Tucker-Lewis Fit Index (TLI), and Goodness of Fit Index GFI (Hu & Bentler, 1998; Kline, 2016). Assessing the measurement model involved inspecting conventionally accepted cut-off values for the aforementioned fit indices (presented in Table 1). Given that χ^2 is sensitive to sample size, often resulting in inflated χ^2 values, it is unlikely that the results would be non-significant (Kenny, 2015; Marsh et al., 1988). All analyses were performed using Amos v.23 and SPSS Statistics v.25 (IBM Corporation, 2017).

The next steps aimed at establishing reliability and validity. Cronbach's alpha suggests the reliability of the instrument (Warner, 2008), with a high alpha value indicating that items in the scale assess the same latent factor. Given the multidimensionality of the construct (Graham, 2006), an alternative internal consistency reliability coefficient was calculated for each subscale, the McDonald's Omega (McDonald, 1999), which according to some scholars provides more accurate reliability findings for applied research (Dunn et al., 2014; Green & Yang, 2015; Trizano-Hermosilla & Alvarado, 2016). The validity of the scale was evaluated using several types of validity indicators such as content validity (assessing how representative the items are of the construct tested), face validity (relating to the content of the items and if they measure what they are supposed to measure), criterion validity (how relevant is a measure to an outcome), and construct validity (the degree of accuracy of measurement of a construct) (DeVellis, 2012; Warner, 2008).

Table 11.1

<i>Goodness-of-fit Indices</i>		
Index	Cut-off values	Source
χ^2/df	< 3 good	(Kline, 2016)
	< 5 good	(Wheaton et al., 1977)
CFI	>.95 very good	(Hu & Bentler, 1998)
	>.90 acceptable	(Schreiber et al., 2006)
PCFI	>.5=acceptable	(Mulaik et al., 1989)
GFI	>.95 very good	(Hu & Bentler, 1998)
SRMR	<.80 good	(Hu & Bentler, 1998)
RMSEA	<.01 excellent	(MacCallum et al., 1996)
	<.05 good	
	<.08 fair	
	>0.1 unacceptable	

Indices: χ^2/df =chi-squared divided by degrees of freedom; CFI= Bentler Comparative Fit Index; PCFI=CFI adjusted for parsimony; GFI=Goodness of fit index ; SRMR=Standardized Root Mean Square Residual; RMSEA=Standardized Root Square Error of Approximation

11.2 Methods

11.2.1 Participants and procedure

An initial sample of 1,129 English-speaking University students in the UK were recruited online using snowball sampling. The sample (after data cleaning) was randomly divided into two subsamples; the first subsample (Sample 1, $n=501$) was used in EFA and the second one (Sample 2, $n=500$) in CFA to assess for population cross-validity (Ortiz de Gortari et al., 2015; Pontes & Griffiths, 2015). Recruiting took place through university lectures in exchange for university credit as well as on social media with a potential financial compensation in the form of *Amazon* vouchers through a pool of participants. Online data collection was deemed preferable due to providing access to a larger more heterogeneous sample of smartphone users, cost and practical considerations. The online survey was developed and administered via the survey platform *Qualtrics* (Provo, UT, USA) and included an information sheet, a consent form, and self-report questions to assess eligibility. Ethical clearance was obtained for the study by the University's Ethics Committee (No. 2018/226), and only participants who met the inclusion criteria were able to complete the survey: (i)

participants should own and use a smartphone with internet connection regularly for at least a year, (ii) be frequent social media users, and (iii) be 18 years old or older. The survey took approximately 25 minutes to complete.

11.2.2 Measures

Socio-demographics and media use habits. Socio-demographic and usage data were collected (gender, age, educational level, and relationship status) and a questionnaire asking participants to indicate various behaviours related to smartphone and social media use (average number of hours online per week, frequency and duration of use as indicated by their smartphone settings) on a multiple choice or open response format. Individuals also responded to a number of other psychometric measures in order to assess the predictive ability of the scale (criterion-related validity).

Daily smartphone and social media use. Participants' weekly time spent on smartphones and on social media were assessed and distinguished between those that used it for less than seven hours, between eight and 14 hours, between 15 and 20 hours, between 21 and 30 hours, between 31 and 40 hours, and more than 40 hours per week, respectively.

The Attentional Control Scale (ACS) (Derryberry & Reed, 2002) is a self-report instrument which assesses the ability to exercise control over the orientation of attention. The 20-item scale is comprised by three factors: attention focusing, attention shifting and flexible control of thought. Sample items in the scale include “*My concentration is good even if there is music in the room around me*”, and “*After being distracted or interrupted, I can easily shift my attention back to what I was doing before*”. Items are rated on a 4-point Likert scale ranging from 1 (*almost never*) to 4 (*always*) with higher scores indicating higher difficulty to focus attention in individuals with high anxiety (Derryberry & Reed, 2002). The ACS has demonstrated adequate psychometric qualities (Derryberry & Reed, 2002; Judah et al., 2014). Cronbach's alpha coefficient in the present study was .80.

The Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003) is a 15-item assessment tool that assesses the dispositional tendency of participants to be mindful in everyday life and has been validated among young people, university students, and community samples (Black et al., 2012; Brown & Ryan, 2003). Item statements reflect experience of mindfulness, mindlessness in general, and specific daily situations, and are distributed across a range of cognitive, emotional, physical, interpersonal, and general domains. Response options are based on a six-point Likert scale from 1 (*almost always*) to 6 (*almost never*). Scores are averaged across the 15 items to obtain an overall mindfulness score with higher scores reflecting higher levels of dispositional mindfulness. Sample items include “*I could be experiencing some emotion and not be aware of it until sometime later*” and “*I find it difficult to stay focused on what's happening in the present*”, and exhibited a high degree of internal consistency in the present study with a Cronbach's alpha of 0.90.

The Emotional Self-Awareness Scale (ESAS) (Kauer et al., 2012) was used to assess emotional self-awareness (ESA) and comprises five domains: recognition, identification, communication, contextualization, and decision making. Emotional awareness refers to the ability to identify and understand emotional states. The scale consists of 32 items (e.g., “*I usually know why I feel the way I do*”) rated from 0 (*strongly disagree*) to 4

(*strongly agree*). The total ESA score ranges from 0 to 128, and sub-scale items are combined to produce a composite score with higher scores indicating higher ESA. The ESAS has presented reasonable internal consistency levels in previous research (Cronbach's $\alpha=0.72$, 0.69 , and 0.76 for pre-test, post-test and six-week follow-up) (Kauer et al., 2012) and adequate levels of validity in prior studies (Bakker & Rickard, 2018; Kauer et al., 2012). In the present study, the ESAS had good internal consistency (Cronbach's α of 0.86).

The Perceived Stress Scale (PSS) (Cohen et al., 1983) is one of the most widely used scales to assess perceived stress and the degree of unpredictability, uncontrollability, and burden in various situations. The scale used was the 10-item version rated from 0 (*never*) to 4 (*very often*) with sample items such as “*In the last month, how often have you felt that you were unable to control the important things in your life?*”, and “*In the last month, how often have you felt that you were on top of things?*” Scores were obtained by summing all responses given by participants to all 10 items, with the higher score indicating more perceived stress. The scale possesses good psychometric properties (Lee, 2012) and its internal consistency in the present study was 0.86 .

The seven-item *Generalized Anxiety Disorder Scale (GAD-7)* (Spitzer et al., 2006) is a brief clinical measure that assesses the presence and severity of Generalized Anxiety Disorder (GAD). The self-report scale evaluates how often during the last two weeks individuals experienced symptoms of GAD. Total scores range from 0–21 with cut-off scores of 5, 10, and 15 being indicative of mild, moderate, and severe anxiety, respectively. Increasing scores on the GAD-7 are strongly associated with greater functional impairment in real-world settings. The items of the GAD-7 are rated from 0 (*not at all*) to 3 (*nearly every day*) and sample items include: “*Feeling nervous, anxious or on edge*” and “*Trouble relaxing*”. The scale has been widely used and considered a valid and reliable screening tool for GAD, with previous research reporting robust reliability, factorial and concurrent validity (Donker et al., 2011; Sousa et al., 2015). In the present study, the GAD-7 demonstrated excellent internal consistency (Cronbach's $\alpha = 0.90$).

The Self-Report Behavioural Automaticity Index (SRBAI) (Gardner et al., 2012) was used to assess habitual strength. The SRBAI uses four items to examine the degree of automaticity and contained through items such as: “*Using social media on my smartphone is something ...I do automatically*” and “*I start doing before I realize I'm doing it*”. Participants indicate their agreement with each item on a Likert scale ranging from 1 (*does not apply at all*) to 7 (*fully applies*). Scores were averaged to obtain an overall habit score, with higher scores indicating stronger habitual smartphone use behaviour. The scale has been reported as psychometrically sound in previous studies, presenting with adequate reliability, convergent, and predictive validity (Gardner et al., 2012; Marchant et al., 2018). In the present study, the SRBAI demonstrated good levels of internal consistency (Cronbach's $\alpha = 0.89$).

The Generalized Self-Efficacy Scale (GSE) (Schwarzer & Jerusalem, 1995) is a widely used 10-item psychometric instrument assessing perceived self-efficacy (e.g., “*I can always manage to solve difficult problems if I try hard enough*”). All items are rated on a four-point Likert scale ranging from 1 (*not at all true*) to 4 (*exactly true*). The GSE has demonstrated satisfactory internal consistency and validity in previous research (De las Cuevas & Peñate, 2015; Schwarzer et al., 1999) and also in the present study (Cronbach's $\alpha = 0.86$).

The Online Vigilance Scale (OVS) (Reinecke et al., 2018) is a 12-item Likert scale which assesses a relatively new construct in the internet-related literature, referring to individuals' cognitive orientation towards online content, expressed as cognitive salience, reactivity to online cues, and active monitoring of online activities. Sample items of the OVS include “*My thoughts often drift to online content*” and “*I constantly monitor what is happening online*”. All items are rated on a four-point Likert scale ranging from 1 (*does not apply at all*) to 4 (*fully applies*). Higher total scores indicate greater levels of online vigilance. The OVS has been reported to exhibit sound construct and nomological validity and high internal consistency (Johannes et al., 2018; Johannes, Meier, et al., 2019; Reinecke et al., 2018). In the present study, the OVS had high levels of internal consistency (Cronbach's $\alpha = 0.90$).

The *Barratt Impulsiveness Scale-Alternative Version (BIS-8)* (Morean et al., 2014) is a psychometrically improved abbreviated version of the 11-item BIS scale (Morean et al., 2014) using only eight items and presenting adequate levels of construct and concurrent validity in young populations (Mathias et al., 2018; Steinberg et al., 2013). The BIS-8 assesses impulsive behaviour and poor self-inhibition using a four-point Likert scale ranging from 1 (*do not agree*) to 4 (*agree very much*). Sample items include: “*I do things without thinking*” and “*I act on the spur of the moment*”. Higher mean scores indicate a higher degree of impulsiveness. In the present study, the BIS-8 had adequate levels of reliability (Cronbach's $\alpha = 0.77$).

The Deficient Self-Regulation Measure (Davies & Hemingway, 2014) is a seven-item scale assessing deficient self-regulation in video game playing adapted for unregulated internet use (LaRose et al., 2009). The scale is rated on a seven-point Likert scale ranging from 1 (*almost never*) to 7 (*almost always*) and has previously demonstrated sound psychometric properties (Davies & Hemingway, 2014). The scale was adapted for smartphone use with sample items such as “*I would go out of my way to satisfy my urges to use social media*” and “*I have to keep using social media more and more to get my thrill*”. The original scale and its adaptation has presented satisfactory psychometric properties (Davies & Hemingway, 2014; LaRose et al., 2009). In the present study, the scale had adequate levels of reliability (Cronbach's $\alpha = 0.89$).

The Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2016; C.-Y. Lin et al., 2017; Monacis et al., 2017a; Pontes et al., 2016) is a six-item self-report scale for assessing social media addiction severity based on the framework of the components model of addiction (salience, mood modification, tolerance, withdrawal, conflict, and relapse) (Griffiths, 2005). Each item examines the experience of using social media over the past year and is rated on a five-point Likert scale ranging from 1 (*very rarely*) to 5 (*very often*), producing a composite score ranging from 6 to 30. Higher BSMAS scores indicate greater risk of social media addiction severity, and a cut-off score over 19 indicates problematic social media use (Bányai et al., 2017). Sample items from the BSMAS is “*How often during the last year have you used social media in order to forget about personal problems?*”. The BSMAS has sound psychometric properties as reported in several studies (Andreassen et al., 2016; Lin et al., 2017; Monacis et al., 2017a; Pontes et al., 2016) with high internal consistency (Cronbach's $\alpha = 0.82$) (Yam et al., 2019). In the present study, the BSMAS had excellent levels of internal consistency (Cronbach's $\alpha = 0.89$).

The Fear of Missing Out Scale (FoMOS) (Przybylski et al., 2013) includes ten items and evaluates the extent to which symptoms of FoMO are experienced. The scale is rated on a seven-point Likert scale ranging from 1 (*not at all true*) to 5 (*extremely true of me*). Sample items include: “*I fear others have more rewarding*

experiences than me” and “*I get anxious when I don’t know what my friends are up to*”. A total score is calculated by averaging responses given by participants to all ten items, with higher scores indicating greater levels of FoMO. This instrument has demonstrated adequate construct validity (Can & Satici, 2019; Przybylski et al., 2013) and internal consistency (Browne et al., 2018; Perrone, 2016). In the present study, the FoMOS had excellent levels of internal consistency (Cronbach’s $\alpha = 0.87$).

The Nomophobia Questionnaire (NMP-Q) (Yildirim & Correia, 2015) includes 20 items that can be responded to using a seven-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Sample items include: “*I would feel uncomfortable without constant access to information through my smartphone*” and “*I would feel nervous because I would not be able to receive text messages and calls*”. Total scores are calculated by summing up responses to each item, resulting in a nomophobia score ranging from 20 to 140, with higher scores corresponding to greater nomophobia severity. NMP-Q scores are interpreted in the following way: 20=absence of nomophobia; 21–59=mild level of nomophobia; 60–99=moderate level of nomophobia; and 100+=severe nomophobia. The scale has demonstrated adequate psychometric properties (Lee et al., 2018; Yildirim & Correia, 2015) and reliability levels (Yildirim & Correia, 2015; Tams et al., 2018) as in the present study (Cronbach’s $\alpha = 0.87$).

The Ruminative Response Scale--Modified (RRS-M) (Genet & Siemer, 2012). The RRS-M is a short six-item scale assessing ruminative responses style (i.e., trait rumination) and is a modified version of the Ruminative Response Scale (RRS) (Nolen-Hoeksema & Morrow, 1991). The scale is rated from 1 (*not at all*) to 9 (*extremely*), and example items include: “*I could not stop thinking about the situation over and over*” and “*I thought about things that could go wrong*”. The RRS assesses the extent to which individuals exhibit depressive responses related to thoughts about self and situations leading to low mood. The RRS-M has presented satisfactory psychometric properties (Genet & Siemer, 2012) and excellent internal consistency in the present sample (Cronbach’s $\alpha = 0.95$).

The Metacognitions about Gaming Questionnaire (MGQ) (Spada & Caselli, 2017) was adapted for social media use for the present study. The 12-item scale was responded on a four-point Likert-type scale ranging from 1 (*do not agree*) to 4 (*agree very much*). The MGQ includes two latent factors: positive metacognitions and negative metacognitions about social media use. Negative metacognitions refer to the difficulty in controlling social media use and content-related thoughts and positive metacognitions to adaptive reflective beliefs related to cognitive and emotional responses to social media use. Sample items include “*Thoughts about social media interfere with my functioning*” and “*Social media stops me from worrying*”. Higher scores represent higher levels of metacognitions about social media use. The scale has demonstrated adequate psychometric properties in previous research (Spada & Caselli, 2017). Internal consistency in the present study was excellent (Cronbach’s $\alpha = 0.90$) for the positive metacognition subscale and Cronbach’s $\alpha = 0.89$ for the negative metacognition subscale.

Positive and Negative Affect Scale Short Form (PANAS-SF) (Watson et al., 1988). The PANAS-SF measures positive and negative affect and contains 20 items, assessing positive (interested, excited, strong, enthusiastic, proud, alert, inspired, determined, attentive, and active) and negative mood (distressed, upset, guilty, scared, hostile, irritable, ashamed, nervous, jittery, and afraid). Responses reflect the extent to which participants have

experienced each emotion in the past weeks on a five-point scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). Each sub-scale range from 10–50, with higher scores indicating greater positive or negative mood, respectively. The PANAS has been found to be a psychometrically sound measure that is often used in research (Crawford & Henry, 2004; Sanmartín et al., 2018). Internal consistency of both sub-scales was high (Positive mood, $\alpha=.86$; Negative mood $\alpha=.88$).

Hospital Anxiety and Depression Scale (HADS) (Zigmond & Snaith, 1983). The HADS consists of 14 items, and comprises two factors assessing anxiety and depression. Sample items include: “*I feel tense or wound up*” and “*I still enjoy the things I used to enjoy*” and are rated on a four-point Likert scale with higher scores suggesting greater levels of anxiety and depression, and scores of 15 and above indicating severe levels. The HADS has adequate levels of validity and reliability and has been widely used in both clinical and other research settings (Bjelland et al., 2002; Mykletun et al., 2001). High inter-correlations between anxiety and depression (between .49 and .63) indicate higher severity (Mykletun et al., 2001). Cronbach’s alpha for the depressive subscale in the present study was .78 and .80 for the anxiety subscale.

11.2.3 Data management strategy

Data cleaning involved identifying missing values above the 10% threshold for incomplete data and chance responding, which resulted in 98 cases being excluded. Listwise deletion was used to handle missing data during the analysis and to assess similar and repetitive patterns of responses (i.e., acquiescence bias) across the scales, resulting in further 19 cases to be removed. Factor analysis has to meet several assumptions such as an adequate sample size, no outliers, no specification error, normality, homoscedasticity, linearity, and the absence of multicollinearity, to establish univariate normality of the measure (DeVellis, 2012). Univariate normality of all 33 items of the SDS was assessed by examining skewness and kurtosis values for each item. Three datapoints on the SDS had absolute values of skewness > 3.0 and kurtosis > 8.0 (Kline, 2016), which were further removed from the dataset. Tolerance and VIF values suggested that there was no statistically significant multicollinearity in the data. Mahalanobis distances and critical values for each case were used to check for multivariate outliers, resulting in eight cases being excluded from the dataset. Therefore, the final sample size for all subsequent analyses was 1,001 participants.

11.2.4. Statistical analyses

Statistical analysis involved the generation of descriptive statistics of the sample, assessment of the dimensionality and factorial structure of the SDS with EFA and CFA and of concurrent and criterion validity by assessing the association between the SDS and measures of relevant psychological constructs (i.e., vigilance, attention control, mindfulness). Analysis of the reliability of the SDS was performed using two different indicators of internal consistency (McDonald’s Omega, Cronbach’s alpha). Finally, gender invariance was performed to assess similarity or divergence in the interpretation of the construct across gender.

11.3 Results

11.3.1 Descriptive Statistics

The final sample of 1,001 English-speaking smartphone and social media users was predominantly female (69.3% female, 30.3% male, and 0.4% other) with an age range from 18-30 years ($M_{age}=21.10$, $SD=2.77$). A total of 730 participants (72.9%) were undergraduate students, 95 were graduate and post-graduate students (9.4%), 76 (7.6%) were employed and 28 (2.8%) participants were unemployed, whereas 72 (7.2%) were both students and employees. Sample 1 ($n=501$) consisted of 88 males (17.6%) males, and 411 females (82%) and two participants who declared as being gender-free (0.4%), whereas Sample 2 ($n=500$) consisted of 219 males (43.8%) males, and 279 females (55.8%) and two participants who declared as gender-free (0.4%). More than half of the participants ($n=524$, 52.3%) were in a relationship and reported different levels of daily smartphone usage: 305 (30.5%) from half an hour to three hours (0.5-3h), half of the participants ($n=503$, 50.2%) reported three to six hours of smartphone use, 158 (15.8%) participants six to ten hours/day, and 35 (3.5%) of participants reported ten or more hours (10+) of smartphone use.

11.3.2 Exploratory Factor Analysis of Smartphone Distraction

In factor analysis, shared and unique variance is analysed with unique variance representing error (Nunnally & Bernstein, 1994; Tabachnick & Fidell, 2001) with the factor representing an underlying construct defined by its items and their score (DeVellis, 2012). The latent variables are tested contributing to theory development through EFA, and theory testing through CFA (Tabachnick & Fidell, 2001). Consequently, factor analysis was conducted to reduce items to fewer factors.

An EFA was conducted on the SDS in Sample 1 ($n = 501$) to examine the factorial structure and construct validity. Sample 2 ($n = 500$) was utilised to conduct the CFA, testing the findings on the EFA and identify latent constructs (Tabachnick & Fidell, 2001). For the EFA, Principal Axis Factoring extraction method was used with Promax (oblique) rotation. Despite an initial conceptualisation of the factors to identify the latent dimensions measured by the items, and due to the absence of another instrument in the literature, it was deemed appropriate to identify the number of latent factors expressing the dimensionality of smartphone distraction, making Principal Axis Factoring the most appropriate choice. Oblique rotation was chosen as the assumption was that factors are correlated, based on the underlying conceptual framework assumed (Tabachnick & Fidell, 2001), based on the literature review conducted.

To measure sampling adequacy and suitability of the data for factor analysis, Bartlett's test of sphericity (BTS), and the Kaiser-Meyer-Olkin (KMO) measure were performed (Pallant, 2005). Results indicated that the proportion of variance in the variables caused by underlying factors was sufficient to indicate a strong relationship and conduct a factor analysis on data (KMO=.882; BTS ($\chi^2[33, 501]=5.399,60$, $p<.001$). Following conventions in EFA, items with factor loadings less than .40 were not retained (Stevens, 2009). The communalities suggested that each item shared some common variance with other items and ranged from .20 for Item 21 to .58 for Item 4 meeting the thresholds to retain items and interpreted to be indicative of that factor

(Ferguson & Cox, 1993). The analysis identified a four-factor structure explaining 60.48% of the total variance of the construct and was extracted after 14 iterations (see Table 11.2).

A scree plot was also used to determine the number of factors to be retained (Cattell, 1966) using the Kaiser criterion (retaining all factors with eigenvalues greater than one; Kaiser, 1960) to obtain the most viable factor solution (Costello & Osborne, 2005; Jöreskog & Sörbom, 1989). However, issues of interpretability have been raised with this criterion (Ledesma et al., 2015). To address criticisms of the Kaiser criterion technique (Costello & Osborne, 2005; Velicer & Jackson, 1990; Zwick & Velicer, 1986) of overestimating the true number of factors (Lance et al., 2006), Horn's Parallel Analysis (Horn, 1965) was also performed since it is considered one of the most accurate factor retention methods (see 13.3.3 and Table 13.3).

11.3.3 Extracting, Rotating and Interpreting Factors

Specifically, factors extracted first were the largest and therefore the most salient. The items loading onto each factor have been ordered in terms of their strength of relationship with each corresponding factor. Items that cross-loaded onto another factor were selected to load onto the factor that shared the highest correlation, where it made clearer theoretical sense. The initial eight-factor solution was not retained as it rendered factors with fewer than three indicators (Jöreskog & Sörbom, 1989; Tabachnick & Fidell, 2001). Instead, a four-factor solution containing four indicators per factor was retained.

The four latent factors were labelled as '*Emotion Regulation*', '*Attention Impulsiveness*', '*Online Vigilance*' and '*Multitasking*'. Examples of the *Emotion Regulation* factor included "*Using my phone distracts me from negative or unpleasant thoughts*" and "*Using my phone distracts me when I'm feeling stressed or anxious*". Example items from the *Attention Impulsiveness* factor included "*I get distracted by my phone notifications*" and "*I get distracted by just having my phone next to me*". Examples of items from the *Online Vigilance* factor included "*I get distracted thinking how many likes and comments I will get while doing another task*" and "*I constantly check my phone even when there are no new notifications*". Finally, the *Multitasking* factor included items such as "*I often walk and use my phone at the same time*".

The cumulative variation accounted for by all four factors after they were rotated was 60.48%. The percentage of the co-variation within the data accounted for by each of the factors and their eigenvalues are displayed in Table 3. Since smartphone distraction comprises various factors accounting for its variance, this may mask a clear conceptual and operational definition. The initial SDS included 33 potential items and was further reduced to 16 items related to the four suggested underlying factors (Table 1), corroborating the theoretical background which informed the development of the scale. More specifically, the first factor (Attention Impulsiveness) which encompassed items 1, 2, 3, and 4 explained 33.92% of variance, and the second factor (Emotion Regulation) included Items 27, 28, 30, and 32 explained 10.48% of variance. The third factor (Online Vigilance) containing Items 7, 13, 16, and 17 explained 8.57% of variance. The final factor (Multitasking) included Items 19, 21, 24, 25 and explained 7.55% of variance. Further assessment of the suitability of each item was done by checking the cross-loadings and it was found that the factor loadings were high on their respective constructs.

Table 11.2

Summary of the Results from the Exploratory Factor Analysis (EFA) on the SDS 33 items obtained from Sample 1 (n = 501)

Items	Factor Loadings				Communalities	
	F1 ($\omega=.78$)	F2 ($\omega=.74$)	F3 ($\omega=.83$)	F4 ($\omega=.63$)	Initial	Extraction
Factor 1: Attention impulsiveness (F1)						
Dis3: I get distracted by just having my phone next to me	.788				.516	.549
Dis2: I get distracted by my phone apps	.753				.495	.556
Dis1: I get distracted by my phone notifications	.748				.489	.549
Dis4: I get distracted by my phone even when my full attention is required on other tasks	.634				.310	.582
Factor 2: Emotion Regulation (F2)						
Dis28: Using my phone distracts me from negative or unpleasant thoughts		.804			.438	.559
Dis32: Using my phone distracts me when I'm feeling stressed or anxious		.720			.466	.532
Dis27: Using my phone distracts me from doing unpleasant things		.678			.400	.477
Dis30: Using my phone distracts me from tasks that are tedious or difficult		.607			.466	.532
Factor 3: Online Vigilance (F3)						
Dis16: I get distracted with what I could post while doing other tasks			.778		.371	.518
Dis13: I think a lot about checking my phone when I can't access it			.612		.436	.505
Dis17: I get distracted thinking how many likes and comments I will get while doing other tasks			.568		.283	.335
Dis7: I get anxious if I don't check messages immediately on my phone			.523		.310	.339
Factor 4: Multitasking (F4)						
Dis25: I often talk to others while checking what's on my phone				.748	.324	.531
Dis24: I often walk and use my phone at the same time				.504	.269	.353
Dis21: I can easily follow conversations while using my phone				.447	.161	.209
Dis19: I use several applications on my phone while working				.403	.373	.433
Percentage of the Total Variance Explained = 60.48 %. Four factors were extracted from the EFA after 14 iterations.						
ω =omega index						
Removed items from each subscale due to low loadings:						
F1: Dis5, Dis6						
F2: Dis26, Dis29, Dis31, Dis33						
F3: Dis8, Dis9, Dis10, Dis11, Dis12, Dis14, Dis15, Dis18						
F4: Dis20, Dis22, Dis23						
Note: ω =McDonald's Omega						

11.3.4 Parallel Analysis

Parallel analysis is recommended as a better technique to evaluate the dimensionality of the construct (Lim & Jahng, 2019) in addition to the scree plot. This is based on the Monte Carlo simulation process, simulating random samples that parallel the observed data (Ledesma & Valero-Mora, 2007). Therefore, only the number of factors that exceed the corresponding values of the random data are considered valid (Horn, 1965). A four-factor solution was corroborated by this analysis (four factors emerged with an

eigenvalue above 1; see Table 11.3), which was a manifestation of the multidimensionality of the construct. However, the initial extraction generated eight factors, which was an overestimation of the factors with no meaningful interpretation available beyond the four-factor solution.

Table 11.3

Comparison of Factor Analysis Eigenvalues to Parallel Analysis Criterion Values

	Factor analysis	Horn's Parallel criteria	Decision
F1	9.508	1.585973	Accept
F2	2.686	1.504356	Accept
F3	2.017	1.447749	Accept
F4	1.857	1.396768	Accept
F5	1.312	1.353429	Reject

11.3.5 Validity and Reliability

Evaluating Internal Consistency of the New Measure

McDonald's Omega and Cronbach's alpha (α) coefficients were calculated for each of the sub-scales in order to assess internal consistency (DeVellis, 2012). Values of $\alpha \geq .70$ were considered to reflect adequate reliability with an item-total correlation between 0.25 and 0.75 (Pedhazur & Schmelkin, 1991). For McDonald's Omega, threshold values of .70 to .90 are considered adequate (Graham, 2006). The response form is a five-point Likert scale ranging from "Almost never" to "Almost always", where high scores represent higher levels of smartphone distraction. Cronbach's α for the overall SDS ($\alpha = 0.87$) suggested a high level of internal consistency and therefore these four factors are strong indicators of the construct. The mean of the SDS was 2.85 ($SD = 0.65$). The four sub-scales presented acceptable to good reliability: Cronbach's alpha for *Attention Impulsiveness* ($\alpha=0.84$), was followed by *Emotion Regulation* ($\alpha=0.80$), *Multitasking* ($\alpha=0.75$), and *Online Vigilance* ($\alpha=0.74$). More specifically, for Sample 1 ($n=501$) the Cronbach's alpha was $\alpha=0.87$, whereas for Sample 2 ($n=500$) was $\alpha=0.86$.

Factorial validity: CFA and multidimensionality testing

11.3.6 Confirmatory Factor Analysis (CFA)

CFA was conducted to explore the factor structure of the SDS using structural equation modelling (SEM) in AMOS v.23 (IBM). The CFA was used to determine how the data from Sample 2 conformed to the factor structure found in Sample 1. In each analysis, the maximum likelihood estimation method was used because it accounts for any non-normality issues and for the model tested the covariance matrices were assessed along with adequacy of fit considering several indices. Table 1 presents the recommended fit indices according to various scholars. For the structural validity of the SDS and to assess the best fit of the construct, three alternative models were tested: a four-factor model (M1) as suggested by the EFA, a higher-order model (M2) with smartphone distraction consisting of the higher order construct, and a bi-factor model (M3). Bi-factor models assess the validity of the multidimensional factors (Reise et al., 2007): higher factor loadings on the

general factor and lower factor loadings on specific factors of the bi-factor model indicate a weak factor with little influence after controlling for the general factor.

Three CFAs were performed (Table 11.4). Model fit indices indicated relatively adequate fit indices for all models. The initial model of four factors produced by the EFA (M1) had a superior model fit [RMSEA=0.055; 90% CI (.046, .064), CFI=0.947; TLI=0.933], followed marginally by the higher order model, with smartphone distraction as a higher order factor (M2), which demonstrated comparable fit [RMSEA=0.050; 90% CI (.040, .059), CFI=0.947; TLI=0.933]. χ^2/DF , RMSEA, CFI, and SRMR were within the range of values demonstrating an appropriate model fit. The four-factor model (M1) only marginally improved model fit given that the factors were strong indicators of smartphone distraction as they may also independently represent other smartphone use behaviours (i.e., attention impulsiveness). However, statistically these two models were almost equal. High correlations amongst the factors were expected as scale items such as Item 17 (online vigilance) share similarity in content with the ‘checking’ items (e.g., Items 11 and 13) (the actual behavioural engagement or tendency for it). All factor loadings of the SDS were statistically significant ($p<.001$) and items related to the latent scale. The CFA was conducted again with a bi-factor solution (M3), to test whether a general factor could account for some variance. However, the bi-factor model did not demonstrate a better model fit: RMSEA=0.102; 90% CI (.090, .120); CFI=0.825, and TLI=0.792. The corresponding bi-factor solution also identified four robust factors after accounting for a general factor. The bi-factor model proved inferior, suggesting that the overwhelming majority of common variance was not due to a general factor and therefore was rejected as an optimal solution. The standardised path coefficients of all three models are shown in the model figures in Appendices 9, 10 and 11.

Table 11.4

Confirmatory Factor Analysis results of three models

Sample and model	n	χ^2	df	GFI	AGFI	CFI	TLI	RMSEA	90% CI	SRMR	AIC	BIC
Sample 2												
4 Factor Model (M1)	500	2,184	94	.952	.931	.959	.947	.049	[0.40-.058]	.0382	289.269	466.282
Higher order model (M2)	500	2,222	96	.951	.930	.956	.946	.049	[0.41-0.58]	.0393	293.298	461.882
Bi-factor model (M3)	500	2,495	88	.949	.921	.951	.933	.055	[0.46-.064]	.0383	315.541	517.842

n=sample size, χ^2 =chi-square, df=degrees of freedom, GFI=goodness of fit index, AGFI= Adjusted Goodness of Fit Index; CFI= Comparative Fit Index; TLI=Tucker-Lewis Index;RMSEA=, The root mean square error of approximation; SRMR= Standardized Root Mean Square Residual;M1=Model 1, M2=Model 2, M3=Model 3

Modification Indices

Modification Indices (MI) were utilised to correlate the corresponding items’ residuals and improve model fit. The largest modification indices were performed in error terms of very similar items, indicating overlapping content. A large modification index was observed between Item 27 (“Using my phone distracts me from doing unpleasant things”) and item 28 (“Using my phone distracts me from negative or unpleasant thoughts” MI = 22.14), Items 16 and 17 (“I get distracted with what I could post while doing other tasks and items” and “I get distracted thinking how many likes and comments I will get while doing other tasks”; MI=20.36) and between Items 28 and 32 (“Using my phone distracts me from negative or unpleasant thoughts”

and “Using my phone distracts me when I’m feeling stressed or anxious”; MI=15.32) due to conceptual similarity. The initial model prior to modifications was: $\chi^2=316.72$, $df=98$; $\chi^2/df=3.232$, $p < .001$, GFI=.928, AGFI=.900, CFI=0.919, TLI= 0.901, RMSEA=.067. The PCLOSE indicator is sensitive to sample size and was therefore not taken into account (Kenny, 2015; Marsh et al., 1988).

Table 11.5

Summary of Confirmatory Factor Analysis results obtained from the 16 items of the Smartphone Distraction Scale SDS on Sample 2 (n = 500)

<i>Factors/Items</i>	<i>Factor Loadings</i>
<i>Online Vigilance</i>	.825
<i>Multitasking</i>	.810
<i>Attention Impulsiveness</i>	.798
<i>Emotion Regulation</i>	.743
<hr/>	
<i>Attention Impulsiveness</i>	
I get distracted by my phone notifications.	.668
I get distracted by my phone apps.	.670
I get distracted by just having my phone next to me.	.772
I get distracted by my phone even when my full attention is required on other tasks	.770
<hr/>	
<i>Online Vigilance</i>	
I get anxious if I don’t check messages immediately on my phone	.586
I think a lot about checking my phone when I can’t access it	.765
I get distracted with what I could post while doing other tasks	.582
I get distracted thinking how many likes and comments I will get while doing other tasks	.540
<hr/>	
<i>Multitasking</i>	
I use several applications on my phone while working	.695
I can easily follow conversations while using my phone	.413
I often walk and use my phone at the same time	.565
I often talk to others while checking what’s on my phone	.643
<hr/>	
<i>Emotion Regulation</i>	
Using my phone distracts me from doing unpleasant things	.645
Using my phone distracts me from negative or unpleasant thoughts	.594
Using my phone distracts me from tasks that are tedious or difficult	.831
Using my phone distracts me when I’m feeling stressed or anxious	.634
<hr/>	
Mean	44.29
<hr/>	
Standard Deviation	10.23
<hr/>	
<i>Instructions: “Below is a collection of statements about your everyday experience with your smartphone. Using the 1–5 scale below, please indicate how often you currently have each experience. Please answer according to what best reflects your everyday experience.”</i>	
<i>All factor loadings were statistically significant (p<.001)</i>	

The first factor (*Emotion Regulation*) refers to strategies individuals use to modulate the emotional state they are in, the timing of the emotion and its expression (Roth et al., 2019). Emotion regulation has been found to be associated with self-control and self-regulation processes and can be dependent on intrinsic (i.e., temperamental) or extrinsic (i.e., attachment) factors (Calkins & Hill, 2007) and may be regulated through avoidance, suppression, or enforced expression or reappraisal (Roth et al., 2019). Within smartphone use, the use of distraction appears to serve a protective function by re-directing attention to a situation of less valence

and therefore avoiding negative emotional states consistent with evidence of general distraction and interference in anxiety (Mathews & Mackintosh, 1998; Mathews et al., 1990).

The second factor (*Attention Impulsiveness*) refers to difficulties in regulation of attention and the frequent loss of attention and engagement in impulsive behaviour (emotion and behaviour). Impulsivity is linked to temporal discounting of rewards driven by emotion regulation and presenting as reaction to emotional arousal (Nigg, 2016). Attention impulsiveness has been associated to habitual checking (Oulasvirta et al., 2012) and frequent need to check in smartphone use is associated with distraction. Smartphones have been suggested in the literature as producing an attentional bias. Focused attention affects task performance (Wu et al., 2020), and chronic media multitasking is associated with attention decrements and higher attentional impulsivity (Uncapher et al., 2016). In conditions where learning is of low interest, attentional impulsivity is associated with reduced lecture comprehension, low motivation, and fluid intelligence (Gupta & Irwin, 2016), to the detriment of academic performance.

The third Factor (*Online Vigilance*) refers to cognitive preoccupation, cognitive orientation, and attentional bias towards social media content, potentially fuelled by FoMO. For a fuller account of this construct, see Chapter 6 – the control model of engagement. Vigilance and checking (reactivity) present conceptual similarity in Factor 3 (Checking) and Factor 4 (Online Vigilance), Items 17 and 18 were added to Factor 3 to resemble the construct of online vigilance (Reinecke et al., 2018, p. 2), which includes the latent factors of *salience* (i.e., thinking intensively online spaces), *reactivity* (i.e., readiness to react to smartphone cues even if it involves interruption of activities), and *monitoring* (i.e., tendency to actively observe online engagement parallel to other activities).

The fourth Factor (*Multitasking*) represents general multitasking taking place while using smartphones which may lead to a distractive state. Task switching requires time investment and mental resources to re-orient to the task at hand with responses being slower and more error-prone (Monsell, 2003). Multitasking has been considered as functionally equivalent to distraction (Aagaard, 2019). However, multitasking may mask the perception of distraction (Zwarun & Hall, 2014).

Table 11.6

Operational Definition and Factors of the SDS

Four Factors – Smartphone Distraction	Content of Items
Emotion Regulation	<ul style="list-style-type: none"> • Distraction as a coping mechanism for poor mood • Distraction as a coping mechanism to relieve tension, stress and anxiety • Distraction as an avoidance
Attention Impulsiveness	<ul style="list-style-type: none"> • Distraction from notifications • Distraction from phone apps • Distraction from device itself
Online Vigilance	

- Distraction due to checking content
- Distraction due to preoccupation about checking
- Distraction due to uncomfortable feelings if unable to check
- Distraction due to preoccupation about validation on social media content
- Distraction due to checking if personal online content has been validated

Multitasking

- Distraction due to using several smartphones applications in parallel
 - Distraction due to switching between working and using the smartphone
 - Distraction due to talking to others /walking and checking
-

11.3.7 Construct Validity

Convergent and Discriminant Validity

The criterion-related validity of the SDS was assessed by examining participants' test scores on the SDS in relation to weekly smartphone use and social media use. As expected, a small positive association between SDS and daily social media use and smartphone use was observed. Convergent validity is the assessment of the level of correlation with a conceptually similar measure (Swank & Mullen, 2017). To investigate the convergent validity of the SDS, partial correlations with measures of Attentional Control (ACS), Mindful Attention and Self-awareness (MAAS), and Emotional Awareness (ESAS) were calculated. A negative association was expected in the relationship between the SDS and ACS, MAAS, and ESAS. As shown in Table 7, the SDS showed significant negative moderate correlations with the ACS ($r [500] = -.365, p < .001$) and the MAAS ($r [500] = -.514, p < .001$), and a small negative correlation with ESAS ($r [500] = -.122, p < .001$) Moreover, moderate correlations were observed between the SDS and negative metacognitions ($r [500] = .376, p < .001$) and positive metacognitions ($r [500] = .300, p < .001$).

Table 11.7

Correlations of the Smartphone Distraction Scale (SDS) With Other Scales: Criterion-related Validity, Concurrent Validity Convergent and Discriminant Validity (n =500)

Scale	Correlations	Cronbach's a
Automaticity	.013	.89
FoMO	.037	.87
NoMO	.001	.95
Online Vigilance	.031	.90
Meta-cognition_Positive	.300**	.90
Meta-cognition_Negative	.376**	.89
Attentional Control	-.365**	.80
Daily recreational Social Media Use	.171**	-
Daily recreational Smartph. Use	.148**	-
Emotional Awareness	-.122**	.86
MAAS	-.514**	.90
Addiction	.595**	.84
Impulsivity	.207**	.77
Deficient Self-Regulation	.470**	.89

For the emotion regulation aspect of the construct, correlations with measures of impulsivity, deficient self-regulation, rumination, stress, FoMO, NoMO, and social media addiction were also assessed for convergent validity. The highest correlation was observed with social media addiction ($r [1,001] = .595, p < .001$), followed by deficient self-regulation ($r [500] = .470, p < .001$), stress ($r [500] = .271, p < .001$), and rumination ($r [500] = .270, p < .001$). No associations were observed between automaticity, FoMO, NoMO and online vigilance. Divergent validity was assessed by examining the correlation with the construct of self-efficacy ($r [500] = .002, p = .675$). All correlations between distraction and the other constructs can be seen in Table 11.7 and Table 11.8 presents associations between SDS and other well-being measures.

Table 11.8

Correlations of the Smartphone Distraction Scale (SDS) with other Well-Being Constructs

Scale	Correlations	Cronbach's a
Stress	.271**	.68
Rumination	.270**	.88
HADS_Depression	-.120**	.78
HADS_Anxiety	-.183**	.80
GAD	.211**	.90
PANAS_Positive	-.116**	.86
PANAS_Negative	.186**	.88
Self_efficacy	.002	.86

11.3.8 Testing for measurement invariance across gender

The current study aimed also to test alternative models of fit by: (i) testing whether the newly developed psychometric test works equally in both male and female young adults; (ii) the measurement model would be invariant across both genders, and (iii) testing the latent means differences (describing the mean values of latent constructs). Testing for invariance across gender was deemed critical given the multidimensional nature of the construct, which could be influenced by individual differences, which appear even more prominent in smartphone use (Chen et al., 2017; Mitchell & Hussain, 2018; Roberts et al., 2014).

The invariance testing process begins with a well-fitting baseline model and involves the testing of equality of sets of parameters through several ordered and progressively more restrictive steps in measurement invariance by testing equality (Byrne, 2008; Cheung & Rensvold, 2002). At each step, model parameters are successively constrained and model fit is assessed to determine continuation or not of restrictive models of invariance testing (Steenkamp & Baumgartner, 1998). The change in fit is assessed by progressively constraining invariance and comparing fit indices amongst the models (Byrne, 2008). Invariance tests were conducted on the first-order level, although there is a second-order factor. This is done to determine if the latent factors are similarly constituted for multiple groups because invariance is mainly relevant to the relationship between the observed items and their immediate latent factor, therefore the higher order relationships are not particularly relevant in this procedure.

To assess factor invariance across gender (to determine the equivalence of the factor structure), a multi-group CFA was utilised with maximum likelihood estimations based on the thresholds of the same

aforementioned fit indices (Table 1). The model was tested independently for gender. Three models – configural invariance, metric invariance, and scalar invariance – were estimated. Invariance may be achieved if there is an adequate fit to the data across groups with only a negligible change in values for fit indices (e.g., Δ CFI, Δ RMSEA). Based on the previous findings of the CFA, it was expected that the four-factor model would fit the data well in both samples. If the data fitted well in an alternative model than the four-factor model, the more parsimonious model would be selected and if model fitted well in both samples, additional invariance tests would be conducted to determine if the measure functions equally across the two groups. In case a difference is observed in the CFA in the two samples, no further invariance testing will be required, and differences in structure will be assessed by examining changes in the fit indices and item loadings onto the respective factors.

Configural invariance. Configural invariance tests whether the same number of factors are prevalent in both genders (i.e., a four-factor model) and whether the same items load to each factor (i.e., same pattern of fixed and free loadings) across groups. Measurement invariance of the model for gender was tested through estimating (Van de Schoot et al., 2012) the SDS model separately for male and female young adults by constraining the basic latent structure to equality across groups. The same MIs were correlated to error terms as in the CFA. The fit indices of the unconstrained models (see Table 11.1) demonstrated configural invariance across gender ($\chi^2[196] = 415.051, p < .001, CFI = 0.915, RMSEA = 0.047 [0.041-0.054]$) and therefore an adequate fit for both gender groups. A chi-square difference test was also conducted and confirmed configural invariance. The same four-factor model fit both groups, suggesting that both genders had the same basic conceptualisation of smartphone distraction and interpreted the items of each factor similarly, attributing the same salience of perceptions and behaviours to the four factors.

Table 11.9

Fit indices for Multi-Group Confirmatory Factor Analysis evaluating Measurement Invariance of the four factor structure of the SDS (n=501)

Models	χ^2	df	CFI	χ^2/df	RMSEA	90% CI	Model comparison	Δ CFI
<i>Males vs. Females</i>								
1. Configural invariance (no constrains)	415.051*	196	0.915	2.118	0.047	[.041-.054]	-	-
2. Metric invariance (equal factor loadings)	427.279*	208	0.915	2.054	0.046	[.040-.052]	2 vs. 1	-
3. Scalar invariance (equal intercepts)	478.171*	224	0.902	2.135	0.048	[.042-.054]	3 vs. 2	-0.013

*Each model compared with the previous model *p<.001*

Metric Invariance. Following configural invariance, metric invariance was evaluated to determine if the strength of the factor loadings of the respective items were equivalent in both groups. A lack of metric invariance could signal a different attribution of importance of certain items or that there is a different understanding of certain items amongst the two groups (Putnick & Bornstein, 2016). To assess metric invariance factor loadings are further constrained to invariance across groups by choosing an item to serve as a referent metric for each factor with subsequent steps to ensure that the referent item itself is invariant across the two samples. To achieve this all other items on the subscale serve as temporary references against the target item (Cheung & Rensvold, 2002). Metric invariance was established if the change in model fit from the

configurally invariant model to the metric model did not exceed the following statistical cut-offs: RMSEA \geq .015, CFI \geq .990 (Chen, 2007). Therefore, a model was tested in which the unstandardised relationships between the items and factors of the SDS were constrained to be equal across the two genders. This constraining to equality did not lead to a significant reduction in model fit (Δ CFI=0.000), thus supporting metric invariance implying equal salience of factors for both male and female students (see Table 10) (Putnick & Bornstein, 2016).

Scalar invariance. Since metric invariance was supported, the third step of measurement was scalar invariance establishing whether mean responses for corresponding items were similar across groups. Scalar invariance tests the equality of intercept terms and is achieved by constraining item intercepts to equality and assessing whether the item loadings and the item intercepts are equivalent. It is established if the change in model fit from the metric invariant model does not exceed RMSEA \geq .015, CFI \geq .990 (Chen, 2007). Scalar invariance is considered valid when comparing latent factor means across groups (Chen, 2008; Steenkamp & Baumgartner, 1998), confirming that both genders respond to the scale similarly (Hong et al., 2003). Therefore, unless scalar invariance is supported, no valid cross-group comparisons can be attempted. Scalar invariance is also a prerequisite to assessing mean differences between the groups (Meredith, 1993; Steenkamp & Baumgartner, 1998). Therefore, to test for scalar invariance all the item intercepts were constrained across groups and results demonstrated that scalar invariance across gender groups was confirmed (Δ CFI=-0.013, Δ RMSEA=0.002) (see Table 10).

Testing for latent mean differences

After scalar invariance, analysis of latent means was considered, which goes beyond the basic step of observed means (i.e., assessed with the use of t-tests or ANOVA) by examining the latent means behind a construct thus assessing what is not directly measurable (Chiu et al., 2015). Differences due to latent means are considered solely when the observed item intercepts and the factor loadings of the items are invariant across groups (Chen et al., 2019). A latent mean analysis was therefore performed for SD among male and female groups by constraining the latent means of the male group (serving as the reference group) to zero, while the mean of the other group was freely estimated (the decision on which group to constrain is arbitrary with no influence on the final estimated mean values) (Byrne, 2006). The comparison between latent means was based on the Critical Ratio (CR) Index (the parameter estimate divided by its standard error), which operates as a z-statistic in testing whether the estimate is statistically different from zero (Byrne, 2006). The test statistic needs to be $> \pm 1.96$ before the hypothesis that the estimate equals 0 can be rejected. When CR values are positive, the comparison group has higher latent mean values than the reference group, which is indicative of the existence of latent mean differences (Tsaousis et al., 2020). In the case of the SDS, latent means analysis identified statistically significant differences between males and females. The positive z-values suggested that the comparison group (females) had significantly higher scores than the reference group (males) across all four latent factors: Emotion regulation (CR=3.83), Attention Impulsiveness (CR=5.02), Online Vigilance (CR=2.69) and Multitasking (CR=3.15), indicating gender differences underlying both cognitive and emotive dimensions of distraction in smartphone use.

11.4 Discussion

Attention is a scarce resource and fragmented attention appears to be a frequent impact of smartphone use related to cognitive interference (Eysenck et al., 2007; Sparrow et al., 2011; Stothart et al., 2015). Distraction is one expression of attentional loss associated with smartphone use. The present study explored a newly conceptualised, theory-driven, multidimensional measure of smartphone distraction based on the need to understand and develop a psychometric assessment framework for smartphone distraction. To achieve this goal, the *perceptual control theory* (Powers, 1973) and the *control model of engagement* (see Chapter 6) for social media and smartphone use in young adults were adopted to explain tendency for distraction in order to control self-presentation, content and relationships online. The present study had the following aims: (i) identify the latent dimensions of SD and develop a respective pool of items, (ii) evaluate the scale's reliability and validity, (iii) investigate the convergent and divergent validity with existing measures from the smartphone literature, and (iv) establish gender invariance (at the configural, metric, and scalar level), and test latent means differences across males and females. The SDS appeared to be a reliable and valid measure for the assessment of SD with sound psychometric properties and invariant across gender in young adults. Results of the CFA showed configural, scalar, and metric invariance for the four-factor structure, suggesting that the four-factor structure of the SDS is comparable across groups. Furthermore, latent mean differences indicated that females were more susceptible to SD than males, consistent with the smartphone literature (Chen et al., 2017; Mitchell & Hussain, 2018; Roberts et al., 2014).

The analyses conducted provided evidence of the validity of a four-factor structure, consistent with the evidence reported in the literature (Aagaard, 2015, 2019; Baron et al., 1978; Barr et al., 2015; Baumgartner et al., 2017; Borkovec & Roemer, 1995; Canale et al., 2019). The present model of the SDS presented an acceptable model fit according to the results obtained from the CFA. The CFA model of SDS indicated that the construct comprised four factors: *attention impulsiveness*, *emotion regulation*, *online vigilance*, and *multitasking*, confirming that smartphone distraction entails a cognitive, emotive, and behavioural component. The findings supported a strong relationship between distraction and online preoccupation and vigilance, stress/anxiety, in line with previous evidence that excessive reassurance seeking (which is potentially related to online vigilance and checking behaviours) was associated with problematic smartphone use and the relationship being mediated by rumination (Elhai et al., 2020). Strong habitual checking behaviours, reinforced by the immediate smartphone access to social media and the disruption of social media notifications, appear to be leading to self-control failures (Du et al., 2019). Moreover, preoccupation for online content takes the form of vigilance, which reflects a cognitive orientation towards cues and a behavioural activation component (hence checking) (Reinecke et al., 2018). Online vigilance may predispose an individual to distract frequently and check devices excessively and therefore use smartphones more than intended or in a compulsive way (Johannes et al., 2019; Reinecke et al., 2018; Throuvala et al., 2019).

As hypothesised, emotion regulation was the factor that loaded most strongly, explaining the largest percentage of variance in the construct, indicating that FoMO is associated with disruptions to attend to smartphone notifications resulting in surface learning in young people (Rozgonjuk et al., 2019), confirming literature of emotion regulation deficits in IGD and PIU (Aydm et al., 2020; Spada et al., 2008, 2015; Spada & Caselli, 2017). Distraction frequency has been associated with Factor 2, attention impulsiveness, which is triggered by anxiety and takes the form of attentional bias, as has been supported in the smartphone and social media use literature (Konok et al., 2017; Mathews et al., 1990; Wegmann & Brand, 2020). There are reasons

to expect a high degree of overlap among the four dimensions, reflected in the high co-variances amongst the factors as well as in the error terms of specific items. All dimensions measured distraction occurring within smartphone use and had an implicit or explicit focus on cognitive preoccupation with smartphone content (primarily social media content, for emotion regulation and resulting attention loss, potentially leading to checking and multitasking), in accordance to evidence (Aagaard, 2019; Thornton et al., 2014; Turel & Serenko, 2020; Uncapher et al., 2016; van der Schuur et al., 2015; Ward et al., 2017; Xu, 2015). Findings have also confirmed that addictive tendencies and distraction interact, influencing smartphone use with detrimental mental health effects (Oraison et al., 2020). Therefore, the overlap and the high inter-correlation amongst the factors was expected.

To establish the convergent and discriminant validity of the SDS, the study investigated the association between various cognitive, emotional and behavioural variables and the SDS factors. Criterion-related and concurrent validity was demonstrated through associations with weekly smartphone use, attentional control and mindful attention and awareness. Significant correlations were also observed between the four factors of the SDS and corresponding psychological constructs, such as emotion regulation, addiction and metacognition, thus providing further evidence for the test's concurrent validity and bridging research on IGD and PIU with SM and SMU in identifying common risk factors and potential outcomes (Aydın et al., 2020; Lindenberg et al., 2017, 2020; Spada et al., 2008, 2015; Spada & Caselli, 2017). The SDS appears to demonstrate acceptable reliability and validity, although further analysis needs to assess items that may influence multicollinearity and normality.

In the present sample, the items 9, 23 and 33 did not significantly contribute to explaining the construct of smartphone distraction and were therefore not retained. The results show that these items were not relevant to this factorial model and could be eliminated from the scale. One reason for the aforementioned observations may be the reverse response key for these items, which aid content validity. However, reverse wording does not necessarily prevent response bias and data may be contaminated by participants' inattention and/or confusion (Sonderen et al., 2013). Additionally, the items concerning the experience of lack of focus may have made it more difficult to respond to, resulting in the lack of correspondence between these and other items of the SDS. Therefore, further work on the scale is recommended which should include these items worded in the same direction as the other items.

Additionally, the present study aimed to assess measurement invariance of the SDS across gender in a University student sample. The findings obtained suggested that the SDS factor structure is the same across gender with equally robust associations between the underlying constructs and the observed indicators across genders, thus providing additional support for the four-factor structure of the SDS. In addition, the SDS achieved both metric and scalar invariance, suggesting equal salience of the indicators across the two groups, providing additional evidence of construct validity for cross-group comparisons for the SDS. As suggested in previous literature, measurement invariance needs to be supported, before any cross-cultural investigations of the scale are attempted (Hong et al., 2003).

Although the SDS demonstrated measurement invariance, findings suggested that the latent means for the SDS sub-scales differed across gender groups. The results from this study found that students of both genders were not similar in their endorsement of the smartphone distraction subscales, with females exhibiting

higher scores than males across all factors, contributing to the emerging body of smartphone literature on gender (Andone et al., 2016; Chen et al., 2017; Mitchell & Hussain, 2018). These results are also in line with findings from previous studies in which females appear to demonstrate higher multitasking, emotion regulation needs, and to be managing their emotions more poorly than males and presenting with higher problematic smartphone use (Andone et al., 2016; Buyukbayraktar, 2020; Meng et al., 2020; Monacis et al., 2017a; Nayak, 2018; Su et al., 2019). Evidence regarding gender differences in multitasking is small with conflictual findings, with some evidence suggesting that women are not better than men at multitasking, while other literature suggests that women present with better multitasking skills (Hirsch et al., 2019; Lui et al., 2020). To explain these differences, the hunter-gatherer hypothesis (claiming a cognitive adaptation to different division of labour roles across the sexes) (Ren et al., 2009) has been proposed to explain findings of females being less affected by task-irrelevant interruptions in experimentally-generated multitasking conditions, suggesting females are better at multitasking. However, media multitasking is considered the new norm, and inadvertently leads to fragmented attention and frequent micro-disengagements, linking multitasking with distraction. Still, no direct conclusions may be drawn given the relative absence of research on smartphone distraction to date. Previous studies examining differences between genders in smartphone use have indicated that females report higher smartphone use and present with higher problematic smartphone use (Chen et al., 2017; Chen et al., 2017; Yang et al., 2019), which clearly suggests cross-gender differences (Sindermann et al., 2020).

The present study is to the author's knowledge the first to demonstrate construct validity for a newly developed measure on SD, as well as evidence regarding measurement invariance assessment across gender. The findings of this study suggest that the SDS functions well and is invariant across genders in young people, providing new insights in the smartphone literature by suggesting cognitive and emotive effects in terms of attentional loss from smartphone use across gender. Additionally, latent means differences were assessed by using a CFA approach which is considered a more robust approach (than t-tests), providing strong empirical support for gender differences (Vandenberg & Lance, 2000). This study contributes to process-oriented smartphone use research by identifying latent constructs of distraction and smartphone use for emotional coping and involvement in potentially problematic smartphone behaviours.

The SDS presents with a strong theoretical foundation, good psychometric properties, short length and easy applicability. The findings obtained suggest that the instrument may be used ~~in the~~ further tested in the general population and reliably assess the construct of SD. The SDS requires further investigation with ethnically diverse samples and different age groups and settings, establishing its test-retest stability, the invariance across cultures and its predictive validity, by exploring its relationship with other psychological constructs, such as anxiety and mood disorders or attention deficit hyperactivity disorder (ADHD) (Lange, 2020) and in clinical samples by identifying how the frequency and compulsiveness of smartphone use and the impact of this cognitive-emotive construct may contribute to the deterioration or alleviation of symptoms of various disorders (Armstrong et al., 2011). Additionally, the role of SD should be examined in terms of risky behaviours, physical injuries (Kim et al., 2017; Kuss et al., 2018) and work performance. Therefore, further validation of the construct is required to encourage research investigating distraction in other contexts to understand a highly prevalent issue within smartphone use better.

Potential limitations in the present study pertain to its generalisability to the broader population, having relied on a convenience self-selected sample of university students, which may not necessarily be representative of all smartphone users. It is unclear how culturally distinct or age different samples (e.g., young children) might respond to this measure. Additionally, the content of items may warrant further refinement (i.e., driving item was not relevant to emergent adults). However, it has been suggested as a common behaviour of concurrent smartphone use amongst older adults (Kuss et al., 2018). Another important potential limitation constitutes the use of self-report questionnaires and potential biases associated to the self-report methods (i.e., social desirability). Combined with behavioural and biometric data, psychometric measures of SD as both an adaptive but also a maladaptive digital experience related to potentially other psychopathological constructs have the additional benefit of providing strong checks on face validity. Additionally, the construct of smartphone distraction does not encompass other experiences of distraction on other devices. Smartphones were chosen as the most ubiquitous device. Such insight would make it possible to discern whether the nature of distraction similarly to online addiction varies between platforms, devices, and content types (Berthon et al., 2019).

Finally, no media multitasking items were included in the scale and therefore this sub-component of multitasking was not accounted for in the development and validation of the SDS scale. Future studies may consider including items related to media multitasking because evidence suggests this to be a common behaviour related to smartphone and overall digital use and could therefore account for a higher percentage in the variance of smartphone distraction. Exploring the construct of digital distraction arising from the multiple devices and disruptions caused by the multiplicity of devices may provide a more inclusive account of the normative digital experience in normative use.

The current findings suggest that the SDS is a psychometrically sound measurement tool assessing SD based on the theoretical framework of the perceptual control theory (Powers, 1973) and the control model of social media engagement (Throuvala et al., 2019) according to which cognitive preoccupation and need to control content, relationships and self-presentation appear to be drivers for distraction via smartphone use. The SDS was designed to be applicable to young adult smartphone users irrespective of level of smartphone use, whether excessive or normative. The SDS may be utilised as a screening tool in interventions to reduce the risk of problematic smartphone use. These could be particularly useful in student populations (Winzer et al., 2018) by allowing higher order work and increased productivity as well as the identification of more adaptive ways of emotion regulation. Given that smartphones are ubiquitous, smartphone distraction is a frequent behaviour, impacting productivity and areas of executive function and therefore reducing distraction is of particular importance to aid performance, emotion regulation, and overall well-being.

11.5 Conclusion

Attention management may be one of the most critical skills of this century where information is abundant. Attention is a scarce resource and its control is exacerbated by the online environment and devices available. Distraction is invariably part of an individuals' online and offline experience. The present study sought to devise the first SDS and further investigate its psychometric properties, given the absence of a similar construct in the smartphone literature. The SDS is best conceptualised within a four-factor

solution. Additionally, the SDS was found to present with gender measurement invariance at the configural, metric, and scalar levels, suggesting that the scale functions equivalently across the two gender groups. The SDS is a theory-driven scale, with strong psychometric properties assessing a complex psychosocial construct defined by cognitive-emotive dimensions with positive and negative valence related to attention impulsiveness, emotion regulation, online vigilance, and multitasking. Within the smartphone literature, it is an emergent issue interfering with everyday functioning and productivity and potentially implicated in problematic smartphone and social media use. Recommendations for further research were provided in terms of digital multitasking, cross-cultural applications, clinical samples (i.e., in individuals with ADHD diagnosis), and assessing other demographics (adolescents and older adults) to further validate the instrument.

Based on initial evidence on the distraction caused in University settings (Kuznekoff & Titsworth, 2013; Mendoza et al., 2018; Zarandona et al., 2019), an online intervention comprising of evidence-based strategies to reduce distraction was tested in an RCT. The following chapter refers to the design and efficacy of the RCT and its ability to reduce SD and related psychological constructs.

Chapter 12. Testing the efficacy of an online randomized controlled trial to reduce distraction from smartphone use

Throuvala, M. A., Griffiths, M. D., Rennoldson, M., & Kuss, D. J. (2020b). Mind over matter: Testing the efficacy of an online randomized controlled trial to reduce distraction from smartphone use. *International Journal of Environmental Research and Public Health*, 17(13), 4842. <https://doi.org/10.3390/ijerph17134842>

12.1 Introduction

12.1.2 Smartphone mental health apps (MHapps) and Online randomized controlled trials

Digital wellbeing apps or MHapps (apps that track an individual's behaviour, i.e., time spent online, or that aid cognitive, emotional and/or behavioural wellbeing) (Bakker et al., 2016) have been suggested as supporting self-awareness and self-regulation (Király et al., 2020) and utilized in mental healthcare given their functionality, accessibility, higher adherence rates, real-time assessment, low-cost and for their intervention potential (Gupta & Mittal, 2019; Linardon et al., 2019). The literature suggests that evidence-based apps may be efficacious in raising self-awareness, mental health literacy and wellbeing, self-efficacy, and ability to cope (Bakker et al., 2016; Bakker et al., 2018a; Bakker & Rickard, 2018; Howells et al., 2016). Online psychological interventions are increasingly being utilised (Kummervold et al., 2008), rendering numerous positive health outcomes (Howarth et al., 2019; Howells et al., 2016; Melia et al., 2020; Neary & Schueller, 2018; Plaza et al., 2013; Torous & Powell, 2015), complementing service provision and recognized by governmental health institutions (e.g., National Institute for Health and Care Excellence (NICE) in the UK) (Sanderson et al., 2020). However, more research is required to determine the comparative effectiveness of these therapies and their components (Gainsbury & Blaszczynski, 2011) in improving mental health and wellbeing and rigorous objective evaluation beyond their developers is required.

To date, there have been a small number of internet-based interventions associated with device use in university settings. Distraction is not considered a dysfunctional construct by itself, but has been implicated in emotion regulation, ADHD, and other disorders (Borkovec & Roemer, 1995; Cho & Lee, 2016; Denkova et al., 2010a), and has been minimally examined in the context of the digital environment with no evidence to date as to strategies that could ameliorate its occurrence (Aagaard, 2015). Therefore, the aim of the present study was to test the preliminary efficacy of an online intervention based on cognitive behavioural principles (i.e., self-monitoring, mood tracking, and mindfulness) to reduce distraction and related psychological outcomes (i.e., stress) among university students. Given: (i) young adults are keen users of smartphone apps, with increased vulnerability to self-regulation and technology use (Kuss et al., 2013), (ii) the high stakes for academic achievement, and (iii) the similarity in processes observed between gambling addiction and social media overuse (Andreassen et al., 2016), the strategies of *mindfulness*, *activity monitoring*, and *mood tracking* utilized in gambling harm-reduction (Bonello & Griffiths, 2019; Calado et al., 2018; Canale et al., 2016) are employed in the present study. These strategies were delivered and facilitated through the use of smartphone MHapps and were tested for their efficacy in reducing levels of distraction and related psychological outcomes

and their role in inducing changes in wellbeing (Patton et al., 2016; Sohn et al., 2019; Spijkerman et al., 2016). The following hypotheses were formulated:

H1. Compared to the control condition at follow-up, students receiving the intervention would report: (i) lower rates of smartphone distraction, smartphone and social media use duration, impulsivity, stress, problematic social media use, FoMO and NoMO and (ii) higher levels of mindful attention, emotional self-awareness, and self-efficacy.

H2. At follow-up, high distractors (HDs) compared to low distractors (LDs) (based on a median-split analysis) would show a greater reduction in distraction and significant improvement in outcomes.

H3. The intervention will mediate the relationship between (i) mindful attention and smartphone distraction, and (ii) emotional awareness and smartphone distraction. Additionally, online vigilance will mediate the relationship between smartphone distraction and problematic social media use.

To the authors' knowledge and given the novelty of the construct of smartphone distraction, this is the first study to examine a preliminary online randomized controlled trial via MHapps for the reduction of smartphone distraction. The present study fills a gap in the smartphone literature by assessing the efficacy of engaging with behaviour change strategies (i.e., mindfulness, self-monitoring, and mood-tracking) used successfully in gambling harm prevention for the reduction of distraction.

12.2 Methods

12.2.1 Design

The present study tested the efficacy of a ten-day online app-delivered randomized controlled trial (RCT) based on cognitive-behavioural principles to reduce distraction (primary outcome) and a number of secondary psychological outcomes: self-awareness, mindful attention, FoMO, anxiety, and depression among university students. RCTs are considered the gold standard in intervention effectiveness despite limitations addressed by scholars (Cartwright, 2007; Sullivan, 2011), primarily for the lack of external validity or methodological choices (Deaton & Cartwright, 2018). A pragmatic psychosocial intervention with an RCT design was chosen (Ruggeri et al., 2013). The duration of the intervention was set given a pragmatic consideration of the free use period of one of the apps (*Headspace*) and, secondly, due to the preliminary nature of this investigation. Consolidated Standards of Reporting Trials (CONSORT) guidelines were followed in the protocol and the procedures and reporting of the intervention (Campbell et al., 2004).

The intervention involved the active engagement for the period of ten consecutive days with three smartphone apps serving three different functions: to assess smartphone and social media use, conduct mindfulness sessions with an emphasis on eliminating distraction, and track mood and assess its impact on distraction, stress, self-regulation, and other measures. Interaction with apps was encouraged to: (i) raise emotional awareness of common mood states, such as feeling down, worried, or stressed through mindfulness, (ii) guide basic smartphone monitoring, focusing skills, and awareness, and (iii) provide insight through mood tracking (Table 1). To further support active engagement with these intervention components, eligible participants were asked to keep a daily online activity log for the duration of the intervention (i.e., the number of screen-unlocks and the time of day and number of minutes for which the smartphone was used, usefulness

of apps, etc.), to aid time perception of daily activities, raise awareness levels, and help increase the accuracy of self-reporting and adherence to the intervention (Oussedik et al., 2017; Schell & Gillen, 2018). Promoting self-awareness of media use and understanding of own behaviour was a key target of the intervention in order to curb distraction. The study was reviewed and approved (No. 2018/226) by the research team’s university ethics committee.

12.2.2 Participants

Participants were recruited using convenience and snowball sampling techniques. After gaining institutional ethical approval, the study was advertised to students through the research credit scheme, in university lectures and labs, and to the public through social media as an online intervention to assess the reduction of smartphone distraction. This experimental intervention demanded a significant time involvement and offering incentives increased the chances of participation and completion of the full ten-day intervention. In return for participation, students were offered either research credits or entry in a prize draw (£50 gift cards). Participants were included in the study based on two screening criteria: regular smartphone and social media usage. Only those affirming both and granting consent were able to continue with participation. Following the completion of the survey, participants were allocated to one of the two conditions (intervention [IG] or control [CG]) and further instructions for participation in the intervention were provided depending on the allocation condition. After initially providing age and gender demographics, participants responded to survey items regarding habitual smartphone and social media behaviour (estimates of duration of use), smartphone distraction severity, trait self-regulation, trait mindfulness and other psychological constructs (detailed in “Materials”). The survey took approximately 25 minutes to complete.

A total of 261 participants were recruited who participated in the baseline assessment. Of these, 155 were undergraduate Psychology students in the UK (59.3%). The sample comprised 47 males (18%) and 214 females (82%), with an age range of 18 to 32 years ($M = 20.72$, $SD = 3.12$). Figure 1 depicts the flow of participants through the study procedures. After the baseline assessment, during the intervention period two individuals of the intervention group withdrew from the study and were not considered in the analysis. From the 259 remaining participants, seven were removed due to providing 90% incomplete data. The final sample considered at baseline was 252 participants (intention to treat (ITT) group) and included 123 participants in the intervention group and 129 in the control group. Participants who completed both assessments were considered in the per-protocol analysis (PP) ($n = 143$, 56% of the original sample), with 72 participants comprising the IG and 71 participants the CG.

Table 12.1

The 3 components of the intervention

Intervention components	Smartphone app used	Evidence-based benefits	Psychological evidence for benefits
Mindfulness			

Brief mindfulness sessions	Headspace app	<ul style="list-style-type: none"> • Mindfulness practice and mood tracking offer benefits in emotion regulation, attention, stress and low mood levels & meta-awareness • Evidence for replenishing students' focused engagement in mental tasks (i.e., homework) 	(Lanier et al., 2019) (Kasson & Wilson, 2017) (Broderick & Jennings, 2012; Hölzel et al., 2011) (Franklin et al., 2017)
Self-monitoring & Self-exclusion			
Social media and smartphone use Anti-Social app Abstinence option		<ul style="list-style-type: none"> • Self-monitoring & exclusion (minutes on social media, times of unlocking smart phone each day, favourite and most time consuming and accessed apps), aid emotion regulation • Reflection on dependence on smartphone, extent of use, lost attention, checking frequency • Performance feedback & meta-awareness 	(Bandura, 1991) (Tseng et al., 2019) (Bentley & Tollmar, 2013) (Evans et al., 2018) (King et al., 2017) (Turel, 2018) (Bakker & Rickard, 2018)
Mood-tracking			
	Pacifica app	<ul style="list-style-type: none"> • Mood tracking can boost overall emotional self-awareness which can in turn lead to improvements in emotional self-regulation 	(Hill & Updegraff, 2012) (Caldeira et al., 2018) (Bakker et al., 2018b)
Daily reminders and blogging were sent as a reminder to maintain routine, reflect on levels of activity (Haug et al., 2012; Schell & Gillen, 2018)			

12.2.3 Materials

The survey consisted of sociodemographic and usage data (questions related specifically to smartphone and social media use [hours per day]). The demographic questions and user-related questions had open responses (i.e., "How many hours per week do you use social media?"). The following scales were used for the psychological measures of the study:

- The Smartphone Distraction Scale (SDS)
- The Mindful Attention Awareness Scale (MAAS) (Brown & Ryan, 2003)
- The Emotional Self-Awareness Scale (ESAS) (Kauer et al., 2012)
- The Perceived Stress Scale (PSS)
- The Generalized Anxiety Disorder Scale (GAD-7) (Spitzer et al., 2006),
- The Self-Report Behavioural Automaticity Index (SRBAI) (Gardner et al., 2012)
- The Generalized Self-Efficacy Scale (GSE) (Schwarzer & Jerusalem, 1995),
- The Online Vigilance Scale (OVS) (Reinecke et al., 2018)
- The eight-item Barratt Impulsiveness Scale-Alternative Version (BIS-8) (Morean et al., 2014)
- The Deficient Self-Regulation Measure (Davies & Hemingway, 2014)
- The Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2016; C.-Y. Lin et al., 2017; Monacis et al., 2017a; Pontes et al., 2016)

- The Fear of Missing Out Scale (FoMOS) (Przybylski et al., 2013),
- The Nomophobia Questionnaire (NMP-Q) (Yildirim & Correia, 2015).

The abovementioned scales' and their psychometric qualities are presented in Chapter 12. Reliabilities for the present study are presented in Table 1.

12.2.4 The Intervention

The intervention initially involved the search and identification of appropriate mobile apps (in both the *Apple iTunes* store and the *Android Google Play* store) for daily self-monitoring of social media activity for mindfulness practices and mood tracking. The apps needed to be freely available in order to be accessible by the participants. Due to time limitations, the development of an app that would encompass all three features (mindfulness for distraction, self-monitoring, and mood-tracking) was deemed adequate for the study given the ample availability of well-designed products offering these services. The following three freely available smartphone lifestyle apps were utilized: (i) *Antisocial* (screen time): to self-monitor screen time/social media use and for voluntary self-exclusion (block app after time limit is reached), (ii) *Headspace* (mindfulness): brief mindfulness sessions, (iii) *Pacifica* (mood tracking): the app encouraged monitoring and tracking an individual's emotional state at various times during the day to enhance awareness.

At the outset of the study, participants were directed to an information statement followed by the digital provision of informed consent before responding to the questions. At the end of the survey, they were automatically assigned through the automatic randomization procedure used by the online survey platform *Qualtrics* to either an intervention or a control group. Therefore, the intervention was double-blind (to participants and investigators). Participants assigned to the IG were asked to download the apps onto their smartphones and to actively engage with all three apps daily for 10 days, which was the maximum free period offered by one of these apps. Participants were encouraged to engage with mindfulness/focusing exercises, to track their emotional state during the day and monitor patterns in their wellbeing, as well as report daily on smartphone usage rates. Thereafter, participants received daily notifications via email during the duration of the intervention to remind them to provide online reports about their own social media usage rates, apps accessed, checking frequency, potential self-restriction from use, and satisfaction with the intervention. This process was used to motivate engagement with the apps and accountability. Efficacy was evaluated by having a CG condition where participants did not engage in any app use and only completed assessments on the first and tenth day. The target of the intervention was to induce a more mindful state and raise the awareness of media and smartphone use, enhance self-regulation and therefore reduce distractions and time spent on smartphones and indirectly on social media by using these apps.

12.2.5 Data analysis

Sample size estimation

The sample size for the RCT was determined a priori using G*Power v.3 software for the expected increased effectiveness of the intervention compared to control on the primary outcome distraction at post-assessment (T2). Empirical reviews (Rothwell et al., 2018) have suggested a median standardised target effect size of 0.30 (interquartile range: 0.20–0.38), with the median standardised observed effect size 0.11 (IQR 0.05–

0.29). The present study was a low-threshold intervention for a non-clinical population, so a mean effect of $d=0.30$ was expected. With a power of $1-\beta = 0.8$, and a significance level of $\alpha = 0.05$, the sample size was calculated to be $n = 95$ participants per group to find between- and within-group effects. To account for attrition rates in online interventions and control for both Type I and II error rates, $n = 125$ participants per group were targeted for recruitment (Bhide et al., 2018).

Data cleaning, assumption testing and descriptive analysis

All data were analysed through SPSS v.25 (Chicago, IL, USA). Preliminary data analyses included examining the data for data entry errors, normality testing, outliers, and missing data. Seven cases were treated with listwise deletion due to a very high percentage of incomplete data at baseline, resulting in a final sample size of 252. For the rest of the dataset, Little's Missing Completely at Random (MCAR) test showed that data were missing completely at random ($p = 0.449$). Multiple imputation was used to complete the dataset for the baseline analysis and for the non-completers from post-intervention assessment based on patterns of missingness. The data were also checked to ensure that all assumptions for the outlined statistical analyses were satisfied. The Kolmogorov-Smirnov test was used to evaluate the normal distribution of the variables, and skewness and kurtosis values were examined. For both assessments, all self-report data were normally distributed. Assumptions of t-tests included normality, homogeneity of variance, and independence of observations. Violations of the assumption of homogeneity of variance were tested using Levene's test of equality of variances (Grimm & Yarnold, 1995). Descriptive statistics were conducted to summarize the demographic characteristics of the sample as well as scores for the self-reported and performance-based measures of interest (i.e., stress). Pearson's correlations examined bivariate relationships between smartphone distraction and psychological variables, and frequency of smartphone and social media use (presented in Table 3).

Randomization and risk of bias

While allocation randomisation aimed to reduce any differences between the groups at baseline, a series of independent sample t-tests for the continuous variables and chi-square tests for the categorical variables (gender, ethnicity and education and relationship status) were conducted to analyse group mean differences and compare the baseline and post-intervention outcomes for the control and intervention groups. These were also applied at post-intervention outcomes for both the control and the intervention group. A decrease from the baseline to the post-intervention assessment was hypothesised for the primary outcomes of smartphone distraction, stress, anxiety, deficient self-regulation, FoMO and NoMO and an increase was hypothesized for mindful attention, self-awareness and self-efficacy.

Following the descriptive analysis, data from the baseline and post-intervention assessments were analysed to test each of the hypotheses provided to inform the assessment of the intervention efficacy. Two approaches to analysis were adopted. First, to isolate any effect of the intervention, a per-protocol (PP) analysis was conducted to maintain the baseline equivalence of the intervention group produced by random allocation (Gupta, 2011). However, given the limitations to this first analysis approach and to minimise biases resulting from noncompliance, non-adherence, attrition or withdrawal (Altman & Doré, 1990; Montori & Guyatt, 2001),

analysis was performed also on an intention-to-treat (ITT) basis (Montori & Guyatt, 2001). However, these results were not reported in the present study.

Analysis of Intervention effects and testing of hypothesized mechanisms

The effects of the intervention were assessed with an analysis of covariance (ANCOVA), with a minimum significance level at $p < 0.05$. ANCOVA was chosen given that it is quite robust with regard to violations of normality, with minimal effects on significance or power (Anderson et al., 2009; S. F. Olejnik & Algina, 1984) with any differences between the groups at baseline, for the various assessments being used as covariates in the model and considered artefacts of the randomisation (Keppel & Wickens, 2004). Co-varying for baseline scores supported the analysis in two ways. First, while randomisation aimed to reduce any pre-intervention differences between the groups, residual random differences may have occurred. Accounting for such differences isolated the effect of the intervention. Partial eta-squared were used as measures of strength of association (Pierce et al., 2004). To better understand the effect size of the intervention, it has been recommended to use the differences in adjusted means (standardized mean difference effect sizes) between the two groups, as standardising can easily distort judgements of the magnitude of an effect (due to changes to the sample SD but not the population SD, which may bias the estimate of the effect size measure, such as Cohen's d) (Olejnik & Algina, 2000). As Cohen's d has been reported in other RCT and pre-post intervention studies, Cohen's d was estimated (Cohen, 1992). Finally, because the sample sizes of the two groups were unequal, Type III Sums of Squares were used for the ANCOVA.

To test the third hypothesis and the hypothesized psychological mechanisms underlying the intervention results, three different mediation analyses were performed across the chosen psychological constructs using SPSS Statistics (version 25) and PROCESS (Model 4; (Hayes, 2012; Hayes et al., 2017; Hayes & Preacher, 2014; Hayes & Rockwood, 2017)), using a non-parametric resampling method bootstrap with 5,000 bootstrapped samples and bias-corrected 95% confidence intervals, to probe conditional indirect effects for the variables examined. These analyses were performed on the ITT sample in post-intervention results.

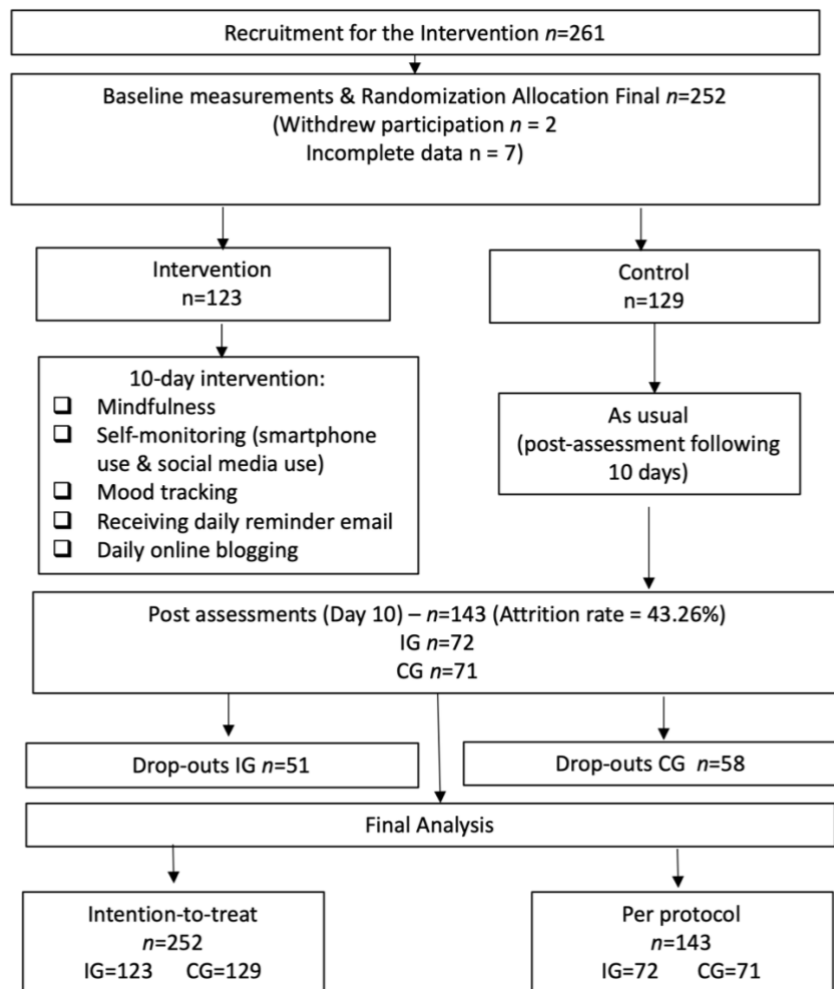


Figure 12.1 Participant flow in the intervention

12.3 Results

12.3.1 Baseline equivalence evaluation

The *t*-test results for the pre-test scores found no significant differences between the groups, indicating independence. The post-test scores were significantly lower in the intervention group. For the smartphone distraction scale, the mean pre-test score was 58.06 ($SD = 7.69$) for the intervention group and 59.72 ($SD = 8.08$) for the control group. The mean post-test score was 39.70 ($SD = 17.67$) for the intervention and 58.78 ($SD = 17.47$) for the control group, respectively. The pre-test score mean was not significantly different between groups ($t = -0.70, ns$), but the post-test score mean was significantly lower for the intervention group than for the comparison group ($t = -6.69, p < 0.001$). The pattern was similar in the results for the other variables except for NoMO, habitual behaviour, and social media use per day. Table 2 provides a summary of the baseline *t*-test and chi-square outcomes and internal consistency for each scale at each measurement period. All scales demonstrated good internal consistency for the sample considered.

Table 12.2

Per protocol baseline sociodemographic, usage data, psychological variables and pre-post intervention scale reliabilities

	Intervention (<i>n</i> =72)		Control (<i>n</i> =71)		Chi square/t- tests	Cronbach's α T1	Cronbach's α T2
Socio/demographics	<i>n</i>	%	<i>n</i>	%		-	-
Gender (female)	60	83.33	62	87.32	1.83, ns ^a	-	-
Education (under graduates %)	67	93.05	65	91.54	1.03, ns	-	-
Relationship status (% not in relation)	40	55.55	38	53.52	1.35, ns	-	-
Ethnicity (White %)	49	68.05	42	59.15	1.63, ns	-	-
	<i>M (SD)</i>		<i>M (SD)</i>		T tests		
Age	20.69 (3.27)		20.82 (3.70)		-0.20, <i>ns</i>	-	-
Smart hours/day	4.55 (2.28)		5.23 (1.89)		-0.28, <i>ns</i>	-	-
SM hours/day	2.17 (1.430)		2.47 (1.28)		-1.36, <i>ns</i>	-	-
Smart. distraction	59.52 (7.69)		57.55 (8.08)		-0.70, <i>ns</i>	.90	.88
Self-awareness	74.71(8.20)		75.00 (9.38)		-0.20, <i>ns</i>	.87	.86
Mindful Attention	3.28 (0.52)		3.40 (0.56)		-1.32, <i>ns</i>	.92	.93
Stress	24.44 (4.72)		28.78 (6.05)		-0.33, <i>ns</i>	.86	.83
Anxiety	15.93 (5.94)		16.63 (4.94)		-0.77, <i>ns</i>	.93	.90
Online vigilance	2.43 (0.48)		2.38 (0.52)		0.63, <i>ns</i>	.94	.91
Efficacy	28.04 (4.35)		28.96 (4.55)		-2.51, <i>ns</i>	.90	.88
FoMO	3.48 (1.36)		3.54 (1.34)		-0.32, <i>ns</i>	.89	.90
NoMO	77.17 (22.40)		86.32 (23.68)		-0.49., <i>ns</i>	.95	.90
Def. self-regulation	14.15 (5.32)		15.35 (5.39)		-1.50, <i>ns</i>	.89	.87
Impulsivity	14.74 (3.39)		16.27 (3.52)		-.2.64, <i>ns</i>	.85	.86
Addiction	17.15 (4.95)		17.18 (5.42)		-.035, <i>ns</i>	.91	.89
Automaticity	5.14 (1.33)		5.11 (1.20)		-0.88, <i>ns</i>	.87	.89

^aNon-significant (n.s.)

Table 12.3

Bivariate Pearson's r correlation analyses

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Distraction	1													
2. Stress	0.199 **	1												
3. Pr. SM use	0.631 **	0.173 **	1											
4. Mind.Att.	-0.523 **	-0.145 *	-0.455 **	1										
5. Self-Aware	-0.340 **	0.057	-0.318 **	-0.209 **	1									
6. Anxiety	0.460 **	0.380 **	0.435 **	0.450 **	0.242 **	1								
7. Onl. Vigil.	0.507 **	0.280 **	0.620 **	0.380 **	0.223 **	0.283 **	1							
8. Efficacy	-0.107	-0.343 **	-0.149 *	-0.101	0.148 *	-0.399 **	-0.056	1						
9. Automat	0.575 **	0.286 **	0.466 *	0.324 **	0.194 **	0.304 **	0.348 **	-0.179 **	1					
10. Impuls.	0.455 **	0.006	-0.053	-0.037	-0.522	-0.026	0.035	0.086	0.037	1				
11. Def. Self-reg.	0.333 **	0.048	0.017	0.048	-0.068	0.007	0.074	0.025	0.049	0.859 **	1			
12. Smart/day	0.314 **	-0.280	0.013	-0.128	-0.025	-0.161	0.082	0.021	-0.145	-0.008	-0.004	1		
13. SM/day	0.116	0.004	-0.025	-0.008	-0.109	0.024	-0.035	-0.111	0.061	0.154	0.168 *	0.423 **	1	
14. FoMO	0.281 **	0.323 **	0.382 **	0.103	0.310 **	0.369 **	-0.032	-0.164 **	0.235 **	0.026	0.035	0.183 **	0.180 **	1
15. NoMO	0.513 **	0.375 **	0.421 **	0.007	0.142 *	0.312 **	0.136 *	-0.209 **	0.392 **	-0.084	-0.084	0.189 **	0.096	0.341 **

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Pr. SM use: Problematic social media use; Mind. Att: Mindful attention; Onl. Vigil.: Online vigilance; FoMO: Fear of Missing Out; NoMO: Nomophobia; Def. self-regulation: Deficient self-regulation; SM/day; Social Media use/day

A series of Bivariate Pearson's r correlation analyses was conducted to examine the results obtained amongst SDs and the secondary outcomes (Table 3). Smartphone distraction correlated significantly with problematic social media use ($r(252) = 0.63, p < 0.01$), anxiety ($r(252) = 0.46, p < 0.01$), online vigilance ($r(252) = 0.51, p < 0.01$), automaticity ($r(252) = 0.57, p < 0.01$), impulsivity ($r(252) = 0.45, p < 0.01$), deficient self-regulation ($r(252) = 0.33, p < 0.01$), smartphone use/day ($r(252) = 0.31, p < 0.01$), FoMO ($r(252) = 0.28, p < 0.01$) and NoMO ($r(252) = 0.51, p < 0.01$). However, smartphone distraction correlated negatively with two variables: mindful attention ($r(252) = -0.52, p < 0.01$) and self-awareness ($r(252) = -0.34, p < 0.01$).

12.3.2 Intervention efficacy evaluation

To test H1 and assess the effect of the intervention on smartphone distraction, two separate ANCOVAs were conducted. First, to isolate any effect of the intervention, a per-protocol analysis was conducted. As depicted in Table 4, distraction outcomes decreased significantly for the intervention group from the baseline (intervention: $M = 58.06, SD = 7.69$; control: $M = 59.72, SD = 8.08$) to the post-intervention assessment (intervention: $M = 39.70, SD = 17.67$; control: $M = 58.78, SD = 17.47$), with a non-significant difference for the control group. As confirmed by Levene's test, the outcome variances were homogenous. Confirming the homogeneity of the regression slopes, the interaction between the baseline scores and the experimental group was significant. There was a main effect of the intervention group on post-intervention distraction scores after controlling for baseline outcomes ($F(1, 140) = 46.59, p < 0.001, \eta_p^2 = 0.250$). The baseline scores were not a significant predictor of post-intervention values ($F(1, 140) = 18.62, p = 0.117$). Post-hoc tests indicated there was a statistically significant adjusted mean difference ($M = -18.95, SD = 2.77, (p < 0.001)$) in reduction between IG compared to CG (Figure 2). For the ITT analysis, a main effect on the intervention group on post-intervention SDS outcomes after controlling for the baseline values was found ($F(1, 250) = 96.88, p < 0.001, \eta_p^2 = 0.28$). As indicated in Figure 2, post-hoc tests indicated there was a significant difference between IG and CG ($p < 0.001$). Comparing the estimated marginal means showed that there was an adjusted mean difference in reduction between IG ($M = 39.56$) compared to CG ($M = 58.93$). Consequently, across both analyses, this hypothesis was supported.

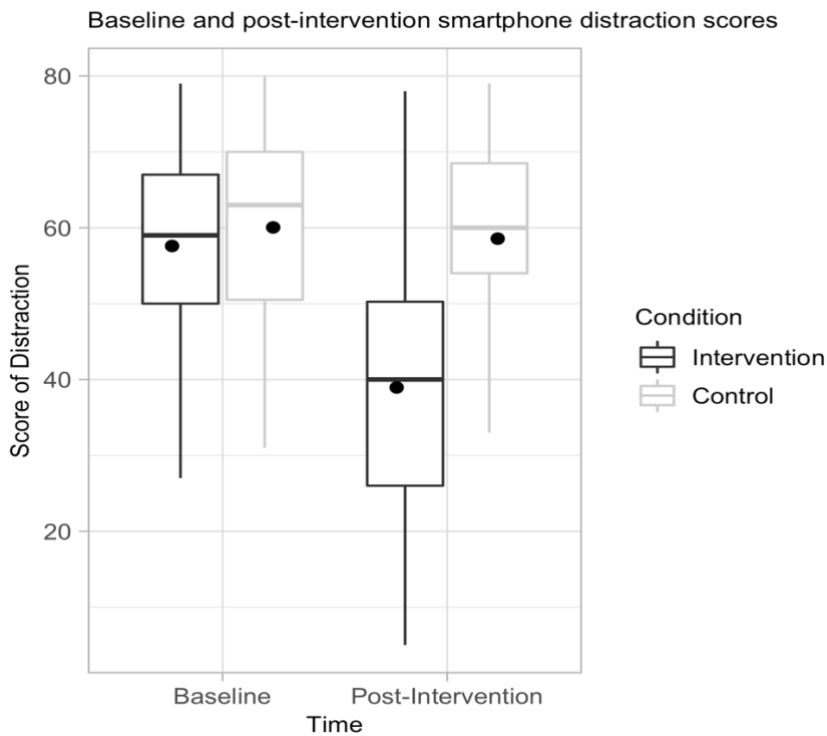


Figure 12.2 Per protocol smartphone distraction outcomes before and after the intervention

ANCOVA analyses for the secondary outcomes were also tested across both PP and ITT samples. Specifically, for the PP sample, main effects of the experimental group on post-intervention outcomes after controlling for baseline scores were found for self-awareness ($F(1, 140) = 18.19, p < 0.001, \eta_p^2 = 0.115$), mindful attention ($F(1, 140) = 16.24, p < 0.001, \eta_p^2 = 0.22$), anxiety ($F(1, 140) = 12.42, p < 0.001, \eta_p^2 = 0.08$), stress ($F(1, 140) = 23.11, p < 0.001, \eta_p^2 = 0.14$), online vigilance ($F(1, 140) = 18.66, p < 0.001, \eta_p^2 = 0.118$), FoMO ($F(1, 140) = 5.49, p < 0.001, \eta_p^2 = 0.04$), deficient self-regulation ($F(1, 140) = 6.60, p < 0.001, \eta_p^2 = 0.045$), self-efficacy ($F(1, 140) = 9.40, p < 0.001, \eta_p^2 = 0.063$), impulsivity ($F(1, 140) = 15.91, p < 0.001, \eta_p^2 = 0.10$), problematic social media use ($F(1, 140) = 6.96, p < 0.001, \eta_p^2 = 0.05$), and smartphone use/day ($F(1, 140) = 4.43, p < 0.001, \eta_p^2 = 0.03$). No intervention effects were found for the intervention group for the variables of social media use/day ($F(1, 140) = 3.697, p = 0.06$), habit strength ($F(1, 140) = 0.78, p = 0.78$), and NoMO ($F(1, 140) = 7.714, p = 0.91$). ITT analyses demonstrated similar patterns to the PP samples' outcomes.

Table 12.4

Per protocol sample (n=143) primary and secondary measures, means, SDs, effect sizes and F-values for between-group comparisons

Measure	Experimental (n=72)		Control (n=71)		Effect <i>F</i>	Effect size ηp^2	Cohen's <i>d</i>
	Pre	Post	Pre	Post			
	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>	<i>M(SD)</i>			
Smart.Distractio	59.52 (7.69)	39.01 (17.67)	57.55 (8.08)	58.67 (17.47)	46.59***	0.25	1.11
Self-awareness	74.71 (8.20)	83.30 (9.89)	75.00 (9.38)	76.25 (10.25)	18.19***	0.12	0.69
Mind.Attention	3.28 (0.52)	3.97 (0.69)	3.40 (0.56)	3.37 (0.76)	16.24***	0.22	0.82
Stress	24.44 (4.72)	24.10 (4.63)	28.78 (6.05)	27.94 (5.24)	23.11***	0.14	0.77
Anxiety	15.93 (5.94)	14.75 (4.43)	16.63 (4.95)	17.44 (4.42)	12.42***	0.08	0.60
Vigilance	2.43 (0.49)	1.98 (0.63)	2.38 (0.52)	2.39 (0.52)	18.66***	0.12	0.70
Self-efficacy	28.04 (4.36)	32.32 (5.08)	28.96 (4.55)	29.99 (5.05)	9.40***	0.06	0.46
FoMO	3.48 (1.36)	2.86 (1.16)	3.54 (1.34)	3.32 (1.22)	5.49***	0.04	0.39
NoMO	77.17 (2.40)	78.03 (2.72)	86.32 (23.6)	79.50 (2.74)	7.71	-	-
Def. self-reg.	17.16 (6.70)	14.00 (5.32)	17.61 (6.91)	15.32 (5.39)	6.60***	0.04	0.25
Impulsivity	17.32 (3.79)	14.74 (3.41)	17.65 (3.92)	16.27 (3.51)	15.91***	0.10	0.44
Probl. SM use	17.15 (4.95)	15.12 (4.40)	17.18 (5.42)	17.24 (5.11)	6.96***	0.05	0.44
Automaticity	5.14 (1.33)	4.77 (1.30)	5.11 (1.20)	4.98 (1.59)	0.78	-	-
Sm. use/day	2.92 (1.75)	2.17 (1.44)	2.89 (1.52)	2.47 (1.28)	3.70	-	-
Smart. use/day	4.51 (2.28)	3.51 (1.88)	4.45 (1.89)	4.11 (1.68)	4.43***	0.03	0.34

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

12.3.3 Intervention effects based on distraction severity

In order to evaluate the effects of the intervention in the intervention group based on level of distraction and to assess whether the effects were consistent in the intervention group independent of degree of distraction, participants were classed into two categories of high distractors vs. low distractors depending on perceived distraction level. A median-split analysis with high vs. low distractor levels was determined by scores above vs. below the median and these were separately analysed inside the intervention group. Therefore, a two-way mixed ANOVA with time (pre-test and post-test) as within-factor and distraction severity (high and low distraction) as between-factor was performed to investigate the impact of the intervention (time) and degree of distraction (high vs. low) as assessed at baseline on distraction levels at post-intervention. This analysis was conducted only for the dependent variable for which the interactions were found to be significant.

Results indicated there was a significant main effect of the intervention $F(1,70) = 77.17, p < 0.001$. There was a significant main effect of distraction $F(1,70) = 21.48, p < 0.001$ with high distractors ($M = 48.67$) benefiting more than the low distractors ($M = 33.54$). Additionally, there was a significant interaction between

the distraction status (high vs. low) and the degree of distraction $F(1,70) = 20.10, p < 0.001$. No significant interactions were found for self-awareness ($F(1,70) = 1.07, p = 0.32$); stress ($F(1,70) = 0.17, p = 0.68$); online vigilance ($F(1,70) = 0.98, p = 0.32$), deficient self-regulation ($F(1,70) = 0.22, p = 0.64$), self-efficacy ($F(1,70) = 0.22, p = 0.64$), anxiety ($F(1,70) = 1.73, p = 0.19$), and social media use ($F(1,70) = 19.28, p = 0.30$). However, significant main effects were also found for self-awareness ($F(1,70) = 30.05, p < 0.001$), deficient self-regulation $F(1,70) = 20.10, p < 0.001$, stress ($F(1,70) = 47.95, p < 0.001$), online vigilance $F(1,70) = 42.07, p < 0.001$, problematic social media use $F(1,70) = 9.94, p < 0.05$; FoMO ($F(1,70) = 10.33, p < 0.001$) and smartphone use/day ($F(1,70) = 53.12, p < 0.001$).

12.3.4 Mediation analyses

More specifically for mediation 1, the intervention group was the proposed independent variable in these analyses, mindfulness was the proposed mediator, and smartphone distraction was the outcome variable. For mediation 2, stress was the proposed independent variable in these analyses, online vigilance was the proposed mediator, and smartphone distraction was the outcome variable. For mediation 3, smartphone distraction was the predictor, social media addiction was the outcome and online vigilance was the mediator. Analysed variables included the T1 scores on the constructs examined as covariates to account for pre-intervention performance.

For mediation 1, it was hypothesized that mindful attention would mediate the relationship between the intervention and smartphone distraction (Table 5). No mediation effect was found for mindful attention on the variables. However, a main effect of the intervention on smartphone distraction (path a: $b = -0.67, t = -8.23, p < 0.001$) was found, but no main effect of mindful attention on smartphone distraction (path b; $b = 1.16, t = 0.67, ns$).

For mediation 2, it was hypothesized that self-awareness would mediate the relationship between the intervention and smartphone distraction (Table 5). An indirect effect was found on self-awareness on the variables ($a \times b: b = -2.02, BCa CI = [-3.10, -1.59]$), indicating mediation. The intervention significantly predicted self-awareness (path a; $b = -6.78, t = -4.32, p < 0.001$) and self-awareness significantly predicted lower levels of smartphone distraction (path b; $b = 0.30, t = 4.02, p < 0.001$).

For mediation 3, it was hypothesized that online vigilance would mediate the relationship between distraction and social media addiction (Table 5). An indirect effect was found on self-awareness on the variables ($a \times b: b = 0.02, BCa CI = [0.01, 0.03]$), indicating mediation. The intervention significantly predicted self-awareness (path a; $b = -0.01, t = -3.32, p < 0.001$) and self-awareness significantly predicted lower levels of smartphone distraction (path b; $b = 1.66, t = 4.02, p < 0.001$).

Table 12.5

Mediation effects of mindful attention and emotional self-awareness on intervention effects and smartphone distraction and online vigilance on smartphone distraction and social media addiction (n=252)

Predictor	Outcome	Mediator	<i>ab</i> (<i>B</i>)	<i>a</i>	<i>b</i>	<i>c</i>	<i>c'</i>
Intervention	Smart.Distract.	Mindful Att.	-.79 [-3.10-1.59]	-.67[-.84, -.51]	1.16 [-2.25, 4.58]	20.75 [16.35, 25.16]	21.55 [16.62,26.48]
Intervention	Smart.Distract.	Self-aware	-2.02 [-3.97, -.35]	-6.78 [-9.15, -4.40]	.30 [.07, .52]	20.91 [16.59, 25.22]	22.93 [18.38, 27.48]
Smart. distract.	Probl. SM use	On.vigilance	.02 [.01, .03]	.01 [.01, .015]	1.66 [.78, 2.54]	.11 [.08, .13]	.089 [.06, .12]

12.4 Discussion

The present study tested the efficacy of an online intervention employing an integrative set of strategies—consisting of mindfulness, self-monitoring and mood tracking—in assisting young adults to decrease levels of smartphone distraction and improve on a variety of secondary psychological outcomes, such as mindful attention, emotional awareness, stress and anxiety, and perceived self-efficacy, as well as to reduce stress, anxiety, deficient self-regulation, problematic social media use and smartphone-related psychological outcomes (i.e., online vigilance, FoMO and NoMO). Results of the present study provided support for the online intervention effectiveness in impacting these outcomes. Findings suggested that students receiving the intervention reported a significant reduction in the primary outcome of smartphone distraction, unlike students in the control group who reported a non-significant reduction in smartphone distraction. In terms of the secondary outcomes, participants in the intervention condition experienced a significant increase in self-awareness, mindful attention, and self-efficacy, and a significant decrease in smartphone use/day, impulsivity, stress, anxiety, deficient self-regulation, FoMO, and problematic use. No significant results were found for social media use per day, habitual/automated use and NoMO.

According to the findings of the present intervention, it appears likely that practising mindfulness and monitoring mood and smartphone activity could lead to a desired behavioural change towards less distraction and less perceived stress with carry-over effects in self-awareness and self-efficacy, similar to interventions for other mental health problems (Bakosh et al., 2018; Bennike et al., 2017; Cavanagh et al., 2013; Gámez-Guadix & Calvete, 2016; Hill & Updegraff, 2012; Hölzel et al., 2011; Mrazek et al., 2013). These findings are consistent with the growing body of research indicating that mindfulness and self-monitoring are effective strategies to increase self-awareness and reduce stress (Auer & Griffiths, 2015; Bennike et al., 2017; Bonello & Griffiths, 2019; Calvete et al., 2017; Cavanagh et al., 2013; S. M. Gainsbury, 2014; Glück & Maercker, 2011; Ophir et al., 2009). Mindful attention could enhance awareness of individual media behaviour by: (i) raising understanding and awareness of disruptive media multitasking activities (i.e., predictors, patterns and effects), and (ii) raising awareness of different strategies for coping with digital distraction and of which strategies are most effective. Second, self-monitoring could help in developing an understanding of media habits and time spent on smartphone and social media activities and could curb perceived excess smartphone interaction, consistent with other study findings (Bakker & Rickard, 2018; Biddle et al., 2015; Kauer et al., 2012; Kazdin, 1974). Therefore, strategies employing increased mindfulness practice and self-monitoring

could aid attentional capacity and self-awareness, which is considered a necessary condition in the behaviour change process of risky behaviours (Prochaska et al., 1992; Prochaska & Velicer, 1997).

Third, mood tracking could enhance awareness of triggers of negative mood and ensuing negative emotional states acting as drivers for distraction. It appears that the same technologies which may impact negatively on young people may be used to leverage smartphone use (Bakker et al., 2018a) and deflect psychological distress if evidence-based behaviour change strategies are applied. Intervention strategies such as mindfulness and self-monitoring may encourage increased self-awareness and thus help reduce distraction levels and increase mindful attention.

The intervention was also successful in reducing secondary outcomes, such as stress levels and FoMO, and it had a positive effect on emotion regulation and loss of control levels. Distraction appears to be associated with higher access to social media content and is mediated by online vigilance. Salience of smartphone-mediated social interactions (i.e., the salience dimension of online vigilance) has been found to be negatively related to affective wellbeing (Johannes, Meier, et al., 2019). It has been reported that emotional dysregulation mediates the relationship between psychological distress and problematic smartphone use (Squires et al., 2020). Higher self-regulation online has been identified as a moderator between need to belong and problematic social media use in young people (Ostendorf et al., 2020) and emotion dysregulation as a mediator between insecure attachment and addiction (Liese et al., 2020). Although distraction is an emotion regulation strategy with a protective function against emotionally distressing states (Borkovec & Roemer, 1995) and dysphoric mood (Kuehner et al., 2009), or is used for adaptive coping (Colder Carras et al., 2018; Huffziger et al., 2009), deficits in attentional control, such as distraction, may also be implicated in stress, anxiety or other affective disorders (Denkova et al., 2010b) and in generalized anxiety disorder with core cognitive symptoms related to excessive thoughts and deficits associated with increased perseverative worry (Armstrong et al., 2011). Therefore, higher mindful attention and monitoring of mood may have influenced the reduction of distraction and the enhancement of emotional control.

Mediation analyses were also performed to understand the relationships between intervention effects on smartphone distraction via two mediators, mindful attention and self-awareness, and of online vigilance on the relationship between distraction and social media addiction. Mediation effects were significant for the relationship among intervention effects and distraction via self-awareness, and for distraction and problematic social media use via online vigilance, indicating that self-awareness could be a potential behaviour strategy to mitigate distraction levels. However, the relationship among intervention effects and distraction was not significant via mindful attention as a mediator. Therefore, in the present study it appeared that despite its statistically significant increase, mindful attention was not a mediating factor for distraction in the intervention. Mindful attention could potentially be the vehicle to increasing emotional self-awareness (Gámez-Guadix & Calvete, 2016; Hill & Updegraff, 2012; Mrazek et al., 2012), prompting more controlled smartphone interactions. On the contrary, online vigilance was found to be a mechanism associated with smartphone distraction and problematic social media use, given the strong preoccupation with the content prompted even by the mere presence of smartphones, confirming previous findings (Johannes, Veling, et al., 2019).

Therefore, despite its protective function, distraction may concurrently serve as a gateway to increased smartphone engagement and time spent on devices. Time spent alone is not a defining factor and it has been argued instead that the interaction of content, context and time spent, as well as the meaning attached to these interactions, may determine the level of problematic media use (Griffiths & Szabo, 2014; Throuvala et al., 2019). Within smartphone use, distraction is a salient behaviour with evidence that distraction and mind-wandering are associated with online vigilance, which via reduced mindfulness may be associated with decreased wellbeing (Johannes et al., 2018). Furthermore, inattention symptoms have been implicated in risk for smartphone addiction and problematic smartphone use (Panagiotidi & Overton, 2020). Therefore, handling distraction, which has neural correlates (Schmitgen et al., 2020), may be the means to resisting cue reactivity, implicated in smartphone addiction, in reduced cognitive performance (Denkova et al., 2010a) or in obsessive-compulsive symptoms (Kempf et al., 2020). Further research is required to assess these cognitive and emotive dimensions of smartphone distraction and its effects on engagement in line with current trends (Wegmann & Brand, 2020). However, it has been proposed that the construct of distraction extends beyond the debate on smartphone addiction by considering the role of the smartphone in coping with negative emotions and addressing preference for online vs. offline communications (Pancani et al., 2019).

Research is still conflicted in relation to the cognitive function of distraction. Experimental smartphone research has provided initial evidence that social apps compared to non-social apps on smartphones do not capture attention despite their perceived high reward value (Johannes, Dora, et al., 2019; Levine et al., 2013), but other studies support a high interference effect (Boer et al., 2019). Therefore, more research is required to elucidate the mechanisms of digital distraction and delineate how digital technologies, individual choices, and contexts affect individuals' attention spans and attentional loss, as well as mental health conditions, such as ADHD and anxiety and overall psychological wellbeing (Kushlev et al., 2016). The present RCT assessed the effectiveness of the impact of the use of mindfulness, self-monitoring, and mood tracking delivered through interaction with smartphone apps in reducing distraction arising from recreational smartphone use and social media use. The findings suggest that engaging with the aforementioned practices was effective in reducing distraction levels, stress, anxiety, deficient self-regulation, impulsivity and smartphone-related psychological outcomes, and improving mindful attention and emotional self-awareness and self-efficacy.

Some limitations need to be taken into consideration. First, a convenience sample of university students was used, which hinders the generalizability of the findings to other groups (i.e., older adults or children). However, this population was considered of primary interest for the study because university students are digital natives liable to experience negative academic consequences due to vulnerability to problematic smartphone use (Rozgonjuk, Elhai, Ryan, et al., 2019).

The effect sizes found in this RCT were medium to large for the variables examined, exceeding the expected range for low-intensity, non-clinical interventions (Richards et al., 2010). However, as a result of the main recruitment protocol, the intervention may have attracted participants who had an interest in the outcomes and a potential self-assessed vulnerability. Therefore, the voluntary, self-selected nature of participation could have introduced a significant degree of participant response and confirmation bias (Althubaiti, 2016), resulting in the medium to high effect sizes. Additionally, the high drop-out rates, consistent with other online RCTs (Melville et al., 2009), could have significantly affected the strength of the findings (Dumville et al., 2006),

and the use of a passive control group might have led to an overestimation of the effects (Furukawa et al., 2014). Due to the use of market-available apps, actual adherence and engagement with the intervention was not accounted for, nor were reasons for dropout (Christensen et al., 2009). Therefore, the findings should be treated with caution and replicated in future designs. Future studies should systematically address response bias and include methods in the RCT to improve the accuracy of self-reported data (Andrews et al., 2015; Y.-H. Lin et al., 2015). Combining self-report with behavioural data (Bauman et al., 2018), ecological momentary sampling (Davis et al., 2019), psycho-informatics and digital phenotyping, the provision of a digital footprint for prognostic, diagnostic and intervention purposes (Baumeister & Montag, 2019), could enhance the ecological validity of the study. Equally, incorporating the measurement of brain activity using magnetic resonance imaging (MRI) in interventions could greatly enhance accuracy of assessment of prevention efforts and understanding of the role of neurobiology in behaviour (Garrison & Potenza, 2014; Suckling & Nestor, 2017).

The impact of the intervention on gender was not examined because this university student sample consisted mainly of female participants. Considering the gender differences reported in smartphone use (Andone et al., 2016; van Deursen et al., 2015) and in attention processes (Feng et al., 2011), future studies should explore its effect, which could have significant implications for the intervention and prevention of attention failures and poor student outcomes (J.-Y. Wu & Cheng, 2018). Additionally, the study design did not manage to provide a longer intervention period due to the lack of freely available apps for participants to use and did not include a second follow-up period to track maintenance of long-term effects, as is customary in RCTs, or the use of qualitative process evaluation for a critical understanding of impact of the intervention components (Albright et al., 2013). Finally, social, economic and family conditions as well as other issues, which are critical to young people's psycho-emotional states and sense of identity, were not accounted for in the present study (Alegría et al., 2018; Macintyre et al., 2018).

Despite these limitations, the study provides initial evidence for efficacy of strategies in curbing smartphone distraction and adds to the limited body of knowledge of cognitive-emotive processes in smartphone and social media use (Wegmann & Brand, 2020). It also contributed to the still limited knowledge on interventions in smartphone distraction and constitutes a simple, first-step, low key intervention programme, which may be practised by individuals seeking support for attentional difficulties on a self-help basis or within a stepped-care clinical framework for prevention purposes (Bakker et al., 2016). Experiencing distraction from smartphones and social media content, interferes with high-level cognitive processes and has productivity and emotional implications (i.e., stress) in various contexts and situations (Garland et al., 2015; Posner, 1980; Risko, 2019; Russell, 2019; Wegmann et al., 2020), being further compromised by digital triggers and the structural design of smartphones prompting salience and reactivity (Wegmann et al., 2017).

These results have clinical implications as low-intensity interventions may prevent small scale emotional problems from developing into clinical disorders and can reduce incidences of mental health problems (Boehm et al., 2012; Trudel-Fitzgerald et al., 2019). Practitioners may also find value in using mindfulness and monitoring practices as an adjunct to therapy for problematic use of smartphones. It may be of high value for academic institutions to build specific university-based programmes on maintaining balanced technology use, tackling unregulated and promoting positive smartphone use, or guiding students towards

suitable methods to address attention problems more effectively (Stellefson et al., 2011; van der Heide et al., 2017). Apps may also be utilized by schools for students that are faced with attentional/excessive use difficulties and in assisting young people to become aware of their emotions in preparation for learning more adaptive coping strategies. Distraction is an emergent phenomenon in the digital era considering that the boundaries between work and recreation are increasingly blurred with both domains arguably dependent on the use of digital media (Chen et al., 2020). More research on attentional processes within smartphone use could aid the understanding of these processes and impacts experienced across different age groups.

12.5 Conclusion

Psychological low-cost interventions may be effective in addressing precursors of problematic behaviours and enhancing wellbeing dimensions. The aim of the present study was to assess the efficacy of an RCT combining evidence-based cognitive-behavioural strategies to reduce distraction from smartphone use, increase mindful attention, emotional self-awareness and self-efficacy and reduce stress, anxiety, deficient self-regulation and smartphone related psychological outcomes (i.e., online vigilance, FoMO and NoMO). Second, it tested the mediating effect of mindful attention and self-awareness of the intervention on distraction, and of online vigilance on the relationship between distraction and social media addiction.

Findings suggested that students receiving the intervention reported a significant reduction in the primary outcome of smartphone distraction, whereas students in the control group reported a non-significant reduction in smartphone distraction. In terms of the secondary outcomes, participants in the intervention condition experienced a significant increase in self-awareness, mindful attention and self-efficacy and a significant decrease in smartphone use/day, impulsivity, stress and anxiety levels, FoMO, deficient self-regulation and problematic social media use. No significant results were found for duration of social media use/day, habitual use and NoMO. Mediation effects of the intervention were also observed on distraction and problematic social media use via the mediators of emotional self-awareness and online vigilance in mitigating distraction levels. Mindful attention was not found to be a mediating process for reducing distraction in the intervention.

Research on digital distraction is still scarce, yet there is increasing interest in cognitive impacts within digital environments. More evidence is required to assess the nature of attention failures and difficulties occurring both in normative and excessive online use. This evidence would allow an understanding of the prevalence and the nature of these difficulties, as well as their integration in intervention media literacy and risk prevention programmes, enhancing wellbeing, productivity and academic performance.

The following Chapter will present a synthesis of all the studies in the present thesis and will offer recommendations for prevention based on these outputs. The Chapter will also address theoretical and practical implications of the present thesis and the final conclusion.

Chapter 13: Synthesis

The present thesis took a stakeholder and mixed methods approach to understanding problematic adolescent digital engagement, defined prevention priorities and identified a common concern amongst stakeholders, namely distraction, an emergent psychological construct in the smartphone literature. By engaging young people, parents and educators in the media literacy process and prevention, professionals and governments can ensure that prevention programmes will be useful and relevant to its stakeholders (American College of Pediatricians, 2020). Additionally, a common stakeholder concern emerged, namely distraction, which will increasingly be one of the most fundamental challenges in a digitally interconnected environment (Aagaard, 2015) and therefore this thesis addressed this emergent issue and tested an efficacy intervention to reduce it. Therefore, the present thesis consisted of four main studies: (i) two systematic literature reviews assessing the efficacy of school-based prevention, (ii) five qualitative studies on stakeholders' views on concerns over perceived online harms and recommendations for school-based interventions, (iii) the development and psychometric validation of an assessment tool to measure perceived smartphone distraction, emerging as a key concern by stakeholders and (iv) an efficacy intervention study to reduce smartphone distraction.

Given that schools are a convenient, cost-effective way for interventions providing access to a large number of students, the studies focused on school-based prevention. Both reviews presented with few and heterogeneous interventions with mixed efficacy findings and presented recommendations for future designs in the respective intervention areas beyond time spent on the activities, in line with emerging evidence (Sauter et al., 2020). Expanding on those reviews, and given the scarcity of triangulated data in cyberpsychology, an empirical investigation of qualitative nature was undertaken across three groups of stakeholders: students, parents and teachers. The first empirical study involved an exploration of *key motivations* for adolescent online uses and motivations for social networking site use as conceptualized by adolescents. Findings offered a fresh understanding of the key drivers of normative adolescent social media behaviour and suggested an alternative motivational factor, that of need to control relationships, content, self-presentation and impressions, which may be implicated in problematic use. The respective Chapter (4) addressed how the need to control may underlie FoMO and nomophobia and could therefore be responsible for increasing engagement or compulsive use.

A second qualitative study was conducted exploring adolescents' *psychological mechanisms of engagement* in the form of psychological processes as these develop in their everyday interactions via social media. The resulting concepts related to individual (cognitive and emotive), social, and structurally-related processes, highlighting a synergy between the processes, conceptualized as the '*control model*' of social media engagement. The findings highlighted a dynamic interplay between the processes as mutually determining the quality and intensity of the interaction and provided an ecological framework of key psychological processes in adolescent social media engagement.

Moreover, understanding stakeholder conceptualizations - student, parent, and teacher - for *online-related psychological harms* experienced by adolescents was sought in order to develop a more coherent understanding of perceived impacts and potential harms as perceived by each stakeholder group. Impacts were conceptualized as running on a continuum from positive to negative uses and their severity depending on the

role of social media and gaming on the overall context in an adolescent's life. Second, negative impacts across stakeholder group were conceptualised as (i) *time displacement impacts*, (ii) *peer judgement impacts* (content) and (iii) *context-related impacts*. Concerns spanned various domains of functioning from physical (i.e., sleep), psycho-emotional (i.e., anxiety, loss of control) and cognitive (i.e., temptation-distraction), affecting both the individual and relationships on both an interpersonal and an intrapersonal level. These findings therefore suggested heterogeneous challenges and potential harms – *beyond just e-safety and the risk of addiction* – but rather having to do with emotional health and depending on personal circumstances and vulnerabilities may become contribute to poor youth mental health and well-being. The need therefore for emotionally healthy schools endorsing positive mindsets and addressing these adolescent challenges requires an urgent response.

Parental perspectives endorsed the need of whole school, emotionally healthy school environments. Since this is the first generation of parents raising children with active continuous engagement in social media, gaming, and other activities in the online environment, according to parents, school interventions were perceived as needing to work along parents to: (i) prevent excessive or problematic use, (ii) enhance parent-child communication, and (iii) help reduce conflicts within the family environment. It was further suggested how changes in policy could adequately support prevention. Themes across teachers and parents highlighted: (i) schools to serve as educational and prevention hubs for information and mediation and incorporate digital education in the formal education system, (ii) provision of public health communication to raise awareness, resolve ambiguity regarding impacts and mitigate excessive use and impacts, and (iii) intervention needs to address time-related, content-related and, context-related impacts, and skill development. Policy recommendations were viewed as timely and necessary to support the parental role and the mitigation of issues, and schools were suggested to be instrumental in providing access to parental education.

School life is critical to adolescent context and therefore teacher perspectives were also considered following the parental views. Teacher recommendations suggested that schools experience a digital transition and the need to redefine expectations to adapt to current needs and prevention efforts. Proposals suggested a modular and developmentally-informed approach for digital harm prevention in schools and to similarly to parental recommendations to prioritise and foster mental and physical health balance through skill development. It was also recommended to educate not ban and provide institutional support for an increasing pastoral role the teachers have to assume towards pupils with emphasis on mental health and contact with parent communities. To achieve this, findings therefore suggested an increasing need for evidence-based training of professionals and education providers to support training needs, confirming previous evidence (Blum-Ross & Livingstone, 2016) and highlighted changes needed in children's digital literacy and mental health promotion.

Therefore the above-mentioned qualitative studies' findings corroborated stakeholder consensus on addressing current gaps in school education and mental health literacy parallel to an urgent demand to impose external regulation and accountability to the gaming industry and social media providers in line with recent findings (Stevens et al., 2021).

External regulation initiatives for online child protection addressing current policy gaps implemented on a national or European level are important legal and regulatory provisions for child protection. Initiatives such as the improvement of age verification systems or age-appropriate design (Science and Technology Committee

- House of Commons, 2020) or compliance with the Audiovisual Media Services Directive (AVMSD) (European Commission, 2020) for child safety and privacy can safeguard children from a technical, policy and legal perspective. However, stakeholder recommendations primarily encompassed strategies to strengthen adolescents' internal regulation and psychological readiness to cope with emotional challenges and the role of the school and parent community voice in regulatory frameworks. These recommendations mainly proposed the following: i) add a formal emotional wellbeing component in education addressing the diverse challenges from online uses, (ii) a systematic interaction between government and key societal institutions (i.e., operators, schools, families) to address activity specific (i.e., games vs SM) and platform specific impacts (i.e., Instagram vs Tiktok) while constantly adjusting to the ever changing technological products, and (iii) focus on the development and practice of key psychosocial skills and competencies across the developmental lifespan. Additionally,

The last two empirical studies focused on assessing smartphone distraction and the efficacy of an online randomized trial, given that distraction was highlighted as a major concern by stakeholders and a critical construct within educational settings (Fu et al., 2020). Research on distraction and its association to problematic smartphone usage is still scarce and to date there is no available assessment tool to measure the construct. The psychometric study involved the development, validation, invariance and latent mean differences of a 16-item measure, the SDS. Findings indicated that SDS is best conceptualized within a four-factor structure and proved to be valid, reliable, and highly suitable for measuring smartphone distraction amongst young adults.

The final study involved an evidence-based, online randomized controlled trial with the use of freely available smartphone apps in young adults in the UK. Participants were asked to engage in monitoring, mindfulness and mood tracking through freely available smartphone apps and complete pre- and post online assessments measuring the efficacy of the intervention on a number of outcomes. Participants of the intervention condition were engaged in: (i) self-monitoring of social media use, (ii) voluntary abstinence from overused platforms, and (iii) brief mindfulness sessions and mood tracking, while registering their user experiences daily to reinforce commitment. Results suggested that the intervention was effective in reducing distraction and stress levels with medium effect sizes, adding to literature suggesting that brief targeted interventions may facilitate substitution, lifestyle change and prevent time, frequency and symptom severity (Park et al., 2020).

13.1 Limitations and Directions for Future Study

Limitations of the studies undertaken and direction for future studies have been reported in the individual chapters. Some overall limitations of the studies and future recommendations are presented here.

The initial studies were qualitative, limiting generalizability of the findings and the quantitative studies were cross-sectional. The results were correlational with the use of self-reported measures (Pluck, 2020). The use of self-report measures is likely to render findings which may exaggerate any associations with mental health problems (Lange, 2020), however, self-report measures have been found to systematically underreport usage behaviours.

In relation to the psychometric validation, given that the analysis already revealed the multi-determined nature of smartphone distraction, it is possible that other psychological factors mediate or moderate distraction, which may have not been captured in the current conceptualization. Finally, the aim was to construct a validated instrument that can measure distraction in a uniform and psychometrically robust manner but this remains to be tested across other demographics and allow cross-cultural comparisons.

In terms of the intervention, the lack of a custom-made smartphone app for the intervention did not allow for passive smartphone tracking or behavioural data which would offer more objective usage data (Messner et al., 2019). As a result, effect sizes should be viewed with caution, and therefore the explanations provided regarding the efficacy of the intervention remain tentative.

Future research to complement the understanding of issues should include longitudinal and clinical studies across the developmental span to address:

- Executive function disruptions/neuroimaging data in normalised/excessive/addictive use
- Account for context, i.e., family/school/peers and contextual interactions on usage and harms
- Shed further light on mediating and moderating variables and processes (Walther, Hanewinkel & Morgenstern, 2014)
- Validate findings that could inform a promising curriculum for the prevention of harms and hazardous and addictive gaming
- Assess gaming disorder within overall adolescent screen time and its overall share in the ‘digital diet’ of adolescents, as there is evidence for physical and psycho-emotional impacts of sedentary behaviours (e.g., associations with obesity, coronary heart disease, anxiety)
- Assess further SD cross-culturally and with other age groups and test a model in relation to problematic SU and SMU
- Share best practices and dissemination of results of programme evaluations

Finally understanding the use of screen time within the family environment would offer insights in the communication patterns and how these develop in relation to the use of technologies, as well as, gender-related differences (Twenge & Farley, 2020).

13.2 Theoretical Implications

The present thesis made the following theoretical contributions to the scant evidence base on online harm prevention by:

1. Offering a process-oriented conceptualization of motivations, online impacts and harms experienced in adolescence using a multiple stakeholder approach
2. Developing a new psychological model explaining the processes involved in online engagement and how these could be implicated in problematic use and in the addiction process
3. Assessing a new theoretical model of distraction within the smartphone literature
4. Developing and testing the first assessment tool to measure SD

5. Conceptualizing, developing and assessing an evidence-based, low-cost intervention to reduce distraction levels from smartphone use.

A theoretical model for social media engagement

The compelling theoretical advance of this thesis is a dynamic, process-oriented, triangulated conceptualization of perceived motivations, online harms by adolescents and school-based recommendations to prevent these concerns. This exploration was followed by the development of a theoretical model of engagement based on the psychological mechanism of control of social relationships and interactions, content creation and self-expression, which underpins adolescent motivations for social media use. Previous accounts for engagement detailed recreational and communication motives, however, this mechanism has not been proposed in the literature as underlying motivations. Need to control which is a psychological and biological human necessity (Leotti et al., 2010), was identified as being potentially implicated in higher and more prolonged engagement in social media and may account for more compulsive and dysfunctional online use in adolescence, which requires further investigation. These novel findings therefore have important implications, attending to a more process-oriented understanding of addictive proclivity rather than a categorical one. A second theoretical advance pertains to the conceptualization, development and assessment of an emergent psychological assessment tool in the smartphone literature, and an evidence-based intervention to reduce it. Specifically the following implications could be highlighted:

A process-oriented model of online challenges and impacts considering individual, social and environmental processes

Part of the theoretical advance in the current thesis involves the development of a process-oriented consideration of motivations, impacts and harms and associated psychological processes integrated in the control model of engagement. This has important implications regarding strategies and outcomes considered in intervention and prevention efforts as it offers a comprehensive psychological account beyond binary/categorical approaches. The control model takes into account individual, social and environmental triggers and explains how these interact and define adolescent online social behaviour.

A stakeholder approach to online harms and prevention priorities

The qualitative studies in the present thesis were the first to offer recommendations for public policy on digital harms in adolescence from a stakeholder consensus and provided new insights for collaborative efforts and policy implementation for adolescent screen time. Further it provided a nuanced approach to harms from different stakeholder perspectives.

The conceptualization, development and assessment of an emergent psychological construct in the smartphone literature: smartphone distraction

Smartphone distraction is a complex psychosocial phenomenon defined by cognitive-emotive dimensions with positive and negative valence related to attention impulsiveness, emotion regulation, online vigilance, and multitasking. The construct was discussed as an emergent issue interfering with everyday functioning and implicated in problematic smartphone and social media use and has theoretical, empirical, and practical relevance for educational and organizational research.

The assessment of an intervention testing the reduction of smartphone distraction

The current research provided initial evidence of efficacy for using smartphone apps as a low-cost, first point intervention to reduce smartphone distraction and promote insight and meta-cognitive ability in online engagement.

13.3 Practical Implications

The present thesis may help prevention efforts, which are timely and current in the policy formation stage in the UK, with *Sex and Relationships* education having been introduced in UK schools from September 2020. Findings could be embedded in the above curriculum and helpful in designing universal and selective prevention strategies and setting priorities for prevention in schools and policymaking, by providing stakeholder input on digital literacy. The present thesis highlighted the following priorities to be considered when designing prevention for PIU:

Media literacy education and emotional health and wellbeing as part of the school curriculum

Media literacy awareness should be promoted across all school stages going beyond e-safety to address psychological harms, create insight and awareness of personal engagement and encourage agency, as this was the main commonality across stakeholders. This should be fostered by social policy initiatives that promote nurturing home and school environments (Abi-Jaoude et al., 2020). These initiatives should include workshops within PSHE that go beyond awareness raising to focus on skill enhancement (i.e., self-control self-regulation, empathy) based on case studies, scenarios and experiential, interactive activities (Shek & Wu, 2016; Throuvala et al., 2019). Additional to the above, more personalized approaches on individual student digital footprint could provide adequate insight and self-evaluation. This could include screen time and activity-specific measurements and objective setting, or reduction-self-improvement goals as compared to time spent on physical activity. The digital intervention provided initial evidence that self-monitoring, mood tracking and mindfulness practices may aid reducing distraction and potentially other habitual responses (e.g., compulsive checking), which may act as precursors to behavioural disorders. A longitudinal IA preventive education from an early age has been recommended (Nakayama et al., 2020).

Schools as prevention hubs applying a ‘whole child’ approach

Brief interventions, which are currently employed, present with mixed effects compared to assessment-only controls (Carney et al., 2016) and given the strong habitual nature of online uses and the environmental context that provides constant attraction and reinforcement for engagement, may weaken the effects of such intervention initiatives. Therefore, a more longitudinal and systematic framework was suggested by parents, reflecting principles of ‘whole school’ approaches. Promotion of ‘whole school’ approaches, which promote positive mental health and well-being of both children and the adults close to them – i.e., parents/carers, school staff – as fundamental in the school culture with the collaboration of the wider community (Anna Freud National Centre for children and families, 2018) has provided positive outcomes in countries where such approaches have been implemented and evaluated (Busch, 2014; Busch et al., 2013; Shek et al., 2011). For example, in the UK in recent years, despite the scarcity of educational resources, initiatives have been implemented in this direction: a mandatory digital citizenship programme for all schools in the UK for ages 4-14 years has been recommended by the UK Children’s Commissioner (The Children’s Commissioner’s Growing Up Digital Taskforce, 2017), there have been calls for evidence and recommendations (Griffiths et al., 2018) and a planned mental health-specific strand within the Teaching and Leadership Innovation Fund to fund training which supports the delivery of whole school approaches (Department of Health - Department of Education, 2017). Recently, the addition of *Sex and Relationships* in school curricula is another step in the same direction.

On an institutional level, the findings suggested that schools could serve as prevention hubs by educating gamers about features of habitual and addictive play, and staff could be trained to identify problem signs that may otherwise go undetected and provide peer support networks for children at-risk by liaising with families, charities and the Child and Adolescent Mental Health services (CAMHS) at an early intervention stage – prior to referral. This could save up service times and additional costs from referrals.

Findings corroborated for media literacy to begin as early as the pre-school age and continue throughout all stages of child socialization in all educational institutions (from primary to upper school) in a modular approach based on children’s interests. Developmentally appropriate approaches to reduce potential harms from smartphone and social media use and collaborative work with families and clinicians would therefore provide a ‘whole child’ approach. ‘Whole child’ approaches should include instead of a generic advise an understanding of the motivations, uses and gratifications and contextual circumstances:

- Understand meaning attributed to the activity by the adolescent
- Address cognitive distortions and rigidities
- Channel maladaptive cognitions (perfectionistic tendencies, achievement demands related to gaming, body image issues) to adaptive functions related to health, sports and school work
- Increasing intentionality in use to support purpose/functional use
- Upskill in areas where the adolescent presents a deficit (i.e. communications skills, empathy, resilience)
- Consider other activities (extra-curricular) and outlets in the child’s life beyond academic pursuits.

Recommendations for Policy on school prevention

Findings designated specific priorities for public policy, advocating that successful approaches to prevention for adolescent digital health and well-being require an intersectoral, multilevel and multi-component approach and schools and digital media provide excellent opportunities for the delivery of such coordinated actions. Providing solid systems for training, mentoring and participation of youth health advocates and peer to peer strategies along tutors has the potential to move on from traditional models of prevention to adolescent-responsive health systems (Patton et al., 2016). Further understanding of the developmental trajectories, risk and protective factors and emerging areas such as attentional loss from use of devices could offer insight into age-specific challenges. Although, with time, some youth may outgrow problematic engagement or disordered levels of use as they become adults through maturation or, in limited cases, through psychological or psychiatric interventions, consequences and harms of engagement may be severe (Derevensky et al., 2019).

13.4 Future prevention Recommendations

In addition to a formal educational component on digital contexts, a regular mandatory seminar component training school staff and parents on developments and new digital products popular with children and adolescents (Griffiths et al., 2018) was proposed by the parent community. This should take the form of regular meetings with the parent community to address concerns, which arise and discuss potential solutions regarding digital uses (Griffiths, Lopez-Fernandez, Throuvala, Pontes, & Kuss, 2018), and schools could be the best venue to achieve this. However, to aid work done in schools, regulators should enforce duty of care for operators.

Exercise corporate social responsibility (CSR)

Regarding operators, social media platforms could monitor problematic engagement and offer support services for at-risk or vulnerable individuals through the funding of mental health charities and the inpatient and outpatient units. The industry should be obliged (as food companies are obliged to report ingredients on labels) to disclose their marketing practices and business models, make them publicly available, and engage with grass roots organizations in addition to the regulator. Additionally operators should pursue collaborations and research by independent bodies to further elucidate impacts of their platforms and services across different age groups. There have been calls especially from academics for the gaming industry to engage and to put in place corporate social responsibility measures (Jones et al., 2013). CSR should produce meaningful impact and protect its very users from harm, informed by evidence-based advice from a multiple stakeholder perspective and this is the primary reason why such collaborations should be encouraged by the industry (Sindermann et al., 2020). The tobacco and gambling industry approaches can be used as a good example to model this on. The view that a stronger CSR should be assumed by the industry is increasingly voiced by gamers

Regulate games and social media psychological hooks

Regulators within the duty of care approach to minimize harms could exert more pressure to regulate specific activities. There is a need to encourage international collaboration for a global video game addiction policy framework, additional to any efforts for self-regulation, school or community efforts and create universal

design recommendations (King, Delfabbro, & Griffiths, 2010; King et al., 2017; Kottalgi, 2019; Ottosson et al., 2019). It is recommended to undertake an extensive review of other countries' best practices on digital regulation and evaluation measures, what has worked and how it has been evaluated (Király et al., 2017; Rehbein & Rumpf, 2017). Moreover, operators' business models based on practices such as intermittent reinforcement (i.e., likes, rewards), should be examined extensively, and practices which hook users psychologically, regulated. Understanding how design relates to harms prolonging vulnerability may help to draft policies, design and assess interventions on emotion regulation and skill development online in schools and communities and understand positive impacts on learning and development.

Emulate good practices from the gambling industry on regulation

Corporate responsibility practices of the gambling industry (i.e., personalized behavioural feedback) can be emulated on gaming/social media platforms (Griffiths & Pontes, 2019). Platforms could designate with a sign on content which photos have been enhanced (e.g., via use of filters). According to the UK Gambling Commission (2018), the prevalence of problem gambling has risen in 2018 to 1.7% compared to 0.4% in 2016 and 0.9% in 2017, which is partly attributed to videogames with gambling-like activities (i.e., buying loot boxes) (Griffiths, 2019). The acquisition of loot boxes or other virtual in-game items primarily targeted at children offers customization options for a player's avatar or faster progression in the game and requires real money exchange, and many operators allow the trading of in-game items for real money (Zendle et al., 2019). Pressure to reconsider the evidence regarding microtransactions [i.e., banning loot boxes or prohibiting sale to secondary markets outside the game (Chansky & Okererg, 2019)], and place age limits (restrictions to gamers over 18 years of age) are actions which ought to be addressed following other countries' examples (i.e., Belgium, The Netherlands, Japan). To date the UK have not yet accepted the potential adverse consequences of microtransactions within gaming and have therefore not yet regulated the purchase of such items (Griffiths, 2019).

Produce an operators' open data framework

In terms of operators' data, the challenge is to combine big data science with behavioural science and build multi-disciplinary teams. Big data can be combined with other sources (sensor data from various devices, e.g., mobile and desktop) to account for the full activity and create 'what if' scenarios and microsimulations to better understand harms (but also benefits) and potential impact of proposed policies in real-time (combining geolocation, frequency, duration, and content production/consumption).

Combining big data to produce real-time, cost-effective early warning systems for more timely intervention (i.e., bullying, suicide ideation, grooming, severity of depression) with experimental research and clinical applications can aid the understanding of harms across and within activities (e.g., social media, gaming, and streaming) and the interactions between real time and content (active/passive) consumption. This will enable a better understanding of the developmental trajectory of online use and related harms across early-late childhood, and early-middle-late adolescence.

13.5 Concluding Remarks

Mental health presents a high prevalence in adolescence with half of mental disorders emerging before the age of 14 years, and 75% by the age of 24 (HM Government, 2011). Therefore, promoting positive mental health is crucial in adolescence as this can help to prevent mental illness from developing and by mitigating its effects. The present thesis identified prevention priorities for online harms within school-based prevention interventions which are increasingly being used for prevention purposes (Throuvala et al., 2019a). Additionally, the present thesis identified a common area of stakeholder concern, namely distraction occurring from online engagement. A psychometric instrument was developed and validated to assess SD, an emergent psychological construct in the smartphone literature. SD is increasingly prevalent and attentional loss is implicated in cognitive interference, emotion regulation, academic performance and productivity. Increasingly reverting to distraction and overreliance on its emotion regulating capacity may be an overall functional coping strategy but in the context of smartphone use it appears to be a psychological process acting as a gateway to prolonged time spent online, checking behaviours and frequent escapism associated to emotion regulation. Finally, a randomized controlled trial tested the efficacy of an online intervention to reduce SD with positive outcomes on distraction and on a number of associated psychological issues, providing evidence on resources which may help reduce distraction when encouraging higher levels of mindfulness and meta-cognition. Practitioners, parents, teachers and policy makers should engage in a regular evaluation of online challenges and harms for children and adolescents while embracing technologies for healthy functioning and well-being.

13.6 Personal Reflection

The attention economy has redefined fundamentally the way we process and interact with our environments. For adults this has meant grappling with media literacy and making comparisons across previous offline and current virtual practices. For the current generation of children and adolescents this does not constitute a dilemma. Reflecting on the findings provided by the studies in the present thesis and particularly in relation to teachers perspectives it is prevalent that views for these stakeholders purport that use of social media and the online environment comprises of a large world of opportunities beyond the challenges and harms which may be experienced, particularly for more vulnerable adolescents.

The present thesis focused primarily on challenges and harms. As usually happens with any novel and therefore unknown innovation, there is initial scepticism, fear and focus on the negative aspects and implications, which inadvertently are part of online engagement. However, as societies become familiar and get used to this new reality of extensive digitalisation - (which covid-19 abruptly brought into the forefront) - the negative impacts will dissipate and then we will be able to focus on what is indeed harmful. This will enable us to attend to those in need of support, such as addiction-prone and vulnerable individuals and groups.

Young people are the drivers of digitalisation and of the integration of the offline and the online in all domains of life. Parents of this generation have no such experiences to draw from their own childhood and upbringing and therefore answer with ignorance and guilt for their own inability to adapt to a new reality of this generation and the generational gap, which is widening at a much faster pace than other eras. For the current generation of young people virtual reality has become a “reality” in their everyday life, integrated in their view of the world and creating another universe where digitalization is an indissoluble part of the

understanding of one's self. Digitalization, having become forcibly part of the mainstream culture through the use of online learning and everyday functioning will soon become part of our value system, forming new values and changing others. We are therefore experiencing currently a transition in our perceptions and understanding of this reality, which will soon cease to pose a threat and incur fear to adults, parents, teachers and other stakeholders surrounding young people. Virtual reality will soon then be considered as 'virtuous' reality.

FoMO and NOMO comprise young people's attempts to form relationships, which is still segregated in adult minds as 'peer interaction online' vs. 'relationships': this demonstrates how we still define these terms by ways of our own adult conceptualisation and experience, driven primarily by the mainstream parental culture, which is largely also fuelling the negative and skewed media presentation of technology use. This perception is radically different from the needs and aspirations of young people, who are growing with the reality of visiting Mars and have a completely different conceptualisation of time and space, attributing a different meaning to these terms, understood as limitless and borderless. Hence, one of the teachers' reflections appears timely: "*I think the consideration that comes to mind is whether one is targeting the right people*" (15M, 42 years) given that this is the first generation of parents and teachers who are faced with this '*problem*'.

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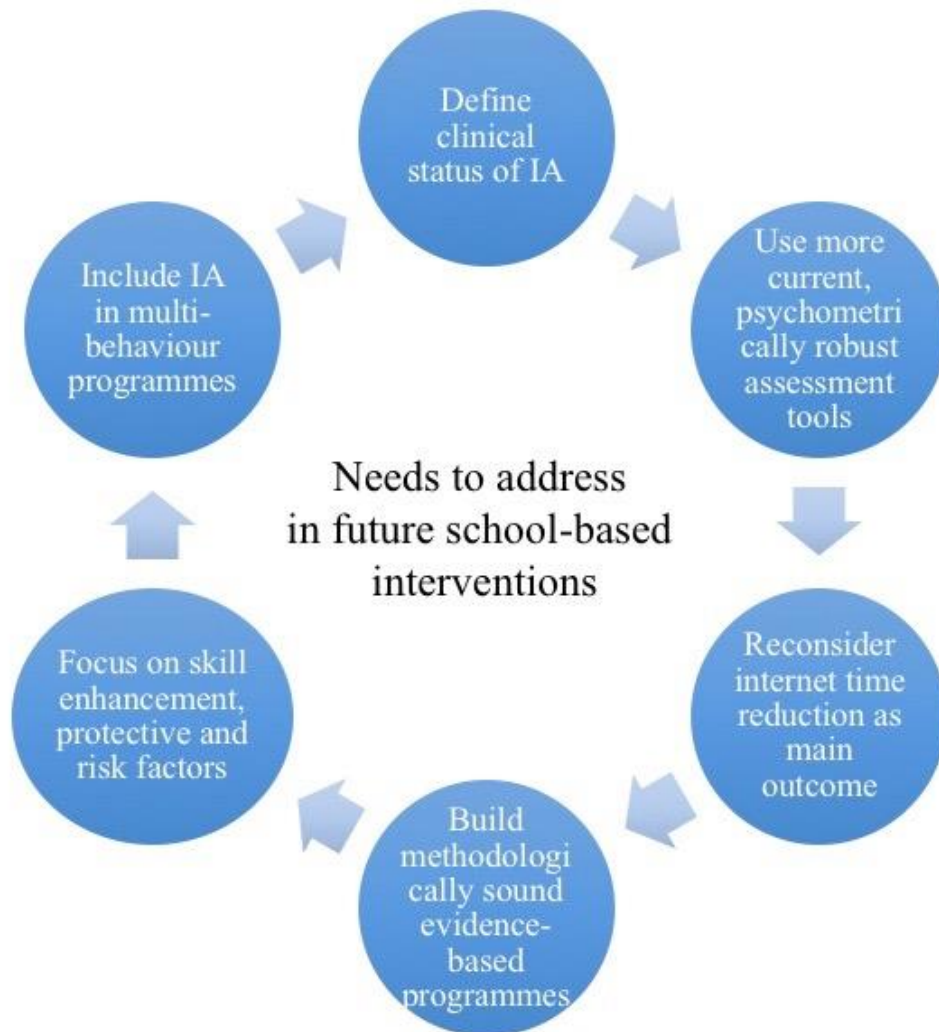
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Appendices

Appendix 1: Recommendations for school-based interventions targeting PIU and IA



Appendix 2: Discussion Guides

STUDENT FOCUS GROUPS

Students' views and experiences with internet use

What apps do you use most and why?

What is your most favourite app and why?

What is your least favourite app and why?

What games do you use most and why?

What is your most favourite game and why?

What is your least favourite game and why?

How do you feel about the time you spend online?

How do you feel about the relation between your online/offline activities?

Attitudes re perceived benefits

What other benefits do you see from being online?

Attitudes re Negative impacts/potential issues

Is there anything negative that you experience or have experienced in the past from your online use?

Does anything worry you about the way you use the Internet?

Have you ever been concerned about the way any of your friends use online apps?

Have you ever been concerned about the way a friend plays games?

Is there something you would like to change in the way you use screens/social media/gaming?

Needs assessment

What ways would help you to....

How would you feel about a school programme that would help you...

What specifically do you think the aim of such programme should be?

What would you like this programme to cover and why?

PARENTS' INTERVIEWS

Parental views and experiences with adolescents' internet use

What type of internet activities do your children get involved in?

What social media apps do they use most often?

What types of games are they engaged in?

How have you been experiencing your children's internet use?

How do you think internet use is affecting their life?

What do you think is positive regarding teenage media use?

What do you think is negative regarding teenage media use?

How do you feel about the time they spend on the Internet?

Is there something that worries you in your children's screen habits? Please explain or offer an example.

Is there something you would like to change in your children's screen habits?

Family communication/parenting screen time

Based on your experience...

How would you characterize family communication about screen time?

What type of discussions do you have with your children about screen time?

Are there any impacts of screen time on family life?

Do you have any concerns?

Needs assessment

How could schools help address your concerns?

Should prevention take place in schools?

Who should prevention target?

What should the specific aims/objectives of prevention be?

What should prevention cover?
Who according to your opinion is most appropriate to deliver prevention in schools?
How could prevention be implemented in the current educational system in the UK?
Which age groups would benefit most from prevention initiatives?
How can the family benefit from prevention in schools?

TEACHER INTERVIEWS

Teacher views and experiences with students' screen time
How have you experienced your students' screen time?
What social media apps do they use most often?
What types of games are they engaged in?
What do you consider the impacts of screen time (positive/negative) to be?
How do you feel about the time they spend online?

Screen time and schools

What impacts do you think screen time has on your students?
How do social media and smartphones impact school life?

Needs assessment

According to your experience, are there any concerns with adolescent screen time?
What would be the best way to address these concerns?
How could schools help address your concerns?
Should prevention take place in schools?
Who should prevention target?
What aims/objectives should prevention have? What content/topics should prevention for screen time cover?
What topics should prevention cover?
Who according to your opinion is most appropriate to deliver prevention in schools?
How could prevention be implemented in the current educational system in the UK?
Which age groups would benefit most from prevention initiatives?
How can the family benefit from prevention in schools?
How can the schools benefit from prevention in schools?
What overall benefits would you expect from this?
If you were the Headmaster how would you try to help some students who are facing problems with screen use?

Appendix 3: Consent Forms

Opt-out form for focus groups (Parents)

For the attention of parents (for students' Focus Groups) Invitation to participate in a research project involving views of adolescent screen time

My name is Melina Throuvala and I am conducting a doctoral research project in psychology. I am investigating the attitudes and experiences of young people with screen time, as well as the impacts of technology use on everyday life. Study findings will inform a school based prevention programme for recreational screen time. To understand what the needs are we are asking few children at your school to participate in a focus group to explore student views, and their experiences and potential concerns regarding their online behaviours. I am therefore, inviting your child to participate in this research study that will inform the design of a prevention programme.

Your child's participation in this research is entirely voluntary. If you decide you do not want your child to participate, you can contact the Head Teacher by phone and send the Opt-out Form to the School. If your child does not participate there will be no adverse consequences whatsoever.

Permission for the participation to this research study has been given by your child's school, that is aware and has approved the topics of discussion. The information gathered from these focus groups will inform the aims, content and design of a prevention programme. Topics that may be discussed during the focus group are for example what your children think is positive and/or negative about their own or their friends' screen time, if they have any concerns and how best they believe these concerns can be addressed. These groups should last about one hour.

The focus groups will be recorded and transcribed for research purposes. The data is strictly confidential, and will be fully anonymised after one month and securely stored in accordance with the Data Protection Act (1998). Participants will be advised not to give personally identifiable information during recording, and they will be labelled with participant numbers rather than names.

In case your child experiences any psychological harm or distress during or as a result of their participation, they may notify me and end immediately their involvement. Should this be the case, provision has been made with your child's school as to the most appropriate person within the school administration that your child can talk to. Your child is not obliged to answer any question, but can do so at their own free will.

If, during the study, you have any queries regarding our instructions, please do not hesitate to ask. If you have any questions regarding the nature of the research, please feel free to ask them at the end of the study.

I can be contacted via email at: melina.throuvala2016@my.ntu.ac.uk.

My supervisor, Dr. Daria J. Kuss, can be contacted at: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham NG1 4BU, UK.

OPTING OUT FORM

- I do not wish my child to take part in this research.
- I understand that there will be no adverse consequences as a result of this.

Thank you for taking the time to read this sheet, and for your interest in our research

Informed Consent Form (Parents)

For the Attention of Parents (Parental Interviews)
Invitation to participate in a research project involving perceptions of adolescent screen time

My name is Melina Throuvala and I am conducting a doctoral research project in psychology. I am investigating the attitudes and experiences of young people with screen time, as well as the impacts of technology use on everyday life. Study findings will inform a school based prevention programme for recreational screen time. To explore the perceived needs we will explore, through meetings with few of your children, interviews with parents like yourself and educators. We therefore are asking you to participate in an interview to explore your views, experiences and potential concerns regarding your child's screen time behaviours.

The purpose of this investigation is to assess the needs for a school prevention programme for screen time, and the information gathered from these interviews will inform its aims, content and design. Questions that may be asked in the interview are for example what your views are about your child's screen time or how you feel about your family communication on screen issues.

The interview should last about 1-1.30 hours. Permission for the participation to this research study has been given by your child's school, that is aware and has approved the topics of discussion. Your personal participation in this research is entirely voluntary and you have the right to withdraw from the study, simply by contacting the researchers. The data is strictly confidential, and will be fully anonymised and securely stored in accordance with Data Collection Act (1998). You are advised not to give personally identifiable information during recording, and you will be labelled with participant number rather than name.

Your participation may involve discussion about issues which may cause a degree of distress. In case you experience any psychological harm or distress as a result of your participation, you may notify me and stop immediately the interview process.

If, during the study, you have any queries regarding our instructions, please do not hesitate to ask. If you have any questions regarding the nature of the research, please feel free to ask them at the end of the study. Thank you for agreeing to participate in this research project.

I can be contacted via email at: melina.throuvala2016@my.ntu.ac.uk. My supervisor, Dr. Daria J. Kuss, can be contacted at: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham NG1 4BU, UK.

Agreement to consent

I voluntarily consent to participate in this study. I consent to the data being anonymously stored for a period of 5 years for academic purposes. I agree to have the interview recorded and transcribed after it is held. I consent that extracts from transcripts be used in research publications and research presentations.

I have been given a copy of this consent form to keep.

Thank you for taking the time to read this sheet, and for your interest in our research

Informed Consent Form (Teachers)

For the Attention of Teachers (Teacher Interviews)
Invitation to participate in a research project involving perceptions of student screen time

My name is Melina Throuvala and I am conducting a doctoral research project in psychology. I am investigating the attitudes and experiences of young people with screen time, as well as the impacts of technology use on everyday life. To explore the perceived needs for prevention we will explore, through meetings with few students, interviews with parents, and interviews with teachers like yourself. Findings from this initial investigation will inform the design of the programme.

Specifically, the purpose of this investigation is to assess the needs and areas of interest for a school prevention programme for adolescent internet use, taking into account student, parent and teacher opinions. We will be asking you to participate in an interview to explore your views, experiences and potential concerns regarding your students' recreational screen time. Questions that may be asked in the interview are for example what your views are about students' screen time or how screen time affects students but also recommendations of how your concerns may be addressed.

The interview should last about 1-1.30 hour. Permission for the participation to this research study has been given by your school. Your personal participation in this research is entirely voluntary, strictly confidential and you have the right to withdraw from the study simply by contacting the researchers. The data is strictly confidential, and will be fully anonymised and securely stored in accordance with Data Collection Act (1998). You are advised not to give personally identifiable information during recording, and you will be labelled with a participant number rather than name.

Your participation may involve discussion about issues which may cause a degree of distress. In case you experience any psychological harm or distress as a result of your participation, you may notify me and stop immediately the interview process.

If, during the study, you have any queries regarding our instructions, please do not hesitate to ask. If you have any questions regarding the nature of the research, please feel free to ask them at the end of the study. Thank you for agreeing to participate in this research project.

I can be contacted via email at: melina.throuvala2016@my.ntu.ac.uk. My supervisor, Dr. Daria Kuss, Division of Psychology, can be contacted at: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham NG1 4BU, UK.

Agreement to consent

I voluntarily consent to participate in this study. I consent to the data being anonymously stored for a period of 5 years for academic purposes. I agree to have the interview recorded and transcribed after it is held. I consent that extracts from transcripts be used in research publications and research presentations.

I have been given a copy of this consent form to keep.

Thank you for taking the time to read this sheet, and for your interest in our research

Attentional processes in smartphone use research study

Use of social media and smartphones is pervasive amongst young people and adults. The current study is investigating attentional processes in smartphone use in young adults. We are investigating the development of an assessment tool to measure attentional processes in relation to smartphone use. The study would like to involve your participation in an online survey that will last approximately 25 minutes in total.

Permission for the participation to this research study has been granted by the Ethics Committee of Nottingham Trent University.

- Your participation in this research is entirely voluntary.
- If you decide you do not wish to participate you may discontinue the study or if you decide at any point during the study and until one month after your participation you may withdraw by contacting the researchers and quoting your participant number.
- If you decide you do not wish to participate there will be no adverse consequences whatsoever.
- The surveys, once collated will be analyzed for research and publication purposes in their fully anonymized form.
- The data is strictly confidential, and will be fully anonymised after one month and securely stored in accordance with the Data Protection Act (1998). On your questionnaires you will be able to enter a participant number rather than names.
- You may participate if you wish in a prize draw and may be compensated with 10 Amazon £10 vouchers or earn 3 SONA credits if you are a Nottingham Trent University student.

In case you experience any distress as a result of your participation, you may notify me by quoting your participant number and end immediately your involvement.

If you have any questions regarding the nature of the research, please feel free to contact the research team via email at: Melina Throuvala: melina.throuvala2016@my.ntu.ac.uk or Dr. Daria Kuss: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Department, Nottingham Trent University, Nottingham NG1 4BU, UK.

Thank you for taking the time to read this sheet, and for your interest in our research

Agreement to consent

I read and understood the above information and voluntarily consent to participate in this online study. I consent to the data being anonymously stored for a period of 5 years for academic purposes.

You are eligible to participate if you are:

1. A daily iPhone or Android smartphone user
2. A daily social media user of at least one social media platform (i.e., facebook, instagram, snapchat, twitter)
3. From 18+ years old

Informed Consent Form (Intervention)

Social media use, smartphones and distraction intervention study

My name is Melina Throuvala and I am conducting a doctoral research project in psychology. I am investigating social media and smartphone use in young adults, and the impact of an intervention on attention, performance and emotions. The study would like to involve your participation daily for a period of 10 days, however you are not obliged in any way to participate for the full duration should you not wish to. You will be asked to complete an online survey and then download and use 3 smartphone apps for 2 weeks. You will be asked to engage in short mindfulness exercises, monitor your screen time and provide daily data on your social media usage as reported on one of the apps you will be using. On the last day (10th day) you will be asked to report back your experiences by completing survey 2. For this purpose you will be asked to provide an email to which you have access, so we can send you a daily reminder during the intervention, reminding you to fill in your usage data. The email will also be used to send you the survey again at the end of the intervention.

The full instructions of this intervention will be explained to you in an information sheet, that follows. Permission for the participation to this research study has been given by the University Ethics Board. The completion of the survey at the start and at the finish should last about 25 minutes and the daily log not more than a few minutes.

Your participation in this research is entirely voluntary. If you decide you do not wish to participate you may or if you decide at any point during the intervention and until one month after your participation that you do not wish to continue participating, you can contact the researchers (contact data below). If you decide you do not wish to participate there will be no adverse consequences whatsoever. The survey that you will be completing daily, once collated will be analyzed for research and publication purposes in its fully anonymized form. The data is strictly confidential, and will be fully anonymised after one month and securely stored in accordance with the Data Protection Act (1998). You are advised not to give personally identifiable information. On your questionnaires you will be able to enter a participant number rather than names.

In case you experience any distress as a result of your participation, you may notify me by quoting your participant number and end immediately your involvement. If, during the study, you have any queries regarding our instructions, please do not hesitate to ask. If you have any questions regarding the nature of the research, please feel free to contact the research team via email at: Melina Throuvala: melina.throuvala2016@my.ntu.ac.uk or Dr. Daria J. Kuss: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham NG1 4BU, UK.

Agreement to consent

I read and understood the above information and I voluntarily consent to participate in this intervention and the online study. I consent to the data being anonymously stored for a period of 5 years for academic purposes

Participant's code number and date

Thank you very much indeed for taking the time to read this sheet, and for your interest in our research.

Appendix 4: Debriefing Forms

Debriefing form for Focus Groups (Students)

Adolescent online experiences and needs assessment for school prevention

Thank you very much for your child's participation. This study was an investigation into students' personal views and experiences for screen time to inform a school prevention programme.

Previous research has found that adolescence is a developmental period characterized by increased emotional and cognitive changes and for identity formation. This identity formation is now shaped to a large extent by the use of new media. Early adolescence has been found to have the highest online usage rates in all age groups. This study aimed to examine the attitudes and habits of adolescents about screen time, and understand their concerns.

How was this tested?

In this study, students were asked to participate in peer group meetings and share their views and personal experiences with their digital lives.

What did we expect to find?

We are aiming to gather some insight into screen time and understand the needs and concerns of adolescents to inform prevention efforts.

What if I want to know more?

For help, support or advice on internet issues you may contact the following services:

<https://www.childnet.com> <http://www.nhs.uk/Livewell/addiction/Pages/addictionwhatisit.aspx>

<https://www.smartrecovery.org.uk>

<http://www.priorygroup.com/addictions/internet>

<http://www.videogameaddiction.co.uk>

<http://www.counselling-directory.org.uk/internet-addiction.html>

Your child's data has been stored anonymously in a password-protected folder up to 5 years and is not linked to any personal information. You have the right to withdraw all of your child's data anytime.

If you have any questions about this research, please contact either of the below:

Melina Throuvala, e-mail: melina.throuvala2016@my.ntu.ac.uk or my Supervisor, Dr Daria Kuss, can be contacted at: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham NG1 4BU, UK.

Once again, thank you for participating.

Debriefing Form for Interviews (Parents)

Views and attitudes towards adolescent screen time and needs assessment for school prevention

Thank you very much for your participation. This study was an investigation into parental views and experiences for adolescent screen time to inform a school prevention programme.

Previous research has found that adolescence is a developmental period characterized by increased emotional and cognitive changes and for identity formation. This identity formation is now shaped to a large extent by the use of new media. Early adolescence has been found to have the highest online usage rates in all age groups. This study aimed to understand parental views and experiences regarding uses and habits of adolescent screen time, and understand parental concerns and recommendations for prevention.

How was this tested?

In this study, parents were asked to participate in individual interview sessions.

What did we expect to find?

We are aiming to gather some insight into adolescent screen time, parental concerns and recommendations to inform school prevention efforts.

What if I want to know more?

If you want to learn more about the impacts of screen time on adolescents then you can read the papers cited below: For help, support or advice on internet issues you may contact the following services:

<https://www.childnet.com> <http://www.nhs.uk/Livewell/addiction/Pages/addictionwhatisit.aspx>
<https://www.smartrecovery.org.uk>
<http://www.priorygroup.com/addictions/internet>
<http://www.videogameaddiction.co.uk>
<http://www.counselling-directory.org.uk/internet-addiction.html>

Your data has been stored anonymously in a password-protected folder up to 5 years and is not linked to any personal information. You have the right to withdraw all of your data anytime.

If you have any questions about this research, please contact either of the below:

Melina Throuvala, e-mail: melina.throuvala2016@my.ntu.ac.uk or my Supervisor, Dr Daria Kuss, can be contacted at: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham NG1 4BU, UK.

Once again, thank you for participating.

Debriefing Form for Interviews (Teachers)

Views and attitudes towards adolescent screen time and needs assessment for school prevention

Thank you very much for your participation. This study was an investigation into your personal views and experiences as tutors about students' recreational screen time and a needs assessment and recommendations to inform a school prevention programme.

Previous research has found that adolescence is a developmental period characterized by increased emotional and cognitive changes and for identity formation. This identity formation is now shaped to a large extent by the use of new media. Early adolescence has been found to have the highest online usage rates in all age groups. This study aimed to understand parental views and experiences regarding uses and habits of adolescent screen time, and understand parental concerns and recommendations for prevention.

How was this tested?

In this study, teachers were asked to participate in interview sessions to provide views and personal experiences and share concerns and recommendations for adolescent screen time.

What did we expect to find?

We are aiming to gather some insight into adolescent screen time, teacher concerns and recommendations to inform school prevention efforts.

What if I want to know more?

For help, support or advice on internet issues you may contact the following services:

<http://www.nhs.uk/Livewell/addiction/Pages/addictionwhatisit.aspx>

<https://www.smartrecovery.org.uk>

<http://www.priorygroup.com/addictions/internet>

<http://www.videogameaddiction.co.uk>

<http://www.counselling-directory.org.uk/internet-addiction.html>

Your data has been stored in a password-protected folder up to 5 years and is not linked to any personal information. You have the right to withdraw all of your data anytime.

If you have any questions about this research, please contact either of the below:

Melina Throuvala, e-mail: melina.throuvala2016@my.ntu.ac.uk or my Supervisor, Dr Daria Kuss, can be contacted at: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, NottinghamTrent University, Nottingham NG1 4BU, UK.

Once again, thank you for participating.

Debrief Form (Validation study)

Social media use, smartphones and distraction research study for the development of a scale

Thank you for participating in this study. The study examined the relationship between smartphones, social media use, and distraction and is aiming to validate a scale regarding smartphone distraction. Use of smartphones has been associated with distraction and has been associated with lower academic performance, stress and prolonged smartphone use. There is currently no comprehensive measure of distraction in smartphone use.

If you decide at any point until one month after your participation, you can withdraw your data by contacting the researchers and quoting your participant number. The data is strictly confidential, and will be fully anonymised after one month and securely stored in accordance with the Data Protection Act (1998). The surveys, once collated will be analyzed for research and publication purposes in their fully anonymized form. Your data will be stored securely in a password protected folder and will be held for up to 5 years. Please note that all the data stored is not linked to any personal information. It is thus highly recommended that you retain this form, as your code would be absolutely necessary to withdraw your data.

Should you have any questions about your rights as a participant, please contact either of the below:

Melina Throuvala at melina.throuvala2016@my.ntu.ac.uk

Dr. Daria Kuss at daria.kuss@ntu.ac.uk

phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Division, Nottingham Trent University, Nottingham NG1 4BU, UK.

Once again we would like to take this opportunity to thank you for participating in this study.

Debrief Form (Intervention)

THANK YOU FOR COMPLETING THE ASSESSMENTS OF The iCare FOR MYSELF STUDY

This study was an online randomized controlled trial and investigated the efficacy of self-monitoring, mindfulness practice and mood tracking, as a first step intervention against distraction from smartphone use.

The study involved the use of free smartphone apps that measure social media use, help engage in short mindfulness exercises and track mood and assessed the impact of the use of these apps on distraction.

Your participation in this research is entirely voluntary. If you decide at any point until one month after your participation, you can withdraw your data by contacting the researchers and quoting your participant number. The surveys, once collated will be analyzed for research and publication purposes in their fully anonymized form. The data is strictly confidential, and will be fully anonymised after one month and securely stored in accordance with the Data Protection Act (1998).

If you have any questions regarding the nature of the research, please feel free to contact the research team via email at: Melina Throuvala: melina.throuvala2016@my.ntu.ac.uk or Dr. Daria Kuss: daria.kuss@ntu.ac.uk, phone number +44 (0) 115 848 4153, International Gaming Research Unit, Psychology Department, Nottingham Trent University, Nottingham NG1 4BU, UK.

Thank you very much indeed for your participation and your interest in our research.

Appendix 5: Recruitment flyer

Want to check your social media habits? How often and how frequently do you use your smartphone?
Want to reduce distraction? Are smartphone apps helpful after all?



The iCare for Myself Research Study – Call for Participation

Evaluating an intervention to reduce distraction

Purpose: We are studying the use of smartphone apps to monitor smartphone use, brief mindfulness and focusing exercises, and the use of mood tracking techniques. The apps work to raise awareness and teach basic smartphone monitoring, mindfulness, focusing skills and awareness of mood of common states, like when feeling down, worried or stressed.

The iCare for Myself research study: Eligible participants will be asked to download the following three apps onto their own iPhone or Android smartphone, and use the apps each day for a 10-day period. You will be asked to report each day how much and how often you use your smartphone as monitored by your screen time app and how often you access the specific apps.

Time Commitment: Individuals will participate in the 10-day iCare for Myself research study, during which, two online assessments will be completed along with provision of daily app usage data. Participants will participate in a prize draw and may be compensated up to £50 in total for the daily input and for completing the study assessments.

Eligibility: You will be eligible to join if you are:

1. A **daily iPhone or Android smartphone user**
2. A **social media user**
3. **18 years old +**

Study Status: The iCare for Myself Research Study is currently recruiting participants!

© Please email me: melina.throuvala@ntu.ac.uk if you are interested in taking part in this study! © Find out useful things about your own smartphone use and social media use!

Appendix 6: Intervention Instructions

THANK YOU FOR COMPLETING THE SURVEY.

You have been assigned to the Intervention condition!

What are we asking you to do?

We ask you to do the following for the next 10 days:

- Monitor your media usage
- Practice mindfulness by using the 'Dealing with Distractions' sessions in Headspace
- Track your mood during the day
- Log your daily experience in the short daily survey

How will you do it

Steps to take:

Download and use freely and as many times a day as you like the following 3 free smartphone apps. You will be asked to do this for the next 10 days.

Screen Time (for iPhone users only)— a screen time management - feature of iOS 12 (default on your iPhone with iOS 12) - access it through Settings OR

Anti-social (for Android users only) - a screen time management. Please download it from (https://play.google.com/store/apps/details?id=com.goozix.antisocial_personal) or visit <http://www.antisocial.io/personal>

Headspace - a meditation and mindfulness app: A mindfulness meditation app for daily practice. Programmes are designed to assist people in dealing with the pressure, stress, and challenges of daily life. The app offers a variety of short and extended, creative exercises and sessions, and for different situations, such as to deal with anxiety or moments of stress. There is a free version to this app. **We encourage you to use the 'Dealing with Distractions' sessions:** <https://my.headspace.com/packs/161>

Pacifica app - a mood & health tracking app. Programmes include monitoring your mood and health (i.e., sleep, exercise, caffeine intake) your progress, the use of relaxation exercises, the practice of meditation, and thought reframing. <https://www.thinkpacific.com>

Use your screen time app - **screen time** or **Anti-social** - daily to check:

Minutes on Social Media: Total number of minutes spent on social media per day.

Favorite Apps: See your most time consuming and accessed apps.

Your Score: Your score is an algorithm that compares usage amount, open rates and other data to compare you to your peers.

Charting: Chart unlocks, time usage and app opens from daily to 30 days.

Blacklist: Block apps to reduce your usage.

Use the 'Headspace' app:

Follow the 10-day 'Dealing with Distractions' sessions as many times during the day as possible.

Use the 'Pacifica' app:

Track your mood for as many times you like set health habits and goals track your progress

Log your daily experience in the short daily survey:

Report daily on a short survey link you will be sent every day by email for the next 9 days your social media usage as reported on your screen time app and answer few questions related to the use of the two other apps (Headspace and Pacifica) .

Take survey 2 in 10 days:

On the 10th day from the day you start, you will be asked to report back your experiences by completing survey 2.

You will be receiving a daily email reminding you to fill in your usage data.

You will be asked to complete this online survey again in 10 days.

Remember to participate in this final survey to enter the prize draw with 5 x £50 Amazon vouchers or earn SONA credits if you are a Nottingham Trent University student.

Remember to participate everyday to enter the Amazon prize draw. Daily survey duration: few minutes. Final survey duration: 25'

THANK YOU FOR COMPLETING THE ASSESSMENT.

Appendix 7. The Smartphone Distraction Scale (SDS) – Initial scale tested

“Below is a collection of statements about your everyday experience with **your smartphone**. Using the 1–5 scale below, please indicate how often you currently have each experience. Please answer according to what best reflects your everyday experience.” The accompanying 5-point scale is 1 (almost never), 2 (not very often), 3 (sometimes), 4 (often), 5 (almost always).

Attention Impulsiveness

1. “I get distracted by my phone notifications.”
2. “I get distracted by my phone apps.”
3. “I get distracted by just having my phone next to me.”
4. “I get distracted by my phone even when my full attention is required on other tasks.”
5. “I’m fully focused on tasks despite my phone distractions.”*R
6. “I can focus on important tasks when I put my phone away.”

Online Vigilance

7. “I get anxious if I don’t check messages immediately on my phone.”
8. “I’m well focused on important tasks even when I receive phone notifications.”*R
9. “I stop important tasks to just message someone on my phone.”
10. “I stop important tasks to check my phone to keep up with what’s going on with my friends.”
11. “I constantly check my phone even when there are no new notifications.”
12. “I get frustrated when I’m unable to check my phone.”
13. “I think a lot about checking my phone when I can’t access it .”
14. “I think a lot about things I saw on my phone.”
15. “I keep looking at my feed even if I’ve just checked my phone.”
16. “I get distracted with what I could post while doing other tasks”
17. “I get distracted thinking how many likes and comments I will get while doing other tasks.”
18. “I constantly check my phone to see who liked my recent post while doing important tasks.”

Multitasking

19. “I use several applications on my phone while working.”
20. “I constantly switch between working and checking my phone.”
21. “I can easily follow conversations while using my phone.”
22. “I only half-listen to others while I’m checking my phone.”
23. “I often drive and use my phone at the same time.”
24. “I often walk and use my phone at the same time.”
25. “I often talk to others while checking what’s on my phone”

Emotion regulation

26. “Using my phone distracts me from my responsibilities”
27. “Using my phone distracts me from doing unpleasant things”
28. “Using my phone distracts me from negative or unpleasant thoughts”
29. “Using my phone distracts me feeling down”
30. “Using my phone distracts me from tasks that are tedious or difficult”
31. “Using my phone distracts me when I’m under pressure”
32. “Using my phone distracts me when I’m feeling stressed or anxious”
33. “Using my phone distracts me when I’m bored”

Appendix 8: The Smartphone Distraction Scale (SDS) – Final scale

“Below is a collection of statements about your everyday experience with **your smartphone**. Using the 1–5 scale below, please indicate how often you currently have each experience. Please answer according to what best reflects your everyday experience.” The accompanying 5-point scale is 1 (almost never), 2 (not very often), 3 (sometimes), 4 (often), 5 (almost always).

Attention Impulsiveness

1. “I get distracted by my phone notifications.”
2. “I get distracted by my phone apps.”
3. “I get distracted by just having my phone next to me.”
4. “I get distracted by my phone even when my full attention is required on other tasks.”

Online Vigilance

5. “I get anxious if I don’t check messages immediately on my phone.”
6. “I think a lot about checking my phone when I can’t access it .”
7. “I get distracted with what I could post while doing other tasks ”
8. “I get distracted thinking how many likes and comments I will get while doing other tasks.”

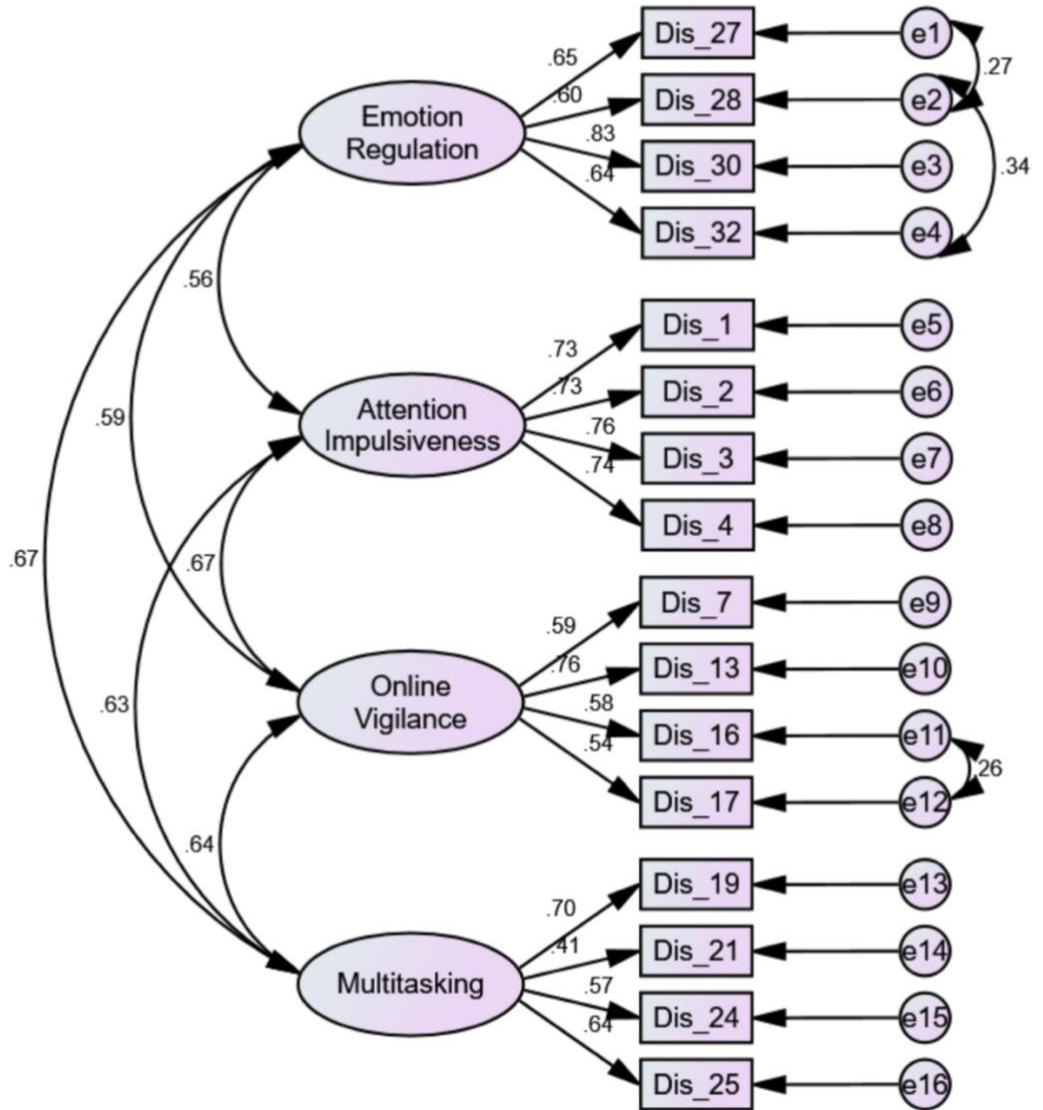
Multitasking

9. “I use several applications on my phone while working.”
10. “I can easily follow conversations while using my phone.”
11. “I often walk and use my phone at the same time.”
12. “I often talk to others while checking what’s on my phone”

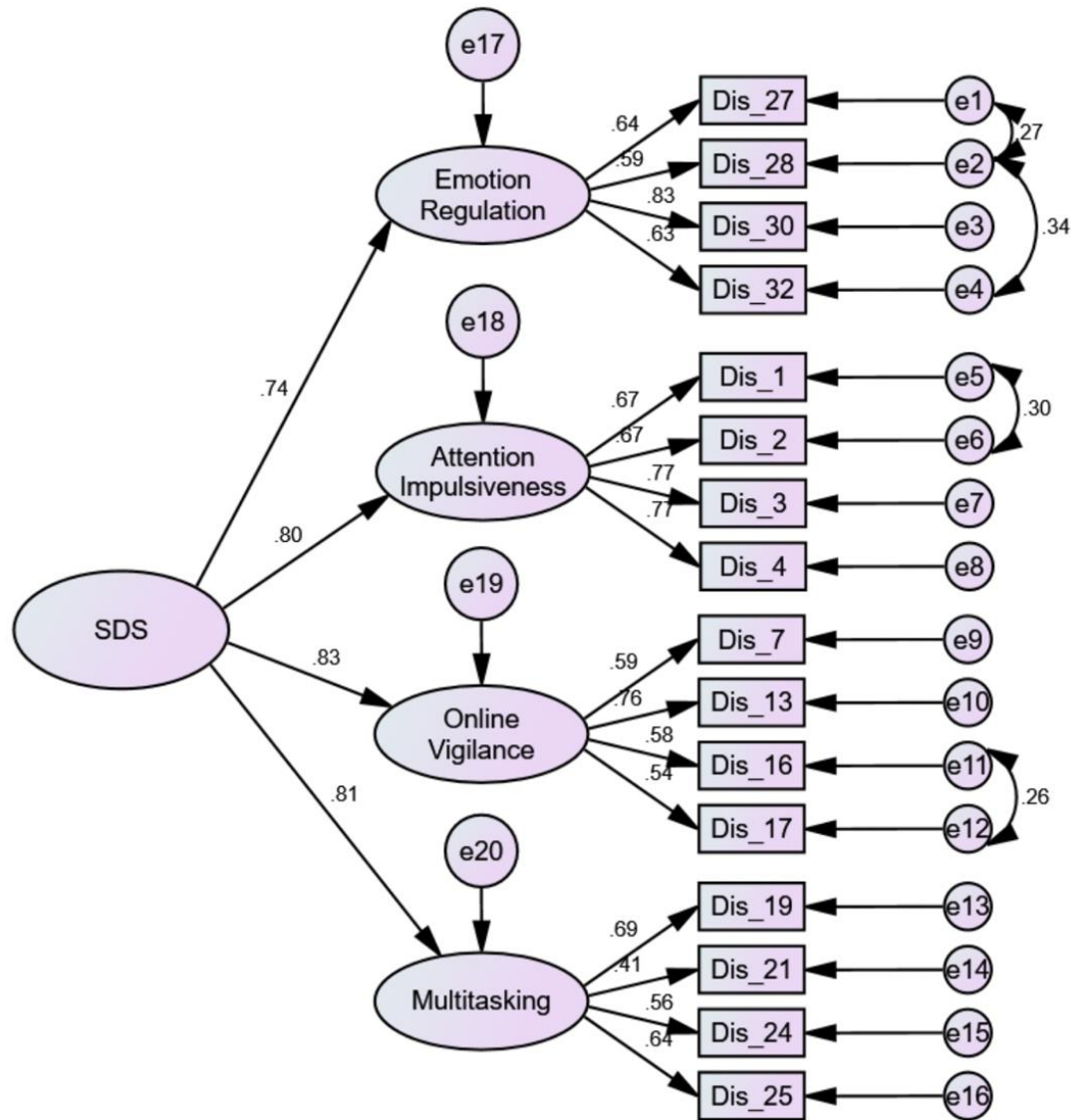
Emotion regulation

13. “Using my phone distracts me from doing unpleasant things”
14. “Using my phone distracts me from negative or unpleasant thoughts”
15. “Using my phone distracts me from tasks that are tedious or difficult”
16. “Using my phone distracts me when I’m under pressure”

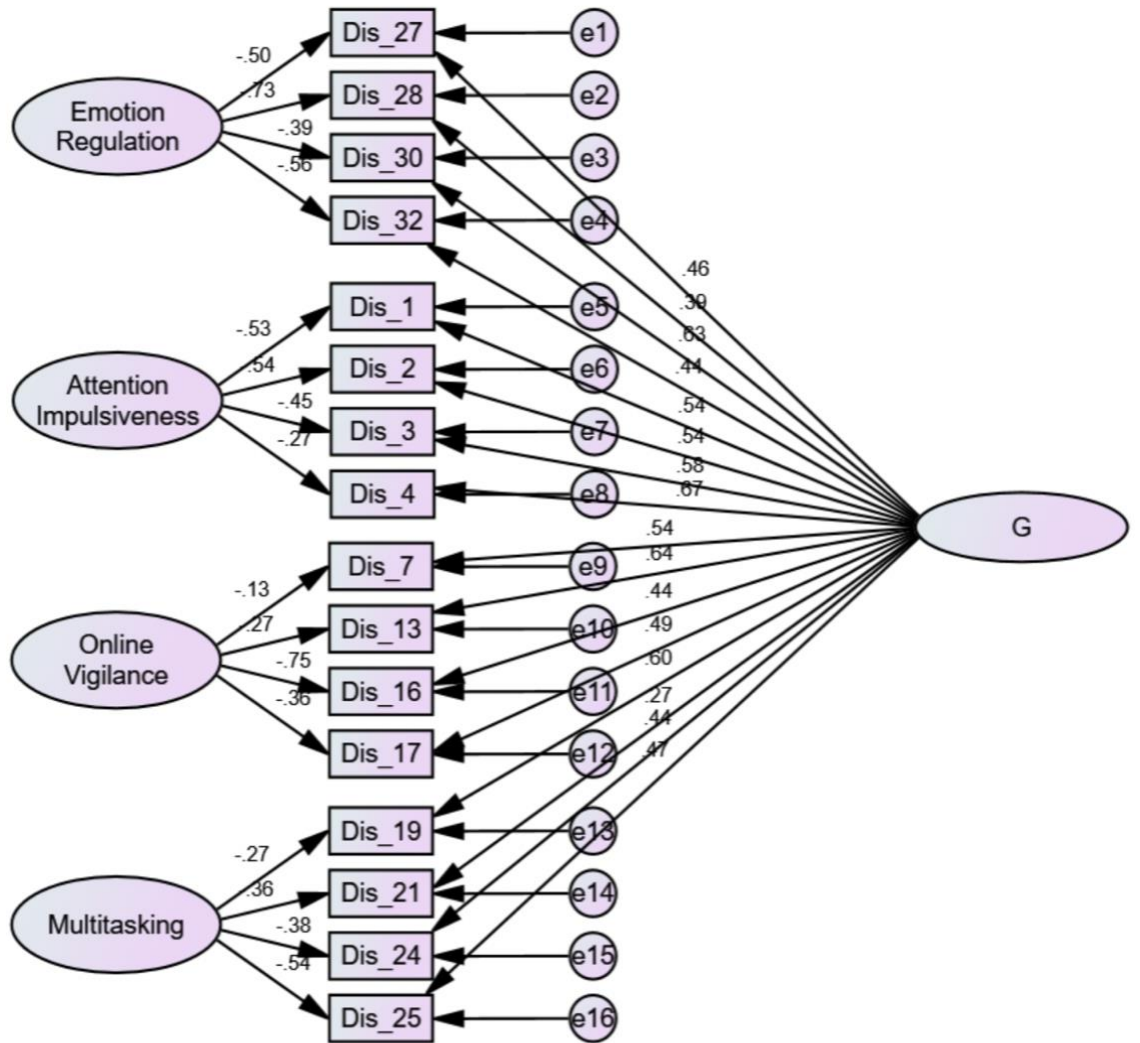
Appendix 9: Four Factor Model



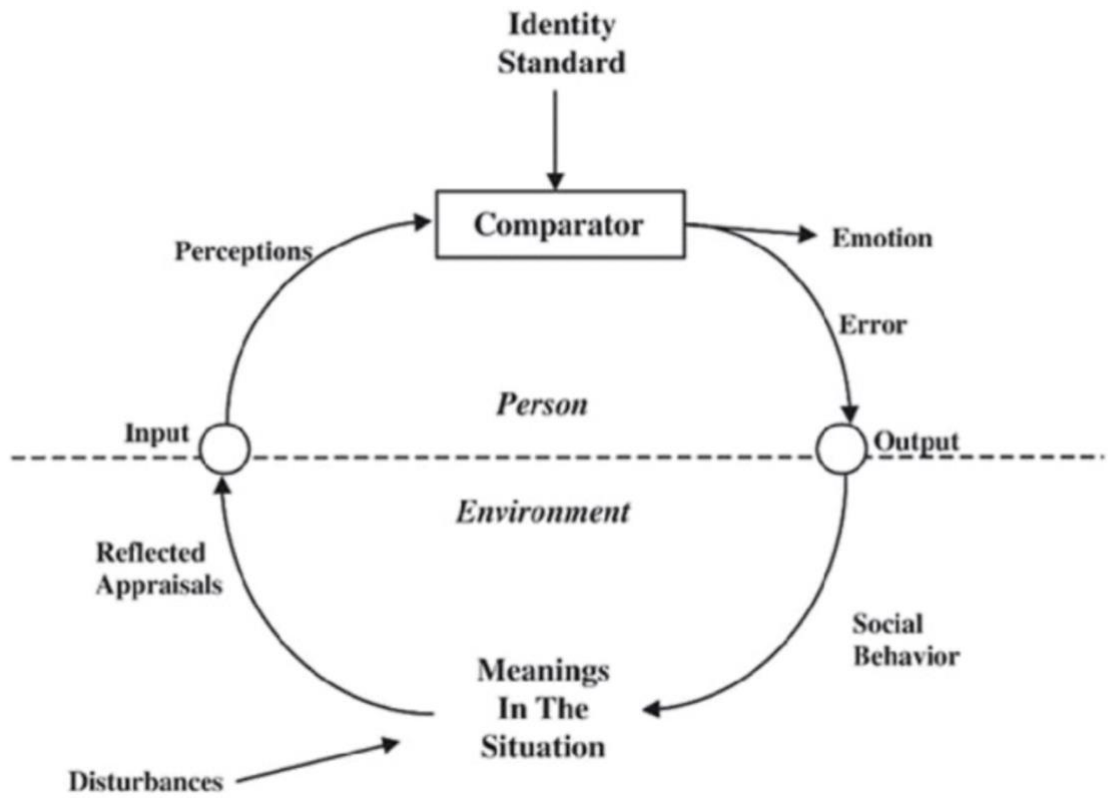
Appendix 10: Higher Order Model



Appendix 11: Bifactor Model



Appendix 12: Components of a feedback loop according to Perceptual Control Theory (Forssell, 2016)



Appendix 13. Scales used in Quantitative studies (Chapters 11 and 12)

The Self-Report Behavioral Automaticity Index (SRBAI) (Gardner et al., 2012)

Using social media on my phone

	Does not apply at all	2	3	4	5	6	Fully applies
Is something I do automatically	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use social media without consciously intending to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use social media without thinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I start using social media before I realise I am doing it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Smartphone Distraction Scale

Below is a collection of statements about your everyday experience with your smartphone. Using the 1–5 scale below, please indicate how often you currently have each experience. Please answer according to what best reflects your everyday experience

	Almost never	Not very often	Sometimes	Often	Almost always
I get distracted by my phone notifications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get distracted by my phone apps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get distracted by just having my phone next to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get distracted by my phone even when my full attention is required on other tasks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm fully focused on tasks despite my phone distractions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can focus on important tasks when I put my phone away	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get anxious if I don't check messages immediately on my phone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm well focused on important tasks even when I receive phone notifications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I stop important tasks to just message someone on my phone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I stop important tasks to check my phone to keep up with what's going on with my friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I constantly check my phone even when there are no new notifications	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get frustrated when I'm unable to check my phone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think a lot about checking my phone when I can't access it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think a lot about things I saw on my phone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I keep looking at my feed even if I've just checked my phone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I get distracted with what I could post while doing other tasks

I get distracted thinking how many likes and comments I will get while doing other tasks

I constantly check my phone to see who liked my recent post while doing important tasks

I use several applications on my phone while working

I constantly switch between working and checking my phone

I can easily follow conversations while using my phone

I only half-listen to others while I'm checking my phone

I often drive and use my phone at the same time

I often walk and use my phone at the same time

I often talk to others while checking what's on my phone

Using my phone distracts me from my responsibilities

Using my phone distracts me from doing unpleasant things

Using my phone distracts me from negative or unpleasant thoughts

Using my phone distracts me from feeling down

Using my phone distracts me from tasks that are tedious or difficult

Using my phone distracts me when I'm under pressure

Using my phone distracts me when I'm feeling stressed or anxious

Using my phone distracts me when I'm bored

The Perceived Stress Scale (Cohen et al., 1983)

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way. **In the last month how often have you...**

	never	almost never	sometimes	fairly often	very often
Been upset because of something that happened unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Found that you could not cope with all the things that you had to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Been able to control irritations in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you felt that you were on top of things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Have you been angered because of things that were outside of your control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How often have you felt nervous and "stressed"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Bergen Social Media Addiction Scale (Andreassen et al., 2016)

How often during the last year have you...

	very rarely (1)	rarely (2)	sometimes (3)	often (4)	very often (5)
Spent a lot of time thinking about social media or planned use of social media?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Felt an urge to use social media more and more?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Used social media in order to forget about personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Tried to cut down on the use of social media without success?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Become restless or troubled if you have been prohibited from using social media?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Used social media so much that it has had a negative impact on your job/studies?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Mindful Attention Awareness Scale (Brown & Ryan, 2003)

Below is a collection of statements about your everyday experience. Please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be.

	Almost always (1)	Very frequently (2)	Somewhat frequently (3)	Somewhat infrequently (4)	Very infrequently (5)	Almost never (6)
I could be experiencing some emotion and not be conscious of it until some time later	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I break or spill things because of carelessness, not paying attention, or thinking of something else	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it difficult to stay focused on what's happening in the present	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend to walk quickly to get where I'm going without paying attention to what I experience along the way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I tend not to notice feelings of physical tension or discomfort until they really grab my attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I forget a person's name almost as soon as I've been told it for the first time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It seems I am "running on automatic" without much awareness of what I'm doing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I rush through activities without being really attentive to them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do jobs or tasks automatically, without being aware of what I'm doing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find myself listening to someone with one ear, doing something else at the same time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find myself preoccupied with the future or the past	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find myself doing things without paying attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I snack without being aware that I'm eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Attentional Control Scale (ACS; Derryberry & Reed, 2002)

It's very hard for me to concentrate on a difficult task when there are noises around	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I need to concentrate and solve a problem, I have trouble focusing my attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am working hard on something, I still get distracted by events around me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My concentration is good even if there is music in the room around me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When concentrating, I can focus my attention so that I become unaware of what's going on in the room around me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am reading or studying, I am easily distracted if there are people talking in the same room	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When trying to focus my attention on something, I have difficulty blocking out distracting thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a hard time concentrating when I'm excited about something	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When concentrating I ignore feelings of hunger or thirst	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can quickly switch from one task to another	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It takes me a while to get really involved in a new task	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is difficult for me to coordinate my attention between the listening and writing required when taking notes during lectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can become interested in a new topic very quickly when I need to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy for me to read or write while I'm also talking on the phone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have trouble carrying on two conversations at once	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a hard time coming up with new ideas quickly	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
After being distracted or interrupted or I can easily shift my attention back to what I was doing before	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When a distracting thought comes to mind, it is easy for me to shift my attention away from it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy for me to alternate between two different tasks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is hard for me to break from one way of thinking about something and look at it from another point of view	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Below is a collection of statements about your everyday experience with your smartphone. Using the 1–5 scale below, please indicate how often you currently have each experience. Please answer according to what best reflects your everyday experience.

The Emotional Self-Awareness Scale (ESAS) (Kauer et al., 2012)

Please indicate the degree to which you agree with each of the following items using the scale below

	never (1)	very little (2)	sometimes (3)	often (4)	A lot (5)
My moods are hard to describe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I examine my feelings and then decide what to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's important to me to understand what my feelings mean	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's hard for me to tell what mood I'm in	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I analyse my personality to try to understand why I'm upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually know why I feel the way I do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often have trouble deciding what will improve my mood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know how I feel about most things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know why I feel the way I feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I go away by myself and think about why I feel a certain way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like to write down what I'm feeling and analyze it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can talk about mood to others	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't really think about why I behave as I do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often 'self-talk' to think about feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm often confused about how I feel about things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I'm often aware of being emotional, but I can't describe the emotion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I frequently take time to reflect on how I feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often know what caused my mood	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I'm usually aware of my emotions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like to go someplace alone to think about my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't often think about my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often think about ways to make myself feel better	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know exactly how I'm feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sometimes I can't figure out how to make myself feel better	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When feeling bad, I try to deal with my problems and concerns	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can verbalise my feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I usually have a clear idea about how my feelings affect my behaviour	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's difficult to make sense of the way I feel about things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I find it easy to write down how I feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It's difficult to communicate what I feel	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often think about the way I feel about things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I analyse recent events to try to understand why I'm upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Ruminative Response Scale-Modified (RRS-M) (Genet & Siemer, 2012)

Please read each of the items below and indicate **how daily events affect your mood**. Please indicate what you **generally** do, not what you think you should do.

	1 Not at all	2	3	4	5	6	7	8	9 Extremely
I could not stop thinking about the situation over and over	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought about how I was feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I couldn't stop thinking about how I was feeling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I continued to think about the situation, wishing it had gone differently	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought about how this would affect my future	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I thought about things that could go wrong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Barratt Impulsiveness Scale-Alternative Version (BIS) (Morean et al., 2014)

Please indicate how characteristic is the following statement of you overall:

	do not agree (1)	agree slightly (2)	agree moderately (3)	agree very much (4)
I plan tasks carefully	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I do things without thinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't pay attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am self-controlled	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I concentrate easily	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am a careful thinker	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I say things without thinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I act on the spur of the moment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Meta-Cognitions about Online Gaming Scale (MOGS) (Spada & Caselli, 2017)
(adapted for social media)

Please indicate how characteristic is the following statement of you overall:

	do not agree (1)	agree slightly (2)	agree moderately (3)	agree very much (4)
I continue to use social media despite thinking it would be better to stop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have no control over how much time I use social media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Once I start using social media I cannot stop	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media makes me lose control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thoughts about social media interfere with my functioning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thoughts about social media are becoming an obsession	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media makes my worries more bearable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media reduces my negative feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media helps me to control my negative thoughts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media stops me from worrying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media reduces my anxious feelings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Social media distracts my mind from problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The Deficient self-regulation Measure (Davies & Hemingway, 2014)

Please indicate how indicative the following statements are of your social media use

	almost never	2	3	4	5	6	almost always
I often spend longer time on social media than I intend to when I start	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have to keep using social media more and more to get my thrill	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel my social media use is out of control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would miss social media if I could no longer use it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would go out of my way to satisfy my urges to use social media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I spend so much time on social media it interferes with other activities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get strong urges to use social media	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Positive and Negative Affect Schedule-short form (PANAS-SF) (Watson et al., 1988).

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way during the past few weeks. Use the following scale to record your answers.

	very slightly or not at all	a little	moderately	quite a bit	extremely
interested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
distressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
excited	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
strong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
scared	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
hostile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
enthusiastic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
proud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
alert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
inspired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
attentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
jittery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Generalised Anxiety Disorder Scale (Spitzer et al., 2006)

Over the last 2 weeks, how often have you been bothered by the following problems?

	not at all	several days	more than half the days	nearly every day
Feeling nervous, anxious or on edge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Not being able to stop or control worrying	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Worrying too much about different things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Trouble relaxing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being so restless that it is hard to sit still	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Becoming easily annoyed or irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeling afraid as if something awful might happen	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Hospital and Anxiety Depression Scale (HADS) (Zigmond & Snaith, 1983).

Tick the box beside the reply that is closest to how you have been feeling in the past week. Don't take too long over you replies: your immediate is best.

I feel tense or 'wound up':

- Most of the time
 - A lot of the time
 - From time to time, occasionally
 - Not at all
-

I still enjoy the things I used to enjoy:

- Definitely as much
 - Not quite so much
 - Only a little
 - Hardly at all
-

I get a sort of frightened feeling as if something awful is about to happen:

- Very definitely and quite badly
 - Yes, but not too badly
 - A little, but it doesn't worry me
 - Not at all
-

I can laugh and see the funny side of things:

- As much as I always could
 - Not quite so much now
 - Definitely not so much now
 - Not at all
-

Worrying thoughts go through my mind:

- A great deal of the time
 - A lot of the time
 - From time to time, but not too often
 - Only occasionally
-

I feel cheerful:

- Not at all
 - Not often
 - Sometimes
 - Most of the time
-

I can sit at ease and feel relaxed:

- Definitely
 - Usually
 - Not Often
 - Not at all
-

I feel as if I am slowed down:

- Nearly all the time
 - Very often
 - Sometimes
 - Not at all
-

I get a sort of frightened feeling like 'butterflies' in the stomach:

- Not at all
 - Occasionally
 - Quite Often
 - Very Often
-

I have lost interest in my appearance:

- Definitely
 - I don't take as much care as I should
 - I may not take quite as much care
 - I take just as much care as ever
-

I feel restless as I have to be on the move:

- Very much indeed
 - Quite a lot
 - Not very much
 - Not at all
-

I look forward with enjoyment to things:

- As much as I ever did
 - Rather less than I used to
 - Definitely less than I used to
 - Hardly at all
-

I get sudden feelings of panic:

- Very often indeed
 - Quite often
 - Not very often
 - Not at all
-

I can enjoy a good book or radio or TV program:

- Often
 - Sometimes
 - Not often
 - Very seldom
-

We are interested in how you personally deal with online content and online communication in everyday life. Please let us know how much you agree with each of the following statement

	Does not apply at all	Hardly applies	Moderately applies	Fully applies
My thoughts often drift to online content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a hard time disengaging mentally from online content	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Even when I am in a conversation with other people, I often think about what is happening online right now in the back of my mind	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Often online content occupies my thoughts, even as I am dealing with other things	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, my thoughts drift there immediately	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, it triggers an impulse in me to check it right away	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, I immediately attend to it, even if I am engaged in other things at that moment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I receive an online message, I immediately give it my full attention	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I constantly monitor what is happening online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often feel the urge to make sure I know what is happening online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I often start certain online applications so I don't miss out on any news	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I always keep an eye on what is happening online at the moment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Generalized self-efficacy scale (Schwarzer & Jerusalem, 1995)

How true is the following statement of you:

	Not at all true	Hardly true	Moderately true	Exactly true
I can always manage to solve difficult problems if I try hard enough	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If someone opposes me, I can find the means and ways to get what I want	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is easy for me to stick to my aims and accomplish my goals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident that I could deal efficiently with unexpected events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Thanks to my resourcefulness, I know how to handle unforeseen situations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can solve most problems if I invest the necessary effort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can remain calm when facing difficulties because I can rely on my coping abilities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I am confronted with a problem, I can usually find several solutions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I am in trouble, I can usually think of a solution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I can usually handle whatever comes my way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

FoMO Scale (Przybylski et al., 2013)

Below is a collection of statements about your everyday experience. Using the scale provided please indicate how true each statement is of your general experiences. Please answer according to what really reflects your experiences rather than what you think your experiences should be. Please treat each item separately from every other item.

	Not at all true	Slightly true of me	Moderately true of me	Very true of me	Extremely true of me
I fear others have more rewarding experiences than me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I fear my friends have more rewarding experiences than me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get worried when I find out my friends are having fun without me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I get anxious when I don't know what my friends are up to	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is important that I understand my friends' "in jokes."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sometimes, I wonder if I spend too much time keeping up with what is going on.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It bothers me when I miss an opportunity to meet up with friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I have a good time it is important for me to share the details online (e.g. updating status)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I miss out on a planned get-together it bothers me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When I go on vacation, I continue to keep tabs on what my friends are doing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Nomophobia Scale (Yildirim & Correia, 2015)

If I did not have my smartphone with me:

	strongly disagree	disagree	somewhat disagree	neutral	somewhat agree	agree	strongly agree
I would feel uncomfortable without constant access to information through my smartphone	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be annoyed if I could not look information up on my smartphone when I wanted to do so	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being unable to get the news (e.g., happenings, weather, etc.) on my smartphone would make me nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be annoyed if I could not use my smartphone and/or its capabilities when I wanted to do so	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Running out of battery in my smartphone would scare me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I were to run out of credits or hit my monthly data limit, I would panic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I did not have a data signal or could not connect to Wi-Fi, then I would constantly check to see if I had a signal or could find a Wi-Fi network	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I could not use my smartphone, I would be afraid of getting stranded somewhere	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If I could not check my smartphone for a while, I would feel a desire to check it	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel anxious because I could not instantly communicate with my family and/or friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be worried because my family and/or friends could not reach me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel nervous because I would not be able to receive text messages and calls	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be anxious because I could not keep in touch with my family and/or friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be nervous because I could not know if someone had tried to get hold of me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel anxious because my constant connection to my family and friends would be broken	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be nervous because I would be disconnected from my online identity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would be uncomfortable because I could not stay up-to-date with social media and online networks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel awkward because I could not check my notifications for updates from my connections and online networks	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would feel anxious because I could not check my email messages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

I would feel weird because I would not know what to do



Appendix 14: Declaration of Collaborative Work

Empirical chapters 2,3,5,6, 10 (combined with Chapter 12) and 12 have been published in peer reviewed academic journals.

Contribution of first author to literature reviews:

- Initiation of review
- Development of key ideas
- Literature collection
- Literature organisation
- Literature analysis
- Write-up
- Implementation of co-authors' feedback

Contribution of first author to empirical chapters:

- Initiation of research
- Development of key ideas
- Development of online survey
- Participant recruitment
- Data collection
- Data cleaning
- Data analysis
- Write-up
- Implementation of co-authors' feedback

Declaration of Co-Author Contribution:

The content of the chapters presented in the thesis reflect the original and independent work completed by the first author (Melina A. Throuvala). Input from the additional co-authors was provided in the form of general feedback / guidance and manuscript edits in line with the normal working expectations of a PhD Student – Supervisor relationship.

No original content in the thesis or accompanying journal articles was produced by any co-authors listed.