

EMOGEN CAMPBELL BSc Hons MSc

ADOLESCENT WELLBEING AND SOCIAL MEDIA USE.

Section A: Which User Characteristics Statistically Moderate the Relationship Between
Social Media Use and Adolescent Wellbeing? A Narrative Review.

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Social Anxiety, Cognition, Emotion and Behaviour.

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Summary of the MRP portfolio

Section A: Presents a narrative literature review using a systematic search methodology of studies examining statistical moderators of social media use and adolescent wellbeing. The review revealed multiple moderators with gender as the most consistent. Clinical recommendations include increasing awareness of moderators associated with harmful effects in adolescents. Research recommendations are made including the need for validated passive social media use measures, greater attention to a wider range of moderators and the need to adopt measures that capture adolescents' responses to specific content or qualities of social media interactions.

Section B: Presents a cross-sectional study of the relationship between social media use and social anxiety in a sample of 76 UK adolescents. Several hypotheses were tested relating to social media use and social anxiety, including the moderating role of age. Hypothetical vignettes were used to explore the cognitive, emotional and behavioural responses to social media scenarios. Results show social anxiety was significantly associated with investment and passive use of social media, and both negative cognitive appraisal and emotional responses to vignettes. Age was also found to moderate the relationship between negative cognitive appraisal and passive social media use. Findings are discussed in terms of adolescents who may be more vulnerable to harmful effects on social media. Clinical and research implications are considered.

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Section A: Literature Review

Which User Characteristics Statistically Moderate the Relationship Between Social Media Use and Adolescent Wellbeing? A Narrative Review.

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Abstract

The topic of social media use and its effect on adolescent wellbeing is now a popular topic among researchers. However, findings are still mixed and inconclusive. Research seems to be shifting away from simply examining whether social media use is beneficial or not, and moving towards identifying individuals that may be more vulnerable to negative effects. Therefore, the present narrative review aims to investigate statistical moderators of the relationship between SM use and adolescent wellbeing. A systematic search of PsychINFO, Medline, Web of Science and Assia was conducted in March 2022 identified 14 papers meeting inclusion criteria. A range of moderators were reported. There was some initial support for gender as a moderator and its interaction with other variables such as emotional regulation and age. Other documented moderators include perceived peer support, anxiety, self-esteem instability and social comparison orientation. Clinical implications such as bringing conversations about social media use into assessments are discussed. However, the results should be interpreted with caution given the limited number of studies. Research recommendations are made concerning the design and direction of future studies.

Introduction

This narrative review explores the current literature on social media (SM) use and outcomes in adolescents: a topic that has increasingly become the focus of empirical studies due to the rapid proliferation of SM over recent years (Statista, 2019). SM has grown in popularity since Facebook was first launched in 2004, followed by other SM platforms, such as Twitter, YouTube, Instagram and more recently, TikTok. SM can be broadly defined as “forms of electronic communication through which users create online communities to share information, ideas, personal messages, and other content (such as videos)” (Meriam-Webster, 2022). While different SM sites offer varying features, a common characteristic is the ability to connect and interact with other site users. This can take the form of online “friends” or “followers” and has transformed patterns of communication, particularly among adolescents (Plaisime, Robertson-James & Mejia, 2020).

The increase in SM use has been associated with a rise in mental health difficulties in this age group (Twenge, 2020). However, evidence regarding the association between SM use and adolescent wellbeing is still a mixed picture. A recent meta-review of the evidence (Valkenburg, Meier & Beyens, 2021) synthesised all existing reviews and meta-analyses on SM use and adolescent wellbeing. They found that findings were “inconsistent” across studies, all reviewed meta-analyses reported considerable variations in the associations under investigation (e.g. Ivie et al., 2020) and most studies were cross-sectional in nature therefore conclusions could not be drawn. Their findings suggest that SM use is weakly associated with higher levels of ‘ill-being’ (defined as anxiety and depressive symptoms, distress or negative affect) but also higher levels of wellbeing. They also identified gaps in the literature including “the lack of attention to risk and protective factors that may uncover which adolescents are particularly susceptible to the effects of SM use” (p.44). Other reviews of the literature have pointed out that research thus far has mainly focused on the positive versus negative effects of SM use on adolescent wellbeing rather than on examining the mechanisms by which different aspects of SM may interact with user characteristics (Sharpiro & Margolin, 2014). The UK government have also called for further research into this topic including “how males and females differently engage with social media” (Scottish Government, 2020).

To make sense of the mixed findings, research is starting to move away from merely investigating the positive and negative effects of SM use, to exploring the moderators of

these effects (Cipolletta et al., 2020). It is plausible that both positive and negative effects of SM use are valid, they simply differ within and between individuals. In addition, given the multi-dimensional nature of wellbeing, there is a growing necessity to be clear about what is being measured. Several reviews in Valkenburg, Meier & Beyen's (2021) meta-review failed to define their outcome variables which led to a "potpourri of cognitive and affective outcomes that each deserve to be investigated in their own right" (p. 44).

Wellbeing

Many different descriptions of wellbeing have been developed (Dodge et al., 2012) and despite it being a growing area of research, precisely how it should be defined remains unanswered. Most researchers view wellbeing as a multi-faceted construct encompassing many different elements. Over the years, different descriptions have been suggested, with the most prominent research in the field dividing wellbeing into two key areas: 'hedonic' and 'eudiamonic' (Ryan & Deci, 2000). Hedonic wellbeing focuses on happiness, defining wellbeing as pleasure attainment and pain avoidance. It is seen as a subjective measure of wellbeing which encompasses cognitive components, such as life satisfaction, as well as affective components such as the absence of negative emotion (e.g., worry, sadness) and the presence of positive emotion (Diener & Lucas, 1999). Eudiamonic wellbeing distinguishes itself from the notion of 'happiness' and includes concepts such as self-acceptance, meaning and life purpose. Research has also recognised the importance of including social support and relationships in models of wellbeing. Individuals who have high levels of relatedness from social networks (DeNeve, 1999) and those with higher quality relationships (Nezlek, 2000) are said to have higher wellbeing. The positive psychology movement coined the term 'flourishing' and put forward a dynamic concept of wellbeing which includes elements such as Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment (PERMA; Seligman, 2011). Dodge et al. (2012) extended the work of Headey & Wearing's (1989) dynamic equilibrium theory to suggest that stable wellbeing is when an individual "has the psychological, social and physical resources" needed to meet a particular challenge. This definition encompasses psychological resources such as self-esteem, life satisfaction and mental health, and recognises the importance of social support. In line with previous reviews (Best, Mankletow & Taylor, 2014), the use of wellbeing as a broad umbrella term that incorporates a diverse psychosocial range of outcomes allow for the inclusion of a wider range of studies, in an area where studies are limited. Therefore, this review will consider both hedonic and eudiamonic elements of wellbeing, as well as the addition of social support

and relationships (Seligman, 2011; Dodge et al., 2012) As similar types of SM use can lead to different mental health and wellbeing outcomes in adolescents (Valkenburg, Meier & Beyens, 2021), this review will attempt to separate out outcomes as well as moderating variables.

Adolescence and social media

Adolescence is a critical period of life when many factors contributing to wellbeing are developed and solidified (Ross et al., 2020). They are also a group for whom SM use is particularly pertinent. The use of SM by adolescents over the last few years has increased significantly, with adolescents now considered to be prolific SM users. A reported 87% of 12-15-year olds in the UK have at least one SM profile (Ofcom, 2021) and 89% of 10-15-year olds report being online every day (ONS, 2020). In addition, around 98% of 12-17-year olds in the UK reportedly own a smartphone (Ofcom, 2021). The constant nature of SM means adolescents often feel a pressure to be continuously connected, also known as the 'fear of missing out' (Course-Choi, 2019). This can lead to disrupted sleep patterns and increased emotional investment in SM (Scott, Bielo & Woods, 2019).

As mentioned previously, SM use has been the topic of much contention in recent years as it has been associated with both benefits and risks. SM may uniquely appeal to adolescents given the characteristics of this developmental stage, making them particularly susceptible to both the positive and negative effects of SM use. Adolescence has long been considered a time of transition which marks the stage of life between childhood and adulthood. Defining the exact temporal parameters around adolescence is challenging as no current consensus exists. Rather, it has been conceptualised as a dynamic developmental period rather than being subject to age norms (Casey, Jones & Hare, 2008). However, for the purposes of this review, adolescence will be defined as any person between the ages of 10 and 19, in line with the definition provided by the World Health Organisation (WHO, 2006). During this period, adolescents experience various cognitive, biological, and social-emotional changes such as fluctuations in wellbeing (Maciejewski, 2019), increased risk-taking behaviours and emotional reactivity (Casey, Jones & Hare, 2008). It is also the time when mental health difficulties, such as depression, typically emerge (Paus, Keshavan & Giedd, 2008). It is generally regarded as a critical time for the self and identity development (Erikson, 1968) as adolescents seek autonomy, particularly from parents. The emphasis shifts to socialisation and there is a greater need for connection with peers (Meeus et al., 2005).

It has been argued that aspects of SM have the potential to fit well alongside adolescent's developmental needs as it can enhance the capacity for socialising online, reduce feelings of loneliness and provide opportunities for self-disclosure (Best, Mankletow & Taylor, 2014). One of the most cited benefits for adolescents is the possibilities SM has to offer in terms of social connection, both with existing friends and new connections that can provide social support (Nesi, Wolff & Hunt, 2019). On the other hand, adolescents also report greater levels of self-consciousness and are more concerned with others perception of self (Pfeifer et al., 2009). They tend to have a less fixed sense of self and are still in a process of discovering who they are. They may therefore rely more on feedback from peers in shaping their identity. SM has opened up new ways for adolescents to construct their identity through self-presentation strategies, such as presenting an idealised self, to gain positive feedback from others (Ward, 2018). This positive feedback might initially serve to elevate self-esteem. However, cognitive or emotional dissonance may arise when adolescents feel this idealised representation of themselves is disingenuous. According to Marcia's (1980) theory of identity development, this form of identity exploration could to a decrease in self-esteem through the process of identity diffusion (Kroger, 2008). In addition, SM use has been linked to the activation of the brain's reward centres. Adolescents are still developing their capacity to self-regulate, both behaviourally and emotionally, and this may therefore place them at risk of excessive SM use (Wu et al., 2013).

Rationale and aim of the review

Overall, much of the research examining SM use and adolescent wellbeing has focused on either benefits or risks of SM use, without much attention being paid to the context and mechanisms underpinning this relationship. This may be of particular interest in an adolescent population for whom SM use is prolific. They also have many biological, social and psychological developments that could interact with SM use and impact wellbeing. As suggested, a gap in reviews thus far appears to be a lack of understanding of the underlying factors that might explain the conflicting and mixed results. This review aims to address some of the gaps in the literature by focusing on individual differences and characteristics that may make certain adolescents more vulnerable to negative outcomes following SM use. More specifically, variables that may moderate the relationship between SM use and measures of adolescent wellbeing and mental health. This review will be narrative in nature based on a systematic search methodology. This is an emerging area of study and therefore it

was felt that overly restricting the type of predictor or outcome variables included may miss potential areas of interest.

The review addressed the following question: Which user characteristics have been shown to statistically moderate the relationship between social media use and adolescent wellbeing?

Methodology

Inclusion criteria

This review identified quantitative research studies that investigated moderators of the relationship between SM use and measures of wellbeing in an adolescent population. The date range was limited from 2006 to the present day, as 2006 is when Facebook became open to public use. Table 1 lists the inclusion criteria.

Table 1

Inclusion criteria for systematic search

Inclusion Criteria
Published in English
Published in or after 2006
Published in a peer-reviewed journal
Participants aged between 10 and 19, or where an age range is not provided, the sample has an average within this range
Research based on social media practices, as per the definition ^a
Research that examined whether at least one variable moderated the outcome(s) of SM use

^a Studies focusing on online gaming were excluded unless there was a clearly identifiable link to SM use. Studies that did not distinguish between online and offline social contact were also excluded.

Literature search

A literature search of electronic databases PsychINFO, Medline, Web of Science and Assia was conducted on 12th March 2022. Internet searches for previous literature reviews of adolescent wellbeing and SM use informed key search terms (Best, Manktelow & Taylor, 2014; Shankleman, Hammond & Jones, 2021; Valkenberg, Meier & Beyens, 2022). These included specifying several popular SM platforms to broaden the search (Statista, 2022). However, it is noted that these search terms did not cover all widely used SM platforms and focused on those popular in Western countries. For example, previous reviews excluded the Chinese SM site 'WeChat' in key search terms despite its popularity. Key search terms were combined with Boolean operators 'OR' and 'AND', and exploded subject headings were

used. The search terms were: (adolescen* OR teen* OR “young people” OR “young person” OR child* OR youth OR girl OR boy) AND (social media OR “online social network” OR “social networking site” OR Facebook OR Instagram OR Twitter OR Snapchat OR TikTok OR “digital technolog*”) AND (moderat* OR vulnerab* OR suscpetib* OR interact*). Titles and abstracts were screened for relevance. Reference sections of retrieved studies and previous review articles were also searched.

Quality assessment

The quality of moderation analyses followed the assessment plan established by Knopp et al. (2013), with a number of quality criteria rated as either: *Not met (0)*, *unclear (?)* or *met (1)*. These rating were then summed together to generate a total quality score ranging from 0-7 (see Appendix 4) and this was used as an indicator of moderation analysis comparison. The Critical Appraisal Skills Programme (CASP, 2018) quality appraisal framework for cohort studies was used to evaluate the research (Appendix 2).

Review

The systematic search identified 14 papers satisfying the inclusion criteria (Figure 1). Information listed by study is presented in Table 2. As suggested in the introduction, the review will use 'wellbeing' as an umbrella term to represent a number of outcome variables seemingly examining different aspects of adolescent wellbeing. This section is structured thematically by the outcome variables in the studies under review: mental health, life satisfaction, self-esteem, friendship quality and externalising behaviours, and then further broken down by moderator.

Overview of included studies

The included studies were all conducted in Western countries across Europe, the UK and USA with most participants identifying as White. Only four studies provided detailed ethnicity data and four studies did not provide any information on the demographics of the sample. Gender was fairly evenly distributed across the studies although two studies (Vogel et al., 2015; Frison & Eggermont, 2017) had an underrepresentation of males. Adolescents ages ranged from 10-19 years; only two studies included participants under the age of 12. See Table 2 for a more detailed overview of study characteristics. Most studies measured SM use by asking participants to report the time spent (i.e., hours per day) on SM platforms; three of these studies separated out active and passive SM use. Other studies focused on SM

experiences by asking participants to recall how often they had positive or negative experiences on SM, experiences of cybervictimisation or engaged in technology-based feedback seeking.

Figure 1.

Flow chart illustrating systematic literature search

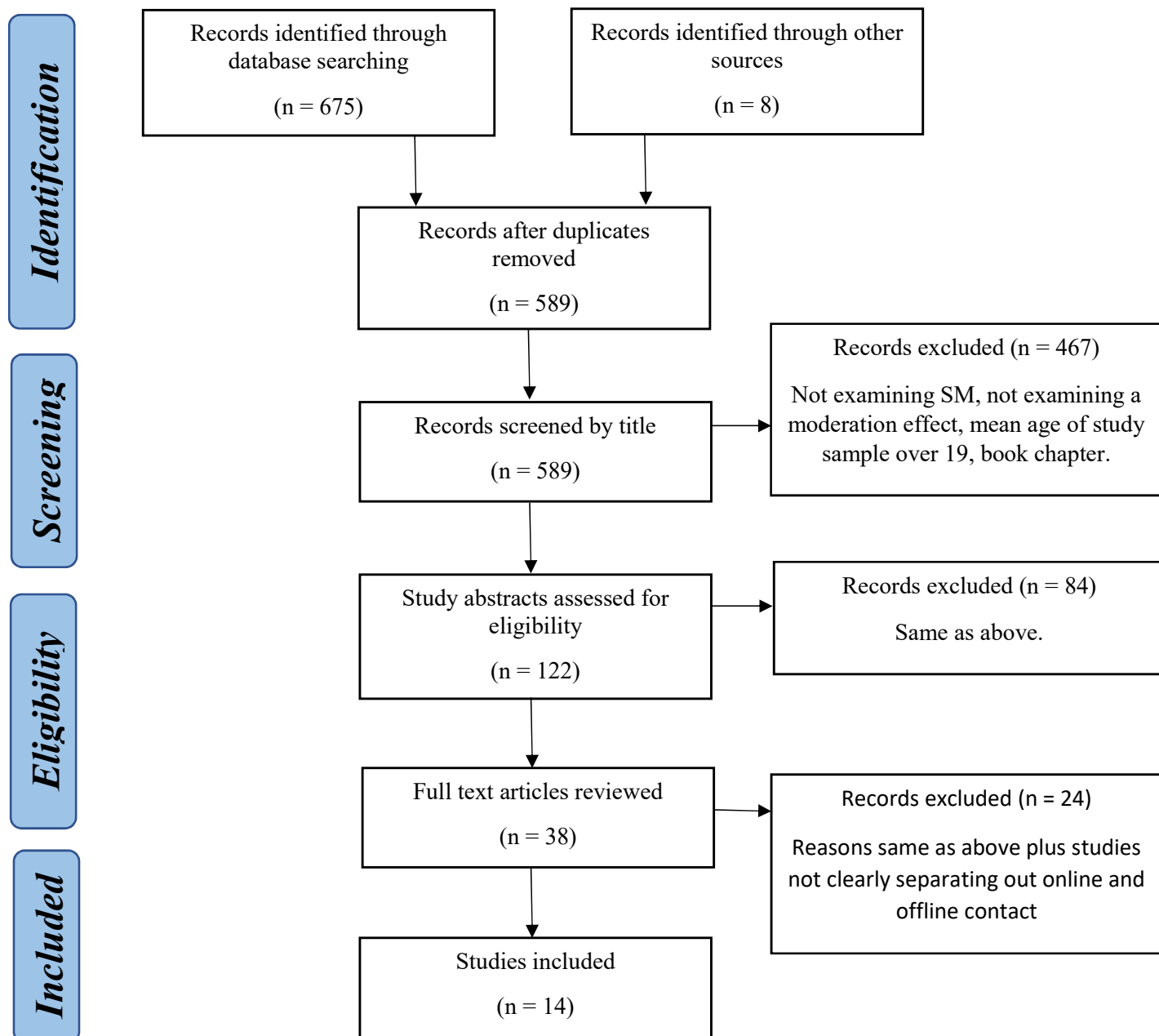


Table 2.*Characteristics and main findings of included studies*

Study no.	Author (year)	Sample size, study design	Location of study: ethnicity of participants	Sample age range (mean), % female	Moderating variable(s), measures	Main outcome variable(s), measures	Data analysis	Main findings
1	Booker, Sacker & Kelly (2018)	9859 (510 participated in all 5 waves) Longitudinal five-wave study, survey data	UK: ethnicity data not provided. Authors suggest a “nationally representative” sample.	10-15 (<i>M</i> = NS), 49% female	<i>Gender</i> - participant demographics collected (male vs. female only) <i>Age</i> - participant demographics collected	<i>Wellbeing</i> - 6-items covering domains of life (i.e. friends, family, appearance, school, school work, life as a whole), Cronbach’s $\alpha = 0.77$ and Strengths and Difficulties Questionnaire (SDQ)	Parallel latent growth curve models. Models measure change by age across individuals and do not measure change over time.	More frequent SM use at age 10 was associated with declines in wellbeing thereafter for females but not males.
2	Calandri, Graziano and Rollé (2021)	336 Longitudinal study two-wave study, survey data	Italy: ethnicity data not provided. Parent’s level of education was medium-high and majority of parents were employed full-time.	12-15 (<i>M</i> = 13 at T1, 14 at T2), 48% female	<i>Gender</i> - participant demographics collected (male vs. female only) <i>Emotional self-efficacy (ESE)</i> - Multidimensional Emotional Self-Efficacy Scale (Caprara et al., 2013) and Positive Regulatory Emotional Self-Efficacy Scale (Caprara et al., 2008)	<i>Depressive symptoms</i> - Centre for Epidemiological Studies Scale – short version (CEDS-10; Pierfederici et al., 1982) <i>Affective wellbeing</i> - Positive Affect and Negative Affect Schedule (PANAS; Terracciano et al., 2003) <i>Life satisfaction</i> , modified version of the Brief Multidimensional Students’ Life	PROCESS-SPPSS macro used to test a three-way interaction model	SM use did not predict depressive symptoms, affective wellbeing or life satisfaction. The effect of SM use on outcomes was moderated by gender and levels of ESE. When females have low levels of ESE and use SM frequently, they have more depressive feelings and lower affective wellbeing and life satisfaction.

						Satisfaction Scale (BMSLSS; Huebner et al., 2006)		
3	van den Eijnden (2018)	538 Longitudinal three-wave study, survey data	The Netherlands: 96.5% Dutch ethnic background. No further ethnicity or SES data provided.	538, 12-15 ($M =$ 12.9), 51.1% female at T1	<i>Gender</i> - participant demographics collected (male vs. female only)	<i>Perceived social competence</i> – Harter’s Self Perception Profile of Adolescents (Harter, 1988) <i>Life satisfaction</i> – the 5-item Satisfaction with Life Scale (SLS; Diener, Emmons, Larsen, & Griffin, 1985) plus two additional items (e.g. I am satisfied with my life)	Structural equation modelling	More disordered SM use predicted lower life satisfaction after one- year follow-up (T1-T2 and T2-T3). Gender moderated the effect of disordered SM use on life satisfaction: the negative effect was stronger for males than for females.
4	Frison & Eggermont (2016), Belgium	910 Cross- sectional, survey data	Belgium: 91.1% born in Belgium, 1.8% in Europe and 2.1% in non- European country. 76.2% parents had a post-secondary degree.	NS ($M =$ 15.44), 51.9% female	<i>Gender</i> - participant demographics collected (male vs. female only)	<i>Depressed mood</i> – The Center for Epidemiological Studies Depression Scale for Children (Weissman, Orvaschel & Padian, 1980)	Structural equation modelling	Negative impact of SM use occurs among girls who passively use Facebook and boys who actively publicly use Facebook. Girls who actively use Facebook who also have higher perceived social support, had a decrease in depressive symptoms
5	Frison & Eggermont (2017), Belgium	671 Longitudinal two-wave panel study	Belgium: No ethnicity or SES data provided.	12-19 ($M =$ 14.96), 61% female	<i>Gender</i> - participant demographics collected (male vs. female only)	<i>Depressed mood</i> – The Center for Epidemiological Studies Depression Scale for Children (Weissman, Orvaschel & Padian, 1980)	Structural equation modelling	Instagram browsing at T1 was related to adolescent depressed mood at T2. No gender differences were found.

6	Frison, Subrahmanyam & Eggermont (2016), Belgium	1840 (1235 completed both waves) Longitudinal two-wave panel study	Belgium: 92% born in Belgium, 5% in a European country and 3% in a non-European country. 58.5% parents had a post-secondary degree.	12-19 ($M = 14.76$ at T1), 48% female	<i>Gender</i> - participant demographics collected (male vs. female only) <i>Age</i> - participant demographics collected <i>Perceived friend support</i> – the friend subscale of the Multidimensional Scale of Perceived Social Support (MPSS; Zimet et al., 1988)	<i>Depressive symptoms</i> – Centre for Epidemiological Studies Depression Scale for Children (CES-D; Irwin, Haydari & Oxman, 2012) <i>Life satisfaction</i> – Satisfaction with Life Scale (Diener et al., 1985)	Multivariate analysis of variance (MANOVA)	Peer victimisation on Facebook predicted decreases in life satisfaction, and life satisfaction predicted decreases in the probability of being victimised on Facebook. Support from friends moderated this relationship. Gender and age did not moderate this relationship.
7	Marsh et al. (2022)	288 Cross-sectional survey data	USA: 82.6% White, 6.9% Bi/Multiracial, 5.6% Black, 4.5% Asian, 4.5% Hispanic, 0.3% American Indian/Alaskan Household income: $M = \$94,686$	288, 13-15 ($M = 14.09$), 45% female	<i>Emotional investment in SM</i> - Social Media Use Integration Scale (SMUIS, Jenkins-Guarnieri et al., 2013) and SMUIS-parent version (only social integration and emotional connection subscales used in this study)	<i>Internalising symptoms</i> - Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2005)	Regression models using PROCESS macro	Emotional investment in SM moderated the relationship between negative SM experiences (i.e. cybervictimisation) and internalising symptoms for adolescents with ADHD. Cybervictimisation was associated with higher anxiety and depression at higher levels of emotional connection to SM.
8	Nesi & Prinstein (2015), USA	619 Longitudinal two-wave study	USA: 47.9% White, 21.1% African American/Black, 23.4%	12-16 ($M = 14.6$), 57.3% female	<i>Gender</i> - participant demographics collected (male vs. female only)	<i>Depressive symptoms</i> - The Short Mood and Feelings Questionnaire (SMFQ)	Hierarchical multiple linear regressions	Technology-based SCFS positively associated with depressive symptoms. Gender and popularity

			Hispanic/Latino, 0.5% Asian, 5.5% Other.		<i>Popularity</i> - Sociometric nomination procedures used (Coie et al, 1983).			moderated this effect. The association was strongest among females and those low in popularity.
9	Ohanessian & Vannucci (2021), USA	1072 Cross-sectional survey data	USA: 64% White, 25% Hispanic/Latino, 11% Black. 43% parents had completed university.	12-14 (<i>M</i> = 12.7), 51% female	<i>Gender</i> - participant demographics collected (male vs. female only) <i>Race/ethnicity</i> - Participant demographics collected	<i>Externalising behaviours</i> -The Delinquent Behaviour Scale (DBS), the five-item behavioural conduct scale of the Self-Perception Profile for Adolescents-Revised (SPPA-R)	Chi-square tests, multivariate analysis of covariance (MANCOVA)	Adolescents who regularly used SM reported more externalising behaviours than non-users. There was a moderation effect of gender and race/ethnicity in that boys who used Facebook and Hispanic adolescents who used Instagram regularly were at increased risk.
10	Van Schalkwyk et al. (2017), USA	100 (44 with ASC, 56 controls) Cross-sectional survey data	USA: no ethnicity or SES data provided	12-19 (<i>M</i> = 15), 47% female	<i>Anxiety</i> - Multidimensional Anxiety Scale for Children 2 nd ed. (March et al., 1997)	<i>Friendship quality</i> - The Friendship Questionnaire (Bierman & McCauley, 1987). Parent and child versions used.	Cross-sectional survey data, multiple regression	SM use significantly associated with friendship quality in adolescents with ASC which was moderated by anxiety levels.
11	Valkenburg et al. (2021)	300 Experience Sampling Method (ESM) study over 3-weeks	The Netherlands: 98% identified as Dutch. Authors suggest that the sample was a “fairly accurate representation” of specific area of The	13-16 (<i>M</i> = NS), 58% female	<i>Gender</i> - participant demographics collected (male vs. female only) <i>Self-esteem (SE) level</i> -inferred from the latent mean of all 126 self-esteem observations	<i>Self-esteem</i> - single-item measure asking “how satisfied about yourself do you feel right now?” (e.g. Robin et al., 2001)	Dynamic Structural Equation Modelling (DSEM)	Sizable differences in the person-specific effects on the valence of SM experiences on adolescents’ SE. These were moderated by SE level, SE instability and peer approval but not physical appearance or gender.

			Netherlands under investigation.		<p><i>SE instability</i> - computed by calculating the intraindividual standard deviation of self-esteem across all self-esteem measure assessments</p> <p><i>Peer approval contingency of SE</i>, - 2 statements "I feel more satisfied about myself...(a) when others praise me and (b) when I get a lot of attention from others (Cronbach's $\alpha = 0.63$)</p> <p><i>Physical Appearance contingency of SE</i> - "I feel more satisfied about myself...(a) when I think I am looking good and (b) when I think I am attractive (Cronbach's $\alpha = 0.82$)</p>			
12	Vandenbosch & Eggermont (2015)	1041 Longitudinal three-wave panel study, survey data	Belgium: 95% of the sample born in Belgium	NS ($M = 15.3$), 43.4% female	Gender – participant demographics collected (male vs. female only)	<i>Self-objectification</i> – an adapted version of the Self Objectification Questionnaire (Noll & Fredrickson, 1998)	Structural equation modelling	Girls who had more frequent SM use at T2 also had higher levels of self-objectification at T3. No gender differences were found in how attractiveness-related use of SM impacted self-

								objectification or body surveillance.
13	Vogel et al. (2015)	120 Experimental study	USA: 65.8% White, 21.7% Black, 6.7% Asian, 3.3% mixed race, 0.8% Pacific Islanders, 1.7% unknown.	NS ($M = 18$), 77% female	<i>Social comparison orientation</i> – Iowa-Netherlands Comparison Orientation Measure (INCOM; Gibbons & Buunk, 1999)	<i>Self-esteem</i> – State Self-Esteem Scale (Heatherton & Polivy, 1991) <i>Affective wellbeing</i> – PANAS (Watson, Clarke & Tellegen, 1988)	Hierarchical regression analysis	Participants high in SCO had higher levels of negative affect and lower self-esteem than those low in SCO after browsing Facebook.
14	de Vries et al. (2016)	604 Longitudinal two-wave panel study	The Netherlands: 97.7% born in The Netherlands	11-18 ($M = 14.7$ at T1), 50.7% female	<i>Gender</i> – participant demographics collected (male vs. female only)	<i>Peer appearance-related feedback</i> – four items asking how often friends gave tips or criticisms about appearance, body, clothes, sexiness, or told them looking good is important (4-point response scale) <i>Body dissatisfaction</i> – the Body Areas Satisfaction subscale of the MBSRQ (Cash, 1994)	Structural equation modelling	Peer appearance-related feedback did not predict body dissatisfaction and did not mediate the effect of SM use on body dissatisfaction. Gender did not moderate the findings.

NS = not specified, T1 = time 1; T2 = time 2; T3 = time 3

Quality assessment of included studies

Design

Most studies in this review were either cross-sectional in design or utilised a two-wave longitudinal approach. Although two-wave studies allow for some tentative suggestions on the direction of the relationship between variables, when examining the role of moderators or mediators, three-wave studies where moderator/mediator, predictor and outcome variables can be measured at different time points could allow for more conclusions to be drawn on the temporal nature of the relationship. This is important given that Frison, Subrahmanyam & Eggermont's (2016) longitudinal study found evidence that depressive symptoms were a risk factor for online peer victimisation, but online peer victimisation did not necessarily lead to increased depressive symptoms.

Measures

The overreliance on self-report measures is a clear weakness of the papers in this review as they can lead to results being under or overestimated. There also appears to be a reliance on frequency-based measures of SM use without taking into consideration the specific activities or experiences on these sites, which is in-line with a recent review of SM use measures (Revranché, Biscond & Husky, 2022). They suggest discrepancies exist between self-reported frequency of SM use and actual use which can limit the investigation of their impact on adolescents' functioning, behaviour and wellbeing.

Sample

A number of studies in this review recruited participants where convenience sampling was utilised or there was an over-representation of White adolescents. However, a strength was that most studies had a fairly even distribution of boys and girls, allowing for comparison between these groups. In most cases, social economic status (SES) data was not collected and therefore could not be controlled for in the analysis.

Moderation analysis

The quality of moderation analysis was mixed, ranging from comparatively low (3) in Van Shalkwyk et al. (2017), who failed to report the reliability or validity of both their moderator and outcome variables, to relatively high (6) in other studies. Studies that lost points did so mainly due to a lack of a-priori hypotheses. In addition, ideally studies would be pre-

registered and have a clear plan for moderation analysis. However, this is work in progress in the field so unsurprisingly it was not clear whether this was the case for studies in this review.

What moderates the relationship between SM use and measures of mental health?

Six studies examined the moderating role of individual user characteristics on the relationship between SM use and aspects of mental health. Five studies focused on depressive symptoms and one study measured both anxiety and depression. This section is grouped by the following moderators: gender, perceived friend support and emotional investment in SM.

Gender

Calandri, Graziano and Rollé (2021) investigated the effects of SM use on subsequent depressive symptoms alongside the potential moderating role of emotional self-efficacy and gender. A convenience sample of 336 adolescents were recruited from seven middle schools in Northwest Italy. They completed a version of the Center for Epidemiological Studies Scale (CESD-10; Pierfederici et al., 1982) that had been validated in an Italian population, at baseline (T1) and one-year later (T2). A regression model that examined the three-way interaction of SM use, emotional self-efficacy and gender was found to be significant, with depressive symptoms at T1 entered into the model as a covariate. The results suggest that when girls have low levels of self-efficacy in emotion regulation along with frequent SM use, they experience more depressive feelings compared to boys. The study makes a novel contribution to the literature, as previous studies of emotional regulation have not considered SM use specifically or focused on adolescents (Pace, D'Urso & Zappulla, 2019). However, the convenience sampling method meant that the sample was not fully representative of the target population and should be generalised with caution. In addition, the study did not capture participant ethnicity data. Some Social Economic Status (SES) data was collected (i.e., parental education level and employment) but it is unclear why this was not controlled for in the analysis.

Nesi and Prinstein (2015) examined the moderating effects of gender as well as popularity on the relationship between technology-based social comparison and feedback-seeking (SCFS) and depressive symptoms. The study used The Short Mood and Feelings Questionnaire (SMFQ; Angold et al., 1995) to assess depressive symptoms across two time-points (baseline and 1 year later). A hierarchical multiple linear regression analysis found that technology-based SCFS was positively associated with depressive symptoms, controlling for frequency of technology use, offline excessive reassurance-seeking and baseline depressive symptoms.

Gender and popularity served as moderators of this effect, such that the association was particularly strong among girls and adolescents low in popularity. However, it is not clear how much the results can be generalised to SM use specifically as the measure of technology based SCFS (Motivations for Electronic Interaction Scale; MEIS) asked about “electronic interaction” which could include other forms of technology-related communication.

Frison and Eggermont (2016) measured two dimensions of Facebook use (active vs. passive) in the relationship with depressed mood. The study was also one of the first to differentiate between *public* (e.g., posting photos, status updating) and *private* (e.g. private/instant messaging) Facebook use. They found that *passive* Facebook use yielded more depressive symptoms among girls compared to boys, and both *public* and *private active* use predicted a decrease in depressed mood in girls. Additional analysis showed that the relationship between active Facebook use and depressive symptoms in girls was mediated by their perception of online social support. The authors were also surprised to find that *active public* Facebook use predicted an increase in depressed mood in boys. However, the study’s focus on Facebook use means the result’s generalisability to other SM platforms may be uncertain.

Frison and Eggermont (2017) examined the association between Instagram use and an increase in depressed mood in a sample of 671 adolescents at two time points. The study separated out types of Instagram use into “posting”, “liking” and “browsing” which reflected types of SM use (i.e. passive vs. active). They found that “browsing” at T1 positively predicted an increase in depressed mood at T2. However, a path-by-path analysis revealed that this association was not moderated by gender. These findings contrast with the previous study (Frison & Eggermont, 2016) however they reference an overrepresentation of female Instagram users (61%) which may partly account for this finding. The attrition rate was also substantial (65.6%) and analyses showed significant group differences between those who completed measures at T1 versus those who completed measure at both T1 and T2. However, missing data were estimated, mitigating potential bias in the model.

Perceived friend support

Frison, Subrahmanyam and Eggermont (2016) investigated the role of three possible moderators (gender, age and perceived friend support) on the reciprocal relationships between negative SM experiences (i.e. peer victimisation on Facebook) and depressive symptoms at two time points, 6 months apart. Cross-lagged analysis indicated that there was a unidirectional relationship between depressive symptoms and peer victimisation on

Facebook. Specifically, depressive symptoms appeared to be a risk factor for online victimisation experiences. The results confirmed that perceived friend support was effective in moderating this association. No moderation effects of gender and age were found however there was an overrepresentation of ‘middle adolescents’ in the sample which may have meant that making comparisons between the age groups was difficult. The study may have also benefitted from differentiating between types of friend support (i.e. online vs. offline) to gain a clearer picture of what may protect adolescents from the harmful effects of online victimisation.

Emotional investment in SM

Marsh et al. (2022) investigated whether emotional connectedness to SM moderated the relationship between negative SM experiences (i.e. cybervictimisation) and internalising symptoms in a sample of adolescents with and without Attention Deficit Hyperactivity Disorder (ADHD). Internalising symptoms were defined as symptoms of anxiety and depression as measured by the Revised Child Anxiety and Depression Scales (RCADS; Chorpita et al., 2005). Level of emotional investment to SM was measured using both parent and child versions of the Social Media Use Integration Scale (SMUIS; Jenkins-Guarnieri et al., 2013) which was a strength of this study as it provides a more robust measure compared to using self-report measures alone. They found that greater cybervictimisation was associated with higher levels of anxiety and depressive symptoms for adolescents with greater emotional connection to SM. However, adolescents who took part in the study were mostly White (82.6%) and therefore the results may not generalise to adolescents from other ethnic backgrounds.

Summary and synthesis

Some evidence exists to support the notion that association between SM use and mental health outcomes (particularly depressive symptoms) can be moderated by user characteristics. Two studies highlighted the moderating role of perceived social support in the relationship between these variables. Nesi & Prinstein (2015) also found evidence that an adolescent’s level of popularity could moderate the association between SM use on depressive symptoms. Both studies allude to the idea that an adolescent’s social circle may play a key role in how harmful SM use is for their mental health. Specifically, adolescents who feel they have less social support or contact may be more susceptible to developing depressive symptoms after SM use.

In terms of gender, the literature suggests a more complex relationship. Three of the above studies indicate that girls may be at increased risk compared to boys, but this may also be dependent on other factors such as their level of emotional self-efficacy and whether they engage in feedback-seeking behaviours. The extent to which adolescents actively or passively use SM seemed to differ by gender, with girls who passively use SM and boys who actively publicly use SM more likely to report depressive symptoms. However, the study by Frison et al., (2017) also attempted to separate out active and passive use and found no support for the moderating role of gender. This study examined the experience of online peer victimisation, as opposed to more general SM use, which may suggest online victimisation is a particularly distressing experience that affects boys and girls similarly. Rather, it may be the level of emotional connection adolescents feel to their SM and how adequate they perceive their social support to be, that moderates the relationship between this and their mental health. Although three of the above studies attempted to distinguish between types of SM use (active vs. passive), further research that explores this in more depth may be one route to gaining a better understand of how SM use impacts boys and girls differently.

What moderates the relationship between SM use and measures of life satisfaction?

Six studies examined the moderating role of individual user characteristics on the relationship between SM use and life satisfaction. This section is grouped by the following moderators: gender, social comparison orientation and perceived friend support.

Gender

Booker, Sacker and Kelly (2018) used data from the UK Household Longitudinal Study and benefitted from a large sample of 10-15-year olds. The findings indicated that gender was a significant moderator in the relationship between SM use and satisfaction with life. More SM use at age 10 was associated with declines in life satisfaction thereafter for girls only. This study controlled for potential confounding variables such as household income and had a large nationally representative sample. However, the measure of SM use referred to a “normal school day” which does not consider SM use outside of school hours and therefore findings may be underestimated. In addition, despite the longitudinal design, the nature of the data collection period and questionnaire meant it was not possible to measure changes over time within individuals.

Calandri, Graziano and Rollé’s (2021) previously discussed study found that the negative association between SM use and life satisfaction was stronger for girls with low emotional

self-efficacy compared to boys. Life satisfaction was measured using a modified version of the Brief Multidimensional Students' Life Satisfaction Scale (BMSLSS; Huebner et al. 2006) which measures satisfaction with six life domains (health, relationship with school friends, school experiences, friendships, family life and leisure time). Although there are different reports about the acceptable value of alpha, most literature suggests a value between 0.70 and 0.95 is within an acceptable range (Tavakol & Dennick, 2011). Cronbach's alpha for the measure was slightly below the acceptable range ($\alpha = 0.69$) bringing into question its reliability.

In contrast, Van den Eijnden et al. (2018) investigated the effects of *disordered* SM use on life satisfaction with adolescents across two years. SM disorder symptoms were measured by adapting the internet gaming disorder scale (Lemmens, Valkenburgh, & Gentile, 2015) and included questions such as "during the past year, have you regularly neglected other activities because you wanted to use SM?". The model found that gender moderated the effect of disordered SM use at both T2 and T3, such that the negative effect of disordered SM use on life satisfaction was higher in boys than girls. Goodness of model fit was evaluated using the comparative fit index (CFI; Bentler, 1990) and the model's CFI was reported as 0.90. However recent studies suggest that a value greater than 0.90 is needed to ensure misspecified models are not accepted and therefore a CFI value of 0.95 or higher is considered an indicator of good fit (Schermele-Engel & Moosbrugger, 2003).

Social comparison orientation

One study investigated the moderating role of the individual difference variable, social comparison orientation (SCO) on life satisfaction. SCO is defined as "the inclination to compare one's accomplishments, one's situation, and one's experiences with those of others" (Buunk & Gibbons, 2006). Vogel et al (2015) used an experimental approach to determine whether adolescents high in SCO would be more likely to engage in social comparisons on SM. Participants were randomly assigned to one of three conditions. In the control conditions, participants either browsed their own Facebook profile or read reviews of a consumer product. In the experimental condition, participants browsed the Facebook profile of an acquaintance, which the authors presumed would result in social comparison. They found an interaction effect for SCO and Facebook use, such that participants with higher self-reported SCO in the experimental condition had more negative affect than those low in SCO, an effect not found in the control condition. This study scored medium on the moderation

quality assessment (5/7) and was the only study to use an experimental approach. This is a strength of the design as stronger conclusions can be drawn regarding causation. However, it is worth noting that the moderator was not experimentally manipulated, which still limits the conclusions in this regard. In addition, the self-selecting, primarily female undergraduate sample (77%) restricts the result's generalisability. Participants also only briefly browsed SM in a lab setting and so the study did not directly assess whether they were engaging in social comparisons, therefore it is possible that a process other than this was responsible for the differences between those who browsed another person's profile and those who did not.

Perceived friend support

As mentioned above, Frison, Subrahmanyam and Eggermont (2016) found that perceived friend support moderated the relationship between online peer victimisation and life satisfaction. The study benefitted from a longitudinal design which was able to determine a reciprocal relationship between these two variables. Multiple group comparison tests found that perceived friend support served as a moderator in both relationships. However, there were high drop-out rates between T1 and T2. The study reports that adolescents who dropped out had significantly lower life satisfaction scores than those who did not which could have impacted the results.

Summary and synthesis

Similar to studies that used depressive symptoms as the outcome variable, studies measuring the association between SM use and measures of life satisfaction suggest a nuanced relationship between gender and SM use. Two of the above studies found evidence that girls may be at increased risk of negative effects. However, it may not be as straightforward as simply looking at gender in isolation, as both studies found gender interacted with another variable to moderate this relationship (i.e., frequency of SM use at a young age and level of emotional self-efficacy). Moreover, in van de Eijnden's (2018) study, they found that boys, compared to girls, were at greater risk of decreases in life satisfaction after *disordered* SM use, which reflects aspects of internet addiction. All these studies had similar quality ratings for moderation (5/7) so, in terms of what may account for this difference, it may be that boys are more likely to engage in SM activities (e.g. online gaming) that have higher addictive potential than girls.

Although not examining the effect of gender, one study did distinguish between types of SM use when seeking to understand the role of social comparisons in the relationship between

SM use and life satisfaction. Vogel et al. (2015) did not explicitly differentiate between active and passive SM use, but their measure of SM use involved participants merely browsing Facebook as opposed to actively engaging with it (e.g. posting/commenting). They found evidence that adolescents with high SCO have worse self-reported life satisfaction levels than those with low SCO. It may be that individuals who passively use SM in addition to having high SCO are particularly susceptible to negative wellbeing outcomes, which is in line with previous research (Chen et al. 2016). However, as this study did not have a comparison group that engaged in active SM use, it cannot be said with certainty that adolescents who actively use SM would not have had a similar result.

What moderates the relationship between SM use and measures of body satisfaction?

Gender

A three-wave panel study was conducted by Vandebosch and Eggermont (2016) looking at whether gender moderated the relationship between SM use, internalisation of appearance ideals (IAI) and self-objectification/body surveillance. The results found some evidence for the moderating effect of gender. Analysis found that girls who had more frequent SM use at T2 also had higher levels of self-objectification at T3. They also developed a four-item scale (MAP-SM) to measure attractiveness-related uses of SM (e.g. “Sometimes I search through the photo albums of an attractive boy or girl on Facebook”). However, no gender differences were found in the way that attractiveness-related SM use related to the tendency to self-objectify or conduct body surveillance. The study benefitted from a large sample size (n = 1041) however, analyses revealed that there were substantial attrition group differences, potentially skewing results. The moderation quality rating of 3/7 also means the results should be interpreted with caution.

The study by de Vries et al. (2016) found that gender did not moderate the association between SM use and several body/appearance-related variables in 604 Dutch adolescents. They found that SM use positively predicted appearance investment, desire for cosmetic surgery and body dissatisfaction in both boys and girls. However, the study only included the use of one specific SM site, popular in The Netherlands, which has since declined in popularity (Newcom Research and Consultancy, 2012). Therefore, the measure of SM use may not accurately capture adolescents’ overall SM use and may not be generalisable to other forms of SM.

Summary and synthesis

Interestingly, there was little evidence to suggest that gender was an individual difference that moderated the relationship between SM use and body satisfaction outcomes. Vandenberg and Eggermont (2016)'s results provide some support for the idea that girls' tendency to self-objectify was more likely to be associated with overall frequency of SM use. This fits with existing literature suggesting that a desire to present themselves as attractive online is stronger for girls than boys (Bailey et al., 2013) and that girls post images of themselves more frequently than boys (Herring & Kapidzic, 2015). However, no gender differences were found for specific attractiveness-related SM use. Moreover, de Vries et al., (2016) found no support for gender differences in SM use and appearance related variables. The lack of evidence for gender differences in the above studies highlights the need to include young men and boys in future research as media that focuses on appearance ideals may affect girls and boys similarly.

What moderates the relationship between SM use and measures of self-esteem?

Valkenburg et al (2021) used an experience sampling method (ESM) to gather data from 300 adolescents over a 3-week time period. They found significant within-person associations of SM use with self-esteem (SE), in that adolescents' self-esteem increased after a positive experience on SM and dropped after a negative one. However, they found substantial differences in adolescents' susceptibility to the effects of SM use on SE. The moderating role of five variables (gender, SE level, SE instability, peer approval and physical appearance) which could explain these person-specific effects of SM use is outlined below.

Self-esteem level

Adolescents with a lower average SE experienced significantly stronger *positive* effects of time spent on SM on SE than adolescents with higher average SE. The authors suggest this may point to a social compensation effect (Kraut et al., 2002) where adolescents with low SE use SM to boost their SE. However only a few participants in the study reported stable low levels of SE (which is consistent with the general population), possibly due to a self-protection process (Valkenburg et al., 2021a). The authors therefore suggest that SE *instability* may provide a better explanation for the influence of SM experiences on SE.

Self-esteem instability

Valkenburg et al. (2021) found that for adolescents with unstable SE, a positive or negative SM experience predicted their overall reported SE than those with more stable SE. These adolescents also reported significantly fewer positive experiences on SM compared to their peers, therefore this result may pertain more to drop in SE after negative experiences as opposed to a surge in SE after a positive one. The authors argue that SE instability seems to be a “critical susceptibility factor to explain the momentary effects of positive and negative SM experiences on SE”. They argue that this result is in line with studies suggesting that adolescents with greater mood instability are more likely to develop depressive symptoms than those with stable moods (e.g., Maciejewski et al., 2019).

Peer approval

Finally, adolescents who did not base their SE on peer approval showed less susceptibility to the effects of positive SM experiences on their SE, than adolescents who did more so. The authors suggest that it is possible these adolescents are particularly focused on SM interactions that gain positive feedback from peers.

A strength of the study was that it used an Experience Sampling Method (ESM) to gather data which captures in-the-moment SM use. It is therefore useful in measuring changes over time and may be more accurate than retrospectively asking adolescents about their SM use. The study found no moderation of gender or physical appearance. However, the moderation quality assessment suggests the study may have been underpowered to detect an effect due to the large number of moderators entered into the model. Cronbach’s alpha was also not reported for the measure of self-esteem, so the reliability of this variable is unclear.

What moderates the relationship between SM use and measures of friendship quality?

Anxiety

Van Schalkwyk et al. (2017) examined the moderating effect of anxiety on SM use and friendship quality in 100 adolescents with and without Autism Spectrum Conditions (ASC). The study used the Multidimensional Anxiety Scale for Children (MASC; March et al., 1997), a measure also previously used in studies of individuals with ASC (e.g. Wood et al., 2009). SM use was assessed using a bespoke measure of SM experience, the Social Media Experience Scale (SMES), which included a subscale designed to measure *active* engagement on SM (SMES-Utility). Analysis indicated adolescents who actively engaged with SM had

higher friendship quality, and this association was stronger for those with lower anxiety scores. However, this was only seen in adolescents with ASC. In addition, the moderating role of anxiety was only demonstrated using parent measures of anxiety and when assessing SM use using the SMES-Utility (as opposed to overall time spent on SM). This result may be due to the fact that the MASC has shown poor correlation between parent and child reports in previous studies, particularly with adolescents with ASC who are hypothesised to have distinct perceptions of their anxiety (Baldwin & Dadds, 2007). Based on the moderation quality assessment criteria, this analysis was the poorest quality due to lack of reporting on the reliability/validity of both the moderator and outcome variables combined with no baseline measure of the moderator.

What moderates the relationship between SM use and measures of externalising behaviours?

Gender, race/ethnicity

One study by Ohannessian and Vannucci (2021) examined the moderating roles of gender and race/ethnicity on the relationship between SM use and externalising behaviours in a sample of 1072 adolescents. Externalising behaviours were measured using the Delinquent Behaviours Scale (DBS) which asked adolescents to report how often they engaged in 17 “problem behaviours” over the past 6 months (e.g. skipping school, stealing, lying etc). The study was the only one in this review to separate out different forms of SM, namely Twitter, Facebook, Instagram and Snapchat which allowed for comparisons across SM platforms. MANCOVA analyses found significant gender and race/ethnicity differences in the use of both Facebook and Instagram. Boys who used Facebook on a daily basis reported the highest level of behaviours as measured by the DBS. In addition, Hispanic and Black adolescents who regularly used Instagram reported significantly higher levels of these behaviours than White adolescents. A strength of the study was that it had a large diverse sample of early adolescents which appears to be representative of the target population. However, it is important to recap some of the considerations regarding causations covered previously. In particular, statistical moderation does not mean race/ethnicity has a causal moderating role. There may be other systemic factors that may influence this finding. This study was conducted in the USA, where racial and ethnic minorities are disproportionately affected by poverty (e.g. Beech et al, 2021). In addition, minority groups may be more likely to experience racism and racial prejudice on SM than White adolescents, which could be more emotionally disturbing and lead to certain behaviours. Future studies should continue to

explore this relationship and the possible causal mechanism at play. This study also included multiple variables and conducted a number of tests which may increase the likelihood of a Type I error (Andrade, 2019).

Discussion

The papers reviewed highlight the nuances and complexity evident within the literature when examining who may be more susceptible to the effects of SM. There was some support for gender as a moderator in studies that examined outcomes related to mental health, life satisfaction and externalising behaviours. Six of the review studies found evidence for a stronger relationship between SM use and negative outcomes in girls compared to boys. However, it may not be as simple as suggesting girls are more at risk from SM use, as three studies also found boys were more at risk from certain types of SM use (i.e., active, disordered) and three studies found no gender differences at all. In addition, in five out of the six studies that found evidence for worse outcomes in girls, this difference was contingent on another variable (i.e., emotional regulation and self-efficacy, feedback-seeking, age and passive use). Therefore, this review suggests that gender as a moderator should not be considered in isolation. There will be differences in the way that adolescents engage with SM and individual traits and abilities that may interact with gender to moderate the relationship between SM use and wellbeing. Limitations of the studies should also be taken into consideration. For example, Vogel et al (2015) and Frison and Eggermont (2017) had an underrepresentation of males, and it is not clear how much the findings of Nesi and Pinstein (2015) can be applied to SM specifically as a form of communication. However, the findings are line with developmental theories of adolescence which suggest that girls tend to have higher emotional intensity and instability compared to boys (e.g. Bailen, Green & Thompson, 2018). Friendships for girls are often very emotionally charged and it may be particularly difficult to manage these when communication is mediated by a device (Gardner & Davis, 2013). Therefore, emotional self-efficacy may be a key skill in adequately managing online friendships. In addition, younger adolescents may not be fully equipped to manage their emotions as some studies suggest that as children get older, their ability to regulate their emotions increases (Theurel & Gentaz, 2018; Sanchis-Sanchis, 2020). However, as only two studies in this review looked at the moderating role of age, much more research is needed to fully explore its impact. Gender was also operationalised using the binary categories of 'male' and 'female'. This excludes the experience of transgender adolescents which may offer insight into the role of gender socialisation rather than biological sex.

This review also suggests level of social support, specifically from friends, could be one of the mechanisms moderating the relationship between SM use and measures of mental health and life satisfaction. The buffering hypothesis suggests social support can buffer the impact of a stressful event on distress levels (Cohen & Wills, 1985) and this review provides some support for the application of this hypothesis to adolescents in the context of social media. Research suggests familiarity is one of the conditions determining who adolescents seek help from and, therefore, they may be more likely to approach friends or family in the first instance (Camara, Bacigalupe & Padilla, 2013). It could be interesting for future research to compare types of support (e.g. online, offline) and also to look more closely at gender differences as girls may be more likely to seek social support than boys (Eschenbeck, Kohlmann & Lohaus, 2007).

Although this review was not specifically investigating the role of *usage* characteristics, (i.e. the different ways in which adolescents use SM), it appears difficult to separate this completely from *user* characteristics. The papers generally defined SM use in terms of frequency but there were also a number of studies that looked at *how* SM is being used (i.e. active, passive, disordered), and the positive or negative experiences following on from these. This offered insight into how these experiences may interact with user characteristics. Of particular interest was passive use of SM, and how girls and adolescents with higher SCO, may be more vulnerable in terms of negative effects. Research seems to be shifting away from simply measuring the time spent on SM to the effects of different types of SM use. Findings from Hokby et al (2016) support this, as they suggest frequent SM use does not necessarily equate to ‘problematic’ SM use.

Strengths and limitations

All studies in this review were conducted in Western countries with a White participant majority. This is not globally representative which means there are limits on the generalisability of the results. ‘WeChat’ is the fifth most popular SM platform in the world (Statista, 2023) and therefore this could have been included as a search term to ensure inclusion of these studies in the review. However, a key strength of this review is that it is the first to examine statistical moderators of the relationship between SM and adolescent wellbeing which appears to be in-line with where the current research is headed (Valkenberg, Meiers & Beyens, 2022).

Directions for future research

As mentioned previously, the self-report measures of SM use in this review are subject to bias. To fully understand the effects of SM use on wellbeing, future research needs to implement measures that capture the quality of SM interactions or adolescents' responses to specific content. Valkenberg et al., 2021 used an experience sampling methodology which was able to capture SM use at regular intervals in real-time. It may be that future studies could use a similar methodology or draw on the use of hypothetical vignettes to examine how adolescents might respond to specific SM scenarios. It is important to note that the transient nature of SM platforms makes over-time comparisons more problematic, so researchers need to decide the costs and benefits of each approach. This brings into question whether SM platforms should be collaborating more with researchers to ensure transparency on their internal processes which could help gain a more accurate picture of how platforms have changed and continue to change over time.

This review provides some initial evidence that the inclination for adolescents to compare themselves to others may be a variable underlying the relationship between SM use and wellbeing. Therefore, studies may benefit from being clear about which SM platforms they are investigating, as some platforms are more geared towards social networking (e.g. Facebook, Twitter), whereas others focus on photo or video sharing (e.g. Instagram, TikTok) which may lend themselves more to social comparisons than others. This review also excluded studies that measured online gaming. However, this may be a form of online communication and socialising that is at risk of being missed from the literature, especially for boys, who are more likely to use online games than girls (Leonhardt & Overa, 2021). Future studies could also consider random sampling methods as well as targeting studies specifically towards ethnic minority groups, particularly as SM is a place where racism and racist hate speech thrives (Daniels, 2013).

One paper in the review investigated the moderating effect of anxiety in a sample of adolescents with ASC (van Schalkwyk et al., 2017). The social compensation hypothesis suggests that people with higher levels of social anxiety may be more likely to use SM to compensate for a deficit in face-to-face interactions (Valkenburg et al., 2005). However, the research on exactly how social anxiety may interact with SM is still mixed, with some studies suggesting that online communication can lead to an increase in friendship quality (Desjarlais & Willoughby, 2010) and others reporting lower levels of self-esteem (Weidman et al., 2012).

The findings from van Schalkwyk et al (2017) suggest that higher levels of anxiety may mitigate the beneficial effects of SM use in this population. It is therefore surprising that very few papers thus far have specifically examined variables that may interact with social anxiety levels in the context of adolescent SM use.

Clinical implications

Findings from this review offer some evidence for gender as a moderator therefore it seems reasonable for clinicians to take this into account. It suggests that factors such as anxiety levels, perceived friend support, investment in SM and emotional regulation may all play a role in mitigating the effects of SM use on mental health outcomes such as depression. One study also found that depressed adolescents may be more at risk of online peer victimisation. However, the limited number of studies on these moderators and lack of research examining clinical populations means the results should be interpreted with caution. The findings point towards the importance of clinical assessment of SM use in early conversations with adolescents and their families. The complexity of the area means that no guidance for clinical practice will apply to adolescents as a whole and it will require more of a nuanced approach. It will be necessary for clinicians to keep up with developments in the SM literature and how certain SM platform's function. In addition, speaking to adolescents about their SM use and behaviours should be a core part of assessments in mental health services, given how integral it is to their lives. Clinicians may benefit from guides (e.g. the Internet Matters guide) and additional training so they can feel more confident in how to broach this topic with young people and be receptive to learning about the young person's relationship with it.

Conclusion

Overall, there appears to be some support for gender as a moderator which may interact with other variables such as age, popularity and emotion regulation levels. The review also suggests there may be some initial findings for perceived friend support, anxiety, emotional investment in SM, self-esteem instability and higher levels of social comparison orientation as moderators. However, the limited number of studies examining moderators other than gender was very limited and therefore more research is needed to fully understand the influence of these variables. In addition, more studies that go beyond simply measuring 'time spent' on SM would offer insight into the types of SM use and experience that may have more negative effects on adolescents.

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Section B: Empirical Paper

Section B: Adolescent Social Media Use: An Examination of the Relationships Between
Social Anxiety, Cognition, Emotion and Behaviour.

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Abstract

Social media has become an integral part of the lives of adolescents and is changing the way they relate and communicate with each other. Despite a proliferation of research over recent years, findings are still inconsistent, and the field lacks studies examining possible susceptibility variables that could make certain adolescents more at risk from SM use. The current study explored the cross-sectional relationships between social media use and social anxiety in a sample of 76 adolescents from the UK (55% female, 10-16 years). Several hypotheses were tested relating to social media use and social anxiety, and hypothetical vignettes were used to explore the cognitive, emotional and behavioural responses to social media scenarios. The moderating role of age was also tested. Higher levels of social anxiety were linked with greater investment in social media, more passive social media use and both negative cognitive appraisal and emotional responses to vignettes. Age was also found to moderate the relationship between negative cognitive appraisal and passive social media use. Contrary to expectations, no gender differences were found. The study highlights that younger adolescents and those with higher levels of social anxiety may be at increased risk of negative effects when using SM. Implications for practice and future research are discussed.

Introduction

Over the last decade, social media (SM) has become integral to the way we communicate and relate to one another. It can be defined as “forms of electronic communication through which users create online communities to share information, ideas, personal messages, and other content (such as videos)” (Meriam-Webster, 2022). The proliferation of SM platforms over recent years has been hard to ignore, particularly for younger generations, those so called ‘digital natives’ who have grown up immersed in the world of online communication. In the UK, almost 90% of young people aged 10-15 report going online at least once a day (Office for National Statistics, 2020) as many adolescents turn to SM platforms such as Snapchat, TikTok and Instagram to connect with each other. While SM platforms provide opportunities for adolescents to connect and interact in different ways, there has also been a concomitant increase during this period in mental health difficulties for this age group (Twenge, 2020). SM use and wellbeing has therefore understandably become a focus of much research over recent years.

However, the findings thus far are still mixed with both benefits and disadvantages of SM use evidenced in the literature. For example, Baker and Algorta (2016) conducted a meta-analysis into SM use in adolescents and found that 16% of studies reported negative effects, 6% positive effects and 13% no significant effects. However, it is worth noting that the vast majority of the studies in this literature were cross-sectional, making causation hard to prove. A more recent umbrella review of empirical studies (Valkenburg, Meier & Beyens, 2021) also found inconsistencies in findings and drew on the Differential Susceptibility to Media Effects Model (DSMM; Valkenburg & Peter, 2013) as one possible explanation. The model proposes that media effects are conditional depending on three types of differential-susceptibility variables: developmental, dispositional and social. In other words, both positive and negative SM outcomes may be valid, they just refer to different individuals.

Social anxiety

One such susceptibility variable that has been linked to mental health outcomes is social anxiety (SA). In the medical model when SA reaches a certain level of impairment and adverse impact on a person’s day-to-day functioning, it is known as Social Anxiety Disorder (SAD). SAD is characterised by a marked and persistent fear of one or more social situations where the person might be exposed to humiliation or scrutiny by others (American Psychiatric Association [APA], 2013). Despite being one of the most persistent anxiety

disorders, only about half of people seek support (National Institute for Health and Care Excellence, 2013). SAD can affect all areas of life and is associated with high levels of negative consequences and impairment (Alonso et al., 2004).

A number of cognitive theories have been proposed to explain why SA can be so enduring (Clark & Wells, 1995; Heimberg et al, 2010; Hofmann, 2007). A central tenet of these theories is that individuals with SA are more likely to misinterpret situations as threatening (i.e. interpretation bias) and to underestimate their ability to cope, leading to behavioural avoidance and arousal, which maintains anxiety (Beck & Clark, 1997). Clark and Well's (1995) model of SAD suggests that when an individual enters a social situation, their focus will become predominately internal. Other cognitive models of SAD also emphasise the importance of SA-related cognitions, including negative beliefs or assumptions about themselves and others that become activated in social settings (e.g. "people think badly of me") (Wong & Moulds, 2011). This can increase the person's sense of threat and trigger a chain of cognitive, emotional and behavioural responses. The use of 'safety behaviours' is a key maintenance factor which can take the form of 'avoidance' or 'impression-management' (Evans et al, 2021). These behaviours are often intended to mitigate feared outcomes. However, in reality, they can actually maintain or worsen anxiety (Salkovskis, 1991).

Social anxiety and social media

SM is another social context that adolescents inhabit. It is therefore understandable that some individuals may experience greater anxiety when engaging with SM, through the mechanisms described above. However, SM also offers individuals new ways to make connections that might be less anxiety-provoking. SA has been associated with lower friendship quality in adolescents (Biggs, Vernberg & Wu, 2011) and therefore SM may offer opportunities for those with SA to socialise with others in a different way. The social compensation hypothesis suggests that people who perceive their face-to-face social networks to be inadequate (e.g., people with high SA) may be more likely to use SM platforms to compensate (Valkenburg, Schouten & Peter, 2005). SM has some unique characteristics which can enable people to have more control over their self-presentation. SM allows the user to focus on one aspect of someone's presentation at a time (e.g., a posted message or appearance in a photo) and then plan how they want to respond. This may be important to understand why people higher in SA may use SM in a safety-seeking way (Kamalou, Shaughnessy & Moscovitch, 2019). However, again, the evidence for whether SM use has benefits for adolescents with SA is

inconsistent. Some studies suggest individuals with SA feel more comfortable online which can lead to an increase in friendship quality (Desjarlais & Willoughby, 2010), whereas others found a relationship between SA and lower self-esteem among people who use SM (Weidman et al, 2012).

Another potential difference, between SM and face-to-interactions, is that new safety behaviours become possible. Current research is now distinguishing between *active* and *passive* SM use and passive use of SM has been associated with higher levels of SA (Verduyn et al., 2017). Active use can be defined as posting or sharing content whereas passive use involves the user browsing information but not engaging in posting themselves. Studies have shown that passive use has been associated with decreases in wellbeing (Liu et al., 2019) and may also be employed as a strategy to manage difficult experiences online (Course-Choi, 2019). In this sense, passive use could be a type of avoidant safety behaviour, in that it may reflect attempts to limit social engagement. This could be particularly pertinent to those with SA as they may be more susceptible to potential disappointment, self-appraisal or negative feelings associated with lack of feedback or perceived negative judgements. A recent systematic review looking at the influence of social media on depression and anxiety in adolescents found that certain attitudes or behaviours online (e.g. active vs passive use of SM) may have a greater association with symptoms of anxiety than frequency of SM use (Keles, McCrae & Grealish, 2019). Shaw et al (2015) also found that university students with higher SA symptoms used Facebook in a more passive way.

Adolescence and the development of social anxiety

The relationship between SA and SM has been particularly highlighted in adolescents given the extent to which adolescents use SM to form and maintain social relationships. The World Health Organization (WHO) currently defines an adolescent as any person between the ages of 10 and 19 (WHO, 2006) although the exact age parameters have yet to reach a consensus. A report by Ofcom (2022) found that 94% of 12-17-year olds use SM on a regular basis and a majority of children under 13 (60% of 8-11-year olds) had their own profile on at least one SM site, despite the age limit of most SM platforms being 13. SM can change the way adolescents engage with their peers and means they are constantly connected to their social world. It is therefore important to continue to research the impact that SM may have on adolescents, and how it may interact with certain vulnerability factors such as SA.

In most cases, SAD has its onset during adolescence, with 90% of cases occurring before the age of 23 (Kessler et al., 2005). Prospective, longitudinal studies suggest it has a median age of onset of 13 years (Kessler et al., 2005). Adolescents are becoming increasingly independent from their family unit and more dependent on their peers (Larson & Richards, 1991). They are also developing certain neurocognitive abilities to help them navigate this. One such ability is self-consciousness, defined as the directing of attention inwards, which can have both private and public forms (Davis & Franzoi, 1999). Public self-consciousness seems most relevant in the context of SM as it relates to the self as a social object and how one is perceived by others (Leigh & Clark, 2018).

As mentioned above, cognitive theories of SA emphasise the role of cognitive processes in its maintenance (Clark & Wells, 1995) however there have been criticisms of simply applying adult CBT models to adolescents given the developmental changes that occur at this life stage. Adolescence is typically characterised by many social, biological, cognitive and emotional changes taking place during the transition from childhood to adulthood. They may experience shifts in identity and cognitive flexibility (Rutter & Rutter, 1993). Emotional and hormonal changes may mean that they experience emotions more intensely and are in a process of learning how to respond to and regulate these (Kuther, 2017). In addition, other more systemic factors may need to be considered in CBT models such as the impact of parental beliefs and behaviours (Leigh & Clark, 2018), and the influence of peers. The heightened emotional salience of social relationships means that peer rejection can lead to anxiety and low mood (Platt et al., 2013), and an increased vulnerability to social fears (Eldreth et al., 2013).

However, over the past few years, there has been an accumulation of research suggesting that certain aspects of the CBT model can be applied to adolescents. In their review, Leigh & Clark (2018), found evidence for the association between SA and the negative interpretation of ambiguous social situations in adolescents. Such biases are thought to intensify anxious adolescents emotional state and avoidant behaviour which can lead to a vicious cycle of anxiety (Taghavi et al., 2000). As such, as well as examining interpretation bias in adolescents it may be helpful for research to investigate levels of negative emotion and choice of behavioural response. There is some evidence that an association exists between SA and safety behaviours in adolescents. (e.g. Hodson et al., 2008; Thomas et al., 2012). However, the majority of these studies were correlational (Leigh & Clark, 2018), making it difficult to draw conclusions. In addition, there are no studies to-date that examine this

premise in the context of SM, where adolescents might have developed a more complex way of navigating and evaluating their online safety (Course-Choi, 2019).

There are also some studies that challenge the notion of applying CBT model of SAD to younger adolescents, particularly those below the age 12. Both Creswell, Murray & Copper (2014) and Waters et al (2008) found no evidence for an increase in threat interpretation amongst anxious compared to non-anxious children aged 7-12. The most widely used measure of interpretation bias is the use of ambiguous vignettes, involving hypothetical scenarios that could be interpreted as threatening or non-threatening (Wait, Codd & Creswell, 2015). This was initially used with adults (Butler & Matthews, 1983) and has since been modified for use with children and adolescents (Barrett et al., 1996; Creswell, Murray & Copper, 2014).

Very few studies have compared the mechanisms of anxiety in different age groups across this life stage (Waite, Codd & Creswell, 2015). Studies have typically grouped children and adolescents together and therefore may have missed important age effects in the association between anxiety, cognition, emotion and behaviour. Given that younger children are now routinely engaging with SM, it is becoming increasingly important for researchers to adopt a broad developmental perspective and increase the age parameters for research undertaken on this topic. Many key changes occur over the course of adolescence that need to be considered. For example, research suggests that children move from more emotional to more cognitively driven regulation strategies as they get older (e.g. Harris et al, 1981; Zimmer-Gemback & Skinner, 2011) and are able to hold in mind more abstract and multidimensional concepts compared to younger children (Blakemore & Choudhury, 2006). As the brain matures, adolescents may become practiced at managing difficult emotions and more likely to think before they respond to situations. There have also been no studies as yet examining the developmental progression of safety behaviours (Leigh & Clark, 2018).

Emotional investment in social media

Most studies to-date have investigated SM use by measuring the frequency with which adolescents access their SM profile (Alsunni & Latif, 2021). Research is now shifting away from measuring time spent on SM to focusing more on different ways adolescents engage with SM (Valkenburg et al., 2021). For example, how 'invested' adolescents are in SM. Adolescents who are more invested in SM may place greater importance on the frequency of their interactions (Neira & Barber, 2014) and have an increased sense of emotional

attachment to SM (Alsunni & Latif, 2021). A recent systematic review of the literature found that both passive use of SM and high investment in SM were drivers of the negative associations between SM use and wellbeing in adolescents (Webster, Dunne & Hunter, 2021). To extend these findings, it could be helpful to examine the factors that might predispose some to greater levels of investment in SM.

Gender

Gender differences have often been cited in the literature, with SM use more strongly associated with wellbeing in girls than boys (Booker, Kelly & Sacker, 2018; McNamee, Mendolia & Yerokhin, 2021). A number of studies have shown girls to have lower wellbeing as indicated by an increase in internalising symptoms (Skogen et al., 2021; Riehm et al., 2019), although there is as yet no consensus concerning this and these differences may involve interactions with other variables. In addition, girls tend to use SM more than boys (Twenge & Martin, 2021; Frison & Eggermont, 2016) and spend more time posting content related to self-image such as selfies (Dhir et al., 2016), whereas boys spend more time gaming (Twenge & Martin, 2021). This poses the question of whether gender differences could exist in how emotionally invested adolescents are in their SM, given the differences in types of use and wellbeing outcomes.

The current study

Considering the mixed findings, more research appears to be needed to elucidate the underlying processes that may be implicated in the relationships between SA and SM use. The aim of the current study was to investigate the relationship between SA and SM use in adolescents, as measured by their passive SM use and investment in SM. The cognitive, emotional and behavioural responses to SM scenarios was explored through the use of hypothetical SM vignettes, as well as the moderating role of age. Gender differences were also explored.

Hypotheses

Hypothesis 1. There will be a significant relationship between:

- a) SA and passive use of SM (Figure 1)
- b) SA and investment in SM

Hypothesis 2. SA will significantly positively predict the:

- a) Negative cognitive appraisal of a hypothetical SM event
- b) Negative emotional response to a hypothetical SM event

Hypothesis 3. Negative cognitive appraisal will significantly predict passive use of SM.

Hypothesis 4. Negative cognitive appraisal of hypothetical SM events will mediate the relationship between:

- a) SA and passive use of SM (Figure 2a)
- b) SA and negative emotional response to hypothetical SM events

Hypothesis 5. Age will be a significant moderator in the relationship between:

- a) SA and passive use of SM (Figure 2b)
- b) SA and negative cognitive appraisal of SM events

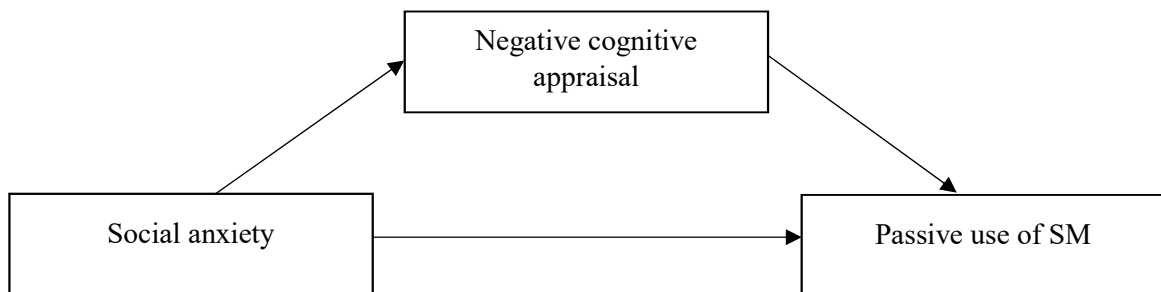
Hypothesis 6. Age will moderate the mediating effects of negative cognitive appraisal of hypothetical SM events on the relationship between SA and passive use of SM (Figure 2c)

Hypothesis 7. Girls will have higher scores than boys on:

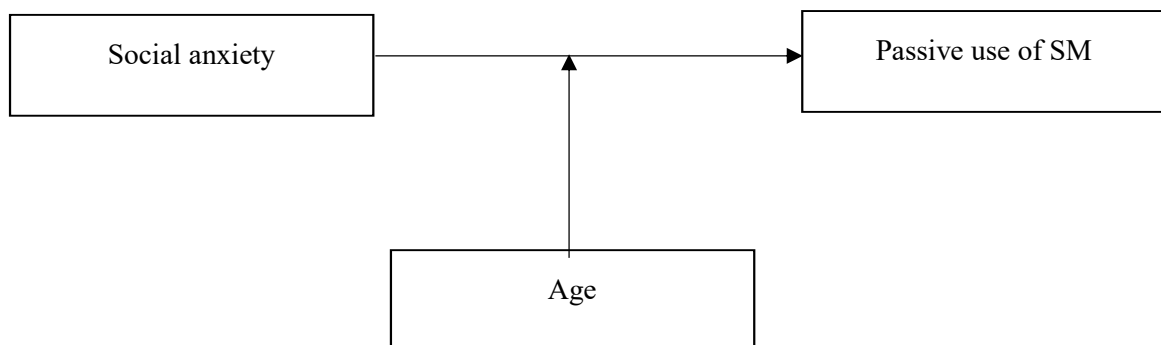
- a) Investment in SM
- b) Emotional response to SM

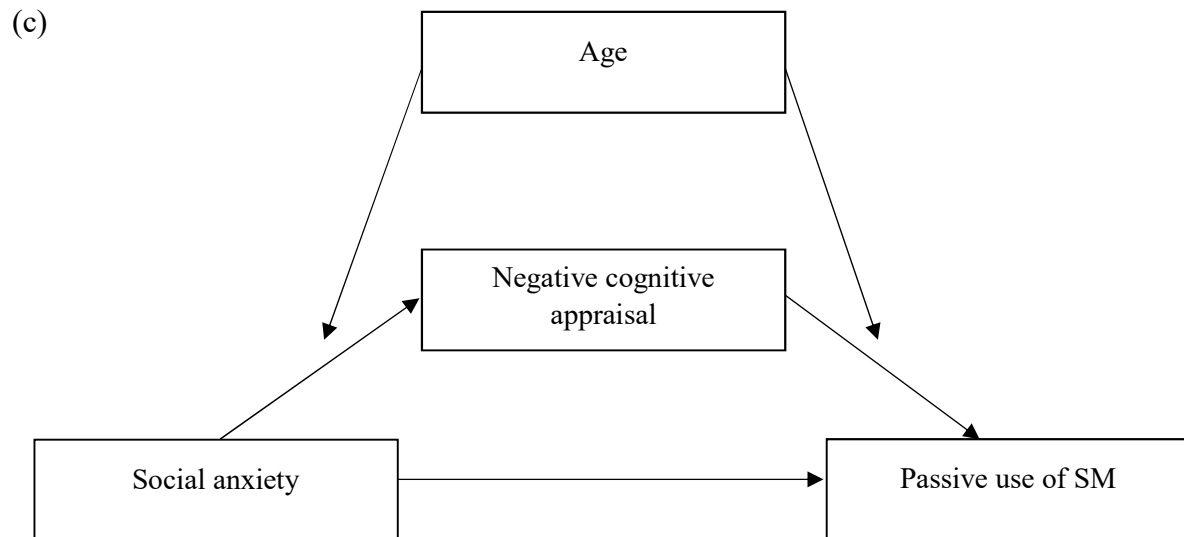
Figure 1.*Hypothesis 1. Total effects***Figure 2.***Hypotheses 4, 5 and 6. Direct and indirect effects*

(a)



(b)





Method

Design

This study used a cross-sectional online survey design, comprising psychometric measures and hypothetical vignettes.

Participants

Participants were recruited from a general population of adolescents aged 10-16 across the UK. Participants were eligible to take part if they were a UK resident, within this age range, and using SM. A convenience sampling strategy was employed, with study adverts being placed on Facebook, Twitter and online parenting forums. Snowball sampling from the researcher's own contacts was also utilised and schools were emailed. However, no response from the contacted schools was received. 163 parents provided parental consent, which led to 76 adolescents taking part. The final sample comprised 42 females, 30 males, 3 who identified as non-binary, and 1 person who did not provide gender information. The mean age of participants was 13.1 years ($SD = 1.69$) and participants were primarily White British (87%). Table 1 contains further demographic information. Participants were not compensated for taking part but were entered into a prize draw to win one of two available retail gift vouchers worth £25 each.

Table 1.*Demographics of the sample*

	N	%
Total	76	100
<i>Gender</i>		
Female	42	55
Male	30	40
Non-binary	3	4
Prefer not to say	1	1
<i>Age</i>		
10	5	7
11	12	16
12	10	13
13	13	17
14	22	29
15	7	9
16	7	9
<i>Ethnicity</i>		
White British	66	87
Indian	5	7
Another White background	2	3
Pakistani	1	1
White and Black Caribbean	1	1
Another mixed background	1	1
<i>Social media platform (participants could select more than one response)</i>		
YouTube	66	87
TikTok	57	75
Snapchat	51	67
Instagram	44	58
WhatsApp	43	57
Pinterest	24	32
Facebook	22	29
Twitter	11	14
Reddit	10	13
Tumblr	4	5
Discord	3	4
Roblox	1	1
Twitch	1	1

The most popular social media site was YouTube (87%), followed by TikTok (75%) and Snapchat (67%). A breakdown of SM platform used by age and gender by age can be found in Appendix 14.

Issues of consent and safeguarding

Approval was granted by the Canterbury Christ Church University, Salomons Institute for Applied Psychology, ethics committee. The British Psychological Society (BPS) guidelines on good practice in research were followed (BPS, 2021). Particular attention was given to risks of psychological harm during the construction of the survey, given the age of the participants. As most of the participants were below the age of 16, parental consent was obtained before they could proceed with the questionnaire. Parents/carers were sent a hyperlink to the participant information sheet (PIS) and consent form (Appendix 6). Parents were recommended not to give consent if they felt their child would be distressed by any of the survey content. Participants were also given this same message on the assent form (Appendix 7) before beginning the survey. Once the survey had started, participants were informed that they could stop at any time by closing their web page. Following completion of the survey, participants were provided with an online debrief (Appendix 8) which recommended they speak with their parent/carer in the first instance if they needed further support. They were also given information on relevant organisations which could offer support for that age group. Parents/carers were informed that their child would be given details of support organisations and were also given the contact information for these support services in the PIS.

Materials

The materials consisted of an online survey administered via Qualtrics and took approximately 15 minutes to complete. The survey included a demographic questionnaire (capturing age, gender, ethnicity and SM platforms used), three self-report measures and six hypothetical vignettes.

Social anxiety

Social Anxiety was measured using the Social Anxiety Scale for Adolescents (SAS-A; La Greca, 1998) (age range 13-18) or Social Anxiety Scale for Children-Revised (SASC-R; La Greca & Stone, 1993) (age range 7-13) depending upon the age of the participant. Both are a self-report measure containing 18 items that include three subscales: Fear of Negative Evaluation (FNE), Social Avoidance and Distress (SAD-New) and Social Avoidance and Distress-General (SAD-Gen) plus four filler items. The scale has been shown to have good construct validity and good reliability, with Cronbach's α on SAS-A varying from 0.85 to 0.95 and α scores on SASC-R ranging, on average, from 0.75 to 0.94 (Tulbure et al, 2012).

The scales are identical except the wording on the SAS-A reflects a more adolescent age range e.g. 'playing with' has been changed to 'doing things with'. Internal consistency scores for the subscales in this study were demonstrated to be acceptable: FNE ($\alpha = .94$), SAD-New ($\alpha = .91$) and SAD-Gen ($\alpha = .80$). Cronbach's alpha for the whole scale was .89.

Passive use of SM

Passive use of SM was measured using a 6-item scale developed by Li (2016) and later revised by Escobar-Viera et al (2018). It is important to note, at the time of writing, there were no known validated measures of passive use in an adolescent population as most studies have used their own unique operationalisation of passive use (Valkenburg, Driel & Beyens, 2022). This scale was originally developed for use with adults but was selected as the language could be easily modified and it was not too long (this was felt to be important given the age group of the participants). Five young people (aged 10-14) also provided feedback on the face validity of this measure prior to the survey going live. All these young people reported that the statements were easy to understand and rate, and related to their SM use. The scale was observed to have good internal consistency in this study ($\alpha = .83$).

This measure has shown good reliability with Cronbach's $\alpha = .72$ for the passive use items and .80 for active use items in an adult sample. The language was slightly amended to reflect the age group (i.e. 'my connections' was changed to 'my friends'). The scale consists of six items reflecting both active and passive use of SM. For example, "I read comments/ratings/reviews on social media sites" (passive) or "I share content on SM sites with my friends" (active). Each statement is rated based on how often they would engage in this behaviour ranging from "never" to "several times a day".

Investment in SM

Investment in SM was measured using an adapted version of the Facebook Intensity Scale (FBI; Ellison, Steinfield & Lampe, 2007). The phrase 'Facebook' was substituted for 'social media' to reflect other SM platforms that young people may use. Many studies have shown this measure to be reliable (i.e. Cronbach's $\alpha > .70$) including instances where it has been adapted for more general SM use (Piewek & Joinson, 2016; Salehan & Negahban, 2013). It consists of six items measured on a 1-5 Likert scale (1 = strongly agree, 5 = strongly disagree) and includes items such as "I feel out of touch when I haven't logged onto social media for a while". The scale has not yet been systematically validated however its psychometric properties may be evidenced by the multiple studies that have used this

measure (Sigerson & Cheng, 2018). A number of studies have included the FBI in factor analyses with adolescent samples, providing support for its structural validity (e.g. Beyens, Frison & Eggermont, 2016). The scale was also shown to have acceptable internal consistency in this study ($\alpha = .86$).

Hypothetical vignettes

Hypothetical vignettes were used to test and capture participant's negative cognitive appraisal, negative emotional response and passive use of SM in relation to six hypothetical ambiguous SM scenarios (Appendix 13). Responses to ambiguous scenarios is a widely used approach to assess anxiety-related thinking styles in children and adolescents (e.g. Barrett et al., 1996; Creswell et al., 2011; Creswell, Murray & Cooper, 2014). The vignettes were partially based on a modified version of Barrett's (1996) Ambiguous Scenarios Questionnaire (Creswell, Murray & Cooper, 2014) but adapted to reflect SM scenarios. This measure has been shown to have good reliability in an adolescent sample (Cronbach's $\alpha = .73$).

These SM scenarios were developed in consultation with young people to enhance their ecological validity and ensure appropriateness for the age group. Prior to the survey going live, five adolescents (aged between 10-14) were given the proposed vignettes. They gave feedback either by speaking directly to the researcher over the phone or via their parents (depending on their preference). This was also to ensure the structure of the vignettes and responses made sense, particularly to younger adolescents. The vignettes were then modified based on feedback. For example, scenario C was changed from creating a "birthday group" on WhatsApp to "social meet up" and a note that the message has been "read" was added to scenario F. However, they also fed back that the proposed scenarios generally felt realistic to their SM use and they were able to understand and answer all questions. Vignettes are listed in Table 2.

Table 2.

Vignette scenarios

A. You post a picture/video of yourself on social media. This picture/video gets half the number of likes a picture/video you post usually would.

B. You are looking at your social media and see a post of your friends talking about an online game they played together. You did not know about this.
--

C. You create a WhatsApp group and add 20 people. You invite them all to a social meet up. You have received 5 responses so far.
--

D. You post a picture/video of yourself on social media. Someone comments on the picture/video saying 'ok'.

E. A picture of you and 3 friends gets put on social media. Everyone apart from you gets tagged.
--

F. You send a message to one of your friends on social media. You see they have read it but they haven't responded.

After being presented with the scenario, negative emotional response was measured by asking participants to rate how upset they would feel in the given scenario on a sliding scale ($0=not\ at\ all\ upset$, $100=very\ upset$). The wording of 'upset' was chosen as it has been used in previous studies as a way of measuring negative emotion in children as young as seven (Creswell, Murray & Cooper, 2014). It was also piloted in the consultation with young people who shared that the word 'upset' was a relatable feeling. Negative cognitive appraisal was measured by giving participants a statement that reflected a possible threatening interpretation of the scenario or 'negative automatic thought' (NAT) then asking them to rate on a sliding scale how likely they would be to think this e.g., how likely would you be to think "they haven't responded because they don't want to come" ($0=not\ at\ all\ likely$, $100=very\ likely$). NATs were chosen to represent cognitive appraisal as they are a widely regarded thinking style in cognitive behavioural models of social anxiety (e.g., Clark & Wells, 1995). Finally, passive use of SM was measured by showing participants a statement designed to reflect a behaviour that involved disengaging with active SM use and asking them to rate how likely they would be to do this e.g., how likely would you be to stop posting on social media for a while but continue to look at other people's pictures? ($0=not\ at\ all\ likely$, $100=very\ likely$). The inclusion of hypothetical vignettes (combined with the consultation with young people) allowed the study to capture responses to detailed scenarios that may offer a more realistic portrayal of the types of situations adolescents encounter on SM, as opposed to general measures of SM use that can often be subject to self-report bias. Internal consistency scores for each vignette scale in this study were acceptable: Emotional response ($\alpha = .89$), cognitive appraisal ($\alpha = .82$) and passive use ($\alpha = .86$).

Procedure

Once the survey and scenarios had been finalised, participants were recruited as detailed above. Once parents/carers had consented, the hyperlink to the survey was given on screen. If they had provided an email address, the link was also sent via email. Parents/carers were able to download a copy of the PIS which contained details on how to contact the researcher or research team if required. After clicking this hyperlink, the participants themselves (i.e. adolescents) were presented with a separate assent form so they could make an informed choice about whether to take part. Participants then completed the demographic questions, self-report measures and vignettes. Following this, they were provided with the online debrief, as detailed above.

Statistical power

Power calculations using G*Power (Faul et al., 2007) recommended that a sample size of 71 would be required to detect a medium effect size based on regression analysis. It was not clear from the literature how much additional power would be needed to test the moderation hypothesis. To address this, the study aimed to recruit a larger sample size (with sufficient numbers in each age group) following advice from Preacher, Rucker & Hayes (2007). However, due to time constraints and considerable difficulties with recruitment, a larger sample size was not possible.

Data analysis

Initial checks of test assumptions including normality, linearity and homogeneity of variance were performed. A preliminary analysis of the data was then conducted. Hypothesis 1 was tested using Pearson's correlation coefficient. Hypotheses 2 and 3 were tested using linear regression analysis. Hypotheses 4-6 were tested using the PROCESS macro for SPSS (Hayes, 2017). PROCESS was employed in place of the traditional causal steps approach (Baron and Kenny 1986), as it is more powerful and robust (Hayes 2009). Finally, Hypothesis 7 was tested using an independent t-test. All analyses were performed with SPSS software.

Results

Preliminary analysis

Before conducting the main analysis, the means and standard deviations for all variables were investigated (Table 3). The mean SA score for the sample was 56 (SD = 15.1), with no difference in SA levels between boys ($M = 53$) and girls ($M = 57$). There is not a clinical cut-

off for this measure however, an indication of the level of SA in this sample can be provided by comparing the mean to the general adolescent sample when the measure was developed ($M = 42.4$; La Greca & Stone, 1993; La Greca & Lopez, 1998). Participants were accessing, on average, 4.5 SM platforms ($SD = 2.08$). A breakdown of this by age can be found in Appendix 14.

Table 3.

Means and standard deviations among the variables SAS, passive use, investment in SM and vignettes

Measure (/max. score)	M	SD
SAS ¹ (/90)	56	15.09
Passive use (/36)	21.9	7.9
Investment (/30)	22.2	5.9
<i>Vignettes</i>		
Cognitive appraisal	55.7	25.1
Emotional response	45.6	27.1
Passive use	41.1	26.8

Statistical analysis

Hypothesis 1 predicted that there would be a positive relationship between SA and passive use of SM in cross-sectional data (Hypothesis 1a) and a positive relationship between SA and investment in SM (Hypothesis 1b). For Hypothesis 1a, there was no significant correlation between SA and passive SM use in the cross-sectional data ($r = .211$, $p = 0.79$, $n = 70$). For Hypothesis 1b, there was a significant positive correlation between SA and investment in SM ($r = .344$, $p = .004$, $n = 69$). Therefore, Hypothesis 1a was not supported and Hypothesis 1b was supported. However, it is worth noting that there was a significant correlation between SA and the measure of passive use in response to hypothetical SM events ($r = .618$, $p = <.001$, $n = 46$), which will be returned to in the discussion.

Hypothesis 2 predicted that SA would positively predict the negative cognitive appraisal of hypothetical SM events (Hypothesis 2a) and negative emotional response to hypothetical SM

¹ Recall from the method, the SASC-R was used for 10-13-year-olds and SAS-A was used for 14-16-year-olds. These are designed to be comparable and are on the same scale therefore an average was taken across both.

events (Hypothesis 2b). Consistent with Hypothesis 2a, a simple linear regression showed that SA significantly positively predicted the negative cognitive appraisal of hypothetical SM events and explained 26% of the variance ($R^2 = 0.26$, $F(1, 45) = 15.89$, $p = <0.01$, $n = 47$); see Table 4 for the coefficients. Similarly, consistent with Hypothesis 2b, a simple linear regression showed that SA significantly positively predicted the negative emotional response to hypothetical SM events and explained 38% of the variance ($R^2 = 0.382$, $F(1, 42) = 25.91$, $p = <0.01$, $n = 44$); see Table 5 for coefficients. Therefore, both Hypothesis 2a and 2b were supported.

Table 4.

Regression summary for SA predicting negative cognitive appraisal of hypothetical SM events

Source	<i>B</i>	<i>SE B</i> 95% confidence interval	β	<i>t</i>	<i>p</i>
Constant	6.701	12.69		.528	.600
Social anxiety	0.879	.220	.511	3.987	<.001

Table 5.

Regression summary for SA predicting negative emotional response to hypothetical SM events

Source	<i>B</i>	<i>SE B</i> 95% confidence interval	β	<i>t</i>	<i>p</i>
Constant	-14.799	12.54		-1.180	.245
Social anxiety	1.113	.219	.618	5.09	<.001

Hypothesis 3 predicted that the negative cognitive appraisal of hypothetical SM events would statistically predict passive use of SM in response to the hypothetical SM events. A simple linear regression showed that this relationship was significant and explained 63% of the variance ($R^2 = 0.630$, $F(1, 38) = 64.69$, $p = <0.01$, $n = 40$); see Table 6 for the coefficients. Therefore, Hypothesis 3 was supported.

Table 6.

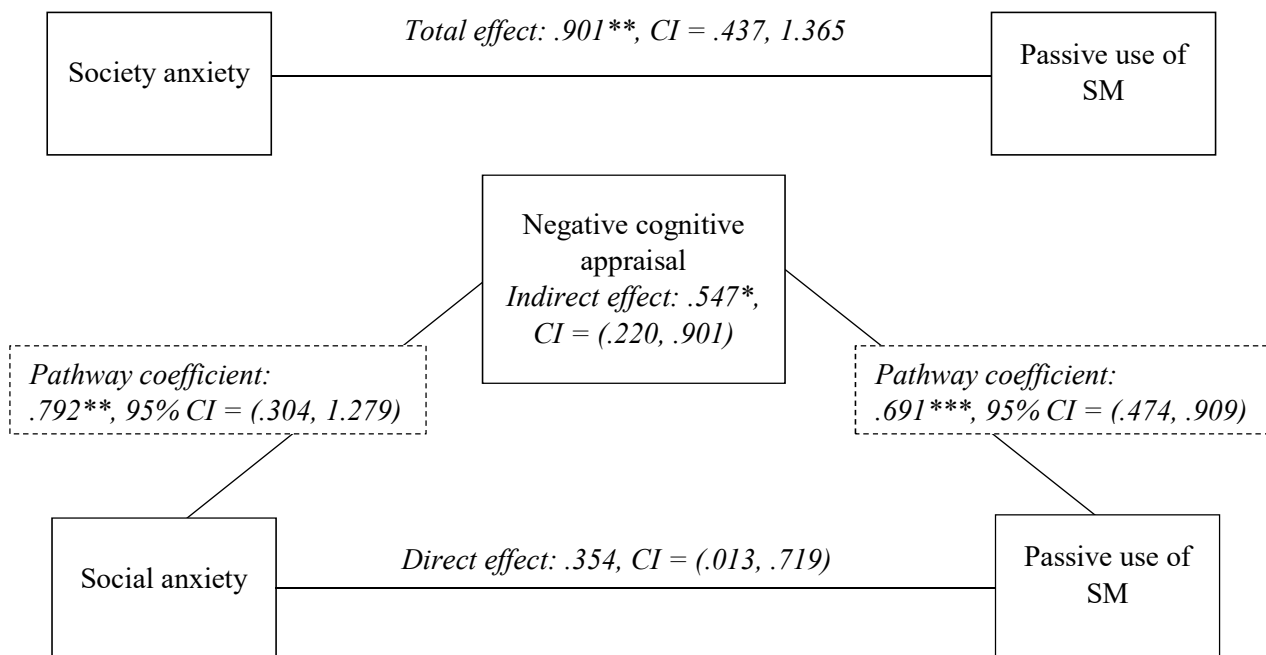
Regression summary for negative cognitive appraisal predicting passive use of SM in response to hypothetical SM events

Source	<i>B</i>	<i>SE B</i> 95% confidence interval (lower, upper)	β	<i>t</i>	<i>p</i>
Constant	-0.052	5.824 (-11.842, 11.738)		-0.009	0.993
Cognitive appraisal	0.790	0.098 (0.591, 0.989)	0.794	8.043	<.001

Hypothesis 4a predicted that the negative cognitive appraisal of hypothetical SM events would statistically mediate the relationship between SA and passive use of SM in response to hypothetical SM events. A simple mediation analysis was conducted using PROCESS. There was evidence for statistical mediation as the confidence interval for the indirect effect did not cross zero. As can be seen from figure 3, there was a total effect, such that high levels of SA predicted greater passive use in the hypothetical vignettes. This relationship was statistically mediated by negative cognitive appraisal as the confidence interval for the indirect effect did not cross zero. The direction of the effect was such that SA predicted more negative cognitive appraisal which in turn predicted greater passive use.

Figure 3.

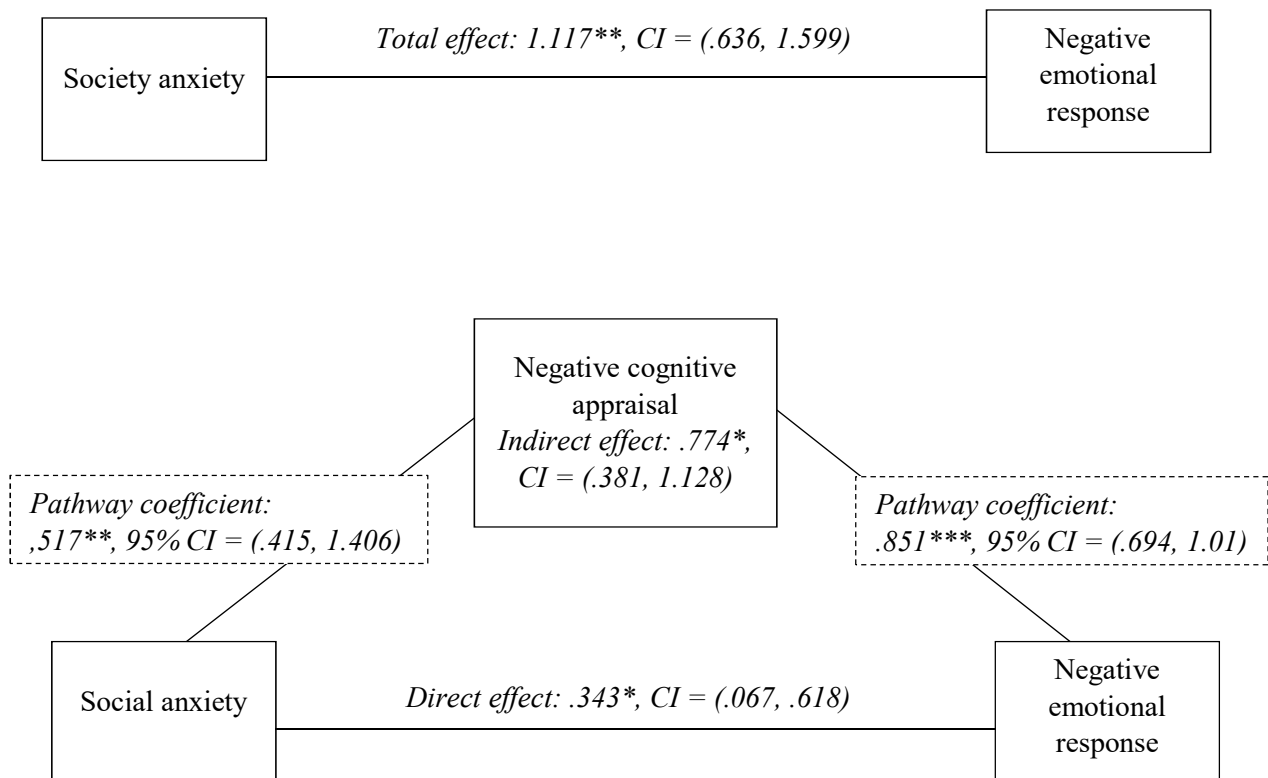
The final mediation model and associated 95% confidence intervals (CIs). Top panel: the total effect when no mediator is included. Bottom panel: the direct and indirect effects when negative cognitive appraisal is included as a mediator. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.0001$



Hypothesis 4b predicted that the negative cognitive appraisal of a hypothetical SM event would statistically mediate the relationship between SA and negative emotional response to a hypothetical SM event. A simple mediation analysis using PROCESS showed that negative cognitive appraisal of a hypothetical SM event was a significant mediator, $b = 0.7743$, [0.3805, 1.1280]. As can be seen in figure 4, there was a total effect, such that high levels of SA predicted greater negative emotional response to hypothetical SM events and this relationship was statistically mediated by negative cognitive appraisal as the confidence interval for the indirect effect did not cross zero. The direction of the effect was such that SA predicted more negative cognitive appraisal which in turn predicted negative emotional response.

Figure 4.

The final mediation model and associated 95% confidence intervals (CIs). Top panel: the total effect when no mediator is included. Bottom panel: the direct and indirect effects when negative cognitive appraisal is included as a mediator. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.0001$



Hypothesis 5a predicted that age will moderate the relationship between SA and passive SM use in cross-sectional data, such that for younger adolescents, there will be a weaker relationship between SA and passive use. All moderation analyses were conducted using PROCESS. As can be seen in Table 7, the confidence interval for the age x SA interaction term crossed zero meaning there was no evidence for moderation by age. The moderating effect of age was also tested in the relationship between SA and passive use in response to hypothetical SM events. Similarly, as can be seen in Table 8, the confidence interval for the age x SA interaction term crossed zero meaning there was no evidence for moderation by age. Hypothesis 5b predicted that age would statistically moderate the relationship between SA and negative cognitive appraisal of hypothetical SM events, such that for younger adolescents, there will be a weaker relationship between SA and negative cognitive appraisal.

Again, as can be seen in Table 9, the confidence interval for the age x SA interaction term crossed zero meaning there was no evidence for moderation by age.

Table 7.

Moderation analysis with passive use in cross-sectional data as the response variable, testing Hypothesis 5a (n = 70)

		<i>B</i>	95% confidence interval (lower, upper)	<i>t</i>	<i>p</i>
Source					
Model 1: $R^2 = 0.1168$, MSE = 15.49	Constant	22.184	(-6.643, 51.011)	1.536	0.129
	Social anxiety (X)	-0.310	(-0.842, 0.221)	-1.166	0.248
	Age (W)	-0.858	(-3.012, 1.296)	-0.795	0.429
	Social anxiety*Age (XW)	0.026	(-0.129, 0.065)	1.341	0.185

Table 8.

Moderation analysis with passive use in response to hypothetical SM events as the response variable, testing Hypothesis 5a (n = 46)

		<i>B</i>	95% confidence interval (lower, upper)	<i>t</i>	<i>p</i>
Source					
Model 1: $R^2 = 0.409$ MSE = 454.86	Constant	42.147	(35.745, 48.548)	13.287	0.000
	Social anxiety (X)	1.115	(0.696, 1.534)	5.37	0.000
	Age (W)	-2.08	(-5.725, 1.563)	-1.152	0.256
	Social anxiety*Age (XW)	-0.117	(-0.371, 0.137)	-0.928	0.359

Table 9.

Moderation analysis with cognitive appraisal of hypothetical SM events as the response variable, testing Hypothesis 5b (n = 47).

	Source	<i>B</i>	95% confidence interval (lower, upper)	<i>t</i>	<i>p</i>
Model 1: $R^2 = 0.267$, MSE = 504.13	Constant	-51.573	(-258.53, 155.39)	-0.503	0.618
	Social anxiety (X)	1.853	(-2.003, 5.709)	0.969	0.338
	Age (W)	4.490	(-11.225, 20.206)	0.576	0.568
	Social anxiety*Age (XW)	-0.075	(-0.364, 0.215)	-0.519	0.606

Hypothesis 6 predicted that age would moderate the mediating effects of negative cognitive appraisal on the relationship between SA and passive use in response to hypothetical SM events. The hypothesised model was tested using the PROCESS macro. Moderation analysis showed that for the first part of the indirect pathway there was no evidence it was moderated by age as the confidence interval did cross zero (95% CI = -.364, .216). However, there was evidence that the second part of the pathway from negative cognitive appraisal to passive use was statistically moderated by age, as the confidence interval did not cross zero (95% CI = .009, .059). For full details see figure 5. The nature of this moderation effect is broken down in further detail in Table 10. For the 11-year-olds, there was no significant relationship between negative cognitive appraisal and passive use but for the 13- and 15-year-olds there was a significant positive relationship such that higher negative cognitive appraisal scores predicted greater passive use.

Table 10.

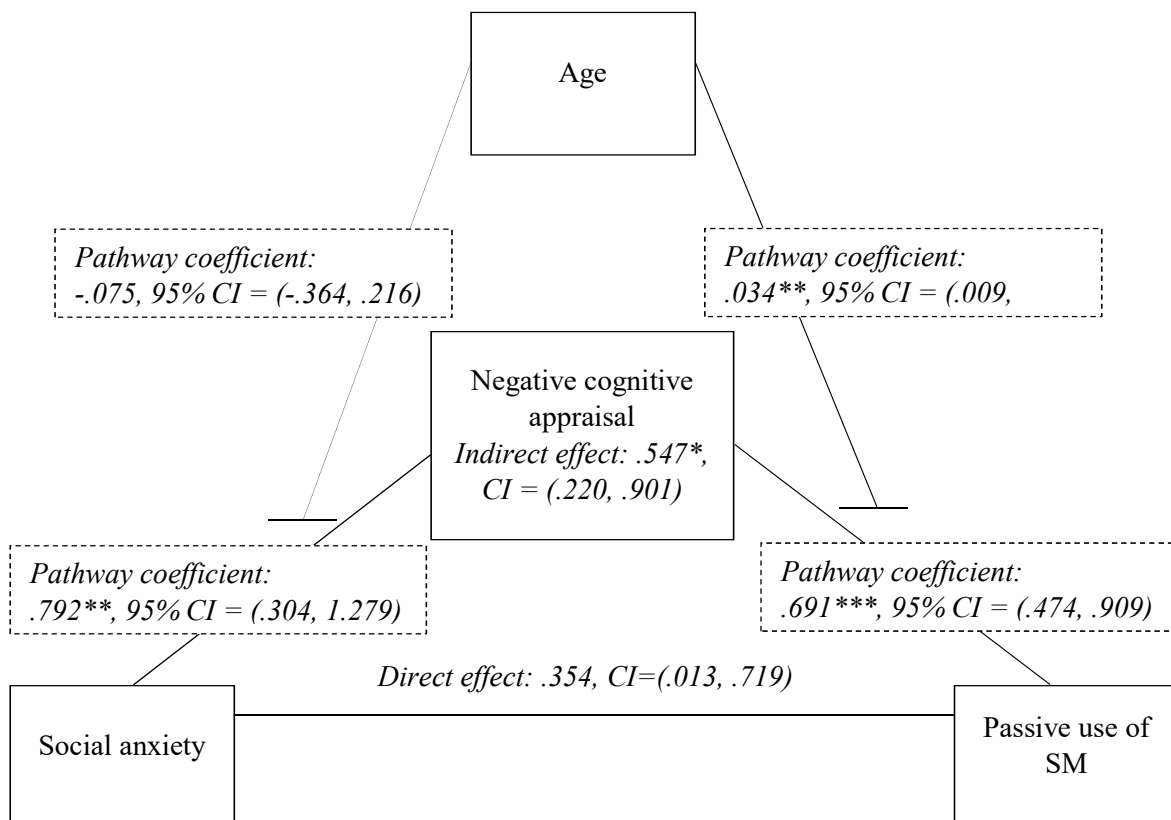
Conditional effects of negative cognitive appraisal on passive use in response to hypothetical SM events at different values of the moderator (age)

Age	Effect	95% confidence interval (lower, upper)	<i>t</i>	<i>p</i>
11	-.009	(-.077, .058)	-.285	.777
13	.059	(.014, .103)	2.667	.011
15	.127	(.061, .194)	3.852	.0004

Figure 5.

The final mediation moderation model and associated 95% confidence intervals (CIs).

** $p < 0.05$, ** $p < 0.01$, *** $p < 0.0001$*



Hypothesis 7a predicted that girls would have higher scores on investment in SM than boys. An independent t-test showed that there were no significant differences between girls ($M = 21.8, SD = 6.7$) and boys ($M = 18.6, SD = 5.9$) on investment in SM $t(39) = -1.5, p = 0.459$. Hypothesis 7b predicted that girls would have higher scores on negative emotional response to hypothetical SM events than boys. An independent t-test showed that there were no significant differences between girls ($M = 49.8, SD = 24.6$) and boys ($M = 33, SD = 27.1$) on negative emotional response $t(39) = -2.1, p = 0.414$.

Discussion

Hypothesis 1 predicted there would be a positive relationship between SA and both passive use of SM and investment in SM. The results of the correlation analysis suggest there was a significant relationship between SA and investment in SM, meaning adolescents with higher levels of SA appear more emotionally invested in SM. These findings support previous research that found a link between higher investment in SM and anxiety (Webster, Dunne & Hunter, 2021). This study extends these findings by suggesting that social anxiety specifically may be linked to investment in an adolescent population. This also provides some support for the social compensation hypothesis: adolescents with high levels of SA who use SM to compensate for deficits in face-to-face relationships, may be more invested in SM as their main medium for social interactions.

The results of hypothesis 1a suggest there was no relationship between SA and passive use in cross-sectional data. However, there was a significant relationship between these variables when measuring passive use through responses to the vignettes. One possible explanation for this difference could be that the vignettes offered a more detailed and elaborated SM scenario which adolescents could more readily identify with and apply to their real lives. Vignettes might therefore present a more ecologically valid measure of passive use. The measure of passive use devised by Li (2016) and Escobar-Viera et al (2018) has not been validated in an adolescent population and therefore measurement issues should be considered. The results of this study provide mixed evidence for a link between SA and passive use. There are currently very few validated measures of passive SM use (Trifiro & Gerson, 2019) and these findings highlight the need for research to address this gap, particularly in adolescents.

Hypotheses 2a and 2b predicted that SA would significantly predict both negative cognitive appraisal and negative emotional response to hypothetical SM events. A simple linear regression confirmed that higher reported SA levels predict the negative cognitive appraisal

of a hypothetical SM event in the adolescent sample, with approximately 26% of the variation being accounted for by the model. Higher reported SA was also associated with adolescents' negative emotional response to a hypothetical SM event, with 38% of the variation accounted for by the model. These findings do not imply causality. However, they are consistent with cognitive theories of social anxiety which suggest that individuals with higher levels of SA may be more likely to overestimate the perceived threat of social interactions and the likelihood of negative outcomes (e.g. Clark & Wells, 1995). The current study extends this by suggesting that this finding may be present in an adolescent population within a SM context.

Hypothesis 4 examined the mechanisms underlying SA and both passive SM use and negative emotional response, as measured in the vignettes. The results suggest that negative cognitive appraisal was a statistical mediator in both relationships. These results would suggest that adolescents are engaging in passive use of SM, through the process of negative cognitive appraisal. Drawing again on explanatory models derived from cognitive theory (e.g. Clark & Wells, 1995; Heimberg et al., 2010), adolescents with higher reported levels of SA may be more likely to underestimate their ability to manage certain social encounters. They could be withdrawing from SM, either temporarily or more long-term, as a strategy to navigate a situation they interpret as being threatening. Passive use could therefore be construed as a safety behaviour to limit exposure to the feared situation. This fits with existing literature on how SA can be conceptualised, but broadens its scope to encompass social situations that occur on SM. However, it should be noted that there was also a significant direct effect between SA and negative emotional response suggesting a relationship exists between these variables outside the mechanism of negative thoughts. This supports literature suggesting adolescents with SAD have higher intensities of negative emotions (Carthy et al., 2010; Tan et al., 2012). SM is a complex, nuanced and evolving area which adolescents are constantly navigating (Course-Choi, 2019) and therefore further research is needed to fully understand how existing models of SAD may map on to the context of SM.

It could be argued that some of these findings are a reflection of more general cognitive and behavioural processes that also occur in contexts other than SM (e.g., Leigh & Clark, 2018). However, there are possibilities on SM that are not so applicable to other forms of communication. For example, the behaviour of passive use includes the unique features of browsing and consuming information related to friends or acquaintances which may be hard

to replicate in contexts outside of SM. Therefore, it may be fair to say that the findings related to passive use appear specific to the SM context.

Moderation by age

Hypothesis 5 was concerned with whether SA, and its relationship with both passive use and negative cognitive appraisal, was moderated by age. The results gave no evidence for moderation by age in any of these relationships, which suggests that the impact of SA on cognition and behaviour was similar for all adolescents in this study. This accords with other studies that found an association between anxiety and negative cognitive appraisal in children and adolescents across a broad age range (Barrett et al, 1996; Creswell et al, 2005). It may be interesting for future studies to examine differences by developmental stage rather than age, as these are not always synonymous.

Hypothesis 6 predicted that age would moderate the mediating effects of negative cognitive appraisal on the relationship between SA and passive use. The results suggest the pathway between SA and negative cognitive appraisal was not moderated by age however interestingly, the path from negative cognitive appraisal to passive use of SM was moderated by age. For the younger adolescents (aged 10-12), there was no significant relationship between negative cognitive appraisal and passive use; however, there was a relationship between these variables for slightly older adolescents (aged 13-16). This suggests that adolescents in the latter age group may be adapting their behaviour in situations they interpret as negative, compared to younger adolescents who are not. One possible explanation for this finding could be that, as children get older and gain greater experience in using SM, they learn certain strategies (i.e., avoidance, withdrawal) to manage difficult online experiences. The current study also builds on the model of adolescent engagement with SM, developed by Course-Choi (2019) which suggests adolescents are constantly going through an active process of evaluating the safety of SM use. Safety, in this context, is defined as “online threats to identity and reputation” rather than a type of physical harm. The model indicates that, if factors compromising such notions of safety outweigh those enhancing it, then adolescents will choose to “stay hidden”, by deploying strategies such as passive use of SM. The findings of the current study suggest that older adolescents may be responding to perceived negative SM events in slightly different ways to younger adolescents. This finding is congruent with neurodevelopmental theories which highlight the increasing sophistication

of thinking which occurs with age (e.g. Luna, 2009). This also enables the older adolescents to utilise more complex coping strategies in situations they may find threatening.

In CBT models, avoidance and safety behaviours as coping mechanisms are evidenced to maintain or increase anxiety. However, as previously suggested, SM is a very different context to the environment in which these models are based and therefore it may be reductionist to assume the same processes apply. It may not be a case of simply suggesting more passive use leads to greater anxiety, as the situation may be complex. There is the potential for a higher occurrence of negative responses on SM due to various factors such as the online disinhibition effect (Suler, 2004) and therefore passive use may be a sensible safety strategy to manage these experiences. A process of calibration may in fact be helpful, to assist adolescents in regulating their SM experiences. Passive use more generally has been associated with decreases in wellbeing (Verduyn et al., 2015). However, research has not yet examined the effects of more transient passive use (i.e., the process of stepping back from active use of SM for a short time). It may be important to understand more about what impact passive use has, as a temporary coping strategy, on adolescent wellbeing.

Gender

The results for hypotheses 7a and 7b provided no evidence of gender differences in both emotional investment in SM and negative emotional response to hypothetical SM events. Boys and girls in the sample reported similar levels of investment in SM, which is contrary to findings from Neira and Barber (2014) who found that girls reported more investment in their SM than boys. The sample size for this part of the study was also relatively small (N=39) with higher number identifying as female (55%) than male (40%) and therefore the failure to find an effect of gender may be a Type II error. If this finding were replicated in a sufficiently powered study, such that we could be confident it is not due to sample size, an alternative possibility might be that the role gender plays has changed over time. Ten years ago, girls appeared more invested in SM however, the SM landscape is constantly changing, meaning boys level of investment may now be on a par with girls. Future studies may therefore wish to replicate this with a larger adolescent sample size.

Clinical implications

There has been a substantial amount of recent attention placed on SM and its contribution to mental health outcomes for young people. This is further highlighted by prospective Government legislation in the form of the Online Safety Bill (UK government, 2022)

advocating for increased independent regulation of internet services. It is therefore imperative that research continues to rigorously explore the link between SM and mental health, so that policy can be driven by robust evidence.

In this study, SA was found to be linked with investment in SM. This is clinically important, as the degree of emotional involvement with SM has previously been associated with lower wellbeing amongst adolescents (Woods & Scott, 2016). For those adolescents experiencing SA, this may also be combined with increased threat appraisal in online social situations and greater passive use of SM. A relevant theory linking stress with personal vulnerabilities is the diathesis-stress model (Coyne & Downey, 1991). The theory proposes that certain vulnerability factors can impact the effect that stressful events have on wellbeing. The current study suggests that adolescents with higher levels SA may be more 'vulnerable' following exposure to certain situations on SM. This highlights the importance of routinely asking about SM use in assessments with young people, particularly those who identify or are discovered to have high levels of SA. An audit conducted in CAMHS clinics across the UK found that only 5% of young people assessed over a 3-month period were asked about their SM usage and its impact on mental health (James & Shetty, 2019). Further research and understanding may help parents, carers and clinicians to feel more confident talking about SM issues with young people who report difficulties with anxiety. It is also likely to be important to consider the role of SM within treatment planning and therapeutic work so that the therapist and young person can think together about how best to safely engage with SM in a more balanced way. Certain CBT techniques can target difficult online social situations to help adolescents learn to cope. For example, through exercises aimed at increasing social and problem-solving skills. Online safety behaviours could also be targeted well within existing cognitive therapy frameworks (Leigh & Clark, 2018).

This study also suggests that older adolescents may be employing behavioural strategies to manage perceived negative SM experiences that younger adolescents are not. Younger adolescents may have not yet learned emotional regulation strategies to manage in an online social environment. It could be beneficial for parents, carers and clinicians to think with these younger adolescents about the coping mechanisms they are using to manage difficult SM experiences and help support them in developing these.

Limitations and implications for future research

This study has several limitations that are worth noting. Firstly, this study used a cross-sectional design and therefore causality cannot be determined. The nature of the relationship between variables may be bidirectional and any interpretation of causality was theoretically driven and not formally testable in this model. This methodology was chosen due to anticipated difficulties in recruiting this age group, including needing to target parents initially to provide informed consent. Future studies would benefit significantly from employing a more longitudinal research design to determine the temporal relationship between variables.

Secondly, this study drew on a cognitive model of SAD and attempted to separate out emotions, cognitions, and behaviours in the vignettes. Although cognitive models provide well-established and evidence-based frameworks for understanding SA in adolescents (Scaini et al., 2016), other frameworks may offer complementary or alternative perspectives. For example, future studies may want to think about additional systemic and personality-related variables that may impact an adolescent's SM experiences, such as quality of parental support or how family dynamics might contribute to this relationship (Field et al., 2008). In addition, all participants were living in the UK and the majority (87%) identified as White British therefore caution should be applied when generalising these findings to other cultures and ethnic groups. This study may also not generalise to other countries that use alternative forms of SM, for example, 'WeChat' which is popular SM platform in China.

Finally, this study relied on both self-report measures and use of hypothetical vignettes. As discussed previously, the use of vignettes may have several advantages over simply using questionnaires alone. However, real-time tracking of young people's SM use over time and gathering data on several other key variables such as mental health, family and social support may provide more robust data.

Conclusion

Overall, the current study suggests that certain SM experiences may interact with high levels of SA, meaning these adolescents may be more vulnerable to negative online experiences. Adolescents in this study with higher reported levels of SA were more likely to appraise SM events negatively, feel more upset by these events, engage more in passive use of SM (based on data from hypothetical vignettes) and be more invested in SM. The study also highlighted that younger adolescents as a group may not be using coping strategies (i.e. passive use of

SM) in the same way as older adolescents. The findings of this study cannot necessarily say whether the impact of passive SM use is positive or negative; it does however suggest that age may influence how adolescents engage with difficult SM experiences. Finally, there was no evidence of gender differences in how invested adolescents were in their SM or their negative emotional response to SM events. Future studies may benefit from exploring different types of passive use (e.g. long-term vs. temporary) and the impact this has on adolescent wellbeing. Studies that employ a longitudinal methodology would also aid in understanding the temporal relationship between variables. Parents, carers and clinicians should consider whether they can help adolescents with high levels of SA to use SM in a less invested way as well as supporting them to better manage their SM experiences. They may also wish to target younger adolescents as a group who may be less familiar with navigating SM.

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Section C: Appendices

A thesis submitted in partial fulfilment of the requirements of
Canterbury Christ Church University for the degree of
Doctor of Clinical Psychology

February 2023

Appendix 1. *End of study report*

Study Title: Adolescent Social Media Use: An Examination of the Relationships between Social Anxiety, Cognition, Emotion and Behaviour.

Introduction: Social media has become an integral part of the lives of adolescents and is changing the way they relate and communicate with each other. Despite a proliferation of research over recent years, findings are still inconsistent, and the field lacks studies examining possible susceptibility variables that could make certain adolescents more at risk from SM use.

Method: The current study explored the cross-sectional relationships between social media use and social anxiety in a sample of 76 adolescents from the UK (55% female, 10-16 years). Several hypotheses were tested relating to social media use and social anxiety, and hypothetical vignettes were used to explore the cognitive, emotional and behavioural responses to social media scenarios. The moderating role of age was tested and gender differences were examined.

Results: Adolescents in this study with higher reported levels of SA were more likely to appraise social media events negatively, feel more upset by these events, engage more in passive use of social media (based on data from hypothetical vignettes) and be more invested in social media. Age was also found to moderate the relationship between negative cognitive appraisal and passive social media use, such that this relationship was stronger for older adolescents (age >13 years). Contrary to expectations, no gender differences were found.

Conclusion: The study highlights that younger adolescents and those with higher levels of social anxiety may be particularly susceptible to harmful effects when using social media. Passive social media use may be a possible coping strategy used by older adolescents to manage perceived negative experiences online. Parents, carers and clinicians may wish to consider whether they can help younger adolescents navigate social media as they may be less familiar with this environment and therefore developed fewer coping strategies. It may also be helpful to support adolescents with higher levels of social anxiety to better manage their social media experience and use social media in a more balance, less invested way. Studies that employ a longitudinal methodology would also aid in understanding the temporal relationship between variables.

Appendix 2. *Section A CASP cohort study appraisal tool*

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Appendix 3. Section A papers assessed by CASP criteria

	Casp checklist – studies 1-7	Brooker, Kelly & Sacker (2018)	Calandri, Graziano & Rolle (2021)	Van den Ejinden (2018)	Frison & Eggermont (2016)	Frison & Eggermont (2017)	Frison, Subrahmanyam & Eggermont (2016)	Marsh et al. (2022)
A. Are the results of the trial valid?	1. Did the study address a clearly focused issue in terms of - Population studied - Study trying to detect beneficial or harmful effects - Outcomes considered	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated
	2. Was the cohort recruited in an acceptable way? - Was the cohort representative of the population? - Was there something special about the cohort? - Was everyone included who should have been?	Yes Data came from a nationally representative sample. Stratified, clustered sampling used	Unsure Convenience sample of schools in one region of Italy. Not representative of target population.	Unsure Data derived from an ongoing longitudinal study. Gender was evenly distributed. Lower educational levels underrepresented.	Unsure Two-step sampling method used. Gender was evenly distributed. Not stated whether sample was representative of target population.	Partly Data were part of a large-scale longitudinal panel study. Females overrepresented in study (61%).	Partly Data came from 15 randomly selected schools. Authors state that the education level of the sample was "representative of the Flemish secondary school population".	Unsure Participants recruited via voluntary response sampling across local schools in two sites located in Southeast and Midwest USA. Participants mostly White. Therefore, not clear whether results can be generalised.
	3. Was the exposure accurately measured to minimise bias? - Did they use subjective or objective measures? - Did the measurements truly reflect what you want them to?	Self-report on SM use subject to bias Participants asked about SM use on a "normal school day" – findings may be underestimated	Self-report of SM use subject to bias and single-item measure only. Measure did not distinguish between types of SM use (e.g. active/passive)	Self-report of SM use subject to bias. Four items related to SM use but two related to instant messaging via smartphone. Validity of the disordered SM use measured not discussed.	Self-report of SM use subject to bias. Validity of passive SM use measure not clear. Only measured Facebook use therefore results may not generalise to other forms of SM. Two-item measures only.	Self-report of SM use subject to bias. Separated out browsing (passive use) and posting (active use) – useful to distinguish between types of use.	Self-report of SM use subject to bias. Negative Facebook experiences measured. Validity of this measure not discussed but did report good reliability. Cronbach's alpha scores given.	Self-report measures of SM use subject to bias. However, authors report measure has good reliability and both convergent and discriminant validity.

		Active SM use measured only – useful to distinguish between active/passive					Only measured Facebook use therefore results may not generalise to other forms of SM.	
4. Was the outcome accurately measured to minimise bias? - Did they use subjective or objective measures? - Did the measurements truly reflect what you want them to?	Partly SDQ is a validated measure. Wellbeing measure not validated – Cronbach’s alpha reported.	Yes Validated measures of emotional self-efficacy, depressive symptoms, affective wellbeing and life satisfaction used. Cronbach’s alpha for all measures reported.	Unsure Validity of life satisfaction measure not discussed.	Yes Validated measure of depressed mood used. Cronbach’s alpha reported.	Yes Validated measure of depressed mood used. Cronbach’s alpha reported.	Yes Validated measure of depressive symptoms and life satisfaction used and Cronbach's alpha reported.	Yes Validated measure of internalising symptoms used. Authors report structural validity across community and clinical samples including adolescents with ADHD.	
5. Have the authors identified all important confounding factors? Have they taken account of the confounding factors in the design and/or analysis? - Considers factors such as gender, age and social class - Look for techniques to correct, control or adjust for confounding factors	Yes “controlled variables were chosen based on the literature and previous analysis...parent and household level covariates were included in the analysis. Covariates were included in the models as time-varying or invariant as appropriate”	Mostly Controlled for wellbeing levels, depressive symptoms and life satisfaction at T1. Data collected on SES but was not controlled for in the analysis.	Mostly “The outcome variable at the previous measurement was included as a control variable, as well as level of education”	Mostly Age, educational level of parents and country of origin all entered as covariates.	Partly Age was controlled for. No other confounding variables considered.	No Confounding variables not considered or reported. No ethnicity or SES data collected.	Yes ADHD status, gender and time spent on SM all included as covariates. Authors provided justifications for selecting these covariates. Age and SES not considered.	

	<p>6. Was the follow-up of subjects complete/long enough?</p> <ul style="list-style-type: none"> - Have the effects had long enough to reveal themselves? - Persons lost to FU may have had different results to those available at FU - Was there anything special about the outcomes of the people leaving? 	<p>Yes</p> <p>5 wave study over 5 years</p> <p>Differences between participants available at follow-up vs not, not reported but analysis modelled by age rather than time</p>	<p>Yes</p> <p>1-year follow up period.</p> <p>Attrition rate was 15.6%. "participants included in the study did not differ from the overall sample on demographics or study variable"</p>	<p>Yes</p> <p>2-year follow up period.</p> <p>Missing data were substantial and therefore estimated and included in the final analysis</p>	<p>No</p> <p>Cross-sectional data used therefore effects across time or direction of effect cannot be determined.</p>	<p>Partly</p> <p>5-month follow-up period. Attrition rate was 34.5%. Adolescents who participated in both waves scored lower on Instagram posting (T1) and depressed mood (T1) than those who did not.</p>	<p>Partly</p> <p>6-month follow-up period. Authors report attrition may have biased sample as adolescents who participated in both waves scored lower on depressive symptoms (T1) and negative Facebook experiences (T1).</p>	<p>No</p> <p>Cross-sectional data used therefore effects across time or direction of effect cannot be determined.</p>
B. What are the results?	<p>7. What are the results of the study?</p> <ul style="list-style-type: none"> - Have they reported the rate or proportion between exposed/unexposed? - How strong is the association between exposure and outcome? 	<p>"For females, increased interaction on SM at age 10 was associated with greater increases in SDQ with age". Path coefficient = 0.10, indicating a small effect.</p>	<p>Using a regression, gender and emotional self-efficacy moderated the effect of SM use on depressive symptoms and life satisfaction.</p>	<p>More disordered SM use predicted lower life satisfaction one year later (T1-T2 and T2-T3). Gender moderated the effect of disordered SM use on life satisfaction: the negative effect was stronger for males than for females. Model fit was satisfactory (CFI = 0.90)</p>	<p>Passive Facebook use yielded more depressive symptoms among girls compared to boys, and both <i>public</i> and <i>private</i> active use predicted a decrease in depressed mood in girls</p>	<p>Passive use of Instagram (browsing) at T1 was related to an increase in depressed mood at T2. Relationships similar among boys and girls.</p>	<p>Peer victimisation on Facebook "marginally" predicts decreases in life satisfaction. Support from friends moderated this relationship.</p>	<p>Emotional investment in SM moderated the relationship between cybervictimisation and internalising symptoms, such that cybervictimisation associated with higher anxiety and depression at higher levels of emotional investment.</p>
	<p>8. How precise are the results?</p> <ul style="list-style-type: none"> - What are the confidence limits? 	<p>95% CI</p>	<p>95% CI</p>	<p>95% CI</p>	<p>95% CI</p>	<p>95% CI</p>	<p>95% CI</p>	<p>95% CI</p>
	<p>9. Do you believe the results?</p> <ul style="list-style-type: none"> - A big effect is hard to ignore - Could it be due to bias, chance, confounding? 	<p>Small effect observed but confounding variables controlled for.</p>	<p>Small effect observed only. Some confounding</p>	<p>Small effects observed only. As stated, model fit was satisfactory but not excellent.</p>	<p>Small effects observed only. Cross-sectional data limits conclusions that can be drawn.</p>	<p>Small effects observed only. Goodness-of-fit of the models was determined using</p>	<p>Did not control for offline peer victimisation. Online and offline peer victimisation</p>	<p>Small effects observed only. Cross-sectional and self-report data limits</p>

	- Are design/methods sufficiently flawed to make results unreliable?	Result may be underestimated due to asking about SM use on a “normal school day”.	variables controlled for.	Controlled for several potential confounding variables.		comparative fit index (CFI). CFI = 0.96 indicating good fit.	are closely related (Sumter et al., 2012) so possible this may have confounded results. Considerable attrition rate.	conclusions that can be drawn.
C. Will the results help locally?	10. Can the results be applied to the local population? - Consider whether participants were sufficiently different from the population to cause concern	Yes Nationally representative sample 49% female	Unsure Convenience sample of schools in one region of Italy. Not representative of target population.	Yes Target population representative of local area but generalisability may be limited to Dutch adolescents. Lower educational levels underrepresented.	Unsure Not clear whether sample is representative of target population.	Unsure Not clear whether sample is representative of target population.	Yes Sample representative of Flemish school population. Cultural differences may limit findings to Flemish population.	Participants mostly White therefore results not generalisable to more diverse sample of adolescents.
	11. Do the results of this study fit with other available evidence?	Previous studies (including some in this review) have reported gender differences in aspects of SM use however this is the first study to observe an interaction with age.	Results are in line with previous studies that have found associations with SM use and wellbeing however this study highlights a more complex relationship (i.e. moderation by emotional self-efficacy)	One of the first longitudinal studies investigating outcomes of disordered SM use. Other research has found positive effects of SM use in maintaining friendships.	Some previous evidence for a gender difference in social skills which could explain the study findings. Results in line with previous studies that suggest passive use of SM may be more harmful for wellbeing than active use but first study to differentiate between public and private use.	Previous studies linking passive use of SM to depressive symptoms in adolescents. No support was found for association between active SM use and depressed mood, contrary to previous findings. No support for gender differences which also contrasts previous cross-sectional studies supporting moderating role of gender.	Fits with previous evidence linking online peer victimisation with decreases in wellbeing. However, first study to examine reciprocal relationship between these variables and the moderating role of perceived friend support. Previous studies focused on main effects (e.g. Landoll et al., 2013).	Findings fit with evidence from one other study to examine emotional investment in SM in the context of internalising symptoms (Woods & Scott, 2016).
	12. What are the implications of this study for practice? - One observational study rarely provides sufficient	The study reports that “it is important to educate adolescents	This study has implications for SM use in early adolescents, particularly for	The study suggests that symptoms of disordered SM use should be	The study suggests that future studies should pay “special attention to the emergence of	The study provides insight into the reciprocal relationship between Instagram	Contributes to the identification of risk groups of peer victimisation on Facebook. Suggest	The findings highlight the importance of identifying which

	<p>robust evidence to recommend changes to clinical practice</p> <p>- Recommendations from observational studies are always stronger when supported by other evidence</p>	<p>specifically females, and their parents on the consequences of high levels of use at younger ages on their future wellbeing”</p> <p>Further longitudinal studies that use parallel latent growth curve models would be useful.</p>	<p>girls. The study suggests that promoting emotional self-efficacy could be help in SM use as an opportunity for life satisfaction rather than a “developmental risk”</p>	<p>regarded as a “developmental threat” for young people and considered a behavioural addiction.</p>	<p>gender differences” on the impact of SM use on wellbeing. The results suggest that social support may be an area to focus on when providing interventions for adolescents.</p>	<p>use and depressed mood in adolescents. The study suggests that attention should be paid to the “prevention and intervention” of reducing passive use” of SM in adolescents.</p>	<p>intervention programs should focus on high risk adolescents and utilise friend support that can protect vulnerable adolescents.</p>	<p>adolescents may be more invested in SM. Thus, targeting interventions that could help reduce investment in SM, particularly for adolescents who have higher anxiety and depressive symptoms.</p>
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	Casp checklist – studies 7-14	Nesi & Prinstein (2015)	Ohannessian & Vannucci (2017),	Van Schalkwyk et al. (2017)	Valkenburg et al (2021)	Vandenbosch & Eggermont (2015)	Vogel et al., (2015)	De Vries et al. (2016)
A. Are the results of the trial valid?	1. Did the study address a clearly focused issue in terms of - Population studied - Study trying to detect beneficial or harmful effects Outcomes considered	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated	Yes Population studied, effects sought and outcomes clearly stated
	2. Was the cohort recruited in an acceptable way? - Was the cohort representative of the population? - Was there something special about the cohort? Was everyone included who should have been?	Partly "The sample closely matched the demographic makeup of the district from which participants were recruited". However, district of schools not stated. 57% female.	Yes Participants recruited via five middle schools in New England, USA. Study does not explain whether all students took part. Ethnicity data collected but not clear if this was representative of the target population. Gender proportionally representative with 51% female.	Unsure Adolescents with and without ASC recruited via voluntary response sampling. Not clear whether those who did not volunteer would have differed from those that did. 70.5% males with ASC - not clear if this is representative.	Unsure Non-random sampling via one large secondary school. Sample was ethnically and educationally representative of local population.	Yes Participants recruited from 12 schools across Belgium. Authors state that "different schooling levels and schooling ages were selected". 56.6% male, SES data not discussed. All students reported to be present during researcher's visit.	No Participants recruited from a university who took part in exchange for course credit. 77% female.	Yes Participants taken from a larger longitudinal study. "However, adolescents attending higher levels of education and with Netherlands-born parents were overrepresented".
	3. Was the exposure accurately measured to minimise bias? - Did they use subjective or objective measures? Did the measurements truly reflect what you want them to?	Self-report measures of SM use subject to bias. Reliability and validity of measures not reported.	Self-report measure of SM use subject to bias. Reliability and validity of measure not reported.	Self-report measure of SM use subject to bias. Measure of SM developed specifically for this study. Reliability and validity not reported.	Self-report on SM use subject to bias.	Self-report on SM use subject to bias. The scale was piloted and internal consistency demonstrated.	Self-report on SM use subject to bias. The measure showed strong reliability. Cronbach's alpha reported.	Self-report on SM use subject to bias.

				Measure included two subscales that examined SM anxiety and active engagement with SM.				
4. Was the outcome accurately measured to minimise bias? - Did they use subjective or objective measures? Did the measurements truly reflect what you want them to?	Yes Measure shown to have good psychometric properties and widely used to assess depressive symptoms in adolescent samples.	Yes Measure reported to have good reliability and validity. Cronbach's alpha reported for the sample.	Unsure Psychometric properties of the measure not reported. Parent versions of the measure used which allowed for comparison between self-report and parent-report.	Partly A single-item validated measure of self-esteem (SE) used. Peer approval and appearance contingencies of SE not validated. Confirmatory factor analysis done and Cronbach's alpha reported ranging from 'questionable' to 'acceptable'.	Yes Measures reported to have good validity and reliability.	Partly A widely-used and validated measure of wellbeing was used. Measure of self-esteem shown to have good reliability. Cronbach's alpha reported. Validity of the self-esteem measure not discussed.	Validity of body dissatisfaction and peer appearance-related feedback not reported.	
5. Have the authors identified all important confounding factors? Have they taken account of the confounding factors in the design and/or analysis? - Considers factors such as gender, age and social class Look for techniques to correct, control or adjust for confounding factors	Yes Baseline depressive symptoms, excessive reassurance seeking and overall frequency of technology use were all entered as covariates. Age and SES not considered.	Partly Age and parental education (as a measure of SES) were entered into the model as covariates.	No Adolescents without ASC had a "diverse psychiatric symptoms" but no covariates entered into the model. Age and SES data not collected or considered.	Mostly Controlled for the autoregressive effect of SE. Age and SES not considered.	Mostly "We controlled for the baseline values of country of origin, age, gender and BMI" SES not considered.	Yes Experimental research design. Participants randomly assigned to one of three conditions. No ethnicity or SES data collected.	Mostly Study controlled for gender and "all analyses included previous levels of the variables of interest. In this way, we controlled for past behaviour."	
6. Was the follow-up of subjects complete/long enough?	Partly	No	No	Mostly	Partly	No	Yes	

	<ul style="list-style-type: none"> - Have the effects had long enough to reveal themselves? - Persons lost to FU may have had different results to those available at FU <p>Was there anything special about the outcomes of the people leaving?</p>	<p>One-year follow-up period.</p> <p>Attrition rate was 10%. Differences between participants at T1 and T2 not discussed.</p>	<p>Cross-sectional data used therefore effects across time or direction of effect cannot be determined.</p>	<p>Cross-sectional data used therefore effects across time or direction of effect cannot be determined.</p>	<p>Participants received a total of 126 surveys across 21 days. Overall compliance rate of 58% which authors describe as “reasonable”. Compliance rate partly due to a technical error as opposed to participant drop out.</p>	<p>Six-month follow-up period.</p> <p>Adolescents completing T1 only were more likely to be from another country, male and have higher BMI, and score lower on body surveillance and internalisation of appearance ideals.</p>	<p>Follow-up data not collected.</p>	<p>15-month follow-up period.</p> <p>Retention rate of 54.2%. Participants who dropped out were, on average, four months older. No other differences reported.</p>
B. What are the results?	<p>7. What are the results of the study?</p> <ul style="list-style-type: none"> - Have they reported the rate or proportion between exposed/unexposed? <p>How strong is the association between exposure and outcome?</p>	<p>Population and gender were moderators in the relationship between technology-based feedback seeking and depressive symptoms. The association was particularly strong among females and adolescents low in popularity.</p>	<p>Boys who used Facebook regularly and Hispanic adolescents who used Instagram regularly were at an elevated risk of behaviours that challenge.</p>	<p>SM use associated with friendship quality in adolescents with ASC, this was moderated by anxiety levels. The moderating role of anxiety was only robustly demonstrated using parent measure of anxiety and the active SM use sub-scale of measure.</p>	<p>Dynamic Structural Equation Modelling (DSEM) found that within-person effects of time spent with SM on SE, as well as the valance of experiences varied from positive to negative. The differences in person-specific effects could be explained by SE level, SE instability and their tendency to base SE on peer approval.</p>	<p>Females who had more frequent SM use at T2 also had higher levels of self-objectification at T3. No gender differences were found in how attractiveness-related use of SM impacted self-objectification or body surveillance.</p>	<p>Participants high in SCO had lower self-esteem and more negative affect than their low SCO counterparts after engaging in SM use</p>	<p>Peer appearance-related feedback did not predict body dissatisfaction and did not mediate the effect of SM use on body dissatisfaction. Gender did not moderate the findings.</p>
	<p>8. How precise are the results? What are the confidence limits?</p>	NS	NS	95% CI	95% CI	95% CI	NS	95% CI
	<p>9. Do you believe the results?</p> <ul style="list-style-type: none"> - A big effect is hard to ignore - Could it be due to bias, chance, confounding? 	<p>Not clear how much the results can be generalised to SM use specifically as the measure of technology</p>	<p>Cross-sectional nature of study means conclusions cannot be drawn. Model fits not reported but separate</p>	<p>Cross-sectional nature of study means conclusions cannot be drawn. Adolescents without ASC</p>	<p>Small effect observed but confounding variables controlled for.</p>	<p>Small effects observed only. Considerable attrition rate limit conclusions that can be drawn. Model fit indices adequate fit but not excellent. Some</p>	<p>Experimental research design meant two control groups were used. Therefore, more able to suggest any changes are due to variables</p>	<p>Good model fit but CI for one result included 0.</p>

	Are design/methods sufficiently flawed to make results unreliable?	based SCFS (Motivations for Electronic Interaction Scale; MEIS) asked about “electronic interaction” which could include other forms of technology-related communication.	models run for each SM platform which allowed for comparisons. Some discussion of the impact of online racial discrimination and wider systemic factors that may impact results.	had other psychiatric symptoms which may have confounded results.		confounding variables controlled for.	being manipulated. However, participants selected by opportunity sampling. Participants briefly browsed SM so social orientation not directly measured.	
C. Will the results help locally?	10. Can the results be applied to the local population? Consider whether participants were sufficiently different from the population to cause concern	Study had a large and diverse sample but did not assess differences in outcomes by ethnicity or SES.	Study reports a diverse sample but it is not clear how representative this is of population.	Representativeness of sample not discussed. Females may be overrepresented in non-ASC sample (62.5%).	“The sample was a fairly accurate representation of the specific area of The Netherlands in terms of educational level and ethnic background”	Cultural differences may limit findings to Belgian population. Not discussed in limitations.	High proportion of females (77%) therefore may not be representative. Older adolescent sample so the results may not be generalisable to younger adolescents	Some acknowledgment that Dutch population may limit generalisability of findings.
	11. Do the results of this study fit with other available evidence?	First study to examine popularity as a moderator in the relationship between technology-based social comparison and depressive symptoms but previous research suggests adolescents lower in popularity receive less positive	Study is contrary to evidence that suggests girls may have more negative outcomes as a result of SM use. First study to examine ethnicity as a moderator in the relationship between SM use and behaviour.	Some support for the 'social compensation' hypothesis as adolescents with ASC able to benefit from SM use. However, this was moderated by anxiety levels. Previous evidence that anxious adolescents may be less likely to benefit from SM use.	Results are in line with research that suggests adolescents with mood instability are more prone to develop depressive symptoms however this is the first study to investigate moderators to explain differences in person-specific susceptibility of SM use on SE.	Study is the first to support relationship between the of sexualising of mass media and the use of SM over time. Finding of increased self-objectification in girls is consistent with previous research (Kapidzic & Herring, 2014).	Findings consistent with previous research that suggests SM use can impact self-esteem and wellbeing. Extends this by examining the moderating role of social comparison orientation.	Moderation by gender is in contrast to previous research. However findings that SM use predicted body dissatisfaction is in line with literature.

		feedback on SM (Mikami et al., 2010). Negative feedback has been found to lead to decreases in self-esteem (Valkenburg et al., 2006).						
12. What are the implications of this study for practice? - One observational study rarely provides sufficient robust evidence to recommend changes to clinical practice Recommendations from observational studies are always stronger when supported by other evidence	The findings suggest that adolescents low in popularity may be more susceptible to negative experiences online. However, the sample overall had low mean levels of depressive symptoms so the results may not generalise to a clinical sample.	Findings suggest gender and ethnicity/race should be considered in the relationship between SM use and behaviours that challenge. Further research is needed, particularly using longitudinal studies and closer examination of causal factors underpinning this finding.	Recruited clinical population - one of only two studies in this review to do so therefore novel contribution to the literature. Clinicians working with adolescents with ASC should give attention to levels of anxiety that may impact positive SM use	The study suggests that all adolescents should be supported by their parents and educators to help them prevent or cope with negative experiences online, even adolescents that mainly have positive SM experiences. Further studies that examine other dispositional moderators such as social anxiety would be useful.	Type of SM use may be an important differentiator when considering SM use and adolescent wellbeing. Further attention should be paid to males as some media use effected both girls and boys similarly.	People higher in social comparison orientation might be more at risk of harmful effects on SM. Future studies should examine other social and personality factors that may make adolescents more vulnerable.	Study suggests the boys and girls may both benefit from interventions aimed to decrease the harmful effects of SM use. However further research is needed.	

Appendix 4. Moderator analyses from included studies and their quality scoring

	Moderator variable (s)	Valid and reliable moderator measure	Baseline measure of moderator	<5 moderators tested	A-priori hypothesis	Direct test of interaction	Valid and reliable outcome measure	Planned moderator analysis	Total score (/7)
Booker, Sacker & Kelly (2018)	Gender Age	1	1	1	0	1	1	?	5
Calandri, Graziano and Rollé (2021)	Gender, emotional self-efficacy	1	1	1	1	1	0	?	5
van den Eijnden (2018)	Gender	1	1	1	0	1	1	?	5
Frison & Eggermont (2016)	Gender	1	1	1	1	1	1	?	6
Frison & Eggermont (2017)	Gender	1	1	1	0	1	1	?	5
Frison, Subrahmanyam & Eggermont (2016)	Perceived friend support, gender, age	1	1	1	1	1	1	?	6
Marsh et al. (2022)	Emotional investment in SM	1	0	1	1	1	1	?	6
Nesi & Prinstein (2015)	Popularity, gender	1	1	1	1	1	1	?	6
Ohannessian & Vannucci (2017)	Gender, race/ethnicity	1	1	1	1	1	1	?	6
van Schalkwyk et al. (2017)	Anxiety	?	0	1	1	1	?	?	3
Valkenburg et al. (2021)	Gender, SE level, SE instability, peer approval, physical appearance	1	1	0	1	1	?	1	5

Vandenbosch & Eggermont (2015)	Gender	1	1	1	0	?	?	?	3
Vogel et al. (2015)	Social comparison orientation	1	0	1	1	1	1	?	5
de Vries et al. (2016)	Gender	1	1	1	1	1	1	?	6

Appendix 5. *Ethical approval letter*

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Appendix 6. Participant information sheet

Parent/carer information sheet

Study title: Social Media Use and Social Anxiety in Children and Adolescents

Name of researcher: Emogen Campbell

Hi, my name is Emogen Campbell and I'm a Trainee Clinical Psychologist at Canterbury Christ Church University. I am being supervised by Dr Fergal Jones, Research Director, Salomons Institute for Applied Psychology and Linda Hammond, Clinical Psychologist.



I'm hoping to find out more about how social media impacts the wellbeing mental health of young people aged 10-16 by asking them to complete a 15-minute online survey. Before you decide whether your child should take part in this research study, it is important for you to understand why the research is being done and what it will involve. There will be a separate information sheet that your child can read.

What is the purpose of the study?

The purpose of the study is to find out more about how young people use social media (like Facebook, Instagram, TikTok and YouTube) and how this might affect their wellbeing and mental health.

What will happen if my child takes part?

If you agree your child can take part, we will ask for your email address and send you a link to the study survey. Your child can either complete the survey there and then or at another time. The survey takes approximately 15 minutes and consists of questions about your child's social media use and how they feel in social situations. There will also be some examples of typical social media scenarios. They will be asked to rate how they might feel or what they might do if these were to happen to them. Most of the questions are multiple choice and there are no right or wrong answers.

Does my child have to take part?

No, this is entirely yours and your child's choice. If they do take part, they are also free to change their mind and withdraw from the study whilst completing the survey by closing their web page. Any data they have entered up until this point will be kept as the data are anonymous. There will be a separate form where your child will be asked if they are happy to take part in the study however informed consent must come from you given their age.

Are there any risks in taking part?

Sometimes thinking about how we are feeling can be upsetting. If you think that answering questions on this topic would be upsetting for your child, please do not ask them to complete this survey.

If your child starts the survey and becomes distressed, they can stop at any point. As the data are anonymous, we cannot provide any specific support advice however if the survey raises any issues you think

your child could benefit from further support with, then the following national support services are available (we will also tell your child about these services on their information sheet and at the end of the survey):

www.childline.co.uk or **0800 1111**

www.youngminds.org.uk

Alternatively, there are more local services if you feel you or your child needs support from them. You can find information on NHS 111 by dialling 111 or using the website www.111.nhs.uk or you can speak to your GP.

I will remind your child of this help at the end of the survey. You can also download a copy of this information sheet. Details for how to do this are provided at the end.

What are the benefits of taking part?

This research should help us better understand how social media impacts the mental health and wellbeing of young people.

By taking part your child will be entered into a prize draw to win a £25 shopping voucher. There are 2 of these available. If they are successful you will be contacted on your given email address.

Will taking part in the study be confidential?

Yes, any personal information provided (i.e. email addresses) will be kept confidential and stored securely on password-protected file on the university file space. The information your child gives in the survey will not be linked to the email address you provide therefore their answers will be anonymous. The survey information will also be kept securely on a password-protected file. The information your child gives will be used for this research study only. Your information will be kept for a maximum of 10 years after the study has finished and will then be destroyed.

What will happen to the results of the research study?

The study will be published on the university's website and available to the public. The results may also be published in a psychology journal. The results are anonymous and will not identify any individual participants, only averages across participants. Everyone who takes part will be asked if they would like to hear about the results of the study via email.

Who is organising and funding the research?

The research is being conducted by Canterbury Christ Church University. An independent research ethics committee have approved the study.

Contact details

If you would like to find out more about the study, have any general questions or would like advice about whether your child should participate, you can email me e.campbell605@canterbury.ac.uk. Alternatively, you can contact my research supervisor Dr Fergal Jones by emailing fergal.jones@canterbury.ac.uk.

If you have any concerns about anything in the study, myself or my supervisor will do our best to answer any questions. If you are still unhappy and wish to speak to someone else, please contact Professor Margie Callanan (Director of Salomons Institute for Applied Psychology) on margie.callanan@canterbury.ac.uk

If you would like to keep a copy of this information sheet, please *[insert information for downloading pdf on Qualtrics]*

Appendix 7. Participant assent forms

Child assent form (ages 14-16)

The social media and wellbeing survey

If there is anything in this information sheet that you don't understand, please speak with your parent or carer.

Hi, my name is Emogen Campbell and I'm a Trainee Psychologist at Canterbury Christ Church University. I am being supervised by Dr Fergal Jones and Linda Hammond who are both Psychologists.



I would like to tell you about a research study I am doing. I have told your parent/carer about this research and they have said it is okay for you to take part but it is also up to you.

Before you decide, it is important for you to understand why the research is being done and what you will do. You can talk this over with your parent/carer before you decide.

What is the study about?

The study is about how young people use social media (like Facebook, Instagram, TikTok and YouTube) and how this makes them feel.

What will happen if I take part?

If you choose to take part, you will be asked some online questions about yourself, your social media use and how you feel in social situations. This will take about 15 minutes. There will also be some examples of things that might happen on social media. You will be asked how you might feel or what you might do if this happened to you. There are no right or wrong answers.

Do I have to take part?

No, this is your choice. If you do take part, you are also free to change your mind and leave the study by closing the web page.

What will happen to the information I give?

Any questions you answer will be anonymous (meaning your answers are not connected to you so we won't know who has given which answers). Because of this, once you have answered questions, we won't be able to remove that data. Your parents will not know the answers you provide unless they are sitting with you when filling in the survey.

All the information collected will be kept private and in a safe place. The information you give will be used for this research study only.

What would happen if I was upset by anything in the research?

Sometimes thinking about how we are feeling can be upsetting. If you think that answering questions on this topic would be upsetting, please do not complete the survey.

However, if you do take part and are upset by anything in the survey, we would advise you to talk to your parent/carer. Alternatively, you may find these websites helpful:

www.youngminds.org.uk

www.childline.org.uk

You can also call Childline for free to speak to someone about how you are feeling on 0800 1111.

What are the benefits of taking part?

This research should help us better understand how social media impacts the mental health and wellbeing of young people.

By taking part you will be entered into a prize draw to win a £25 shopping voucher. There are 2 of these available. If you win, we will email your parent/carer a voucher to pass on to you.

What will happen to the results of the research study?

Your parent/carer will be asked if you both would like to hear about the results of the study via email. The study will be put on the university's website for others to read. The results may also be written in a psychology paper. The results are anonymous and will not identify any people so nobody will see the answers you give. Your parent/carer has been asked if you would like to hear about the results of the study by email. If they have said yes we will email this to them.

Who is organising and funding the research?

The research is being conducted by Canterbury Christ Church University.

I have read and understand the above information and am happy to take part

Child assent form (10-13)

The social media and wellbeing survey

If there is anything in the below information sheet that you don't understand, please speak with your parent or carer.

Hi, my name is Emogen Campbell and I'm training to be a Psychologist at Canterbury Christ Church University. I am being supervised by Dr Fergal Jones and Linda Hammond who are both Psychologists.



I would like to tell you about some research I am doing. I have told your parent/carer about this research and they have said it is okay for you to take part, but it is also up to you.

Before you decide, it is important for you to understand why the research is being done and what you will do. You can also talk this over with your parent/carer before you decide.

Why is the research being done?

The research is being done to find out more about how young people use social media (like Facebook, Instagram, TikTok and YouTube) and how this makes them feel.

If I do the research, what will happen?

You will be asked some online questions about your social media use and how you feel when around other children. This will take about 15 minutes. There will also be examples of things that might happen on social media. You will be asked how you might feel or what you might do if this happened to you. There are no right or wrong answers.

Do I have to do the research?

No, this is your choice. If you do take part, you are also free to change your mind and leave the study when answering questions by closing your web page.

What will happen to the information I give?

Any answers you give will be kept private.

We will not know who has given which answers.

Your parents will not know the answers you give unless they are sitting next to you. All the information collected will be kept in a safe place.

What would happen if I was upset by anything in the research?

Sometimes thinking about how we are feeling can be upsetting. If you think that answering these questions would be upsetting, please do not complete the survey.

However, if you do take part and are upset by any of the questions, we would advise you to speak to your parent/carer. Or you may find these websites helpful:

www.youngminds.org.uk

www.childline.org.uk

You can also call Childline for free to speak to someone about how you are feeling on 0800 1111.

What are the good things about taking part?

This research should help us better understand how social media makes young people feel.

By taking part you will be entered into a prize draw to win a £25 shopping voucher. There are 2 of these available. If you win, we will email your parent/carer a voucher to pass on to you.

What will happen to the results of the research study?

The research will be put on the university's website for other people to read. The results might also be written in a psychology paper. The results will be from everyone who has taken part so nobody will be able to see the answers you give. Your parent/carer has been asked if you would like to hear about this too. If they have said yes we will email this to them.

I have read and understand the above information and am happy to take part

Appendix 8. Participant online debrief

Thank you for taking part in the survey. If your parent/carer has provided an email address you will be entered into a prize draw to win a £25 shopping voucher.

If you would like to talk to anyone about anything you found upsetting during this survey, please speak to your parent/carer. Or you might find these websites helpful:

www.childline.org.uk or phone **0800 1111**

www.youngminds.org.uk

Please do not forward this survey link to anyone else.

Appendix 9. *Social Anxiety Scale for Adolescents (SAS-A; ages 14-18)*

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Appendix 10. *Social Anxiety Scale for Children Revised (SASC-R; ages 7-13)*

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Appendix 11. *Measure of passive use*

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Appendix 12. *Facebook Intensity Scale*

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F. You send a message to one of your friends on social media. You can see that they have read it but they haven't responded.

How would you feel in this situation?

Please respond by moving the slider.

0 50 100
 (not at all upset) (very upset)

Why do you think they haven't responded?

How likely would you be to think "they haven't responded because they don't want to talk to me"?

Please respond to the following statement by moving the slider.

0 50 100
 (not at all likely I'd think this) (very likely I'd think this)

What would you do if they hadn't responded?

How likely would you be to stop sending messages to that person for a while but continue to look at social media?

Please respond to the following statement by moving the slider.

0 50 100
 (not at all likely) (very likely)

Appendix 14. Breakdown of gender and social media platform use, by age

Age	10	11	12	13	14	15	16
No. of SM platforms used	1.8	4.3	3.6	4.5	4.9	5.5	5.7
<i>Gender</i>							
Females (%)	2 (2.6)	8 (10.5)	6 (7.9)	5 (6.6)	15 (19.7)	4 (5.3)	2 (2.6)
Males (%)	3 (4)	4 (5.3)	4 (5.3)	8 (10.5)	5 (6.6)	1 (1.3)	5 (6.6)
Non-binary (%)					1 (1.3)	2 (2.6)	
<i>SM platforms used</i>							
YouTube	5	9	9	11	20	5	7
TikTok	2	8	10	10	16	5	6
Snapchat	1	6	8	10	14	6	6
Instagram		5	3	8	16	6	6
WhatsApp	1	7	3	9	14	5	4
Pinterest		5	2	2	10	3	2
Facebook		1	1	4	9	3	4
Twitter				3	4	2	2
Reddit		1		4	2	2	
Tumblr				1	2	1	
Discord					1	2	
Roblox		1					
Twitch							1