

BRETT HAYES BSc Hons MSc

AN INVESTIGATION IN TO THE DIFFERENT FACTORS RELATED
TO PROBLEMATIC SMARTPHONE USE

Section A: A meta-review of problematic smartphone use and its
correlates.

Word Count: 6226 (374)

Section B: Problematic Smartphone Use, psychological flexibility, and
quality of life the general population.

Word Count: 7151 (728)

Overall Word Count

14479

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

APRIL 2023

SALOMONS INSTITUTE
CANTERBURY CHRIST CHURCH UNIVERSITY

Acknowledgements

First and foremost, I would like to express my gratitude to my supervisor, Dr Fergal Jones, whose support, guidance, and advice have been invaluable. I would also like to thank the general public who gave their precious time participating in my research.

Undertaking this research has taken a considerable amount of personal resources, and without the support of my wife, none of it would be possible. Thank you for sustaining me throughout this process. I would also like to thank my family, who have helped me along life's journey during and before clinical psychology training.

Summary

Section A provides a meta-review that synthesises reviews exploring problematic smartphone use (PSU) and associated correlates. The review aimed to aid theory development in this area by grading the evidence to help readers understand which correlates are of clinical relevance. Five themes were generated, *sleep, emotional and mental health factors, trait factors, ways of coping* and *physical activity*. All themes reported an association with PSU among children and young people. Sleep, emotional and mental health factors, and trait factors had the strongest evidence base. It is recommended that future research explores PSU in older populations while using therapeutic models.

Section B consists of an empirical investigation into the relationship between PSU, psychological flexibility (and its sub-components) and quality of life in the UK general population. The results showed that psychological inflexibility predicted PSU. Lack of contact with values also predicted PSU, but not above and beyond other elements of the hexaflex model. PSU did not mediate any relationship between psychological flexibility (or psychological inflexibility) and quality of life, or between hexaflex elements and quality of life. Due to the general lack of significant results, findings indicate that the hexaflex model would be of limited utility in understanding PSU at present.

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AN INVESTIGATION OF PROBLEMATIC SMARTPHONE USE,
PSYCHOLOGICAL FLEXIBILITY AND QUALITY OF LIFE

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Abstract

Smartphone use is increasing, and problematic smartphone use (PSU) has frequently been labelled a public health concern. Building upon the vast number of studies exploring the relationship between different correlates and PSU, many reviews exist exploring how PSU relates to a range of psychological factors. Previously no succinct review existed to help guide researchers/clinicians to make sense of this area or aid theory/intervention development.

A meta-review was undertaken that synthesised reviews exploring correlates of PSU between the years of 2019 – 2022. Sixteen reviews were synthesised into five main themes, *sleep, emotional and mental health factors, trait factors, ways of coping and physical activity*. There was a consistent positive relationship between PSU and increased emotional and mental health difficulties, poorer sleep, trait factors (such as insecure attachment), unhelpful ways of coping and reduced levels of physical activity. However, different methodological limitations mean some associations should be interpreted cautiously and not generalised to other samples (physical activity or ways of coping).

This meta-review supports the view that different correlates are related to PSU across different themes, countries and, to some extent, populations. Studies sampling older populations that also utilise models used in psychological therapy are recommended for areas of future research.

Introduction

Since the invention of the iPhone in 2007, the smartphone has become an integrated part of modern life, with 6.8 billion smartphones active worldwide (Statista, 2023). The introduction of new technologies has frequently caused concern; the printing press (Blair, 2003), the TV (Sussman & Moran, 2013), games consoles (Reer & Quandt, 2021) and the smartphone (Elhai et al., 2017) have all been viewed as potentially problematic.

Concerns about smartphone use have been voiced across different forums within society, such as news programmes, documentaries and academic research (BBC, 2019; Elhai et al., 2017; Orłowski, 2020), all expressing a view that smartphone use can become problematic and is a public health concern (Loleska & Pop-Jordanova, 2021). Despite the high level of concern and the apparent risk to public health, defining problematic smartphone use (PSU), also known as smartphone addiction, has been difficult (Lanette et al., 2018).

Spending longer than anticipated on your phone, repeatedly picking up your phone, being told by others you spend too long on the phone, not wanting to miss out on social media updates (or similar), remaining 'glued' to your phone, feeling anxious/panicky when you do not have your phone, or worrying you may be separated from your phone have all been suggested as 'symptoms' of PSU (Harris et al., 2020; Lanette et al., 2018).

While a small number of clinicians have written about how PSU can be understood from a psychodynamic perspective, namely, object relations, unconscious desire, or attachment theory (MacRury & Yates, 2016; Parent & Shapka, 2020; Tugwell, 2021), there has been little/no research as to how PSU works in clinical practice (via case reports or similar). However, research models/frameworks have been developed to try and identify underlying processes/factors of PSU.

The two main models attempting to explain PSU are the pathway model (Billieux et al., 2015) and the Interaction of Person-Affect-Cognition-Execution (I-PACE) model (Brand et al., 2016). Both models explored correlations between variables hypothesised to underly PSU. The pathway model (Billieux et al., 2015) hypothesises that poor impulse control (impulsivity pathway), a need for excessive reassurance to maintain relationships with others (excessive reassurance pathway) and sensation seeking (extraversion pathway) are important processes underlying PSU. Exploring their model empirically, they found support for the pathway model in a largely female undergraduate student sample (Canale et al., 2021). The I-PACE model (Brand et al., 2016) is a framework which hypothesises that a person's 'core characteristics' are made up of biological, psychological and psychopathological factors. A person's core characteristics interact with their coping style, affective (emotional regulation) and cognitive processes (implicit association and expectations) to make the internet addictive. The I-PACE model was originally developed to explain addictive internet behaviours (such as gambling) but has also been applied to PSU, with multiple factors being significantly associated with PSU (Mehmood et al., 2021). Both the pathway model and the I-PACE models do not explain how the different elements of their proposed models interact to create and/or maintain PSU (or internet addictive behaviours) and were largely developed and tested using student samples (Canale et al., 2021; Mehmood et al., 2021).

While these models have been useful for developing research in this area, the academic literature has not been able to use these models (or other research) to define when or how smartphone use becomes problematic or addictive. Attempts to define PSU by screen time (Orben & Przybylski, 2019; Riehm et al., 2019; Sohn et al., 2021) and attempts to get PSU into the DSM five (Lin et al., 2016) have resulted in little progress towards how to best define when a person's smartphone use becomes a problem. Researchers are having ongoing debates about how to best define PSU, expressing concerns that taxonomical inflation will

not resolve the underlying difficulties in defining PSU (Montag et al., 2020). Despite these difficulties in defining PSU, researchers have spent considerable time researching what PSU ‘looks’ like for a person, and they have utilised psychometric theory to develop self-report questionnaires to do this.

There is a wide range of questionnaires measuring PSU (78+ scales), and while they have been readily used, a recent review summarised that their psychometric properties are often insufficient, and scales are without a strong theoretical foundation. The finer details and challenges around PSU measurement are outside the scope of this meta-review, and more information can be found in Harris et al. (2020). The most commonly used measure in the literature is the smartphone addiction scale, or its short version (SAS, SAS-SV (Kwon et al., 2013)). The SAS-SV has excellent psychometric properties and has been validated in multiple populations/countries (Harris et al., 2020; Nikolic et al., 2022). The SAS-SV (Kwon et al., 2013) and other similar measures have been used to explore the prevalence of PSU and to understand if other factors are linked to, or are moderators of, a person’s PSU (Meng et al., 2022; Pearson & Hussain, 2016). This interest has produced a vast amount of research exploring PSU and related factors, which can be broadly categorised as correlates of PSU.

This plethora of primary studies has resulted in researchers conducting systematic reviews and meta-analyses to make sense of the evidence while simultaneously producing reviews considered higher quality than single research studies (Burns et al., 2011). While helpful, a researcher/clinician interested in this area may find it difficult to make sense of all these reviews (without taking a considerable amount of resources to do so). Furthermore, the range of different facets of PSU measured and the range of correlates researched means making sense of any one correlate related to PSU is also hard. Understanding which correlates are clinically relevant and which are not can be useful in aiding theory and intervention development for PSU, as it has been in other areas, for example, OCD research

(Clark & Purdon, 1995). Given the concern and potential impact of PSU, and the current state of evidence, a meta-review is indicated.

In short, a meta-review ‘sums up’ the reviews conducted in a particular area (Hennessy et al., 2019). It builds upon existing standardised processes of synthesising evidence (i.e. meta-analysis reviews and systematic reviews) while adding further questions to assess reviews. A meta-review also emphasises the importance of reporting how many primary studies are used across reviews (referred to as the corrected covered area) and, if done well, can be considered the highest level of evidence and can be influential on research, policy and practice (Hennessy et al., 2019). The current meta-review aims to 1) help to identify the strongest evidence base for correlates of PSU by grading the quality of reviews and (2) provide an overview of PSU and its correlates by synthesising reviews across a broad range of areas. This meta-review aims to help clarify which correlates are strongly associated with PSU and which are not, with the aim of guiding/helping researchers and clinicians with theory and intervention development.

Method

This review utilised a meta-review approach, following the recommended approach of Hennessy et al. (2019) and hence followed three broad cyclical steps 1) preparation phase; reviews are selected and read to understand better the research, its aims, context, findings and implications 2) organising phase, where reading and re-readings were undertaken, alongside note writing, to explore similarities and differences of methods used to synthesise primary studies within the review 3) abstraction phase, descriptions of the data are formulated, and reviews are grouped to form categories (based on a theme, method or other appropriate features across the review).

Search Strategy

A systematic literature search was conducted to identify reviews (systematic and meta-analysis reviews) exploring correlates associated with PSU, following PRISMA guidelines (Page et al., 2021). Databases searched were Pubmed, PsychInfo and ASSIA using specific search terms. Search terms (see Table 1) were generated by synthesising search terms from previous reviews in this area. Searches were limited to find reviews between 2019 – 2022 to ensure the meta-review included up-to-date research in this area and due to the sharp increase of published research in this area since 2019 (J. Zhang et al., 2022). Additionally, the reference lists of eligible reviews were hand searched to ensure no relevant reviews were missed.

Table 1: Search terms used for meta-review.

Search Terms ¹	Year Filtered
(phone* OR smartphone* OR smart-phone* OR mobile-phone* OR cellular-phone* OR cell-phone* OR telephone) AND (addict* OR compuls* OR dependen* OR excess* OR fear OR misuse OR mis-use OR over-use OR overuse OR nomophobia OR 16athology* OR phubbing OR “problematic use” OR “separation anxiety” OR smombie OR zombie) AND (review OR meta-analysis OR meta-synthesis OR metasynthesis OR systematic-review)	2019-2022

¹ Search terms were supplemented with [Title/Abstract] if required by database, otherwise database search options were selected to include Title/abstract (via dropdown options)

Review Criteria

The literature search was conducted by the sole author, initially; the titles and abstracts of reviews were screened. Reviews were then screened based on the following inclusion/exclusion criteria:

- i) Full text is accessible in English
- ii) Published in a peer-reviewed journal (i.e., not a dissertation or conference paper) between 2019-2022
- iii) The review concerns correlates/predictors of problematic smartphone use (i.e., smartphone addiction or synonym(s))
- iv) The review used a standardised checklist/procedure to assess the quality of the primary studies, and a PRISMA diagram (or similar) was used to show the inclusion of studies
- v) The review scored 'high' on the JBI checklist (see *quality assessment* section),
- vi) The review needs to be sufficiently detailed to understand the nature of the included primary studies (design, correlate, effect size etc).

The exclusion criteria for reviews were:

- i) The review only reports online behaviours (such as social media use, 'risky' internet behaviour etc.) while using a smartphone (when PSU is not reported or cannot be ascertained from the published research) or,
- ii) The review focused solely on physical/physiological variables (e.g. radiation exposure).

Data Extraction

For each review, the following information was extracted, in line with suggestions from (Hennessy et al., 2019): Author, publication year, type of review, country, population, number of studies, number of participants, date ranges of primary studies, information about check for publication bias/heterogeneity, types of smartphone measures used and review verdict.

Quality Assessment

In order to assess the quality of the reviews, identified reviews underwent a quality check using the JBI checklist for systematic reviews and research synthesis (Joanne Briggs Institute, 2017) as per the inclusion/exclusion criteria. The JBI checklist was chosen (compared to other options such as CASP) as it has been reported as being more sensitive to aspects validity (Hannes et al., 2010), which felt important when conducting this meta-review. The JBI checklist asks eleven questions which aim to assess the methodical quality of the review, explore whether publication bias has been assessed (across design, the way the research was carried out) and check if the analysis/synthesis was appropriate (Aromataris et al., 2015; Joanne Briggs Institute, 2017). All included reviews scored high on the JBI checklist per inclusion criteria requirements.

In addition to using a standardised checklist to assess review quality, additional questions from the best practice guidelines for conducting a rigorous systematic meta-review were utilised (Hennessy et al., 2019). Questions from the checklist explored if the research was funded, if there were any conflicts of interest, the datedness of the primary studies used, whether protocols were pre-registered prior to study commencement and whether the analysis methods were appropriate. Furthermore, the checklist recommends extracting the number of studies and participants relevant to your research questions and exploring if the authors

considered whether specific studies influenced their findings (above using a standardised checklist). The second set of questions aimed to elicit a more nuanced understanding of the included reviews and allow for a more accurate synthesis of findings – questions appearing only on the best practice checklist are tabulated (Table 3).

Approach to Meta-Review

Approach to Synthesis

Reviews were synthesised using a textual narrative process following Barnett-Page and Thomas (2009) and Hennessy et al. (2019). The similarities and differences between reviews, their quality, key findings and strengths and limitations were considered during synthesis.

Corrected Covered Area (CCA)

An important component of a meta-review is calculating how many studies appear in more than one review (Hennessy et al., 2019). The overlap value, named the corrected covered area (CCA), is important as it helps to decipher how many reviews use the same (or different) primary research studies in their reviews. The categories for overlaps percentage are 0-5% *slight*, 6-10% *moderate*, 11-15% *high* or 15%> *very high* (Pieper et al., 2014). A higher CCA value means the same primary studies repeatedly appeared across different reviews. The CCA in this meta-review was reported within each theme (see results section), using the following formula (Pieper et al., 2014): $CCA = N - r / (r \times c) - r$. CCA = Corrected Covered Area, N = total number of publications across all reviews within the meta-analysis

(including double counting across reviews), r = number of rows (number of indexed publications), and c -the number of reviews (included in the review).

Results

From the systematic literature search, 4,659 reviews were identified and screened (after duplicates were removed), with 34 full texts retrieved and reviewed. Sixteen reviews were retained following screening based on inclusion/exclusion criteria (see Figure 2).

Included reviews were conducted across a range of countries (China, Ireland, Malaysia, Pakistan and the UK), with primary studies being conducted across the globe. The included reviews consisted of 14 meta-analyses and two narrative systematic reviews. The total number of primary studies across reviews was 614, with 441,697 participants. More details regarding included reviews can be found in Table 2.

The results section is structured by theme. Themes were formed by grouping similar psychological constructs together into a larger theme – a rationale for each theme grouping is detailed at the start of each theme section. Each theme section contains a table of included reviews, a brief overview of the area, a discussion of the reviews' primary studies (design and quality), their findings (strength and consistency) and limitations, before considering what we can conclude about the theme in relation to PSU.

Figure 1 The PRISMA flowchart for included reviews

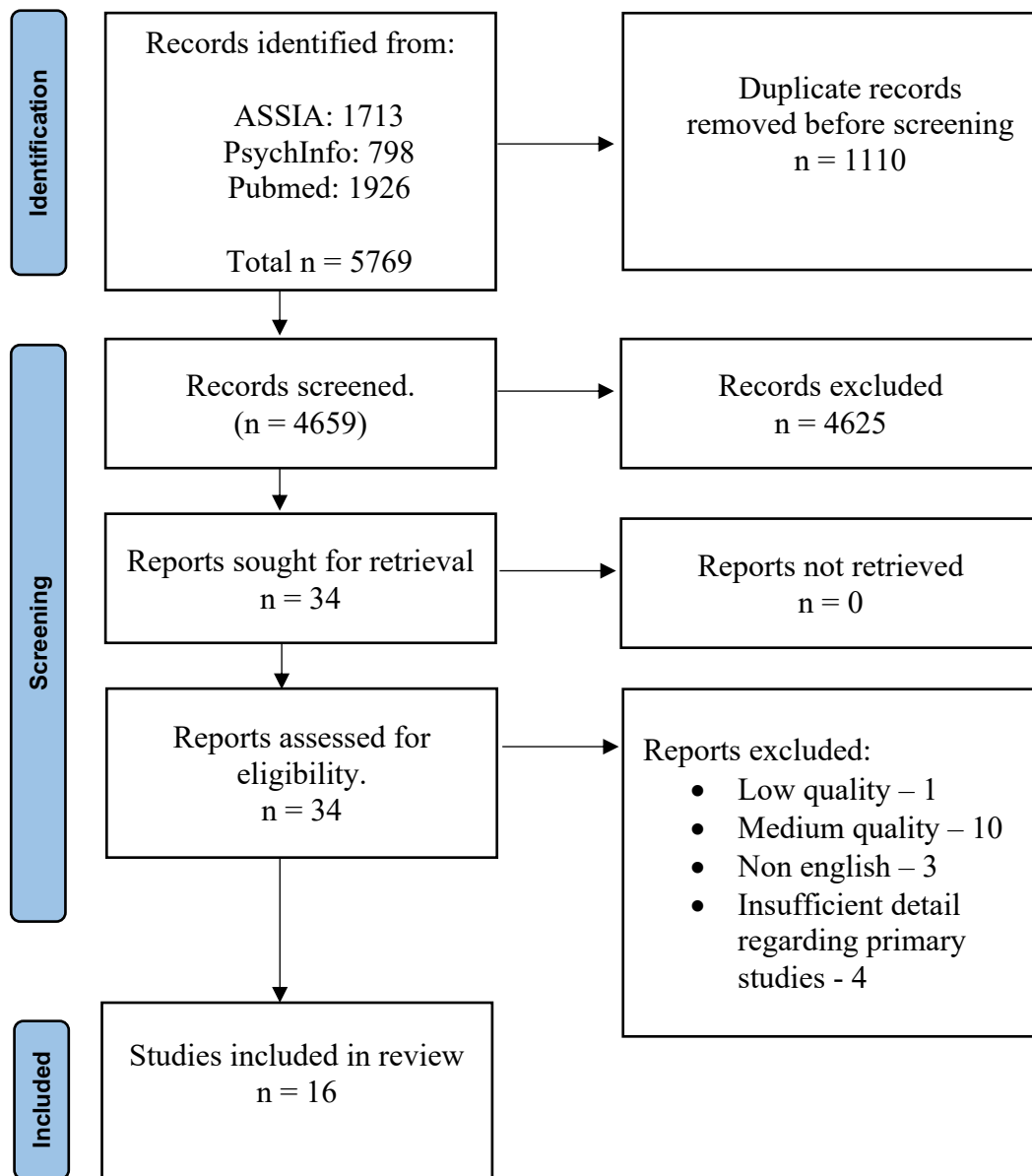


Table 2: Included reviews exploring correlates of PSU

Author	Review Type	Number of		Theme(s)
		studies	participants	
Azam et al. (2020)	Narrative systematic	8	5,167	Physical Activity
Mac Cárthaigh et al. (2020)	Narrative systematic	9	6,715	Sleep
Y. Ding et al. (2022)	meta-analysis	71	54,725	Emotional and Mental Health factors, and Trait factors
W. Ding et al. (2022)	meta-analysis	56	11,570	Emotional and Mental Health factors, and Ways of coping
Huang et al. (2022)	meta-analysis	26	23,387	Emotional and Mental Health factors
Li et al. (2020)	meta-analysis	48	33,955	Sleep, Emotional and Mental Health factors
Liang et al. (2022)	meta-analysis	64	45,765	Emotional and Mental Health factors
Lu et al. (2021)	meta-analysis	33	20,349	Ways of coping
Ran et al. (2022)	meta-analysis	82	48,880	Emotional and Mental Health factors
Shahidin et al. (2022)	meta-analysis	21	3,793	Emotional and Mental Health factors

Table 2 continued: *Included reviews exploring correlates of PSU*

Author	Review Type	Number of		Themes(s)
		studies	participants	
Sohn et al. (2019)	meta-analysis	22	23,652	Emotional and Mental Health factors, Sleep
Xiao et al. (2022)	meta-analysis	17	42,522	Physical Activity
Xiong et al. (2022)	meta-analysis	76	42,522	Trait factors
Yang et al. (2019)	meta-analysis	14	30,830	Sleep, and Emotional and Mental Health factors
Y. Zhang, et al. (2022)	meta-analysis	38	21,017	Trait factors
J. Zhang, et al. (2022)	meta-analysis	29	26,848	Sleep
Totals		614	441,697	

Table 3 : Best practice checklist questions

Author	Review Type	1	1b	2	4e	6b2	7	8	9	10	11a	11b	11b2
Azam et al. (2020)	NS	U	U	N	N/A	N/A	N/A	N/A	N	Y	Y	No, however studies with high risk of bias were removed	N
Y. Ding et al. (2022)	MA	Y	N	Y	M	RE	Y	Y	N	E &B	Y	No, however poor-quality studies were excluded	Y
W. Ding et al. (2022)	MA	Y	N	Y	M	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	N
Huang et al. (2022)	MA	N	N	N	M	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	?
Li et al. (2020)	MA	N	N	Y	M	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	Y
Liang et al. (2022)	MA	Y	N	N	M	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	N

Table 3. NS = Narrative systematic review, MA = meta-analysis. E&B = Begg's and Egger's test. U = unclear, M = multiple, RE = Random Error. 1 = Was the review financially supported 1b) Conflict of interest 4e) Moderators 6b2) Quantitative modelling assumptions 7) Metric of the main effects(s) 8) Heterogeneity statistics 9) Was the review part of an update 10) Publication bias assessed 11a) Quality of primary studies assessed 11b) In addition to study quality assessment tool, 11b2) did reviewers examine if key results depend on inclusion of poor studies. NB: Questions that only appeared in the best practice checklist are included in this table If the questions appeared in both JBI and best practice checklists, they do not appear in this table.

Table 3 continued: Best practice checklist questions

Author	Review Type	1	1b	2	4e	6b2	7	8	9	10	11a	11b	11b2
Lu et al. (2021)	MA	Y	N	N	M	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	Y
Mac Cárthaigh et al. (2020)	NS	U	U	N	N/A	N/A	N/A	N/A	N	N/A	Y	No, however poor-quality studies were excluded	N
Ran et al. (2021)	MA	Y	N	Y	M	RE	Y	Y	N	E&B	Y	Statistically tested for impact of one study and also excluded poor studies	N
Shahidin et al. (2022)	MA	Y	N	Y	N/A	RE	Y	Y	N	N	Y	No, however poor-quality studies were excluded	N
Sohn et al. (2019)	MA	Y	N	Y	N	RE	Y	Y	N	I ²	Y	Urged caution on interpretation of findings due to low quality of primary studies	N
Xiao et al. (2022)	MA	Y	N	N	M	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	N

Table 3. NS = Narrative systematic review, MA = meta-analysis. E&B = Begg's and Egger's test. U = unclear, M = multiple, RE = Random Error. 1 = Was the review financially supported 1b) Conflict of interest 4e) Moderators 6b2) Quantitative modelling assumptions 7) Metric of the main effects(s) 8) Heterogeneity statistics 9) Was the review part of an update 10) Publication bias assessed 11a) Quality of primary studies assessed 11b) In addition to study quality assessment tool, 11b2) did reviewers examine if key results depend on inclusion of poor studies. NB: Questions that only appeared in the best practice checklist are included in this table If the questions appeared in both JBI and best practice checklists, they do not appear in this table.

Table 3 continued: Best practice checklist questions

Author	Review Type	1	1b	2	4e	6b2	7	8	9	10	11a	11b	11b2
Xiong et al (2022)	MA	Y	N	N	M	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	N
Yang et al. (2019)	MA	Y	N	N	N	RE	Y	Y	N	E&B	Y	No, however poor-quality studies were excluded	N
Y. Zhang et al. (2022)	MA	Y	Y	N	M	RE	Y	Y	N	E&B	Y	Sensitivity analysis to evaluate the influence of each study using the leave-one-out method.	Y
J. Zhang et al. (2022)	MA	Y	N	Y	M	RE	Y	Y	Y	E&B	Y	No, however poor-quality studies were excluded	N

Table 3. NS = Narrative systematic review, MA = meta-analysis. E&B = Begg's and Egger's test. U = unclear, M = multiple, RE = Random Error. 1 = Was the review financially supported 1b) Conflict of interest 4e) Moderators 6b2) Quantitative modelling assumptions 7) Metric of the main effects(s) 8) Heterogeneity statistics 9) Was the review part of an update 10) Publication bias assessed 11a) Quality of primary studies assessed 11b) In addition to study quality assessment tool, 11b2) did reviewers examine if key results depend on inclusion of poor studies. NB: Questions that only appeared in the best practice checklist are included in this table If the questions appeared in both JBI and best practice checklists, they do not appear in this table.

Sleep

Table 4: Reviews exploring sleep and PSU.

Author	Review type	Number of		Primary study quality	Population	Main finding
		studies	participants			
Mac Cárthaigh et al. (2020)	narrative systematic	9	6,715	All studies included	Adolescents	Weak-to-moderate correlations between PSU and reduced sleep quality were reported.
Li et al. (2020)	meta-analysis	14	9,969	Moderate/high	College and medical students	PSU had a small correlation with sleep quality ($r = .28$, 95% <i>CI</i> [0.22-0.33], $p < 0.01$).
Sohn et al. (2019)	meta-analysis	7	4,194	Low	CYP	PSU was associated with an increased odds of poorer sleep quality ($OR = 2.60$, 95% <i>CI</i> [1.39, 4.85], $p < .01$)

CYP: Children and young people under 25 years old

Table 4 continued: Reviews exploring sleep and PSU

Author	Review Type	Number of		Primary study quality	Population	Main finding
		studies	participants			
Yang et al. (2019)	meta- analysis	14	30,830	Moderate/high	Children to adults (up to age 65)	PSU was associated with an increased risk of poorer sleep quality, <i>OR</i> = 2.19 (95% <i>CI</i> , [1.79, 2.67]), <i>p</i> <.05)
J. Zhang et al. (2022)	meta- analysis	29	26,848	Medium/high	College and University students	PSU was associated with an increased risk of sleep disorder (<i>OR</i> = 2.25, 95% <i>CI</i> , [1.72, 2.94], <i>p</i> <.05)
Totals		88	78,556			
Overlap			1.43%			

Overview of Sleep Reviews

In total, there were five reviews which explored the association between poorer sleep and PSU. Four reviews where sleep was a primary focus (Mac Cárthaigh et al., 2020; Li et al., 2020; Yang et al., 2020; J. Zhang, et al., 2022), with one review including sleep as part of a wider summary of PSU and its correlates (Sohn et al., 2019). Sleep quality was assessed by asking participants about sleep quality, duration, sleep efficiency and the use of sleep medication.

All reviews' primary studies utilised cross-sectional studies, aside from two observational studies (J. Zhang et al. 2022) and the datedness of primary studies was 2010-2021. The reviews consistently reported a positive relationship between PSU and poorer sleep quality (OR ~ 2, or a small-to-medium significant correlation) across populations²/countries (see Table 4). The same type of relationship was reported in the narrative systematic review, namely a weak-to-moderate positive correlation between PSU and lower quality sleep (no summary/overall effect size statistics were available for Mac Cárthaigh et al., 2020). Across the sleep reviews, only sampling type (in primary studies) was a significant moderator, with studies where random sampling took place reported a larger effect size. Geographical location, being a medical student, sample size, survey method (online vs paper) and PSU measure used did not significantly moderate the relationship between poorer sleep and PSU.

There were common limitations across the reviews exploring the relationship between sleep and PSU. Firstly, the quality of the primary studies varied, meaning confidence in reviews findings could be hindered by this. Secondly, the variation of search terms and dates

² Only one primary study in Yang et al had participant older than 20's

used means primary studies included could have varied, potentially influencing the conclusions reached. Thirdly, the generalisability of findings was effected due to the age and nationality of samples used (often CYP from specific countries). Fourthly, all primary studies within reviews utilised a cross-sectional design meaning no causal links about the relationship between sleep and PSU could be made. Fifthly, all reviews only included published papers, and research written in English (aside from J. Zhang et al., 2022), meaning grey literature would have been excluded from most reviews. Finally, no standardised cut-off for PSU means reviews could not have known if they had investigated phone use that was truly problematic to a person.

The main area of concern from the best practice checklist questions (Hennessey et al., 2019) was the variation of quality labels given to primary studies. Reviews used different checklists to assess the quality of studies, meaning there is some variation in the quality labels given to included studies, e.g., studies that were graded as low quality in Sohn et al., (2019) were graded as high in (Li et al., 2020). The overlap of primary studies in this area were 1.43% which is considered a *slight* overlap (Pieper et al., 2014).

Despite the aforementioned limitations and lack of causal explanations, we can reasonably conclude there is a link between PSU and poorer sleep quality in children, adolescents and young people (CYP). Due to the limited number of reviews (and primary studies) using working-age adults/older adults, more research would be required before generalising the association of poorer sleep and PSU to this age group.

Emotional and Mental Health Factors

Table 5: Reviews exploring emotional and mental health factors related to PSU

Author	Review Type	Number		Primary study quality	Population	Main Finding
		studies	participants			
Y. Ding. Et al (2022)	M	33	33,332	Moderate/ high quality	Adolescents, Undergraduate and non-students older than 24 years old	PSU was had a significant moderate positive correlation with alexithymia ($r = .40, p < .05$), and negative emotions ($r = .31, p < .05$). and a moderate negative correlation with subjective well-being ($r = -.33, p < .05$) and a small negative correlation life satisfaction ($r = -.17, p < .05$), and positive emotions ($r = -.18, p < .05$).
Huang et al. (2022)	M	26	23,387	Moderate/ high quality	Mainland Chinese students	PSU has a moderate positive correlation with alexithymia ($r = .41, 95\% CI = [0.37, 0.45], p < .05$)

M = meta-analysis

Table 5 continued: Reviews exploring emotional and mental health factors related to PSU

Author	Review Type	Number of		Primary study quality	Population	Main Finding
		studies	participants			
W. Ding et al. (2022)	M	14	23,387	Moderate/ high	Adolescents	PSU had a significant negative correlation with self-esteem ($r = -.25, p < .01$)
Liang et al. (2022)	M	64	45,765	Medium/ high	Chinese adolescents	Significant negative correlation coefficient between self-esteem and PSU ($r = -.25, p < .05$)
Yang et al. (2019)	M	13	30,830	Moderate/ high	Children and adults up to 65 years old	PSU was associated with increased risk of depression ($OR = 2.88, 95\% CI, [2.30, 3.79], p < .05$) and anxiety ($OR = 3.50, 95\% CI [2.20, 5.57], p < .01$)

M = meta-analysis

Table 5 continued: Reviews exploring emotional and mental health factors related to PSU

Author	Review Type	Number of		Primary study quality	Population	Main Finding
		studies	participants			
Li. Et al. (2020)	M	34	23,986	Moderate/ high	Student (college)	A significant positive correlation was found between PSU and anxiety, ($r = .39$, 95% <i>CI</i> , [.34-.45]) and PSU and depression ($r = .36$, 95% <i>CI</i> , [.32-.40])
Ran et al. (2021)	M	82	48, 880	Good/fair	Students	A significant positive correlation was found between social anxiety and mobile phone addiction ($r = 0.31$, $p < .01$) ³
Shahidi n et al. (2022)	M	21	3,793	All quality studies included	Students (College and university)	Meta-regression analysis showed a positive correlation between ED and PSU ($R^2 = 1.0$, $p < .01$)

M = meta-analysis

³ Confidence intervals missing from published paper

Table 5 continued: Reviews exploring emotional and mental health factors related to PSU

Author	Review Type	Number of		Primary study quality	Population	Main Finding
		studies	participants			
Sohn et al. (2019).	M	20	23,076	Low	Children, Adolescents and adults under 25	PSU was associated with an increased odds of depression (<i>OR</i> = 3.17; 95% <i>CI</i> , [2.30, 4.37], <i>p</i> <.01); increased anxiety (<i>OR</i> = 3.05 95% <i>CI</i> , [2.64-3.53], <i>p</i> <.01); and higher perceived stress (<i>OR</i> = 1.86; 95% <i>CI</i> , [1.24-2.77], <i>p</i> <.01)
Totals		307	256,436			
Overlap			2.71%			

M = meta-analysis

Overview of the Emotional and Mental Health Factors Reviews

Nine meta-reviews were grouped to form a category concerning *emotional and mental health factors* (see Table 6). Anxiety, alexithymia, depression, emotional dysregulation, high stress, self-esteem, subjective well-being, life satisfaction and positive emotions were included within this theme. These areas were grouped as they often co-occur in discussions around mental health difficulties and emotional distress (Marchesi et al., 2000).

All reviews' primary studies utilised cross-sectional studies and were dated between 2011-2021 (aside from one cohort study included in Yang et al., 2019). The reviews consistently reported a link between emotional and mental health factors and PSU (see Table 5). This finding was consistent across subcategories (anxiety, depression etc), participants groups and countries. Reviews frequently explored if different variables statistically moderated the relationship between PSU and emotional and mental health factors. Culture (large effect size in eastern countries vs western countries), sample size (studies with > 500 participants had a stronger effect size than studies <500 participants), and year of publication (new research had a stronger effect size) were all significant moderators of the relationship between PSU and emotional and mental health factors. It should be noted that these moderators only appeared in one review each.

Other variables were tested to see if they statistically moderated the relationship between PSU and emotional and mental health factors. Age, geographical location, questionnaires used (PSU or a measure of emotional and mental health factors) and publication type were reported as both significant and non-significant moderators, depending on the review. PSU was found to have a moderate positive association with alexithymia and negative emotions, anxiety, social anxiety, depression, higher stress and emotional

dysregulation, and a small negative association with subjective-wellbeing, life satisfaction, positive emotions, and self-esteem.

The reviews exploring emotional and mental health factors discussed different methodological limitations. Mainly, they were unable to propose a causal link between PSU and measured variables. There were also conceptual issues, i.e., not having a single definition of PSU, and reviews also noted their findings were unable to be generalised outside of the sample, which was often adolescents.

Across some reviews, different ratings for the same studies (between Sohn et al., 2019; Li et al., 2020) were given, highlighting the issues of subjectivity even when using standardised checklists to assess primary study quality. Publication bias was considered, and detailed protocols were followed in all reviews. The overlap of primary studies was *slight*, 2.7% (Pieper et al., 2014). While evidence was rated using a standardised checklist across all reviews, Sohn et al. (2019) graded the evidence as low but upgraded depression evidence quality to ‘moderate’ due to a consistently reported link. It was unclear if there were any underlying sampling/methodological issues considered when making this decision.

When considering the above limitations of the reviews, population and methodology used, we can conclude there is a significant association between emotional and mental health factors and PSU. However, the issues of some samples (ages and focus on specific countries) and primary study quality in particular sub-themes of this factor means we should be cautious in generalising these findings, particularly in relation to social anxiety, self-esteem, and emotional dysregulation.

Traits Factor

Table 6: Reviews exploring trait factors and PSU

Author	Type of Review	Number of		Primary study quality	Population	Main Finding
		studies	participants			
Y. Ding et al. (2022)	M	38	21,393	Poor studies excluded	Adolescents, Undergraduate students and non-students 24+ years old	Significant positive correlation between PSU and attachment anxiety, $r = 0.37, p < .05$.
W. Ding et al. (2022)	M	6	8,643	High	Adolescents	Significant moderate negative correlation PSU and self-control, $r = -.48, p < .05$.
Li et al. (2022)	M	29	21,844	Moderate/high	Students (College)	Significant moderate correlation with impulsivity, $r = .38, p < .01$.
Xiong et al. (2022)	M	33	17,737	Moderate/high	Chinese adolescents	Small positive correlation between PSU and psychoticism ($r = .16, p < 0.01$), and a moderate positive correlation between PSU and neuroticism ($r = .32, p < 0.01$). There was no significant correlation between PSU and extroversion ($r = -.06, p > .05$)
Y. Zhang et al. (2022)	M	38	21,017	Moderate/high	Students	Moderate positive correlation between PSU and attachment anxiety ($r = .40, p < .05$) and a weak positive correlation between PSU and attachment avoidance ($r = .20, p < .05$)
Totals		144	90,634			
CCA				3.11%		

M = meta-analysis

Overview of Trait reviews

A range of correlates which are commonly defined as traits have been group together, these are attachment, personality, trait self-control and trait impulsivity (de Ridder et al., 2012; Huang et al., 2017; Nettle & Shaver, 2006).

All reviews contained cross-sectional studies, dated between 2012-2021. The five meta-reviews consistently linked trait factors to PSU, in student samples. PSU had a moderate positive correlation with attachment anxiety, impulsivity, neuroticism, a small positive correlation with psychoticism and attachment avoidance, and a negative moderate correlation with self-control. There was no significant correlation between extraversion and PSU.

Across the reviews, there were common methodological issues. Reviews were limited by primary study design (use of questionnaires), populations (mainly students), small sample sizes (which made subgroup analysis difficult), lack of longitudinal research, lack of high-quality primary research and being unable to make any causal links between trait factors and PSU due to use of cross-sectional studies.

The impact of key studies, or moderate quality studies were not considered beyond study selection i.e., in meta-analysis they did not explore high vs medium quality studies in the analysis nor their discussion (Y. Ding et al. 2022, Xiong et al., 2022 and Y. Zhang et al. 2022). However, a strength of the reviews was the exploration of different statistical moderators of the relationship between PSU and traits. Across the range of moderators investigated, no single variable was consistently found to statistically moderate the relationship between PSU and traits factors. The following variables were both significant and non-significant, depending on the review: Age, being a medical student, gender,

geographic location, measurement tool used (PSU or trait measure) publication type (dissertation vs published), sample size, and year of publication.

When considering the above reviews findings, primary study quality and overlap and their limitations, we can conclude that there is a link between most trait factors (aside from extraversion) and PSU in Chinese student populations. Caution should be used when generalising outside of these samples. Notably Ding's review (Y. Ding et al., 2022) only contained one primary study with participants aged >24 years old.

Ways of Coping

Table 7: Ways of Coping Reviews

Author	Type of Review	Number of		Primary study quality	Population	Main Finding
		studies	participants			
W. Ding et al. (2022)	M	17	11,899	Medium/high	Chinese adolescents	Weak negative correlation between PSU and social support ($r = -.16, p < .01$).
Lu et al. (2021)	M	32	20,349	Medium	Chinese adolescents	Significant positive moderate correlation between PSU and negative coping style ($r = .31, p < .05$)
Totals		49	32,248			
Overlaps			0%			

M = meta-analysis

Overview of Ways of Coping reviews

Social support and coping style have often been researched together and can be considered common factors when understanding how individuals manage distress/difficult life events (Kessler et al., 1985; C. Lin, 2016). Therefore, it appeared appropriate to group these two factors. Two meta-analyses explored ways of coping and PSU (see Table 7), with both reviews using cross-sectional research and their primary studies were conducted between 2011-2021. The overlap across reviews was 0%.

The two meta-reviews reported a small/moderate significant association between ways of coping and PSU within Chinese adolescents. The two meta-analyses reported type of measurement and study design (self-report and cross-sectional), samples (limited age range), and no causal mechanism being explored, as limitations of their reviews.

The two meta-analyses considered a range of statistical moderators. Across reviews, non-published research was found to have a larger positive moderating effect than non-published research. The type of PSU measurement used was also a significant moderator in the relationship between ways of coping and PSU. Lu et al. (2021) also found that newer research has a stronger moderating effect on the positive association between PSU and negative coping style. Across reviews, age and gender was not statistically significant moderators of the relationship between ways of coping and PSU.

While the reviews statistically tested for the difference between published and non-published research, the number of published studies was small across reviews. W. Ding et al. (2022) contained 76% of non-published research (13 dissertations) and 24% published research (4 papers) therefore findings should be interpreted cautiously.

Due to the reviews' findings and limitations, we should be cautious when interpreting the negative association between ways of coping and PSU in Chinese adolescents. Caution

should be exercised due to the high level of non-published research (across reviews, 23 out of 49 total studies were not-published, 46.93%), medium-quality primary studies and the impact of other moderators. Based on current evidence, generalising this relationship outside the sample populations would not be advisable. Furthermore, the role of age and gender in ways of coping and PSU does not appear to be clear and would require further exploration.

Physical Activity and PSU

Table 8: Reviews exploring physical activity levels and PSU

Author	Type of Review	Number of		Primary study quality	Population	Main Finding
		Studies	participants			
Azam et al. (2020)	NS	8	5,423	Good/Fair	Students	Higher PSU use was significant related to lower physical activity.
Xiao et al. (2022)	M	17	42,522	High	Adolescents/young adults aged between 11 and 24 years	A significant negative small correlation was found between PSU and levels of physical activity $r = -.24, p < .01$).
Totals		25	47,945			
CCA			6.9%			

NS = Narrative systematic review, M= Meta-analysis

Overview of Physical Activity Reviews

One systematic review (Azam et al., 2020) and one meta-analysis (Xiao et al., 2022) reviewed studies exploring physical activity and PSU. All primary studies within the reviews utilised a cross-section study design and were conducted between 2013-2021. Both reviews reported a negative association between physical activity levels and PSU in ages between 11-24 years old.

Both reviews had notable strengths. Xiao et al. (2022) included higher quality studies, investigated publication bias, and they also investigated a range of moderators (geographical location, population sampled and data collection method), although none were statistically significant. A strength of the Azam et al. (2020) review was its recommendations for future longitudinal research, suggesting useful alternative methods of capturing levels of physical activity.

The meta-review and the narrative systematic reviews noted several limitations, such as sampling and data collection method (opportunistic and self-report questionnaire). Generalisability of their findings was limited by the use of student samples and only using research published in English. While the Azam et al. (2020) review scored high on detail of synthesis, the grouping of participants across studies did not feel appropriate, given no statistical comparison were made to explore these differences. For example, children were grouped together with medical students. Furthermore, only two studies (out of the eight) scored as good quality. Therefore, their findings should be cautiously interpreted.

When considering the above review findings, primary study quality, population and review limitations, we should be cautious about the association between physical activity levels and PSU in Chinese students. Caution should also be exercised in terms of generalising these findings outside of the narrow sample. More studies across different populations and

age groups would be advised. Additional studies in this population may also be useful so new reviews could explore this relationship without using the same primary studies as Xiao et al. (2022) and Azam et al. (2020), particularly given the *moderate* overlap across reviews (Pieper et al., 2014).

Discussion

This meta-review synthesised 16 reviews, with 614 studies and 441,697 participants from a range of countries and aimed to identify correlates of PSU. The 16 reviews were grouped into five themes (*sleep, emotional and mental health factors, trait factors, ways of coping and physical activity*) and evidence synthesised.

Within each theme (*sleep, emotional and mental health factors, trait factors, ways of coping and physical activity*), no reviews reported findings that contradicted other reviews within their theme. The findings reported in each theme remained constant across populations, countries, age groups, whether the research was published or not, and measurement scales used. Across reviews, different variables were used to investigate if they statistically moderated the relationship between the theme and PSU. Across all themes, no single variable (such as age or gender) was found to be a significant moderator, both within each theme and across themes. Frequently within each theme, moderators were significant within one review and not in another.

While there was a clear and consistent link between the five themes (*sleep, emotional and mental health factors, trait factors, ways of coping, and physical activity*) and PSU, some themes had a stronger evidence base than others. Sleep, emotional and mental health factors, and trait factors had the strongest evidence base for an association with PSU. Ways of coping and levels of physical activity evidence base were less strong due to the quality of studies included, the amount of reviews included and the high levels of non-published research.

There were common strengths and limitations across the reviews included in this meta-review which will now be discussed.

All reviews synthesised their findings with a high level of detail, were transparent about how studies were included, and followed correct statistical procedures (when a meta-analysis). Most reviews focused on children and young people, and the consistency of findings in this population increases confidence in the reliability of the findings (even when considering the limitations of the reviews). While of a high standard, reviews also had common methodological limitations across themes.

There are a number of limitations, firstly generalisation of findings is limited by the fact that participants were often, children, adolescents or undergraduate students. Generalisability is also limited by the fact participants were mainly female and often from a particular nation, e.g. Chinese citizens. Secondly, grey literature was dealt with differently across reviews. Some reviews explicitly stated its inclusion and statistically tested for this. Other reviews did not express that non-published literature was included in their review. Thirdly, all reviews (largely) used cross-sectional studies meaning no causal inferences could be made about the relationships they investigated i.e., anxiety does not cause an increase in PSU. Fourthly, issues of taxonomy were prevalent across all reviews. Due to the lack of a standardised cut-off and definition for PSU all reviews lacked the ability to state if their findings were related to 'truly' problematic smartphone use. Fifthly, the variation of standardised checklists used highlighted the subjective nature of assessing primary study quality. This led to the same primary studies receiving different quality ratings across reviews, creating inconsistency across reviews within the same area.

The meta-review findings can be partially understood in relation to the pathway model (Billieux et al. 2015) and the I-PACE model of PSU (Brand et al. 2016). The meta-

review themes support elements of the pathway model (Billieux et al. 2015). The association between PSU and lower self-esteem, increased anxiety (from emotional and mental health factors), insecure attachment style and neuroticism (from trait factors) could be conceptualised as part of the excessive reassurance pathway model of PSU. While included within the excessive pathway model of PSU, emotional instability was not a focus of any included reviews; therefore, no evidence has been found within this meta-review to support its inclusion. Billieux et al (2015) suggest psychological distress is linked to PSU, the emotional and mental health factors (within this review) supports this suggestion. The association between PSU and impulsivity and low self-control (from trait factors) reported in this meta-review would be seen as part of the impulsive pathway of PSU (Billieux et al. 2015). With respect to the extraversion pathway, the findings from the meta-review do not support that extraversion (from trait factors) is associated with PSU. The other elements of the extraversion pathway did not emerge within the included reviews therefore evidence cannot be considered.

Different themes from this meta-review could also be conceptualised within the I-PACE model (Brand et al., 2016). The emotional and mental health factors associated (specifically, anxiety and depression) with PSU would be conceptualised as psychopathology within a person's core characteristics within the I-PACE model. Additionally, trait factors (low self-esteem and impulsivity) would be conceptualised as personality elements of a person's core characteristics underlying PSU within the I-PACE model. Ways of coping (specifically negative ways of coping) associated with PSU (within this meta-review) would be conceptualised within the coping style component of the I-PACE model. There are other elements of the I-PACE model that could not be supported by this meta-review due to their absence. Namely, ADHD, the role of specific cognitions, conscientiousness, affective and cognitive processes related to specific cues, and internet-related cognitive biases.

Across both models of PSU (pathway and I-PACE), the role of sleep was not incorporated. Due to the consistent link between sleep and PSU, this could be an important element to include into research models going forward. The link between PSU and physical activity would require more research before recommending this factor be incorporated into existing models.

Aside from the associations between insecure and anxious attachment types and PSU, no reviews explored other psychodynamic perspectives. Due to the lack of reviews in this area, the evidence for the role of object relations (MacRury & Yates, 2016) and unconscious desires (Tugwell, 2021) in PSU could not be considered.

Clinical Implications

The strength and consistency of associations between correlates and PSU could have clinical implications for those working with CYP. Due to the association between emotional and mental health factors and PSU, exploring how a person's phone use relates to their current difficulties could be beneficial for clinicians. Becoming more curious about how a person's phone use interacts with their current difficulties (such as sleep, anxiety or depression) may help provide useful information during assessment and would be advisable for those working with CYP. At present it is not clear if this is routinely done within mental health services. Furthermore, there could be scope for more preventative work/research in this area. For example, research and interventions supporting children and young people to develop healthier habits with their phones could be useful. Progress in this area could potentially help CYP be less vulnerable to the associated difficulties of PSU. When pursuing preventative work in this area, using a psychological framework to guide the process would be advised. One possible model that could be useful is the ACT model due to its

transdiagnostic approach, focus on values and valued living, and its documented effectiveness in enhancing well-being (Harris, 2009; Gloster et al., 2020; Petersen et al., 2022). When conducting research in this area, professionals should be cautious around the language used when framing PSU, being mindful of difficulties arising from framing these difficulties as an addiction (Montag et al., 2020).

Strengths and Limitations of Meta-Review

The use of extensive search terms, filtering review dates to only include recent reviews (keeping the findings up-to-date) and the range of databases searched, were all strengths of this meta-review. The exclusion of reviews with little information about primary studies was also a strength as this allowed for a more succinct synthesis of review findings. Utilising the best practice checklist questions (Hennsey et al., 2019), above and beyond using the JBI (Joanna Briggs Institute, 2017) checklist was also a strength as it allowed for a nuanced understanding of the reviews within each theme. Finally, the inclusion of the overlap calculations in itself was also a strength, particularly as every other meta-review does not do this (Pieper et al., 2014)

This meta-review had several limitations; the papers were screened by one author (compared to the recommended two or more), meaning research bias and errors could have occurred through this process, with no additional checks undertaken to ensure the quality of this process. Non-English papers were also excluded, meaning findings published in other languages were missed, which could have impacted the data synthesis and meta-review findings.

Similar to the included reviews, this meta-review makes no claims about when or how a person's phone use becomes problematic. Due to the scope and method of the review, other

factors could be linked to PSU that are not included here (e.g., increased trait mindfulness has been associated with lower PSU in an individual study, Regan et al., 2020)). Furthermore, no reviews included longitudinal research, meaning no inferences can be made about PSU over multiple and longer time frames. The included reviews also focused on CYP in non-clinical populations; meaning findings are limited to these populations and ages groups. Furthermore, there is no way of delineating how problematic a persons phone use is, or whether the levels reported across reviews require clinical intervention, due to no standardised cut-off score for PSU.

Future Research

Based on the findings from this meta-review, areas for future research are considered. In relation to specific themes identified, further research into the relationship between PSU and ways of coping and physical activity levels are recommended. Higher quality primary research would be beneficial in further exploring these associations. The vast majority of primary studies across reviews sampled children and young people. Future research should sample older and more diverse populations to explore how different psychological factors interact with a person's phone use. Helping to do this could aid our understanding of PSU across the lifespan. Additionally, researching how a person's phone use interacts with those across clinical populations (including those with neurodevelopmental or learning difficulties) may further aid our understanding.

Future research should help to define when a person's phone use become problematic. Using a range of methodical and theoretical positions would be advised to help and explore PSU from a range of perspectives. Qualitative research coupled with standardised measures

could help to achieve this aim. This may also help to understand to what extent PSU may be a public health problem.

While there is a clear and consistent associations between PSU and different factors (sleep, emotional and mental health factors, traits factors, ways of coping and physical activity), exploring PSU more widely could help to understand if PSU in itself is a public health problems. Research could help to pick apart if PSU stands alone, or if it only exists as a problem within the context of other psychological or mental health difficulties.

Future research could explore if clinicians working with CYP are asking about phone use in clinician settings. Researching if or how routinely this is being done and the clinical utility would be helpful in further exploring the relationship between PSU and mental health difficulties. It would also help to close the gap between research and clinical practice that exists in this area.

Research exploring how PSU relates to specific therapeutic models (ACT, CBT or psychodynamic) could also be beneficial. Exploring how elements of PSU interact with specific parts of different models (say ACT, CBT or psychodynamic) would also allow for our understanding to be further developed from particular perspectives. Exploring how PSU fits within existing therapeutic models could potentially lead to advances in both theory and intervention development. Furthermore, research utilising therapeutic models could also lead to the development of questionnaires from new perspectives. This approach has been helpful in other areas; for example, ACT questionnaires for specific disorders have been found to have better validity and treatment sensitivity (Ong et al., 2019).

This meta-review identified five themes of correlates which were strongly associated with PSU, mainly in CYP. The evidence suggests that PSU has a range of correlates which are relevant to future research and clinical practice. The gaps in the research suggest

sampling a wider range of populations would be useful. Additionally, researching PSU from the perspective of therapeutic models would also be helpful in developing our understanding in this area, as it has been in other areas (Clark & Purdon, 1995). At present, there is a lack of research in non-CYP populations and from the perspective of therapeutic models.

References

- Aromataris, E., Fernandez, R., Godfrey, C. M., Holly, C., Khalil, H., & Tungpunkom, P. (2015). Summarizing systematic reviews: methodological development, conduct and reporting of an umbrella review approach. *International Journal of Evidence-Based Healthcare*, 13(3), 132-140. 10.1097/xeb.0000000000000055
- Azam, M., Ali, A., Mattiullah, J., & Perveen, N. (2020). "Physical activity, sports participation, and smartphone addiction in adolescent students: a systematic review". *Journal of Evidence-Based Psychotherapies*, 20(1), 25-41. 10.24193/jebp.2020.1.2
- Barnett-Page, E., & Thomas, J. (2009). Methods for the synthesis of qualitative research: a critical review. *BMC Medical Research Methodology*, 9(1), 59. 10.1186/1471-2288-9-59
- BBC (2019). *Are you addicted to your phone?*. BBC.
https://www.youtube.com/watch?v=6_SUFvY80G4.
- Billieux, J., Maurage, P., Lopez-Fernandez, O., Kuss, D., & Griffiths, M. (2015). Can Disordered Mobile Phone Use Be Considered a Behavioral Addiction? An Update on Current Evidence and a Comprehensive Model for Future Research. *Current Addiction Reports*, 2(2), 156-162. 10.1007/s40429-015-0054-y
- Blair, A. (2003). Reading Strategies for Coping with Information Overload ca. 1550-1700. *Journal of the History of Ideas*, 64(1), 11-28. 10.2307/3654293
- Brand, M., Young, K. S., Laier, C., Wölfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-

Cognition-Execution (I-PACE) model. *Neuroscience & Biobehavioral Reviews*, 71, 252-266. <https://doi.org/10.1016/j.neubiorev.2016.08.033>

Burns, P. B., Rohrich, R. J., & Chung, K. C. (2011). The Levels of Evidence and Their Role in Evidence-Based Medicine. *Plastic and Reconstructive Surgery (1963)*, 128(1), 305-310. 10.1097/PRS.0b013e318219c171

Canale, N., Moretta, T., Pancani, L., Buodo, G., Vieno, A., Dalmaso, M., & Billieux, J. (2021). A test of the pathway model of problematic smartphone use. *Journal of Behavioral Addictions*, 10.1556/2006.2020.00103

Clark, D. A., & Purdon, C. L. (1995). The assessment of unwanted intrusive thoughts: A review and critique of the literature. *Behaviour Research and Therapy*, 33(8), 967-976. 10.1016/0005-7967(95)00030-2

de Ridder, D. T. D., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking Stock of Self-Control. *Personality and Social Psychology Review*, 16(1), 76-99. 10.1177/1088868311418749

Ding, Y., Huang, H., Zhang, Y., Peng, Q., Yu, J., Lu, G., Wu, H., & Chen, C. (2022). Correlations between smartphone addiction and alexithymia, attachment style, and subjective well-being: A meta-analysis. *Frontiers in Psychology*, 13, 971735. 10.3389/fpsyg.2022.971735

Ding, Y., Wan, X., Lu, G., Huang, H., Liang, Y., Yu, J., & Chen, C. (2022). The associations between smartphone addiction and self-esteem, self-control, and social support among Chinese adolescents: A meta-analysis. *Frontiers in Psychology*, 13, 1029323. 10.3389/fpsyg.2022.1029323

- Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders, 207*, 251-259.
10.1016/j.jad.2016.08.030
- Gloster, A. T., Walder, N., Levin, M. E., Twohig, M. P., & Karekla, M. (2020). The empirical status of acceptance and commitment therapy: A review of meta-analyses. *Journal of Contextual Behavioral Science, 18*, 181–192.
<https://doi.org/10.1016/j.jcbs.2020.09.009>
- Hannes, K., Lockwood, C., & Pearson, A. (2010). A Comparative Analysis of Three Online Appraisal Instruments' Ability to Assess Validity in Qualitative Research. *Qualitative Health Research, 20*(12), 1736-1743. 10.1177/1049732310378656
- Harris, B., McCredie, M., & Fields, S. (2020). Examining the psychometric properties of the Smartphone Addiction Scale and its short version for use with emerging adults in the U.S. *Computers in Human Behavior Reports, 1*, 100011. 10.1016/j.chbr.2020.100011
- Hennessey, E. A., Johnson, B. T., & Keenan, C. (2019). Best Practice Guidelines and Essential Methodological Steps to Conduct Rigorous and Systematic Meta-Reviews. *Applied Psychology : Health and Well-Being, 11*(3), 353-381. 10.1111/aphw.12169
- Huang, S., Zhu, Z., Zhang, W., Chen, Y., & Zhen, S. (2017). Trait impulsivity components correlate differently with proactive and reactive control. *PLoS ONE, 12*(4), e0176102.
10.1371/journal.pone.0176102
- Joanne Briggs Institute. (2017). *Checklist for systematic reviews and research syntheses*.
<https://jbi.global/critical-appraisal-tools>.

- Kessler, R. C., Price, R. H., & Wortman, C. B. (1985). Social Factors in Psychopathology: Stress, Social Support, and Coping Processes. *Annual Review of Psychology*, 36(1), 531-572. 10.1146/annurev.ps.36.020185.002531
- Kwon, M., Kim, D., Cho, H., & Yang, S. (2013). The Smartphone Addiction Scale: Development and validation of a short version for adolescents. *PLoS ONE*, 8(12), Art e83558.
- Lanette, S., Chua, P., Hayes, G., & Mazmanian, M. (2018). How Much is 'Too Much'? *Proceedings of the ACM on Human-Computer Interaction*, 2(CSCW), 1-22. 10.1145/3274370
- Li, Y., Li, G., Liu, L., & Wu, H. (2020). Correlations between mobile phone addiction and anxiety, depression, impulsivity, and poor sleep quality among college students: A systematic review and meta-analysis. *Journal of Behavioral Addictions*, 9(3), 551-571. 10.1556/2006.2020.00057
- Liang, Y., Huang, H., Ding, Y., Zhang, Y., Lu, G., & Chen, C. (2022). The Relationship Between Self-Esteem and Mobile Phone Addiction Among Mainland Chinese Adolescents: A Meta-Analysis. *Psychological Reports*, , 3329412211091-332941221109115. 10.1177/00332941221109115
- Lin, C. (2016). The roles of social support and coping style in the relationship between gratitude and well-being. *Personality and Individual Differences*, 89, 13–18. <https://doi.org/10.1016/j.paid.2015.09.032>

- Lin, Y., Chiang, C., Lin, P., Chang, L., Ko, C., Lee, Y., & Lin, S. (2016). Proposed Diagnostic Criteria for Smartphone Addiction. *PLoS ONE*, *11*(11), e0163010. 10.1371/journal.pone.0163010
- Loleska, S., & Pop-Jordanova, N. (2021). Is Smartphone Addiction in the Younger Population a Public Health Problem? *Prilozi (Makedonska Akademija Na Naukite i Umetnostite. Oddelenie Za Medicinski Nauki)*, *42*(3), 29. <https://www.ncbi.nlm.nih.gov/pubmed/35032372>
- Lu, G., Ding, Y., Zhang, Y., Huang, H., Liang, Y., & Chen, C. (2021). The correlation between mobile phone addiction and coping style among Chinese adolescents: a meta-analysis. *Child and Adolescent Psychiatry and Mental Health*, *15*(1), 1-60. 10.1186/s13034-021-00413-2
- Mac Cárthaigh, S., Griffin, C., & Perry, J. (2020). The relationship between sleep and problematic smartphone use among adolescents: A systematic review. *Developmental Review*, *55*, 100897. 10.1016/j.dr.2020.100897
- MacRury, I., & Yates, C. (2016). Framing the Mobile Phone: The Psychopathologies of an Everyday Object. *Communication and Media (Novi Sad, Serbia)*, *11*(38), 41-70. 10.5937/comman11-11517
- Marchesi, C., Brusamonti, E., & Maggini, C. (2000). Are alexithymia, depression, and anxiety distinct constructs in affective disorders? *Journal of Psychosomatic Research*, *49*(1), 43-49. 10.1016/S0022-3999(00)00084-2
- Mehmood, A., Bu, T., Zhao, E., Zelenina, V., Alexander, N., Wang, W., Siddiqi, S. M., Qiu, X., Yang, X., Qiao, Z., Zhou, J., & Yang, Y. (2021). Exploration of Psychological

Mechanism of Smartphone Addiction Among International Students of China by
 Selecting the Framework of the I-PACE Model. *Frontiers in Psychology*, 12, 758610.
 10.3389/fpsyg.2021.758610

Meng, S., Cheng, J., Li, Y., Yang, X., Zheng, J., Chang, X., Shi, Y., Chen, Y., Lu, L., Sun,
 Y., Bao, Y., & Shi, J. (2022). Global prevalence of digital addiction in general
 population: A systematic review and meta-analysis. *Clinical Psychology Review*, 92, Art
 102128.

Montag, C., Wegmann, E., Sariyska, R., Demetrovics, Z., & Brand, M. (2020). How to
 overcome taxonomical problems in the study of Internet use disorders and what to do
 with "smartphone addiction"? [References]. *Journal of Behavioral Addictions*, 9(4), 908-
 914.

Nikolic, A., Bukurov, B., Kocic, I., Soldatovic, I., Mihajlovic, S., Nesic, D., Vukovic, M.,
 Ladjevic, N., & Grujicic, S. S. (2022). The Validity and Reliability of the Serbian
 Version of the Smartphone Addiction Scale-Short Version. *International Journal of
 Environmental Research and Public Health*, 19(3), 1245. doi: 10.3390/ijerph19031245.
 10.3390/ijerph19031245

Noftle, E. E., & Shaver, P. R. (2006). Attachment dimensions and the big five personality
 traits: Associations and comparative ability to predict relationship quality. *Journal of
 Research in Personality*, 40(2), 179-208. 10.1016/j.jrp.2004.11.003

Ong, C. W., Lee, E. W. M., Levin, M., & Twohig, M. P. (2019). A review of AAQ variants
 and other context-specific measures of psychological flexibility. *Journal of Contextual
 Behavioral Science*, 12, 329–346. <https://doi.org/10.1016/j.jcbs.2019.02.007>

- Orben, A., & Przybylski, A. K. (2019). The association between adolescent well-being and digital technology use. *Nature Human Behaviour*, 3(2), 173-182. 10.1038/s41562-018-0506-1
- Orlowski, J. (Directors). (2020). *The Social Dilemma*. [Video/DVD] Exposure labs.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ (Online)*, 372, n71. 10.1136/bmj.n71
- Parent, N., & Shapka, J. (2020). Moving beyond addiction: An attachment theory framework for understanding young adults' relationships with their smartphones. *Human Behavior and Emerging Technologies*, 2(2), 179-185. 10.1002/hbe2.180
- Pearson, C., & Hussain, Z. (2016). Smartphone Addiction and Associated Psychological Factors. *Addicta : The Turkish Journal on Addictions*, 3(2)10.15805/addicta.2016.3.0103
- Petersen, J. M., Hayes, L., Gillard, D., & Ciarrochi, J. (2022). ACT for Children and Adolescents. In *Oxford University Press eBooks*. <https://doi.org/10.1093/oxfordhb/9780197550076.013.27>
- Pieper, D., Antoine, S., Mathes, T., Neugebauer, E. A. M., & Eikermann, M. (2014). Systematic review finds overlapping reviews were not mentioned in every other overview. *Journal of Clinical Epidemiology*, 67(4), 368-375. 10.1016/j.jclinepi.2013.11.007

- Ran, G., Li, J., Zhang, Q., & Niu, X. (2022). The association between social anxiety and mobile phone addiction: A three-level meta-analysis. *Computers in Human Behavior*, *130*, 107198. [10.1016/j.chb.2022.107198](https://doi.org/10.1016/j.chb.2022.107198)
- Reer, F., & Quandt, T. (2021). *Games Addiction: A Comprehensive Overview*. Oxford University Press. [10.1093/acrefore/9780190228613.013.1154](https://doi.org/10.1093/acrefore/9780190228613.013.1154)
- Regan, T. J., Harris, B., Van Loon, M., Nanavaty, N., Schueler, J., Engler, S., & Fields, S. (2020). Does mindfulness reduce the effects of risk factors for problematic smartphone use? Comparing frequency of use versus self-reported addiction. *Addictive Behaviors*, *108*, 106435. <https://doi.org/10.1016/j.addbeh.2020.106435>
- Riehm, K. E., Feder, K. A., Tormohlen, K. N., Crum, R. M., Young, A. S., Green, K. M., Pacek, L. R., La Flair, L. N., & Mojtabai, R. (2019). Associations Between Time Spent Using Social Media and Internalizing and Externalizing Problems Among US Youth. *Archives of General Psychiatry*, *76*(12), 1-9. [10.1001/jamapsychiatry.2019.2325](https://doi.org/10.1001/jamapsychiatry.2019.2325)
- Shahidin, S. H., Midin, M., Sidi, H., Choy, C. L., Nik Jaafar, N. R., Mohd Salleh Sahimi, H., & Che Roos, N. A. (2022). The Relationship between Emotion Regulation (ER) and Problematic Smartphone Use (PSU): A Systematic Review and Meta-Analyses. *International Journal of Environmental Research and Public Health*, *19*(23), 15848. [10.3390/ijerph192315848](https://doi.org/10.3390/ijerph192315848)
- Sohn, S. Y., Rees, P., Wildridge, B., Kalk, N. J., & Carter, B. (2019). Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: A systematic review, meta-analysis and GRADE of the evidence. *BMC Psychiatry*, *19*10.1186/s12888-019-2393-z

- Statista. (2023). *Number of smartphone mobile network subscriptions worldwide from 2016 to 2022, with forecasts from 2023 to 2028*. Retrieved from <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>
- Sussman, S., & Moran, M. B. (2013). Hidden addiction: Television. *Journal of Behavioral Addictions, 2*(3), 125-132. 10.1556/JBA.2.2013.008
- Tugwell, S. (2021). What lurks beneath: The erotic charge of the Laplanchean unconscious and the digital object. *Psychoanalysis, Culture & Society, 26*(2), 165-180. 10.1057/s41282-021-00216-6
- Xiao, W., Wu, J., Yip, J., Shi, Q., Peng, L., Lei, Q. E., & Ren, Z. (2022). The Relationship Between Physical Activity and Mobile Phone Addiction Among Adolescents and Young Adults: Systematic Review and Meta-analysis of Observational Studies. *JMIR Public Health and Surveillance, 8*(12), e41606. 10.2196/41606
- Xiong, S., Xu, Y., Zhang, B., Zhu, L., & Xie, J. (2022). Smartphone Addiction and Eysenck's Personality Traits Among Chinese Adolescents: A Meta-Analysis. *Frontiers in Psychology, 12*, 794112. 10.3389/fpsyg.2021.794112
- Yang, J., Fu, X., Liao, X., & Li, Y. (2020). Association of problematic smartphone use with poor sleep quality, depression, and anxiety: A systematic review and meta-analysis. *Psychiatry Research, 284*, 112686. <https://doi.org/10.1016/j.psychres.2019.112686>
- Zhang, J., Zhang, X., Zhang, K., Lu, X., Yuan, G., Yang, H., Guo, H., Zhu, Z., Wang, T., Hao, J., Sun, Y., Su, P., Yang, L., & Zhang, Z. (2022). An updated of meta-analysis on the relationship between mobile phone addiction and sleep disorder. *Journal of Affective Disorders, 305*, 94-101. 10.1016/j.jad.2022.02.008

Zhang, Y., Ding, Y., Huang, H., Peng, Q., Wan, X., Lu, G., & Chen, C. (2022). Relationship between insecure attachment and mobile phone addiction: A meta-analysis. *Addictive Behaviors, 131*, 107317. [10.1016/j.addbeh.2022.107317](https://doi.org/10.1016/j.addbeh.2022.107317)

Appendices A – CCA calculation

Due to the considerable size of the tables required to calculate the CCA for each theme within the meta-review, the numbers used in the calculations for the themes are detailed below, with one **tabulated** example table showcased (*see physical activity CCA table below*).

Physical Activity CCA calculation

Study Index Number	Primary Study	Azam et al (2020)	Xiao et al. (2022)	No of time study appears in a review
1	Ding et al. (2021)		Y	1
2	Alosaimi et al. (2016)	Y		1
3	Gumusgul (2018)	Y		1
4	Csibi et al. (2016)	Y		1
5	Penglee et al., (2019)	Y		1
6	Lepp et al. (2013)	Y		1
7	Haripriya et al. (2019)		Y	1
8	Demirci et al. (2015)	Y		1
9	Boumosleh & Jaalouk (2017)	Y		1
10	Kim et al. (2015)		Y	1
11	Yang et al.(2019)		Y	1
12	Numanoğlu-Akbaş et al.(2020)		Y	1
13	Zhong et al.(2021)		Y	1
14	Hosen et al. (2021)		Y	1
15	Li et al. (2021)		Y	1
16	Buke et al. (2021)		Y	1
17	Abbasi et al. (2021)		Y	1
18	Islam et al. (2021)		Y	1
19	Halil (2021)		Y	1
20	Guo et al. (2022)		Y	1
21	Saffari et al.(2022)		Y	1
22	Lin et al. (2022)		Y	1
23	Chen et al.(2022)		Y	1
24	Xie et al.(2019)		Y	1
25	Pereira et al.(2020)		Y	1
26	Tao et al.(2020)		Y	1
27	Zou et al.(2021)		Y	1
28	Venkates et al. (2017)	Y	Y	2
29	Haug et al. (2015)	Y	Y	2

Number of publications across review

31

(including double counting)

R = number of rows	29
C = number of reviews	2
CCA =	$(31-29)/(29*2) -29$
CCA =	2/29
CCA =	0.0689
Convert to %	6.89%

Ways of coping and - CCA calculation

Number of reports in reviews number of publications (primary studies)	82
Number of included reviews	2
CCA	$(82-82)/(82*2)-82$
CCA	0.0
CCA convert to %	0.00%

Trait Factors - CCA calculation

Number of reports in reviews number of publications (primary studies)	260
Number of included reviews	5
CCA	$(260-231)/(231*5)-231$
CCA	0.0311
CCA convert to %	3.11%

Emotional and Mental Health Factors - CCA calculation

Number of publications across review (including double counting)	280
R = number of rows	231
C = number of reviews	$(280-231)/(231*9)-231$
CCA =	0.0267

CCA convert to % **2.68%**

Sleep - CCA calculation

**Number of publications
across review (including
double counting)**

78

R = number of rows

74

C = number of reviews

$(78-74)/(74*5)-74$

CCA =

0.0143

CCA convert to %

1.43%

BRETT HAYES BSc Hons MSc

AN INVESTIGATION INTO THE DIFFERENT FACTORS RELATED
TO PROBLEMATIC SMARTPHONE USE

Section B: Problematic Smartphone Use, psychological flexibility, and
quality of life the general population.

Word Count: 7151

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

APRIL 2023

SALOMONS INSTITUTE
CANTERBURY CHRIST CHURCH UNIVERSITY

Section B

Abstract

Problematic smartphone use (PSU) has been associated with a wide range of psychological factors. Previous studies have largely been conducted in student samples and have not situated their research within the context of therapeutic models, meaning there are gaps in our understanding of PSU in relation to the general population and therapy models.

This research aimed to explore the relationship between a person's smartphone use, quality of life and psychological flexibility in the general population. Specifically, the hypotheses were interested in testing how a person's contact with their values links to their phone use. A cross-sectional design was implemented, with participants being asked to complete a questionnaire relating to their quality of life, smartphone use, and psychological flexibility/ inflexibility.

The results of this study suggest that PSU is predicted by psychological inflexibility and a lack of contact with values. PSU was not predicted by other elements of the hexaflex model. Furthermore, PSU did not mediate any relationships between psychological flexibility/inflexibility and quality of life. The cross-sectional design used means causal inferences cannot be made. Based on the findings from this study, the hexaflex model provides little utility in understanding PSU within this population.

Keywords: smartphone use, psychological flexibility, quality of life, acceptance and commitment therapy

Introduction

Smartphones have become an integral part of modern life (Sarwar & Soomro, 2013). Since the introduction of the iPhone in 2007, smartphone ownership has risen to over six billion globally, with 63 million smartphone users in the UK (Uswitch, 2022). In the UK, the average time a person spends on their phone each day is around 4.41 hours (Statista, 2023). With the high level of ownership, daily usage, and the UK government's aim to enhance digital connectivity within their 'levelling up' plan (Gov, 2022), there is no sign that the smartphone will disappear soon.

With this increased integration into people's lives, research has explored the negative effects of excessive smartphone use. Research has found that problematic smartphone use (PSU) is positively correlated with depression and anxiety, and negatively correlated with self-esteem, quality of life, physical activity levels and productivity (Alhassan et al., 2018; Billieux, 2012; Duke & Montag, 2017; Elhai et al., 2019; Kim et al., 2015; Sela, 2022). Furthermore, within society the smartphone narrative suggests that they are interrupting people's ability to engage with 'real life' which is in turn affecting their quality of life (Vanden Abeele & Nguyen, 2022). The negative associations with PSU has provided a basis for researchers to label PSU a public health problem with children and young people (Loleska & Pop-Jordanova, 2021). While the link between PSU and psychological factors appears clear, what constitutes problematic smartphone use has been harder to describe.

Constantly checking your phone, feeling panicky when you are without your phone, thinking about your smartphone when you do not have it, using your phone for longer than intended, going to bed later than planned due to smartphone use, other people saying you spend too much time on your phone, and missing work due to excessive phone use have all been suggested as aspects of PSU (Elhai et al., 2017; Harris et al., 2020). These types of descriptions are often included in questionnaires measuring PSU, of which there are many.

A range of questionnaires have been developed to measure and understand PSU, with several terms being proposed. Within these questionnaires (and society more broadly), the most commonly used term is 'smartphone addiction' (Harris, 2020). In fact, the most commonly used questionnaire in this area is titled the 'smartphone addiction scale' (Kwon et al., 2013). Other labels to describe this phenomenon include smartphone dependence, obsessive, pathological smartphone use, nomophobia and problematic smartphone use.

Despite 'smartphone addiction' being the most commonly used term within the research and it even being used within models of PSU (Griffiths, 2019a; Billieux et al. 2015), there are ongoing debates about how to define PSU, with recent research has suggested there is insufficient evidence to define PSU as an addiction, despite studies assuming that it is (Lanette et al., 2018; Raneva & Carbonell, 2018; Yu & Sussman, 2020). While this has been applied to PSU, insufficient evidence has been produced to counter the WHO's concerns that a phenomenon, such as PSU, is not an addiction, if it can the area of concern can be better understood by underlying/pre-existing phenomena (such as other mental health difficulties). This point has also been echoed by Garcia-Nagano (2021), who collated PSU prevalence measures across the world and noted the variability across papers of what constitutes smartphone addiction. Furthermore, some research has even reported participants saying their excessive smartphone use is bad without being able to specify why (Lanette et al., 2018). Across measures, research, and participants' viewpoints, deciding on how to define PSU has proven difficult.

One-way researchers have tried to define PSU is by a person's smartphone screentime; however, this has been seen as problematic. Davidson et al., (2020) demonstrated that researchers often conflate screentime with PSU, and they suggest that these two constructs should be measured separately as increased screentime does not always translate to more problematic use (Jameel, Shahnawaz, & Griffiths, 2019a). It is argued that the impact of

phone use, rather than the time spent on the phone, is more useful to consider when researching PSU (Shaw et al., 2020). Despite different attempts, there are currently no standardised categories or other metrics to define PSU.

While there has been difficulty in defining PSU, different models attempting to understand PSU have been developed. Billieux et al. (2015) proposed that poor impulse control, an excessive need to maintain relationships with others and sensation seeking are three pathways that could explain the underlying processes in PSU. A second model, the I-PACE model (Brand et al., 2016) developed originally to understand addictive internet behaviours, such as gambling, has also been applied to PSU (Mehmood et al., 2021). A person's psychological, psychopathological, and biological factors are grouped together to form a person's core characteristics. These core characteristics interact with how a person copes, how they regulate their mood and what thoughts and expectations they have about internet use. Another model that has been applied to PSU is the components model of behavioural addictions, which suggests that underlying elements of PSU are; salience, mood modification, tolerance, withdrawal 'symptoms' and conflict and relapse (Csibi et al., 2019). It should be noted that all the aforementioned models/evidence were considered when researchers deliberated whether PSU is an addiction. All previously discussed models do not provide a causal explanation of PSU, and they were largely developed in student samples (Canale et al., 2021; Brand et al., 2016; Csibi et al., 2019). However, these models have been useful in researching PSU and provide an insight into the content of a person's experience (type of thinking, type of mood modification, type of thinking style etc.) when related to PSU (Billieux et al., 2015).

While understanding PSU from these perspectives has been useful, there could be utility in exploring PSU from an Acceptance and Commitment Therapy (ACT) perspective. A shift from exploring the content of a person's thoughts to exploring how they relate to their

experience could be useful in understanding PSU, as it has been for cognitive behavioural approaches more broadly, i.e., the move from second-wave to third-wave CBT approaches (Carvalho et al., 2017). Using ACT as a framework could help provide a different perspective on when or why a person's phone use becomes problematic. Furthermore, it could be helpful to understand PSU from a therapeutic model.

ACT helps people to "accept what is out of your personal control and commit to taking action that enriches your life" (Harris, 2009, p.6) and is underpinned by the hexaflex model. The hexaflex has six core components (1) contact with the present moment, (2) values, (3) committed action, (4) self-as-context, (5) cognitive defusion, and (6) experiential avoidance. These elements together are understood to represent psychological flexibility or the inverse, psychological inflexibility (Hayes et al., 2011; Hayes et al., 1999). Both psychological flexibility and psychological inflexibility have been researched in relation to quality of life and mental health difficulties.

Quality of life has been repeatedly linked to psychological flexibility and increased well-being (Hayes et al., 2006; Kashdan & Rottenberg, 2010, Dawson & Golijani-Moghaddam, 2020). Quality of life can be thought of as how a person perceives their life and often relates to their health, well-being, relationships, goals, and concerns and is influenced by their current life context and culture (WHO, 1998). Within research quality of life has been measured across a range of areas, such as physical, psychological well-being, emotional support, personal and spiral fulfilment (Mezzich et al., 2011). The inverse of psychological flexibility, psychological inflexibility, has been repeatedly linked to a range of mental health difficulties and reduced quality of life (Rueda & Valla, 2020; Sela, 2022) and has also been directly associated with PSU (Roberts et al., 2022).

In relation to PSU and psychological inflexibility, research has either used a broad measure of psychological inflexibility (Roberts et al., 2022), or research has explored concepts independently of the hexaflex model (and its subcomponents). For example, reduced trait mindfulness and increased experiential avoidance have all been associated with increased PSU in student samples (Regan et al., 2020; Ruiz-Ruano et al., 2020). The aforementioned research exploring PSU and psychological inflexibility (or related elements) lacks generalisability due to the student samples used, and the AAQ-II (Bond et al., 2011) has been critiqued for being too broad (correlating with too many other measures). It has been suggested that the AAQ-II does not provide clinicians and researchers with a method to research specific elements of the hexaflex model (Rolffs et al., 2018). The Multidimensional Psychological Flexibility Inventory (MPFI, Rolffs et al., 2018) addresses the limitations of the AAQ-II and allows for all individual elements of the hexaflex to be explored in relation to PSU.

In other areas, the MPFI (Rolffs et al., 2018) has been used to explore subcomponents of obsessive-compulsive symptoms (Thompson et al., 2022). This research showcased the usefulness of the MPFI. Thompson et al. (2022) found self-as-context more predictive of obsessive-compulsive symptoms (above other elements of the hexaflex). The direct comparison of subcomponents of the hexaflex appeared useful in this area and could also have utility in relation to PSU.

While related traits (or broad measures) have been used to explore psychological inflexibility and PSU, research exploring smartphone use suggests other areas might be useful to investigate, namely values and committed action. The suggestion of putting down your phone, connecting with what is important to you, and doing more of what you love is commonplace in public forums and research. These instructions are often found within digital

detoxes, which claim detoxing will improve your quality of life (Vanden Abeele & Nguyen, 2022; Newport, 2020; Goodin, 2017).

Within ACT, values are underlying principles that are important to you (Harris & Hayes, 2019). Valued living has been shown to be significantly associated with improved quality of life and negatively associated with mental health difficulties (Hayes & Hofmann, 2018; Palfai et al., 2011; Pavlacic et al., 2021). Conceptually linked to values is committed action. Within ACT, committed action is taking action in line with your values (Harris & Hayes, 2019) and has been found to be associated with increased well-being (Li et al., 2021). It has also been found to be a protective factor in those with ongoing illnesses (Coutinho et al., 2021; Li et al., 2021; Gagnon et al., 2016) and was predictive above and beyond acceptance, mindfulness, cognitive fusion and distress when researching procrastination in students (Gagnon et al., 2016).

Based on the association between values, committed action, and quality of life, we may hypothesise the role of PSU in this relationship. If digital detoxes help people get back to what is important to them, then increased PSU may be associated with lower committed action and valued living. Furthermore, it could be worthwhile exploring how PSU interacts with quality of life and psychological inflexibility (and its inverse); given all these constructs have been associated with one another in separate research studies (Sela, 2022; Roberts et al., 2022; Kashdan & Rottenberg, 2010).

Based on previous findings and gaps in the literature, this study explored the relationship between PSU, psychological inflexibility (and its subcomponents, their inverse) and quality of life. The below hypotheses were generated based on the research discussed in the introduction. Hypotheses are grouped by general effects (the relation between psychological flexibility, quality of life, PSU), general mediation effects (does psychological

inflexibility, quality of life, or PSU act as mediators in these relationships), action-specific mediation effects (do elements of the hexaflex mediate relationship between PSU and quality of life), and controlled for effects (do elements of the hexaflex contribute to the relationship between quality of life and PSU, above and beyond other elements of the hexaflex).

In relation to the direction of the hypotheses, while there potentially could be a bi-directional relationship between different elements of the hexaflex and PSU, arguably, the relationship of greatest clinical interest is the extent to which psychological in/flexibility predicts PSU. Hypothetically, it could be that there is also a relationship in the reverse direction (theoretically creating a feedback loop); for example, if people are using their phones as a result of not being able to sit with their experience, they are less likely to develop psychological flexibility. However, this study is interested in psychological inflexibility predicting PSU, as there are already well-established interventions to address psychological inflexibility, which have a much stronger evidence base than interventions targeting PSU (Hayes et al., 2006; Kashdan & Rottenberg, 2010; Dawson & Golijani-Moghaddam, 2020; Van Velthoven, Powell, & Powell, 2018; Malinauskas & Malinauskienė).

Please note that the evidence from the MPFI development paper suggests that flexibility and inflexibility are separate constructs, as opposed to being the opposite ends of the same dimension, hence the need for the separation of these constructs during hypothesis testing (Rolffs et al., 2018). This is useful for research which could explore if different sections of the hexaflex interact with another construct, say PSU.

Hypotheses

General Effects

1a) Higher levels of psychological inflexibility will predict higher levels of PSU

1b) Higher levels of psychological flexibility will predict lower levels of PSU

1c) Higher levels of psychological inflexibility will predict lower quality of life

1d) Higher levels of psychological flexibility will predict higher quality of life

General Mediation Effects

2a). PSU will partially statistically mediate the relationship between psychological inflexibility and quality of life

2b). PSU will partially statistically mediate the relationship between psychological flexibility and quality of life

Action Specific Effects

3a). Higher levels of lack of contact with values will predict higher levels of PSU

3b). Greater contact with values will predict lower PSU

3c). Higher levels of inaction will predict higher PSU

3d). Higher levels of committed action will predict lower PSU

Action Specific Mediation Effects

4a). PSU will partially mediate the relationship between lack of contact with values and quality of life

4b). PSU will partially mediate the relationship between contact with values and quality of life

4c). PSU will partially mediate the relationship between inaction and quality of life

4d). PSU will partially mediate the relationship between committed action and quality of life

Controlled for Effects

5). Any statistically significant effects from hypothesis 3 or 4 will be entered into new analysis to test hypothesis 5. Hypotheses 5 proposed that significant effects found in hypotheses 3-4 will remain supported, when controlling for the other elements of the hexaflex model (i.e. psychological flexibility elements: acceptance, present moment awareness, self-as-context, defusion; and psychological inflexibility elements: experiential avoidance, lack of contact with present moment, self-as-context and fusion). In other words, inaction, committed action, contact with values and lack of contact with values will play the predictive and mediational roles, specified above, over and above the other elements of the hexaflex.

Method

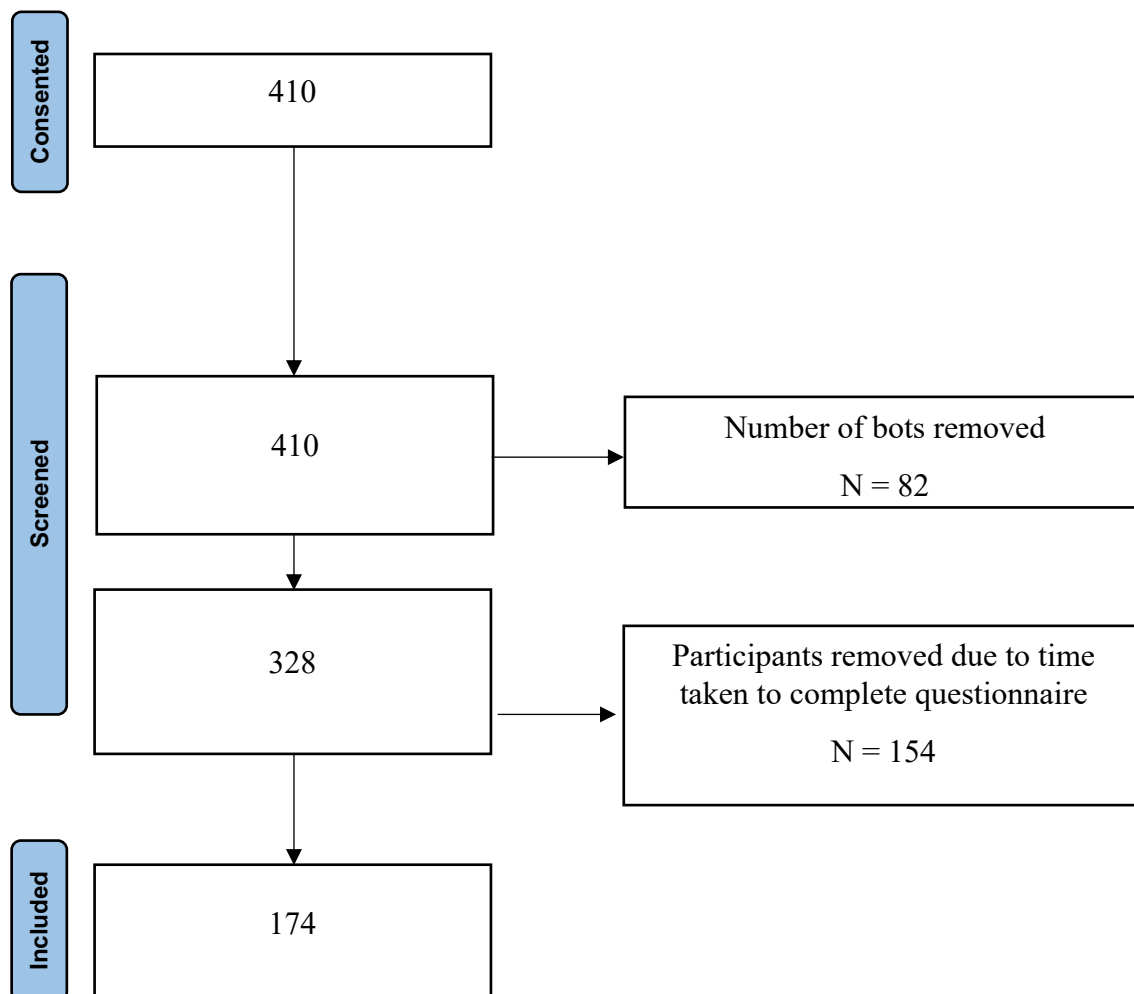
Participants and Recruitment

Participants were invited to take part in an online survey. Participants had to be 18 years or older, a UK resident, own a smartphone and consent to answer questions about their smartphone use, their day-to-day internal experiences and quality of life. The study was advertised across multiple social media websites. Snowball sampling was also used, where social media users were asked to forward the questionnaire to anyone, they felt would be interested in taking part (see Appendix A). Participants were offered the chance to enter into a £100 random prize draw upon completion of the questionnaire (if they provided consent for this and entered a valid email address).

The study aimed to recruit between 148 and 368 participants so the statistical analysis would be adequately powered (.8) to detect a medium (.26) to small effect size (.14), per suggestions from Fritz & MacKinnon (2007).

Figure 2. Participants Number Flow

The flow of participants numbers in the study is detailed in Figure 3, and Table 7 provides an overview of the included sample. The majority of participants were females, white British, and in full-time employment. Participants owned a range of smartphones; the most popular was the iPhone (55.75%), followed by Samsung (23.56%), Huawei (6.32%) and Motorola (6.32%), Google Pixel (3.45%), Xiaomi (1.72%), Sony (1.15%), OnePlus (0.57%), with some participants not detailing what phone they owned (1.15%). Participants were also asked to provide their actual or estimated screentime over the last week in hours (see Table 1).



Participants' responses were quality checked to ensure responses were human and that questionnaires were completed within a reasonable time frame (see Figure 3). Participants' responses were included if the reCAPTCHA score was $>.5$ seconds and the time taken to complete questionnaires was between 10-60 minutes. The reCAPTCHA completion time recommended by Qualtrics software and questionnaire completion parameters were informed by how long the author took to complete a practice run of the questionnaire during project's development. ReCAPTCHA is a brief online test used to determine if the user of the website is a human or a robot. The reCAPTCHA test asks users to solve a problem or identify objects within an image.

Table 7: Demographic Information of Participants

	<i>N/ Mean</i>	<i>%/SD</i>
Gender		
Male (including trans male)	64	36.78
Female (including trans female)	92	52.87
Non-binary	9	5.17
Other	5	2.87
Prefer not to say	1	0.57
Missing	3	1.72
Age	32	10.23
Ethnicity		

	Asian or Asian British – Indian	1	0.6
	Asian or Asian British – Pakistani	4	2.3
	Black or Black British – African	2	1.1
	Black or Black British – Any other Black background	1	0.6
	Black or Black British – Caribbean	1	0.6
	Mixed – Any other mixed background	11	6.3
	Mixed – White and Asian	2	1.1
		<i>N/ Mean</i>	<i>%/SD</i>
Ethnicity	Mixed – White and Black African	6	3.4
	Mixed – White and Caribbean	5	2.9
	Other Ethnic Groups – Chinese	5	2.9
	Prefer not to answer	1	0.6
	White – Any other white background	13	7.5
	White – British	109	62.6
	White – Irish	11	6.3
	Missing	2	1.1
Employment Status	Employed full- time	108	62.1
	Employed part-time	27	15.5

	Full-time homemaker or carer	3	1.7
	Full-time student	11	6.3
	Prefer not to answer	1	0.6
	Retired	10	5.7
	Self-employed	9	5.2
	Unemployed	3	1.7
	Missing	2	1.1
		<i>N/ Mean</i>	<i>%/SD</i>
<hr/>			
Average			
screentime per day		97/4.43	2.18
(hours: minutes)	Actual		
	Estimated	64/4.40	2.01
<hr/>			

Design

The study employed a cross-section questionnaire design, with questionnaires being delivered online by Qualtrics.

Measures

Multicultural Quality of Life Index (MQLI).

The Multicultural Quality of Life Index (Mezzich et al., 2011: see Appendix B) is a ten-item self-report questionnaire measuring quality of life across different areas: physical well-being, psychological/emotional well-being, self-care and independent functioning, occupational functioning, interpersonal functioning, social-emotional support, community and services support, personal fulfilment, spiritual fulfilment, and global perception of quality of life. The MQLI has demonstrated good internal consistency ($\alpha = .88$), good test re-test reliability ($r = .94$, Mezzich et al., 2011), good convergent validity (Álvarez et al., 2010) and has been validated in multiple samples (Mundal et al., 2021, Jatfuff et al., 2007). The internal consistency for MQLI in this sample was good ($\alpha = .92$, $\omega = .93$). The MQLI is scored by averaging the completed responses; participants are asked to rate each area between *poor* (1) and *excellent* (10). Higher scores indicate better quality of life. Permission for the scale to be used as part of this research can be found in Appendix C.

Smartphone Addiction Scale – SV (SAS-SV).

As discussed during the introduction, the concept of addiction is no longer seen as a helpful concept in the context of problematic smartphone use. Nevertheless, the SAS-SV (Kwon et al., 2013) scale is one of the best (psychometrically) measures of PSU and uses older terminology.

The SAS-SV (Kwon et al., 2013) is a ten-item self-report questionnaire which measures a person's smartphone 'addiction' (see Appendix D). The SAS-SV has been shown to have good internal consistency ($\alpha = .93$; Harris et al., 2020), test-retest reliability (in a non-UK sample, (Nikolic et al., 2022) and has been validated in a USA sample (Harris et al.,

2020). The SAS-SV has been translated into many different languages (Esmailpour et al., 2021; Andrade et al., 2020). The version used in this study was an English translation used in published research. The English translations were confirmed by Kwon et al. (2013) not to have altered the meaning of the questionnaire (Olson et al., 2020). The internal consistency for SAS-SV in this sample was good ($\alpha = .85$, $\omega = .85$). The SAS-SV scale provides a single score calculated by adding all the completed items together. Participants are asked to rate each item on the following scale: *strongly disagree*, *disagree*, *weakly disagree*, *weakly agree*, *agree*, *strongly agree*. A higher score indicates more severe smartphone ‘addiction’.

Measure of Psychological Flexibility Index (MPFI).

The MPFI is a 60-item self-report questionnaire (see Appendix E). The MPFI can be scored to create ‘global’ scales of psychological flexibility and psychological inflexibility. The MPFI has subscales that measure aspects of psychological flexibility (Acceptance, Present Moment Awareness, Self as Context, Defusion Values, Committed Action) and psychological inflexibility (Experiential Avoidance, Lack of Contact with the Present Moment, Self as Context, Fusion, Lack of Contact with Values, Inaction). Psychological flexibility and inflexibility total scores are calculated by taking an average of their respective subscales. As previously discussed, psychological flexibility and inflexibility are not simply opposites of each other, with it being possible a persons could change on one element of the hexaflex but not others (Rolfes et al., 2018). The two general factors (psychological flexibility and inflexibility) and the 12 subfactor structure of the MPFI were confirmed via confirmatory factor analysis across different studies and in translated versions (Tabrizi et al., 2023, Landi et al., 2021, Lin et al., 2020).

Each subscale contains five questions to which participants are asked to respond using the following scale: *never true* (1), *rarely true* (2), *occasionally true* (3), *often true* (4), *very often true* (5), and *always true* (6). Each subscale score is calculated by taking an average of completed responses. Higher scores indicate a greater presence of the measured trait, i.e., higher score on the values scales indicates that a person is more in contact with their values.

The MPFI has excellent psychometric properties (Internal consistency .96, Rolffs et al., 2018) and has been validated in different samples (Tabrizi et al., 2022; Y. Lin et al., 2020). The internal consistency for MPFI in this sample was good in this sample ($\alpha = .85$, $\omega = .85$). For each global scale (psychological flexibility and inflexibility) and subscale, a higher score indicates more of the measured trait, i.e., greater acceptance, greater lack of committed action. All scales provide scores ranging between 1-6.

Ethical Approval

Ethical approval for this research project was obtained from the Salomons Ethics Panel (Reference: V:\075\Ethics\2019-20; Appendix F). All participants were required to read the information sheet and provide consent before starting the questionnaire.

Consent was given online (Appendix G), and participants were encouraged not to participate in the study if they thought it might be distressing. They were also recommended to stop the questionnaire if they felt distressed during the process (See Appendix H). After completing the questionnaire, participants were provided with de-briefing information about the study and signposted to relevant advice on reducing their smartphone use (Appendix I).

Statistical Analysis

Hypotheses 1a-d and 3a-d were tested using linear regression. Mediation analyses were conducted to test Hypotheses 2a-b and 4a-d using the PROCESS macro for SPSS (Hayes, 2013) which employed a bootstrap method (5000 bootstrap samples). For hypothesis 5, it is planned to examine whether any of the significant effects found from hypothesis 3 remained significant when control variables were included. This will be done by repeating the linear regressions with the controlled variables entered in the first step and the predictor entered in the second step. In addition, it was planned to test whether any of the mediation analyses for hypothesis 4 remained significant with control variables, by including the control variables as co-variables in the mediation analysis using the PROCESS macro (Hayes, 2013).

For mediation effects, total, indirect and direct effects were tested. The term effect means a statistical effect is investigated and should not be mistaken to infer causality (A. Hayes, 2013). Total effect, direct effects and indirect effects are demonstrated in Figure 4 and 5 below using variables from hypothesis 2a.

Figure 3 Illustration of Total Effects

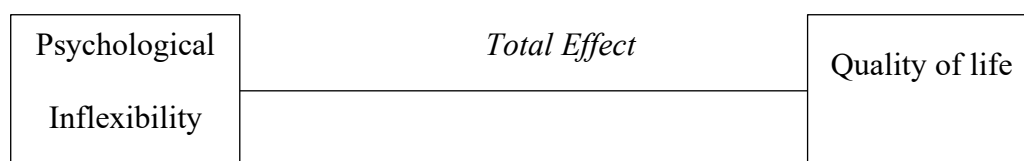
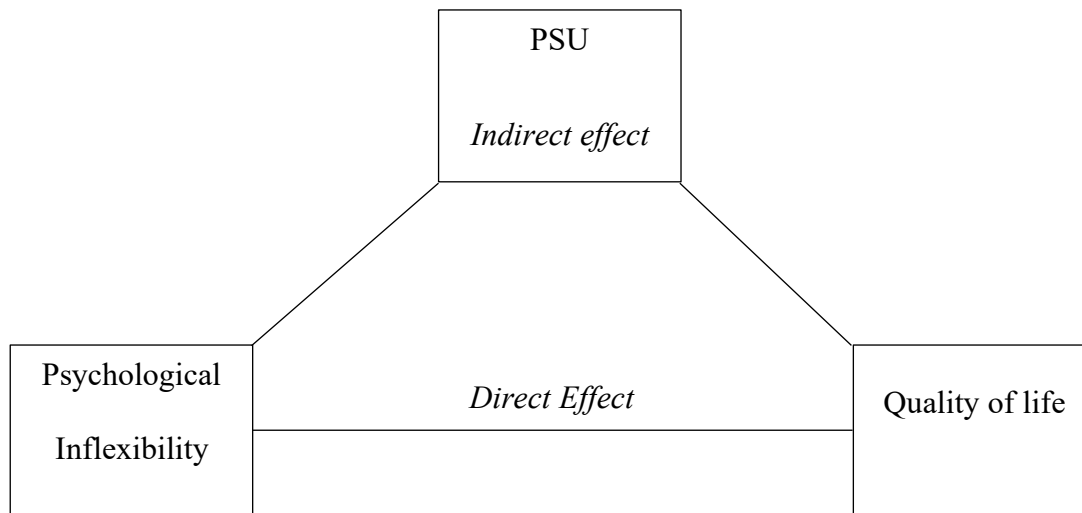


Figure 4 Illustration of direct and indirect effects of a mediation regression analysis



Prior to all statistical analyses being conducted all assumptions were checked for each specific analysis (regression, mediated regression analysis). The data did not violate any of the tests underlying assumptions.

Results

Descriptive Statistics

The descriptive statistics of standardised measures are presented in Table 8, alongside the amount of missing data per measure.

Table 8 Descriptive Statistics of Standardised Measures used

Scale Name	N	Mean (SD)	Range	Missing Data %
Multicultural Quality of Life Index (MQLI)	171	6.72 (1.92)	2.2-10	1.75
Problematic Smartphone Use (SAS-SV)	168	31.83 (9.57)	10-55	3.57
Psychological Flexibility (MPFI)	170	3.87 (.83)	2.13-5.77	2.35
Psychological Inflexibility (MPFI)	165	3.42 (1.00)	1.43-5.60	5.17

Hypothesis 1 (General Effects)

Four separate linear regressions were used to test if psychological flexibility or inflexibility predicted levels of PSU and quality of life. Each analysis had one predictor (psychological flexibility or psychological inflexibility) and one dependant variable (PSU or quality of life). Psychological inflexibility significantly predicted higher levels of PSU ($b = 2.3$, $R^2 = .58$, $F(1,161) = 9.88$, $p = .02$). Additionally, higher levels of psychological flexibility significantly predicted higher quality of life, ($b = 1.68$, $R^2 = .52$, $F(1,168) = 184$, $p < .001$). Higher levels of psychological flexibility did not significantly predict lower levels of PSU ($b = -.07$, $R^2 = .00$, $F(1,165) = .01$, $p = .94$) and higher levels of psychological inflexibility did not predict lower levels of quality of life ($b = .08$, $R^2 = .01$, $F(1,163) = .01$, $p = .30$). Therefore hypothesis 1 was only partially supported.

Hypothesis 2 (General mediating effects)

Hypothesis 2a

Bootstrapped mediation analysis examined whether PSU partially statistically mediated a relationship between psychological inflexibility and quality of life .

Table 9: Meditation Regression Statistics for Hypothesis 2a

Effect	Path	B	SE	95% CI		p
				Lower	Upper	
Total	Psychological Inflexibility → Quality of life	.20	.15	-.02	.50	.20
Indirect	Psychological Inflexibility →PSU→ quality of life	-.05	.16	-.13	.04	>.05
Direct	Psychological Inflexibility → Quality of life	.25	.16	-.06	.56	.11

As can be seen by Table 9, there was no evidence of an indirect effect. Therefore, there was no evidence of PSU mediating a relationship between psychological inflexibility and quality of life. This is perhaps unsurprising given that there was no evidence of a relationship between psychological inflexibility and quality of life in the first place; i.e. total effect was also non-significant (see also hypothesis 1).

Hypothesis 2b

Bootstrapped mediated analysis examined if PSU partially statistically mediated the relationship between psychological flexibility and quality of life.

Table 10: Meditation Regression Statistics for Hypothesis 2b

Effect	Path	B	SE	95% CI		p
				Lower	Upper	
Total	Psychological Flexibility → Quality of Life	1.71	.12	1.47	1.95	<.01*
Indirect	Psychological Flexibility →PSU→Quality of Life	.00	.02	-.04	.04	>.05
Direct	Psychological Flexibility → Quality of Life	1.71	.12	1.47	1.95	<.01*

* reached statistical significance.

There was no evidence of an indirect effect. Therefore, there was no evidence of PSU mediating the relationship between psychological flexibility and quality of life. Therefore, hypothesis 2b was not supported. However, there was a significant relationship between psychological flexibility and quality of life that was not mediated by PSU, as there was a significant direct effect (see Table 10).

Hypothesis 3 (Action Specific Effects)

To test if lack of contact with values and committed action predicted PSU, separate simple regression analyses were conducted to test each of Hypotheses 3a-3d. Higher levels of lack of contact with values significantly predicted higher levels of PSU ($b = 1.48$, $R^2 = .03$, $F(1,160) = 5.23$, $p = .02$) therefore, hypothesis 3a was supported. Higher contact with values did not significantly predict lower levels of PSU ($b = -.14$, $R^2 = -.06$, $F(1,164) = .03$, $p = .86$). Higher levels of inaction did not significantly predict higher levels of PSU ($b = 1.01$, $R^2 = .02$, $F(1,160) = 3.06$, $p = .08$). Higher levels of committed action did not predict lower levels of PSU ($b = .62$, $R^2 = .00$, $F(1,161) = .67$, $p = .41$). Due to the lack of significant associations found, hypothesis 3b-d were not supported.

Hypothesis 4 (Action Specific Mediation Effects)

To test hypothesis 4a-d, bootstrapped mediation analysis was used. The mediating role of PSU was explored in the relationships between the respective predictors values, lack of contact with values, committed action and inaction, and the dependent variable quality of life. Thus, four separate mediation analyses were conducted.

Table 11: Mediation regression analysis testing hypotheses 4

		95% CI					
Effect	Path	<i>B</i>	<i>SE</i>	Lower	Upper	<i>p</i>	
	Total	Lack of contact with values → Quality of Life	.10	.13	-.16	.37	.43
4a	Indirect	Lack of contact with values → PSU → Quality of Life	-.21	.03	-.09	.03	>.05
	Direct	Lack of contact with values → Quality of Life	.13	.13	-.13	.40	.33
	Total	Values → Quality of Life	1.40	.11	1.17	1.62	<.01*
4b	Indirect	Values → PSU → Quality of Life	.00	.01	-.03	.03	>.05
	Direct	Values → Quality of Life	1.40	.11	1.17	1.61	<.01*
	Total	Inaction → Quality of Life	-.11	.12	-.34	.12	>.05
4c	Indirect	Inaction → PSU → Quality of Life	0.00	.02	-.06	.03	>.05
	Direct	Inaction → Quality of Life	-.01	.02	-.06	.03	>.05
	Total	Committed Action → Quality of Life	1.33	.11	1.11	1.55	<.01*
4d	Indirect	Committed Action → PSU → Quality of Life	-.02	.02	-.07	.025	>.5
	Direct	Committed Action → Quality of Life	1.33	.11	1.13	1.56	<.01*

* reached statistical significance <0.01

As can be seen by Table 11, in relation to hypothesis 4a, there was no evidence of an indirect effect. Therefore, there was no evidence of PSU mediating the relationship between lack of contact with values and quality of life. This is perhaps unsurprising given that there was no evidence of a relationship between lack of contact with values and quality of life in the first place, i.e. the total effect was also non-significant. In relation to hypothesis 4b, there was no evidence of an indirect effect. Therefore, there was no evidence of PSU mediating the relationship between values and quality of life. However, there was evidence of a statistically significant relationship between values and quality of life. In relationship to hypothesis 4c, there was no evidence of an indirect effect. There was no evidence of PSU mediating the relationship between inaction and quality of life (Table 11). This is perhaps unsurprising given that there was no evidence of a relationship between inaction and quality of life. As can be seen in Table 7, in relation to hypothesis 4d, there was no evidence of an indirect effect. Therefore, was no evidence of PSU mediating the relationship between committed action and quality of life. Although there was evidence of a significant relationship between committed action and quality of life. In summary, PSU was not a significant mediator in any of these analyses therefore no elements of Hypotheses 4 were supported.

Hypothesis 5 (Controlled for Effects)

As discussed in the statistical analysis section, hypothesis 5 planned to examine if any significant effects from hypothesis 3 remained significant when control variables were included. It was also planned to test if significant effects from the mediation analyses from Hypotheses 4 remained significant when control variables were entered as covariates. These analyses were planned to test if action specific variables had an effect, above and beyond other elements of the hexaflex.

From Hypotheses 3 and 4, only one finding concerning an action specific construct was significant, namely that *lack of contact with values* predicted higher *PSU* (hypothesis 3a). To test hypothesis 5, with respect to this finding, a regression analysis was conducted with other elements of the hexaflex being statistically controlled for by entering them as predictors into the first step of a regression predicting *PSU* and entering *lack of contact with values* into the second step. *Lack of contact with values* did not significantly improve the model fit, over and above the other elements of the hexaflex, $R^2 = .25$, $\Delta F(1,149) = .23$, $p = .63$. Therefore hypothesis 5 was not supported.

Discussion

The current study explored the relationships between *PSU*, psychological flexibility, and inflexibility (and their sub-components) and quality of life within the general population. The study also aimed to explore if specific components of the ACT hexaflex model were predictive of *PSU* above and beyond other elements in the hexaflex. The discussion will summarise the study's key findings, strengths and limitations. The research and clinical implication of the findings will then be discussed along with recommendations for future research.

Main Findings

Following statistical testing of hypotheses 1-5 a few main findings emerged: Only one element of the tested hexaflex elements, *lack of contact with values*, predicted *PSU*. However, this did not predict *PSU* above and beyond the other hexaflex elements. Committed action or inaction did not predict *PSU*. In no analyses was *PSU* a significant mediator between hexaflex variables and quality of life. *PSU* also did not mediate the relationship between psychological flexibility/inflexibility and quality of life. The only other predictor of

PSU was psychological inflexibility. Psychological flexibility predicted better quality of life, as did valued living and committed action. Psychological inflexibility did not significantly predict lower quality of life.

General Effects

The finding of psychological inflexibility predicting PSU is consistent with the findings from (Roberts et al., 2022; Ruiz-Ruano et al, 2020) who reported this within a student sample. This study's findings adds to those of Roberts et al., (2022) and other related studies that psychological inflexibility is associated with a range of difficulties (Rueda & Valla, 2020; Sela, 2022)

No previous research has explored psychological flexibility (directly) and PSU. Given the evidence presented in the MPFI questionnaire development papers (Rolfs et al., 2018), we should not assume that psychological flexibility and inflexibility are the exact opposite, as people can score differently on different subcomponents of the measures. Previous research has reported a negative correlation between psychological flexibility and inflexibility (Jeong et al., 2020) therefore it is perhaps surprising that the same relationship was not born out in relation to PSU.

Similar to other research using the MPFI, this study replicated the finding that psychological flexibility was associated with increased quality of life (Hayes et al., 2006; Kashdan, 2011, Dawson & Golijani-Moghaddam, 2020). However, this research did not replicate the finding that psychological inflexibility is associated with lower quality of life (Jeong et al., 2020). Within these general effects, it is unclear whether statistical power could account for the unusual findings or whether unmeasured variables influenced these relationships.

Specific Hexaflex Predictors

Lack of contact with values, valued living, committed action and inaction were hypothesised to (separately) predict PSU. Only lack of contact of values was predictive of higher PSU. This suggests that when a person is not in contact with their values, they will have higher levels of PSU. While predictive in a single regression analysis, lack of contact with values was not predictive above and beyond the other element of the hexaflex. The finding that lack of contact with values predicted PSU, is broadly in line with the lack of contact with values is linked to increased mental health difficulties (Hayes & Hofmann, 2018; Palfai et al., 2011; Pavlacic et al., 2021).

While the lack of contact with values predicted PSU, the inverse was not true. Higher contact with values did not predict lower PSU. This hypothesis was predicated on the assumption that if a person's quality of life is higher, then their phone use would be less problematic. The finding that increased contact with values does not predict lower PSU is counter to digital detox claims (Vanden Abeele & Nguyen, 2022; Newport, 2020; Goodin, 2017). It is also against the general idea shown in research that valued living is linked to increased quality of life (Hayes & Hofmann, 2018; Palfai et al., 2011; Pavlacic et al., 2021).

Overall, contact with values provided little new understanding of PSU. This is perhaps surprising given the narrative around digital detoxes that suggests using your phone prevents you from doing things which are important to you (Vanden Abeele & Nguyen, 2022; Newport, 2020; Goodin, 2017). Furthermore, due to the aforementioned relationship, it is perhaps unexpected that the inverse was not true due to the negative correlation between these two variables within the MPFI development paper (Rolfs et al., 2018). It could be that the lack of contact with values could be significant due to a Type 1 error. Alternatively, the

effect size could be quite small in all other hypotheses 3b-3d therefore may not have been detected based on the current sample size.

Committed action was hypothesised to predict lower levels of PSU, with the inverse inaction hypothesised to predict higher levels of PSU. However, neither was significantly associated with PSU. The importance of committed action has been reported in quality of life and has also been reported to mediate the relationship between experiential avoidance and life satisfaction amongst students (Coutinho et al., 2021; Li et al., 2021), however it does not appear to be a useful concept for understanding PSU.

Committed action is conceptually linked to valued living, as someone is thought to need to define their values in order to act in accordance with them (Hayes et al., 2006). With this in mind, it is perhaps surprising that their relationships with PSU were not consistent. It could be assumed that committed action and valued living would either both be significant or non-significant. It is not clear if other statistical moderators/mediators not measured, or lack of power might help explain this difference. It is also possible that some of the significant findings in this study are Type 1 errors due to inflation of familywise alpha arising from multiple statistical tests being conducted.

Taken together, predicting PSU from the perspective of lack of contact with values and committed action (or inaction) has added little to how we might understand PSU. The lack of committed action and valued living not being significant in PSU is largely counter to the importance placed on these areas in digital detoxes (Vanden Abeele & Nguyen, 2022; Newport, 2020; Goodin, 2017).

Roles as a mediator

While PSU has been reported to mediate a range of relationships; for example the relationship between neuroticism and depression, and neuroticism and quality of life (Gao et al., 2017) it did not mediate any relationships tested within this study. PSU did not mediate the relationship between psychological flexibility or inflexibly and quality of life. Additionally, PSU did not mediate the relationship between elements of the hexaflex (committed action, inaction, values, or lack of contact with values) and quality of life.

These findings could be because there is indeed no mediating effect of PSU in these relationships. Alternatively, these relationships could be influenced by other variables not measured, such as the difference between ‘aware’ and ‘unaware’ smartphone use, which has been shown to impact quality of life (Sela et al., 2022). Finally, the lack of statistical power within the mediation analyses may have meant a small effect size was not found.

In summary, PSU also did not mediate any relationship between hexaflex components and quality of life or psychological flexibility or inflexibility. While there could be other factors not measured in the study (or a lack of statistical power), at present, the hexaflex does not appear to be a useful framework to understand a person’s PSU, at least when measured using the SAS-SV (Kwon, et., 2013). The implications of this for research and clinical practice are discussed later (see *Implications*).

Strengths and Limitations

Strengths

The current study had several strengths; the sampling of the general population was a strength as previous studies had (for the vast majority) focused on children, adolescents,

young adults, and students. The measures used were also a strength as they allowed for a wide range of areas of quality of life to be measured, PSU levels to be directly compared to other studies, and new areas of the hexaflex to be explored in relation to PSU and quality of life. The high internal inconsistency of all the standardised scales was also a strength of this study. Using an ACT-based questionnaire helped to close the gap that currently exists between research and clinical practice was also a strength.

Limitations

This study had several limitations. The use of the cross-sectional design means that no causal inferences could be made about the relationships between PSU, quality of life and psychological flexibility. Another limitation of the study was the sample. Only recruiting participants with a social media account may have excluded members of the public who are not active social media users.

The questionnaires used in this study were presented in a way that could be seen as ableist. The language used and the delivery method would have been suitable only for those of a certain educational background and those who would not require technological assistance in reading the online questionnaire. These two factors may have excluded certain individuals from taking part in the study, which was a limitation. Additionally, the MPFI questionnaire's language is heavily influenced by the ACT model, meaning those without experience with ACT (or this type of way of describing phenomena) may have found it difficult to accurately relate to the statements within the measure. For the SAS-SV, the questionnaire only captures a specific aspect of phone use (for example, it omits the content of a person's phone use); therefore, it is likely to only explain one aspect of PSU – meaning other important areas could have been missed. Furthermore, it could be that the general population's phone use differs from the samples in previous research. For example, previous research mainly focused

on children, young people and students, who may have different uses for phones based on their developmental needs/lifestyle; therefore, it could be that the SAS-SV is not valid at measuring PSU within this population.

A limitation of the analysis was the lack of exploration of moderators, such as type of smartphone use (aware or unaware smartphone use, as previously discussed, Sela, 2022). Future research could further explore the role of moderators on PSU within the general public. Furthermore, another limitation of the study is that participants were not asked if *they* felt their smartphone use was a problem. This has been beneficial in other studies (Jameel, Shahnawaz, & Griffiths, 2019b). Due to the method used for data collection (online questionnaire), and despite filtering out reCAPTCHA and shorter/longer responses, there was no objective way to know how diligently participants filled out the different measures. This was a limitation of the data set.

While this study explored the relationship between PSU and different variables, it is important to remember that across all scales, there is a difference between statistical significance and clinical significance. As there is no standardised cut-off for PSU, we cannot conclude that participants found their smartphone use ‘addictive’.

Despite initially recruiting a good sample size to detect a medium to small effect size in mediated analysis, the numbers were reduced after the data were prepared for analysis. The included response was reduced due to filtering out a considerable number of participants responses which were unlikely to be genuine. Additionally, the mediation analysis may have been underpowered to detect small effect sizes (Fritz & McKenna, 2007). This could be addressed in future studies by recruiting larger samples.

Another limitation of this research is that it does not consider the wider societal context. For example, smartphone use is a cultural norm within the UK, and the country has

recently emerged from the COVID-19 pandemic. Furthermore, the impact of the wider social narratives around technology was not considered, which can have an impact on people's perception of their phone use (Lanette et al., 2018).

Implications

Research Implication

As suggested by Rolfs et al. (2018), the MPFI was used to explore new ground. The finding of psychological inflexibility being linked to PSU is helpful. However, the underlying subscales provided little additional information in understanding PSU from this perspective. Future research replicating this study in a larger sample would be advised, possibly alongside considering a different range of variables.

The lack of a significant direct or indirect relationship between PSU and quality of life opens up the question of how problematic smartphone use is within the general population. Future research could further explore the nature of the relationship between PSU, quality of life, and psychological distress (such as anxiety or depression). Based on the current studies finding, it may be inferred that PSU is not a public health problem in this population, as it is within younger populations (Loleska & Pop-Jordanova, 2021).

While not statistically tested, the levels of PSU were not unexpectedly different from those reported in other countries and samples. The mean SAS-SV score in this study falls within the range of other mean figures reported within this area (García-Manglano et al., 2021). The means SAS-SV score was similar despite the current study's samples being slightly older than in other research (mean age = 32 years old vs <30 years old in García-Maglano et al., 2021). The comparable scores on the SAS-SV suggest there was nothing inherently different about the participants phone use in the current study, relative to other

research. Therefore it is unlikely that the lack of significant associations found during hypotheses testing can be explained by the levels of SAS-SV. Future research should be cautious about making causal inferences between two measured variables. For example, when associations between PSU and anxiety are reported, research often claims PSU is therefore a significant problem (Alhassan et al., 2018). This is without sufficient evidence of what questionnaire scores constitute truly problematic smartphone use.

From the author's knowledge, this is the first study measuring SAS-SV in the general population of the UK. As with other studies in this area, we are not able to say if the PSU levels reported are *truly* problematic due to the lack of standardised cut-off point on the SAS-SV. As discussed by (García-Manglano et al., 2021), we should be cautious about inferring the SAS-SV scores as representative of a true 'addiction', given the lack of a standardised cut off.

While other research has used a general measure of psychological flexibility when investigating the relationship with PSU (Roberts et al., 2022) this is the first study to explicitly explore some of the subcomponents of the hexaflex model and PSU. This had the potential to help increase our understanding of PSU from the ACT perspective. However, the current study suggests that the hexaflex model is of limited utility when trying to understand PSU. It may be helpful to explore and develop a questionnaire about PSU from the ACT perspective, as it has been with other mental health difficulties (Ong et al., 2019). Conducting this in the general population may also be beneficial due to the vast majority of studies recruiting students as participants. Future research should continue to explore PSU within larger samples in an effort to help define when PSU becomes impactful in a person's life.

Previous models (the pathway model, the I-PACE model addiction, Billeux et al., 2015; Brand et al., 2016) have been helpful in trying to characterise and operationalise

different elements of PSU. At present, using the hexaflex adds little understanding of PSU from a different perspective. Future research could continue to develop an understanding of PSU from all the models, and using different research methods would be advised. For example, qualitative research from the perspective of any of the models could help to understand the nuances of a person's phone use similar to (Jameel et al., 2019b) but in adult samples.

In general, research in this area might benefit from using qualitative methods to obtain richer information about PSU which in turn could increase our understanding. As with this study, sampling older and more diverse populations would be recommended due to the focus on younger participants in published research.

Clinical Implications

Based on the current study's findings, there is little evidence to suggest that the hexaflex model is useful in understanding PSU in this population. The likelihood of this being due to a measurement issue is low, given the psychometric properties of questionnaires used, and is also unlikely due to the levels of PSU measured in this sample (as discussed in *research implications*). Given the existing literature, at present, a CBT approach would be most useful to clinicians when treating PSU (Khalily et al., 2021). However, the evidence for this approach is not robust; therefore, a formulation-based approach to supporting the individual seeking help could be most useful. Taking into account a person's own idiosyncratic circumstances during formulation, along with a close evaluation of what is helpful throughout the intervention, is likely to be beneficial, as per suggestions from the Division of Clinical Psychology (2011). Ultimately, more evidence is required to develop stronger evidence in this area, using the ACT or other therapeutic other models.

Conclusion

This was the first study to explore the relationships between problematic smartphone use (PSU), psychological flexibility and inflexibility and quality of life within the general population in the UK. It was hypothesised that the hexaflex model could provide useful information in understanding PSU. However, based on this study's findings, the hexaflex model provides little utility in understanding PSU. As PSU did not mediate the relationship between psychological flexibility and quality of life, it opens up the question around how problematic smartphone use is for the general population. More research would be recommended to determine if PSU is a public health concern in this population. Future research is recommended to use alternative research methods, such as a qualitative approach to further explore and understand PSU from an ACT perspective.

References

- Álvarez, I., Bados, A., & Peró, M. (2010). Factorial structure and validity of the Multicultural Quality of Life Index. *Quality of Life Research: An International Journal of Quality of Life Aspects of Treatment, Care and Rehabilitation*, 19(2), 225–229.
<https://doi.org/10.1007/s11136-009-9581-0>
- Andrade, A. L. M., Scatena, A., Martins, G. D. G., Pinheiro, B. de O., Becker da Silva, A., Enes, C. C., de Oliveira, W. A., & Kim, D.-J. (2020). Validation of smartphone addiction scale - Short version (SAS-SV) in Brazilian adolescents. *Addictive Behaviors*, 110. <https://doi.org/10.1016/j.addbeh.2020.106540>
- Bailey, R. W., Vowles, K. E., Witkiewitz, K., Sowden, G., & Ashworth, J. (2016). Examining Committed Action in Chronic Pain: Further Validation and Clinical Utility of the Committed Action Questionnaire. *The Journal of Pain*, 17(10), 1095-1104.
<https://doi.org/10.1016/j.jpain.2016.06.011>
- Billieux, J., Maurage, P., Lopez-Fernandez, O., Kuss, D., & Griffiths, M. (2015). Can Disordered Mobile Phone Use Be Considered a Behavioral Addiction? An Update on Current Evidence and a Comprehensive Model for Future Research. *Current Addiction Reports*, 2(2), 156-162. <https://doi.org/10.1007/s40429-015-0054-y>
- Brand, M., Young, K. S., Laier, C., Wölfling, K., & Potenza, M. N. (2016). Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: An Interaction of Person-Affect-Cognition-Execution (I-PACE) model. *Neuroscience & Biobehavioral Reviews*, 71, 252-266. <https://doi.org/10.1016/j.neubiorev.2016.08.033>

Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire-II: a revised measure of psychological inflexibility and experiential avoidance. *Behavior Therapy*, 42(4), 676–688.
<https://doi.org/10.1016/j.beth.2011.03.007>

Coutinho, M., Trindade, I. A., & Ferreira, C. (2021). Experiential avoidance, committed action and quality of life: Differences between college students with and without chronic illness. *Journal of Health Psychology*, 26(7), 1035-1045.
<https://doi.org/10.1177/135910531986016>

Csibi, S., Griffiths, M. D., Demetrovics, Z., & Szabo, A. (2019). Analysis of Problematic Smartphone Use Across Different Age Groups within the ‘Components Model of Addiction.’ *International Journal of Mental Health and Addiction*, 19(3), 616–631. <https://doi.org/10.1007/s11469-019-00095-0>

Dawson, D. L., & Golijani-Moghaddam, N. (2020). COVID-19: Psychological flexibility, coping, mental health, and wellbeing in the UK during the pandemic. *Journal of Contextual Behavioral Science*, 17, 126–134. <https://doi.org/10.1016/j.jcbs.2020.07.010>

Division of Clinical Psychology. (2011). Good Practice Guidelines on the use of psychological formulation. <http://www.sisdca.it/public/pdf/DCP-Guidelines-for-Formulation-2011.pdf>

Elhai, J. D., Dvorak, R. D., Rueda, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders*, 207, 251-259.
<https://doi.org/10.1016/j.jad.2016.08.030>

- Esmaeilpour, F., Letafatkar, A., Baker, J. S., Dutheil, F., Khazaei, O., Rabiei, P., & Anarinejad, A. (2023). Reliability and construct validity of the smartphone addiction scale short version (SAS-SV) in Iranian students. *Zeitschrift Für Gesundheitswissenschaften [Journal of Public Health]*, 31(3), 345–353. <https://doi.org/10.1007/s10389-021-01529-7>
- Fritz, M. S., & Mackinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science*, 18(3), 233–239. <https://doi.org/10.1111/j.1467-9280.2007.01882.x>
- Gagnon, J., Dionne, F., & Pychyl, T. A. (2016). Committed action: An initial study on its association to procrastination in academic settings. *Journal of Contextual Behavioral Science*, 5(2), 97-102. <https://doi.org/10.3390/ijerph19010358>
- García-Manglano, J., López-Madrigal, C., Sádaba-Chalezquer, C., Serrano, C., & Lopez-Fernandez, O. (2021). Difficulties in Establishing “Truth” Conditions in the Assessment of Addictive Smartphone Use in Young Adults. *International Journal of Environmental Research and Public Health*, 19(1), 358. <https://doi.org/10.3390/ijerph19010358>
- García-Oliva, C., & Piqueras, J. A. (2016). Experiential Avoidance and Technological Addictions in Adolescents. *Journal of Behavioral Addictions*, 5(2), 293-303. <https://doi.org/10.1556/2006.5.2016.041>
- Gov. (2022). *Levelling Up the United Kingdom*. HM Government.
- Goodin, T. (2017). *OFF. Your digital detox for a better life*. Ilex.
- Harris, B., McCredie, M., & Fields, S. (2020). Examining the psychometric properties of the Smartphone Addiction Scale and its short version for use with emerging adults in the

U.S. *Computers in Human Behavior Reports*, 1, 100011.

<https://doi.org/10.1016/j.chbr.2020.100011>

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis*. Guilford Press. <https://doi.org/10.1111/jedm.12050>

Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and Commitment Therapy: Model, processes and outcomes. *Behaviour Research and Therapy*, 44(1), 1-25. <https://doi.org/10.1016/j.brat.2005.06.006>

Jatuff, D., Zapata-Vega, M. I., Montenegro, R., & Mezzich, J. E. (2007). The multicultural quality of life index in Argentina: a validation study. *Actas Espanolas de Psiquiatria*, 35(4), 253–258.

Jameel, S., Shahnawaz, M. G., & Griffiths, M. D. (2019a). Smartphone addiction in students: A qualitative examination of the components model of addiction using face-to-face interviews. *Journal of Behavioral Addictions*, 8(4), 780-793.
<https://doi.org/10.1556/2006.8.2019.57>

Jameel, S., Shahnawaz, M. G., & Griffiths, M. D. (2019b). Smartphone addiction in students: A qualitative examination of the components model of addiction using face-to-face interviews. *Journal of Behavioral Addictions*, 8(4), 780-793.
<https://doi.org/10.1556/2006.8.2019.57>

Jeong, B., Lee, J. Y., Kim, B. M., Park, E., Kwon, J., Kim, D., Lee, Y., Choi, J., & Lee, D. (2020). Associations of personality and clinical characteristics with excessive internet and smartphone use in adolescents: A structural equation modeling approach. *Addictive Behaviors*, 110, Art 106485. <https://doi.org/10.1016/j.addbeh.2020.106485>

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review*, 30(7), 865–878.

<https://doi.org/10.1016/j.cpr.2010.03.001>

Khalily, M. T., Bhatti, M. M., Ahmad, I., Saleem, T., Hallahan, B., Ali, S. A., . . . Hussain, B. (2021). Indigenously adapted cognitive-behavioral therapy for excessive smartphone use (IACBT-ESU): A randomized controlled trial. *Psychology of Addictive Behaviors*, 35(1), 93-101. doi:10.1037/adb0000677

Kuru, T., & Çelenk, S. (2021). The relationship among anxiety, depression, and problematic smartphone use in university students: the mediating effect of psychological inflexibility. *Alpha Psychiatry*, 22(3), 159-164. <https://doi.org/10.5455/apd.136695>

Kwon, M., Kim, D., Cho, H., & Yang, S. (2013). The Smartphone Addiction Scale: Development and validation of a short version for adolescents. *PLoS ONE*, 8(12), Art e83558. <https://doi.org/10.1371/journal.pone.0083558>

Landi, G., Pakenham, K. I., Giovannetti, A. M., Presti, G., Boccolini, G., Cola, A., Grandi, S., & Tossani, E. (2021). Italian validation of the Italian multidimensional psychological flexibility inventory (MPFI). *Journal of Contextual Behavioral Science*, 21, 57–65. <https://doi.org/10.1016/j.jcbs.2021.05.007>

Lanette, S., Chua, P., Hayes, G., & Mazmanian, M. (2018). How Much is 'Too Much'? *Proceedings of the ACM on Human-Computer Interaction*, 2(CSCW), 1-22.

<https://doi.org/10.1145/3274370>

Levin, M. E., MacLane, C., Daflos, S., Seeley, J. R., Hayes, S. C., Biglan, A., & Pistorello, J. (2014). Examining psychological inflexibility as a transdiagnostic process across

psychological disorders. *Journal of Contextual Behavioral Science*, 3(3), 155-163.

<https://doi.org/10.1016/j.jcbs.2014.06.003>

Li, Y., Yang, F., Pan, C., Chu, Q., & Tang, Q. (2021). Validation of the Committed Action Questionnaire-8 and Its Mediating Role Between Experiential Avoidance and Life Satisfaction Among Chinese University Students. *Frontiers in Psychology*, 12, 655518.

<https://doi.org/10.3389/fpsyg.2021.655518>

Lin, Y., Chiang, C., Lin, P., Chang, L., Ko, C., Lee, Y., & Lin, S. (2016). Proposed Diagnostic Criteria for Smartphone Addiction. *PloS One*, 11(11), e0163010.

<https://doi.org/10.1371/journal.pone.0163010>

Lin, Y.-Y., Rogge, R. D., & Swanson, D. P. (2020). Cross-cultural flexibility: Validation of the traditional Mandarin, simplified Mandarin, and Japanese translations of the Multidimensional Psychological Flexibility Inventory. *Journal of Contextual Behavioral Science*, 15, 73–84. <https://doi.org/10.1016/j.jcbs.2019.11.008>

Loleska, S., & Pop-Jordanova, N. (2021). Is Smartphone Addiction in the Younger Population a Public Health Problem? *Prilozi (Makedonska Akademija Na Naukite i Umetnostite. Oddelenie Za Medicinski Nauki)*, 42(3), 29. <https://doi.org/10.2478/prilozi-2021-0032>

Malinauskas, R., & Malinauskienė, V. (2019). A meta-analysis of psychological interventions for Internet/smartphone addiction among adolescents. *Journal of Behavioral Addictions*, 8(4), 613–624. <https://doi.org/10.1556/2006.8.2019.72>

Mehmood, A., Bu, T., Zhao, E., Zelenina, V., Alexander, N., Wang, W., Siddiqi, S. M., Qiu, X., Yang, X., Qiao, Z., Zhou, J., & Yang, Y. (2021). Exploration of Psychological Mechanism of Smartphone Addiction Among International Students of China by

Selecting the Framework of the I-PACE Model. *Frontiers in Psychology*, 12, 758610.

<https://doi.org/10.3389/fpsyg.2021.758610>

Mezzich, J. E., Cohen, N. L., Ruiperez, M. A., Banzato, C. E. M., & Zapata-Vega, M. I.

(2011). The Multicultural Quality of Life Index: presentation and validation. *Journal of Evaluation in Clinical Practice*, 17(2), 357-364. <https://doi.org/10.1111/j.1365-2753.2010.01609.x>

Mundal, I., Laake, P., Mezzich, J., Bjørkly, S. K., & Lara-Cabrera, M. L. (2021). Assessment of the quality of life in parents of children with ADHD: Validation of the Multicultural Quality of Life Index in Norwegian pediatric mental health settings. *Frontiers in Psychology*, 12, 638006. <https://doi.org/10.3389/fpsyg.2021.638006>

Newport, C. (2020). *Digital minimalism: Choosing a focused life in a noisy world*. Penguin Books.

Nikolic, A., Bukurov, B., Kocic, I., Soldatovic, I., Mihajlovic, S., Nestic, D., Vukovic, M., Ladjevic, N., & Grujicic, S. S. (2022). The Validity and Reliability of the Serbian Version of the Smartphone Addiction Scale-Short Version. *International Journal of Environmental Research and Public Health*, 19(3), 1245.

<https://doi.org/10.3390/ijerph19031245>

Olson, J. A., Stendel, M., & Veissière, S. (2020). Hypnotised by Your Phone? Smartphone Addiction Correlates With Hypnotisability. *Frontiers in Psychiatry*, 11, 578. |

<https://doi.org/10.3389/fpsyg.2020.00578>

Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction? *Journal of Behavioral Addictions*, 7(2), 252-259. <https://doi.org/10.1556/2006.7.2018.49>

- Pavlacic, J. M., Schulenberg, S. E., & Buchanan, E. M. (2021). Experiential avoidance and meaning in life as predictors of valued living: A daily diary study. *Journal of Prevention and Health Promotion*, 2(1), 135–159. <https://doi.org/10.1177/2632077021998261>
- Rueda, B., & Valls, E. (2020). Is the effect of psychological inflexibility on symptoms and quality of life mediated by coping strategies in patients with mental disorders? *International Journal of Cognitive Therapy*, 13(2), 112–126. <https://doi.org/10.1007/s41811-020-00069-4>
- Ruiz-Ruano, A. M., López-Salmerón, M. D., & López Puga, J. (2020). Experiential avoidance and excessive smartphone use: a Bayesian approach. *Adicciones (Palma De Mallorca)*, 32(2), 116-127. <https://doi.org/10.20882/adicciones.1151>
- Sarwar, M., & Soomro, T. (2013). Impact of Smartphone's on Society. *European Journal of Scientific Research*, 98(2), 216-226. https://www.researchgate.net/publication/236669025_Impact_of_Smartphone%27s_on_Society
- Sela, A., Rozenboim, N., & Ben-Gal, H. C. (2022). Smartphone use behavior and quality of life: What is the role of awareness? *PloS One*, 17(3), e0260637. <https://doi.org/10.1371/journal.pone.0260637>
- Shaw, H., Ellis, D. A., Geyer, K., Davidson, B. I., Ziegler, F. V., & Smith, A. (2020). Quantifying smartphone “use”: Choice of measurement impacts relationships between “usage” and health. *Technology, Mind, and Behavior*, 1(2). <https://doi.org/10.1037/tmb0000022>

- Statista. (2023). *Number of smartphone mobile network subscriptions worldwide from 2016 to 2022, with forecasts from 2023 to 2028*. www.statista.com. Retrieved 03/04/2023, from <https://www.statista.com/statistics/330695/number-of-smartphone-users-worldwide/>
- Tabrizi, F. F., Larsson, A. B., Grönvall, H., Söderstrand, L., Hallén, E., Champoux-Larsson, M.-F., Lundgren, T., Sundström, F., Lavefjord, A., Buhrman, M., Sundin, Ö., McCracken, L., Åhs, F., & Jansson, B. (2022). Psychometric evaluation of the Swedish Multidimensional Psychological Flexibility Inventory (MPFI). *Cognitive Behaviour Therapy*, 1–22. <https://doi.org/10.1080/16506073.2022.2153077>
- World Health Organization. (1998). Programme on mental health : WHOQOL user manual, 2012 revision. World Health Organization. <https://apps.who.int/iris/handle/10665/77932>
- Vanden Abeele, M. M. P., & Nguyen, M. H. (2022). Digital well-being in an age of mobile connectivity: An introduction to the Special Issue. *Mobile Media & Communication*, 10(2), 174-189. <https://doi.org/10.1177/20501579221080899>
- Van Velthoven, M. H., Powell, J., & Powell, G. (2018). Problematic smartphone use: Digital approaches to an emerging public health problem. *Digital Health*, 4. <https://doi.org/10.1177/2055207618759167>
- Yu, S., & Sussman, S. (2020). Does Smartphone Addiction Fall on a Continuum of Addictive Behaviors? *International Journal of Environmental Research and Public Health*, 17(2), 422. <https://doi.org/10.3390/ijerph17020422>

Section C Appendices
Appendix A – Research Adverts

Adverts 1

Tweet or caption to be used on social media: *Participants wanted: Own a smartphone? We would like to hear about your experiences – follow the link to complete the questionnaires about psychological factors related to smartphone use* [\[\[tinyurl\]\]](#)



Participants Wanted

Own a smartphone, live in the UK, 18+ years old?
Happy to answer questions about psychological factors connected with smartphone use?
£100 voucher random prize draw

 Canterbury Christ Church University

Advert 2

Tweet or caption to be used on social media: *Participants wanted: Own a smartphone? We would like to hear about your experiences – follow the link to complete the questionnaires about psychological factors related to smartphone use [[tinyurl!]]*

Canterbury Christ Church University

PARTICIPANTS WANTED

Smartphone use questionnaire

Happy to answer questions about psychological factors connected with smartphone use?

£100 prize draw →

Time Limit

Own a smartphone?

18+ years old?

Live in the UK?

Participants wanted

ts387@canterbury.ac.uk

Advert 3

Tweet or caption to be used on social media: *Participants wanted: Own a smartphone? We would like to hear about your experiences – follow the link to complete the questionnaires about psychological factors related to smartphone use [[tinyurl]]*



**Canterbury
Christ Church
University**

Participants Wanted

HAPPY TO ANSWER QUESTIONS ABOUT
PSYCHOLOGICAL FACTORS LINKED TO
SMARTPHONE USE?

£100 VOUCHER RANDOM PRIZE DRAW

Appendix B – Multicultural Quality of Life Index

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Appendix C – Permission To Use MQLI

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Appendix D – Smartphone Addiction Scale – English version

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Appendix E – Multidimensional Psychological Flexibility Inventory

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Appendix F – Ethical Approval

Ethical approval letter

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Appendix G – Consent Form

Consent form

Consent Form

Please indicate below whether you agree with each statement.

	Yes	No
I have read the information sheet and understand what is involved in taking part in this research	<input type="radio"/>	<input type="radio"/>
I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason	<input type="radio"/>	<input type="radio"/>
I agree for my anonymous data to be used in further research studies on a similar topic (that will involve one of the current research team)	<input type="radio"/>	<input type="radio"/>
I confirm that I am a UK resident 18 years or older who owns a smartphone	<input type="radio"/>	<input type="radio"/>
I agree to take part in the study	<input type="radio"/>	<input type="radio"/>

0% 100%

Appendix H - Information Sheet

What is the purpose of this study?

Do you own a smartphone, live in the UK and are aged 18 or over? If so, you can participate in this research asking people about their smartphone use and day-to-day experiences. Researchers at Canterbury Christ Church University are running a study to explore if we can identify which factors might contribute to a person's smartphone use becoming problematic. The study is being run by Brett Hayes (Trainee Clinical Psychologist) under the supervision of Dr Fergal Jones (Clinical Psychologist). Please contact the researcher, if you have any questions that are not answered by the below information (please see the end of this page for contact details).

What will taking part involve and who can take part?

The research will involve spending around 10-12 minutes answering online questionnaires about experience using your smartphone, your wellbeing and day-to-day internal experiences, which you can complete anonymously. The questions in the questionnaire are closed questions (i.e. selecting from pre-determined options, and no writing will be required). You can participate in this research if you own a smartphone and are a UK resident aged 18 years or older.

What are the risks of taking part?

The risks associated with taking part in this study are low. However, it is possible that some people may find answering questions on the above-mentioned topics upsetting. If you think that would be the case for you, please do not take part. In the unlikely event that you start the questionnaires and then find some of the questions upsetting, you can either skip those questions or stop the research altogether, by closing the browser.

Do I have to take part?

No, participation is voluntary. We will ask you to complete a consent form if you agree to participate. After you have completed the questionnaire, you can withdraw your data up to 48 hours after completion without providing a reason, so long as you provided your email address when answering the questions (as we'd need this to identify your data).

Prize Draw

Once you have completed the questionnaires, you can opt into a prize draw for £100 of Amazon vouchers. If you opt into the draw, we'll need your email address, so we can notify you if you win.

Will my taking part in this study be kept confidential?

All personal information obtained during the research will be kept strictly confidential. All data from the study will be saved on password-protected and encrypted storage. All data will be anonymised before analysis, and there will be no identifiable information if the research is published. To aid this process, all participants will be assigned a participant number, and your name and other identifying information will not appear in the analysis or any reporting of the study. For more information about how the University deals with data protection, please see <https://www.canterbury.ac.uk/services/governance-and-legal-services/data-protection>

What will happen to the result of the research study?

A summary of the study's findings will be sent to all participants (in 2023) who provided an email address during the questionnaire completion process. A report about the study will be submitted to Canterbury Christ Church University, which will be made publicly available. The study may also be published in a shorter form in a scientific journal. All reports will maintain anonymity. Data provided may also be used in future research studies on the same topic if a member of the current research team is working on the new research project.

What do I do if I have any questions, concerns or complaints

If you have any questions or wish to raise concerns or complaints, please contact the lead researcher, Brett Hayes, on b.hayes307@canterbury.ac.uk as soon as possible. If you are not satisfied with the response or wish to complain more formally you can contact Professor Margie Callanan, Director, Salomon Institute for Applied Psychology, Canterbury Christ Church University on margie.callanan@canterbury.ac.uk

What do I do if I want to take part?

If you want to participate, please read each of the following statements on the consent form and then check the boxes to indicate whether you agree with them.

Appendix I - Debrief Sheet

Thank you for completing the questionnaire - your responses have been submitted

Debriefing Information Sheet 1.2

Thank you for taking the time to participate in this research. In this study, we were exploring if there is a link between psychological flexibility and a person's smartphone use. The study did not involve elements of deception.

Psychological flexibility is the “capacity to be present, open up, and do what matters” (Harris, 2009)⁴ and is the focus of a psychological therapy called, Acceptance and Commitment Therapy – click [here](#) for more information

If you opted into the prize draw and win this, you will be contacted via email. If you opted to receive a summary of the study’s findings, you will be sent these via email.

If you find your smartphone use problematic, turning off certain app notifications, keeping your phone in a different room, not using your phone in bed and setting aside some time without your phone can be helpful – more detailed information can be found [here](#).

If you were distressed by completing this questionnaire, or if you wish to seek psychological support for your mental health and well-being, please seek support from your GP, or click on the relevant link: [England](#), [Scotland](#), [Wales](#), [Northern Ireland](#) to find a mental health service near you.

⁴ Harris, R. (2009). *ACT Made Simple: An Easy-To-Read Primer on Acceptance and Commitment Therapy*. Oakland, CA: New Harbinger.

Thank you for your participation in this research; your involvement has been a valuable part of developing a better understanding of problematic smartphone use and the factors linked to it.

If you have any feedback for the study team, please contact [[email address]]

NAME

Appendix J – Guidelines for Submission to International Journal of Environmental Research and Public Health

Manuscript Submission Overview

Types of Publications

IJERPH has no restrictions on the maximum length of manuscripts, provided that the text is concise and comprehensive. Full experimental details must be provided so that the results can be reproduced. *IJERPH* requires that authors publish all experimental controls and make full datasets available where possible (see the guidelines on [Supplementary Materials](#) and references to unpublished data).

Manuscripts submitted to *IJERPH* should neither be published previously nor be under consideration for publication in another journal. The main article types are as follows:

- *Article*: These are original research manuscripts. The work should report scientifically sound experiments and provide a substantial amount of new information. The article should include the most recent and relevant references in the field. The structure should include an Abstract, Keywords, Introduction, Materials and Methods, Results, Discussion, and Conclusions sections, with a suggested minimum word count of 4000 words.
- *Review*: Reviews offer a comprehensive analysis of the existing literature within a field of study, identifying current gaps or problems. They should be critical and constructive and provide recommendations for future research. No new, unpublished data should be presented. The structure can include an Abstract, Keywords, Introduction, Relevant Sections, Discussion, Conclusions, and Future Directions, with a suggested minimum word count of 4000 words.
- *Case reports*: Common in medical journals, case reports present detailed information on the symptoms, signs, diagnosis, treatment (including all types of interventions), and outcomes of an individual patient. They usually describe new or uncommon conditions that serve to enhance medical care or highlight diagnostic approaches. The structure of case reports differs from articles and includes an Abstract, Keywords, Introduction, Detailed Case Description, Discussion, and Conclusions, with a suggested minimum word count of 2500 words.

Submission Process

Manuscripts for *IJERPH* should be submitted online at susy.mdpi.com. The submitting author, who is generally the corresponding author, is responsible for the manuscript during the submission and peer-review process. The submitting author must ensure that all eligible co-authors have been included in the author list (read the [criteria to qualify for authorship](#)) and that they have all read and approved the submitted version of the manuscript. To submit your manuscript, register and log in to the [submission website](#). Once you have registered, [click here to go to the submission form for IJERPH](#). All co-authors can see the manuscript details in the submission system, if they register and log in using the e-mail address provided during manuscript submission.

Accepted File Formats

Authors are encouraged to use the [Microsoft Word template](#) or [LaTeX template](#) to prepare their manuscript. Using the template file will substantially shorten the time to complete copy-editing and publication of accepted manuscripts. The total amount of data for all files must not exceed 120 MB. If this is a problem, please contact the Editorial Office ijerph@mdpi.com. Accepted file formats are:

- *Microsoft Word*: Manuscripts prepared in Microsoft Word must be converted into a single file before submission. When preparing manuscripts in Microsoft Word, we encourage you to use the [IJERPH Microsoft Word template file](#). Please insert your graphics (schemes, figures, *etc.*) in the main text after the paragraph of its first citation.
- *LaTeX*: Manuscripts prepared in LaTeX must be collated into one ZIP folder (including all source files and images, so that the Editorial Office can recompile the submitted PDF). When preparing manuscripts in LaTeX, we encourage you to use the [IJERPH LaTeX template files](#). You can now also use the online application [writeLaTeX](#) to submit articles directly to *IJERPH*. The MDPI LaTeX template file should be selected from the [writeLaTeX template gallery](#).
- *Supplementary files*: May be any format, but it is recommended that you use common, non-proprietary formats where possible (see [below](#) for further details).

Disclaimer: Usage of these templates is exclusively intended for submission to the journal for peer-review, and strictly limited to this purpose and it cannot be used for posting online on preprint servers or other websites.

Free Format Submission

IJERPH now accepts free format submission:

- We do not have strict formatting requirements, but all manuscripts must contain the required sections: Author Information, Abstract, Keywords, Introduction, Materials & Methods, Results, Conclusions, Figures and Tables with Captions, Funding Information, Author Contributions, Conflict of Interest and other Ethics Statements. Check the Journal ***Instructions for Authors*** for more details.
- Your references may be in any style, provided that you use the consistent formatting throughout. It is essential to include author(s) name(s), journal or book title, article or chapter title (where required), year of publication, volume and issue (where appropriate) and pagination. DOI numbers (Digital Object Identifier) are not mandatory but highly encouraged. The bibliography software package *EndNote*, ***Zotero***, *Mendeley*, *Reference Manager* are recommended.
- When your manuscript reaches the revision stage, you will be requested to format the manuscript according to the journal guidelines.

Cover Letter

A cover letter must be included with each manuscript submission. It should be concise and explain why the content of the paper is significant, placing the findings in the context of existing work. It should explain why the manuscript fits the scope of the journal.

Any prior submissions of the manuscript to MDPI journals must be acknowledged. If this is the case, it is strongly recommended that the previous manuscript ID is provided in the submission system, which will ease your current submission process. The names of proposed and excluded reviewers should be provided in the submission system, not in the cover letter.

All cover letters are required to include the statements:

- We confirm that neither the manuscript nor any parts of its content are currently under consideration or published in another journal.
- All authors have approved the manuscript and agree with its submission to (journal name).

Author Biography

Authors are encouraged to add a biography (maximum 150 words) to the submission and post it to **SciProfiles**. This should be a single paragraph and should contain the following points:

1. Authors' full names followed by current positions;
2. Education background including institution information and year of graduation (type and level of degree received);
3. Work experience;
4. Current and previous research interests;
5. Memberships of professional societies and awards received.

Guidelines access from <https://www.mdpi.com/journal/ijerph/instructions#submission>

Appendix K – Summary Report to Participants

Dear Participant,

Thank you again for taking part in my study exploring smartphone use, psychological flexibility and quality of life. We managed to get over 400 people to take part in the study, which was a great help.

In this study, we were investigating if there is a link between a few different areas; psychological flexibility, problematic smartphone use and quality of life. Psychological flexibility is the “*capacity to be present, open up, and do what matters*” (Harris, 2009); there is also psychological inflexibility which is the opposite. Problematic smartphone use is a term used for when a person’s smartphone use starts to cause problems in different areas of their lives. Quality of life can be thought of as how a person perceives their life and often relates to their health, well-being, relationships, goals and concerns they may have.

The results of the study indicated that psychological inflexibility predicted higher problematic smartphone use. That is, people who find it difficult to be present, open up to their own experiences and find it difficult to do what matters to them had more difficulty with their smartphone use.

The results also found that people who were less in touch with what was important to them had more problems with their smartphone use. Interestingly, problematic smartphone use did not impact the relationship between psychological flexibility and quality of life. Also, people who are able to be present, open up to their experience, and do what is important to them report a better quality of life.

Thank you again for taking part in my research, and please do contact me if you have any further questions at [[email address]]

Best wishes, , Trainee Clinical Psychologist

Appendix L – Feedback Summary for Ethics Board

Dear Board of Ethics,

Thank you for providing feedback and approval on my research project in February 2023. I have now completed my research project investigating problematic smartphone use, psychological flexibility and quality of life; below is a summary of my project.

Problematic smartphone use (PSU) has been associated with a wide range of psychological factors. Previous studies have largely been conducted in student samples and have not situated their research within the context of therapeutic models, meaning there are gaps in our understanding of PSU in relation to the general population and therapy models.

This research aimed to explore the relationship between a person's smartphone use, quality of life and psychological flexibility in the general population. Specifically, the hypotheses were interested in testing how a person's contact with their values links to their phone use. A cross-sectional design was implemented, with participants being asked to complete an questionnaire relating to their quality of life, smartphone use, and psychological flexibility/ inflexibility.

The results of this study suggest that PSU is predicted by psychological inflexibility and a lack of contact with values. PSU was not predicted by other elements of the hexaflex model. Furthermore, PSU did not mediate any relationships between psychological flexibility/inflexibility and quality of life. The cross-sectional design used means causal inferences cannot be made. Based on the findings from this study, the hexaflex model provides little utility in understanding PSU within this population.

Trainee Clinical Psychologist