Exploring a preliminary model of the impact of social networking sites on young people's mental health during the Covid-19 pandemic

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Thesis declaration form

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

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Overview

This thesis explores the relationship between social media and young people's mental health and is divided into three parts.

Part one of this thesis is a systematic literature review. It explores the evidence regarding the impact of using social networking sites (SNS) on adolescent's mental health, with a specific focus on experimental research.

Part two is an empirical study, which explores a preliminary model of the impact of using SNS on young people's mental health. Specifically, this study sought to test a model, based upon the interpersonal-connections-behaviours framework (Clark et al., 2018), including patterns of use associated with both positive and negative mental health outcomes. Results suggest that 'disconnecting' patterns of use, involving upward social comparisons, were associated with greater levels of generalised anxiety, depression and social anxiety. The findings for 'connecting' patterns of use, involving behaviours that build social capital, were less robust. This was a joint project with another trainee clinical psychologist who studied the relationship between motivations for social media use and mental health outcomes.

The final section is a critical appraisal of the systematic review and empirical paper. It reflects on the varied professional and personal challenges faced at each stage of the research process, and explains what was learnt as a result.

Impact statement

Social media use among young people is extensive and continues to grow (Twenge et al., 2019). Understanding more about the relationship between social media use and young people's mental health is essential to promoting the well-being of young people and informing the healthy usage of such technologies. This research addressed several gaps in the existing research base, including the predominance of cross-sectional research (Schønning et al., 2020) and the under-reliance on theoretical frameworks (Frost & Rickwood, 2017).

The systematic review focused exclusively on experimental research examining the relationship between using SNS and adolescents' mental health. Findings point to a nuanced relationship between using SNS and depression, identifying variables that influence the strength of this relationship and offering insight into underlying mechanisms.

The empirical paper was grounded in theory, drawing on the interpersonal-connections-behaviours framework (Clark et al., 2018) to test a model of helpful and harmful patterns of use on SNS. A key finding of this research is that engaging in upward social comparisons is associated with greater levels of depression, generalised anxiety and social anxiety among young people. This is the first study to examine the relationship between drawing upward social comparisons on SNS on levels of generalised and social anxiety among young people. Both papers highlight the importance of a more nuanced understanding of the relationship between using SNS and mental health, emphasising the importance of considering *how* users interact with SNS rather than simply the quantity of use. Such findings have a range of implications.

For clinical practice, results highlight the potential value of clinicians routinely enquiring about how users interact with SNS. Findings suggest that drawing upward social comparisons on social media may have a detrimental impact on mental health, therefore the use of psychoeducation and cognitive techniques to reduce the impact of such comparisons may be employed. Furthermore, the results could be applied to educational settings, informing the school curriculum, and guiding interventions targeting harmful patterns of use and promoting 'healthy' use of SNS.

In terms of the application of these findings to research settings, both the empirical paper and review highlight gaps in the existing literature and important directions for future research. These include a greater emphasis on research employing experimental and longitudinal designs, examining and comparing the impact of using different SNS, experimental research focusing on the impact of use on adolescents' anxiety, theory-driven research and a focus on different patterns of engagement with SNS. Findings also suggest potential avenues for intervention studies.

The plan is to disseminate the findings of both the systematic review and the empirical paper by publishing the work in peer reviewed journals. Furthermore, there are plans to disseminate the findings to the clinical community by presenting the results at a University College London doctorate in clinical psychology conference focusing on social media in December 2021.

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Part 1: Literature Review

The relationship between social media use and adolescent mental health - a systematic narrative review of experimental research.

Abstract

Aims: This study aimed to review experimental research focusing on the impact of social networking sites (SNS) on adolescents' mental health. It hoped to develop greater understanding about the nature of this relationship, identify any mediators or moderators of this relationship, and explore theoretical underpinnings drawn upon in the research.

Methods: A systematic search of PsychInfo, Web of Science and Medline databases was undertaken for all relevant studies from 1997 to September 2020.

Results: Eleven studies met the inclusion criteria and were subjected to a quality review using a standardised quality assessment rating tool. The majority of the papers were rated as high quality and the most studied platform was Facebook. Results pointed to a nuanced relationship between using SNS and depression, influenced by individual user characteristics (e.g. higher social comparison orientation and baseline depression) and distinct patterns of use (e.g. passive use, exposure to positive content and other-oriented locus of engagement). Only one explored the relationship between using SNS and anxiety and no significant association was documented.

Conclusions: These findings point to a relationship between using SNS and adolescents' levels of depression, which is influenced by user characteristics and patterns of use. In terms of theory the results support social comparison theory and the rich-get-richer hypothesis. In addition, they highlight the importance of more research in this field to further elucidate the role of individual differences and patterns of engagement, as well as studying a greater range of SNS.

Introduction

Social media is omnipresent in society and is rapidly modifying how individuals interact with each other. The rise of the online environment is unquestionable and according to a recent article (Clement, 2020) the number of worldwide social networking site (SNS) users is 3.6 billion, and this is estimated to grow to 4.4 billion by 2025. Children and adolescents are the most avid users of social media (Livingstone et al., 2011) and they have grown up in a unique time period where the use of screens is extensive and media use is pervasive (Crone & Konijn, 2018).

The Royal Society for Public Health and Young Movement (2017) found that 91% of teenagers use the internet for social media, with the average adolescent spending around two hours a day on social media (Twenge et al., 2019a). Recent research indicates that social media use is continuing to rise among adolescents (Perrin, 2015). However, there have been changes in platform preferences over time; thus, Facebook is no longer being the most frequently used, having been overtaken by YouTube, Instagram and Snapchat (Anderson & Jiang, 2018). Social media has redefined the way people communicate and has become the main form of online communication for young people (Lenhart, 2015). In the context of the Covid-19 pandemic, there has been a surge in the amount of time spent online, including increased use of social media, the internet, gaming and television consumption (Ofcom, 2020a, 2020b).

The difference between social media and SNS

The terms social media and SNS are often used interchangeably, though there are notable differences. The exact definition of social media has been debated; however, one popular definition refers to social media as Web 2.0 internet-based applications where users have their own profiles and generate their own content, in

order to facilitate connection with others (Obar & Wildman, 2015). Social media therefore encompasses both SNS and messenger applications, and SNS may be considered as a subcategory of social media.

Adolescent development and SNS

Adolescence is a developmental stage marking the transition between childhood and adulthood. It is a critical period of development and most mental health difficulties have their onset during this window (Kessler et al., 2005). At this point in development, there is a strong desire to fit in with others and the opinions of peers become increasingly valued, whilst parental influence reduces (Blakemore & Mills, 2014). Thus, during this time adolescents' focus is on developing and sustaining peer relationships (Brown & Larson, 2009) and they are highly attuned to feedback from their peers and their perceived status (Harter et al., 1996). Adolescents have indicated that peer evaluations impact on their sense of personal worth and they associate the experience of rejection with feelings of personal unworthiness (O'Brien & Bierman, 1988).

SNS provide a platform where people can easily connect with individuals all across the world (Bányai et al., 2017) and they have offered a new way for adolescents to develop and maintain relationships with peers. In contrast to face-to-face interactions, SNS offer individuals with choice and control about what information they present about themselves (Fitzpatrick et al., 2016; Sassi & Gharbi, 2015). Therefore, users are able to monitor and adapt the information they share, which often includes editing pictures using retouching software (Kleemans et al., 2018) to present an idealised version of themselves (Zhao et al., 2008).

Given that information on SNS is often public and available, adolescents are able to view and evaluate the profiles of their network, while their own information is also

open to evaluation. Adolescents are particularly vulnerable to developing low self-esteem (Orth et al., 2015) and developmental theories have highlighted the importance of identity formation as a key task during adolescence (Barber & Olsen, 1997; Erikson, 1968). Research has identified that adolescents use SNS in the service of identity development, engagement with peers and in the development of aspirations (Subrahmanyam & Smahel, 2011; Uhls et al., 2017). SNS offer opportunities for social comparisons and feedback, which have been found to influence both adolescent's self-esteem and identity (Nesi et al., 2017).

Adolescent mental health

The mental health of young people is currently a growing concern within the UK (Department of Health, 2015; Pitchforth et al., 2019) and globally (Bruha et al., 2018), posing significant societal and economic costs. The prevalence of mental health difficulties is increasing over time (Twenge et al., 2019b), with 12.8% of those aged 5 to 19 meeting criteria for a mental health disorder within the UK (NHS Digital, 2018), and nearly 15% globally (Polanczyk et al., 2015). Correspondingly, the number of referrals and demand for specialist support services for children and adolescents has also been growing over time (NHS Benchmarking Network, 2019).

The reasons behind the growing rates of mental health difficulties among young people are not known, however a number of factors have been suggested to possibly contribute to this increase. In a recent report by Young Minds (2017) rising academic pressure was identified as a concern, with 80% of young people noting that exam pressure had impacted on their mental health. Other factors that have been suggested to contribute to the increasing prevalence of mental health difficulties are cyberbullying (Kim et al., 2018), increased sedentary behaviour (Biddle & Asare, 2011), financial difficulties and poverty (Dashiff et al., 2009; Richardson et al., 2017). Twenge et al. (2018) suggested that the increase in mental

health difficulties among young people is linked to the rise in SNS use, whilst others have emphasised the effects of using SNS (Bell et al., 2015). Together the increase in the rise of mental health difficulties and SNS use, alongside the notable developmental changes that take place in adolescence, highlights the importance of developing a thorough understanding of the relationship between SNS and the mental health of adolescents.

The relationship between SNS and mental health

Since children and adolescents started using SNS adults have been concerned about the possible harm that these sites may cause, with this becoming increasingly important as usage rates have rocketed among this group (Kaess, 2020). In particular, concerns have been raised about the implications of SNS use and the risks adolescents are exposed to (Boyd, 2014). In line with the widespread nature of SNS, the research base has grown exponentially with an increasing interest in the impact of SNS use on mental well-being (Schønning et al., 2020). At present, the debate regarding the impact of using SNS on young people's mental well-being remains ongoing (Berryman et al., 2018) and existing research paints a mixed picture. The current evidence base can be divided into four categories: those indicating negative effects, beneficial effects, mixed effects and those suggesting no relationship between SNS use and mental health.

In terms of the negative effects of SNS use, recent systematic reviews have found a small correlation between increased use and symptoms of depression (McCrae et al., 2017; Verduyn et al., 2017). A recent meta-analysis (Huang, 2017) found that time spent on SNS was negatively associated with psychological well-being, however the size of the correlation was small. Fewer studies have been conducted focusing on the impact of SNS use on anxiety symptoms (Benson, 2018). However, results from two large studies, together surveying over 13,000 adolescents,

documented a positive association between time spent on SNS and greater anxiety symptoms (Tsitsika et al., 2014; Yan et al., 2017). Piteo and Ward (2020) confirmed the association between time spent on SNS, or frequency of use, and higher levels of anxiety in a systematic review, although they noted the effects were small.

Contrastingly, other research has challenged the negative effects of SNS use, instead focusing on beneficial outcomes. However, it is notable that fewer studies have focused on positive outcomes associated with SNS use (Uhls et al., 2017). A recent meta-analysis found a small positive correlation between SNS use and perceived social resources (Domahidi, 2018), with perceived social resources conceptualised as a superordinate concept comprising of perceived social capital and social support. In a survey of university students, using SNS for social purposes was found to be linked to increased social capital and life satisfaction, while using SNS for recreational reasons was not associated with social capital, but linked to greater loneliness (Guo et al., 2014). Similarly, in a cross-sectional study, Wang et al. (2014) found that using SNS to communicate with others was associated with greater mental well-being among students.

Not all research has found evidence of a relationship between using SNS and mental well-being. In a survey of university students, Lee et al. (2011) found that the frequency of SNS use was not related to mental well-being. A recent systematic review (Seabrook et al., 2016) concluded that there was no clear relationship between the quantity of SNS use and symptoms of depression and anxiety. However, the findings suggested that the quality of social interactions on SNS played a key role. Seabrook et al. (2016) concluded that interactions involving social connectedness or social support had a beneficial impact on levels of anxiety and depression, while those involving social comparisons or negative interactions had a detrimental effect.

Limitations of the existing research base

As the use of SNS has become more extensive the research base has continued to grow; nonetheless there remains a lack of consensus around whether using SNS impacts young people's mental health (Frith, 2017). Neither a causal relationship nor a direction of causality has been established, and there are reasons to believe that the knowledge base is unclear and incomplete (Orben, 2020). The vast majority of existing research is observational (Radovic et al., 2017) and focuses on short-term associations, whilst there remains a dearth of research focusing on the longitudinal impact on functioning (Hur & Gupta, 2013) or exploring the underlying mechanisms or mediating factors in the relationship between using SNS and mental well-being (Jiang & Ngien, 2020). The lack of longitudinal research and experimental designs limits the ability to understand the potentially causal associations between using SNS and mental well-being (Sarmiento et al., 2018).

The existing evidence base has been criticised for lacking a theoretical framework to synthesise current research and inspire future research (Nesi et al., 2018a) and for being "concerned-centric" (Orben et al., 2020), ignoring the potential beneficial aspects that using SNS may offer (de Leeuw & Buijzen, 2016). Research suffers from focus on single platform use, with Facebook being the most studied singular platform accounting for 39% of all research (Schønning et al., 2020). A focus on single platforms is problematic given the ever-changing nature of SNS and the declining popularity of Facebook among adolescents (Anderson & Jiang, 2018; Duncan, 2016). Furthermore, young peoples' motivations for using SNS have been found to differ across platforms (Alhabash & Ma, 2017). This highlights the importance of multi-platform research and the risk of existing research becoming outdated.

Whilst there have been concerns around the level of SNS use among young people (e.g., frequency of use or hours of use per day), research suggests that the way it is used may be more important (Davila et al., 2012). This fits with a further criticism of the evidence base, namely that most research has focused on the frequency of using SNS, rather than the patterns of use (Valkenburg & Peter, 2007), and few studies have explored mediating factors that may play a role in this relationship (Jiang & Ngien, 2020; Karim et al., 2020). This points to a need to understand *how* adolescents interact with SNS and the mechanisms of action in the relationship between SNS and mental well-being.

Aims

This systematic review aimed to examine experimental research focusing on the relationship between using SNS and adolescents' mental health, specifically symptoms of anxiety and depression. The focus on anxiety and depression was adopted because these are the two most common mental health difficulties experienced by this age group (Clarke et al., 2020; NHS Digital, 2018) and the most prevalent in child and adolescent mental health services (Local Government Association, 2021). The study adopted a data-driven approach, with the findings emerging from the data. The intention was to gain a better understanding of the nature of the relationship between using SNS and anxiety and depression, including the theoretical underpinnings, to identify any potentially causal factors and variables that influence the strength of this relationship. The review also aimed to identify gaps in the existing evidence base and inform future research in this area.

Defining adolescence

Adolescence is the developmental period that starts with the onset of puberty and finishes with the onset of adulthood. A relatively broad definition of adolescence, i.e.

those from 10 to 24 years, was adopted for this review. The lower age limit of 10 was adopted based upon the starting age of adolescence as defined by the World Health Organisation (2020). While the upper age limit of 24 years is in line with recent research, which highlights the continual neurobiological and physical development of young people into their early twenties (Sawyer et al., 2018).

Defining social networking sites

SNS were defined based on the definition by Ellison and Boyd (2013) as networked communication platforms that enable users to: (1) develop personal and uniquely identifiable profiles; (2) create public connections with others; and (3) create and interact with content created by users.

Method

This review explores the evidence regarding the impact of using SNS on adolescents' mental health, with a specific focus on *experimental* research. The method and results were conducted and reported in line with PRISMA guidelines (Liberati et al., 2009). Systematic reviews are designed to paint a reliable picture of the existing best evidence relevant to a research question (MacDonald, 2003). A systematic narrative review, rather than a meta-analysis, was deemed appropriate due to the breadth of study objectives, diverse methodologies and range of theoretical concepts across the studies included in this review (Baumeister, 2013). Thus, it is inappropriate to conduct a meta-analysis when studies differ in terms of research design, methods of analysis, sample characteristics and outcome variables (Sharpe, 1997).

Search strategy

To identify relevant articles, a systematic literature search was performed in September 2020 on three databases: (1) PsychInfo; (2) Medline; and (3) Web of Science. Medline and PsychInfo were chosen because they encompass two fields relevant to this review, namely medical and psychology research. Web of Science was selected due to its broader focus as a multi-disciplinary research database. The search was limited to publications after 1997 since this was the year that the first social networking site, SixDegrees, was established (Boyd & Ellison, 2007). To reduce the potential for publication bias, which poses a significant threat to the conclusions of a systematic review (Baumeister & Leary, 1997), the search process included both published and unpublished literature. Given that there was no resource for translation only papers published in English were eligible for inclusion.

The search was carried out on one day and following this an alert system was set up to provide notifications of any potentially eligible papers published after the search date. The reference lists of key papers were also reviewed to identify any further relevant articles. A search strategy was developed based on the three key concepts of this review: (1) adolescents; (2) social media; and (3) mental health, specifically anxiety and depression. A key concept focusing on experimental research was not included, given that including research design terms in the search has previously been cautioned against (Baumeister & Leary, 1997). A range of synonyms and truncations were used to search for relevant papers and subject headings were used based on the requirements of each database. The search terms based on the Ovid Medline search are shown in Table 1.

Table 1

Search terms based on the Ovid Medline search

Participants	exp Adolescent/ OR adolescen* OR teen* OR youth* OR juvenile OR 'high school student*' OR 'secondary school student*' OR schoolchild* OR young person* OR boys OR girls OR young people* OR Millennial* OR college student* OR undergraduate* OR freshmen* OR freshman* OR Sophomore* OR "generation Y" OR "generation Z" OR [(Emerging OR Emergent OR Young OR Transition*) adj2 adult*] OR [(Young adj2 (men or women OR female* OR male*)] AND
Exposure	exp Social Networking/ OR exp Social Media/ OR social network* OR online social network* OR Facebook OR Instagram OR Twitter OR YouTube OR Snapchat OR Tumblr OR Pinterest OR Buzzfeed OR Bebo OR Myspace OR Tiktok AND
Outcomes	exp mental health/ or exp mood disorders/ or exp anxiety disorders/ OR mental disorder OR mental illness OR psychological disorder OR psychological disturbance OR emotional problem OR mood disorder* OR depress* disorder* OR major depressive disorder OR depression OR depress* symptoms OR dysthym* OR seasonal affective disorder OR affective disorder OR anxiety symptoms OR anxious OR anxiety OR agoraphobia OR panic disorder OR separation anxiety OR OCD OR obsessive-compulsive disorder OR phobic disorder OR phobia OR social anxiety OR hypochondriasis OR health anxiety OR PTSD OR post traumatic stress OR posttraumatic stress

Eligibility criteria

The review focused on participants aged between 10 and 24 as described. However, a degree of flexibility was adopted with the older age boundary due to the infancy of experimental research in this field, alongside the knowledge that most research has been conducted on undergraduate samples where a small minority of participants are older than 24. Studies which included participants over 24 years were only selected if the mean age was lower than 24 years and the majority of participants were younger than 24 years. Where there was insufficient detail to make this judgement, the authors were contacted.

For inclusion, studies were required to adopt an experimental design. Experimental designs were defined as studies that included an active manipulation of a dimension of SNS use (the independent variable), in comparison to a control group, and tested whether this manipulation had an impact on adolescents' mental health (the dependent variable). This design is important because it enables causal inferences to be drawn about the effect of the independent variable upon the dependent variable.

There are many different types of SNS used by adolescents and young adults across the world and studies conducted on any social networking site, or multiple sites, were eligible for inclusion, as reflected in the search criteria. Studies focusing on exposure or manipulation of other internet-based activities (such as video-gaming, television, emailing, blogging or general smartphone use) were excluded, unless they also measured the use of SNS and clearly separated this in their analysis.

Given the subjective nature of terms related to psychological well-being, such as 'mental health', and the possibility for these constructs to be operationalised in different ways, this review focused on measures of anxiety and depression. To be included in the review, studies were required to include a measure of the symptom severity of depression and/or anxiety. It was acknowledged that it would be optimal if these measures were reliable and validated on this age group; however, given the limited research in this area studies were not excluded on the basis of reliability and validity, but this was included as a category in the quality assessment. Studies were excluded if they focused on behavioural outcomes, such as suicide, substance misuse or aggression instead of mental health *per se*, as well as those focusing on body image, unless they also included a measure of depression and/or anxiety symptoms and separated this in their analysis.

The screening process

Papers were organised using Endnote reference management software and initially screened duplicates were removed. Following this, to determine whether studies were eligible for inclusion a two-stage screening process was adopted. Initially, papers were screened by reading their titles and abstracts to establish basic relevance, including a focus on SNS and mental health. In the second stage of screening, papers were read in full to identify papers that met the inclusion criteria as mentioned above. Any queries regarding inclusion were resolved via discussion with the supervisor of this thesis.

Quality Assessment

The quality of the eligible studies was evaluated using the Standard Quality Assessment Criteria for Evaluating Primary Research Papers (Kmet et al., 2004), which is in line with the Centre for Reviews and Dissemination (2009) recommendations. This assessment tool was developed to assess a variety of study designs using 14 criteria: (i) research question sufficiently described, (ii) appropriate study design, (iii) method of subject selection, (iv) description of participant characteristics, (v) random allocation of participants, (vi) blinding of investigators, (vii) blinding of participants, (viii) well defined outcome and exposure measures, (ix) appropriate sample size, (x) analysis described and appropriate, (xi) estimate of variance for main outcomes, (xii) controlled for confounding variables, (xiii) results reported in sufficient detail and (xiv) conclusions supported by results. To ensure a more rigorous assessment of quality covering all of the relevant factors for this area of research four additional criteria were added: (xv) measure of effect size for main outcomes, (xvi), outcomes assessed using valid and reliable measures of anxiety and/or depression (xvii) complete outcome data and (xviii) adherence to study protocol.

Each study was assessed for the degree to which it met each of the criteria (Yes = 2, Partial = 1, No = 0 and Not applicable = NA). In terms of the additional criteria, for the criterion focusing on the use of valid and reliable measures of anxiety and/or depression, the following scoring was adopted: a score of 2 was allocated if the measure used was a validated and reliable measure of depression or anxiety in line with diagnostic classification systems, such as the DSM-V (American Psychiatric Association, 2013) or the ICD-10 (World Health Organisation, 1992); a score of 1 was given if a valid and reliable measure was used, but it did not directly map on to diagnostic classifications, for example studies that used the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988); a score of 0 was allocated when studies did not adopt a valid or reliable measure of depression or anxiety (e.g. the use of single-item scales). For the complete outcome data criterion, there are no standardised cut-off values that are agreed upon (Hong et al., 2018). Therefore, the following thresholds rates were adopted: for studies with less than 5% drop out (Higgins et al., 2016) a score of 2 was given; for studies with less than 20% drop out (Thomas et al., 2004) a score of 1 was given; for studies with greater than 20% drop out a score of 0 was allocated.

For each study a summary score, indicating the overall quality, was calculated. The summary score was computed by adding the scores for individual items and dividing them by the total available score and converting into a percentage, thereby excluding any items rated as not applicable. Kmet et al. (2004) did not provide labels to distinguish the quality of papers and therefore the following cut-offs were applied: <= 55% = low; > 55% medium; => 75% = high.

Results

This section is divided into four parts: study selection, an overview of the study characteristics, a discussion of the quality ratings, followed by a summary of the findings. The findings section is separated into five categories driven by the data, examining the impact of the following on adolescents' mental health: active and passive use of SNS; the amount of SNS use; the locus of engagement; the type of content on SNS; the use of different platforms.

Study selection

The search of PsychInfo, Medline and Web of Science yielded 4401 papers and two papers were identified by reading the reference lists of key papers. Figure 1 provides a PRISMA flow diagram (Liberati et al., 2009) of the screening and selection process. Of the 109 papers read in full, the main reasons for exclusion were the wrong age of participants, the wrong outcome measures or a non-experimental research design. Overall, the screening process identified 11 papers that were eligible for inclusion in this review. These 11 studies are summarised in Table 2.

Overview of study characteristics

All of the articles included in this review were published between 2013-2020 with six published in 2018 or after, highlighting the recent increase in this type of research. Most studies (n = 9, 81.82%) were conducted in the United States of America, with one conducted in the Netherlands and another in the United Kingdom. The sample sizes ranged from 76 to 588, with a mean of 174.18 and the total number of participants across the studies was 1916. The mean age of samples ranged from 15.26 to 21.4 years, with two studies conducted with high school students and the remaining with university students. The majority of studies had a greater proportion of females, ranging from 47.6% to 100% across the studies, although one study did

not provide this information. Four authors were contacted to request additional information that was not available in the publication (Deters & Mehl, 2013; Hunt et al., 2018; Kenney, 2018; Mosquera et al., 2020) e.g., sample age range, mean or standard deviation.

Figure 1

PRISMA flow diagram for study selection

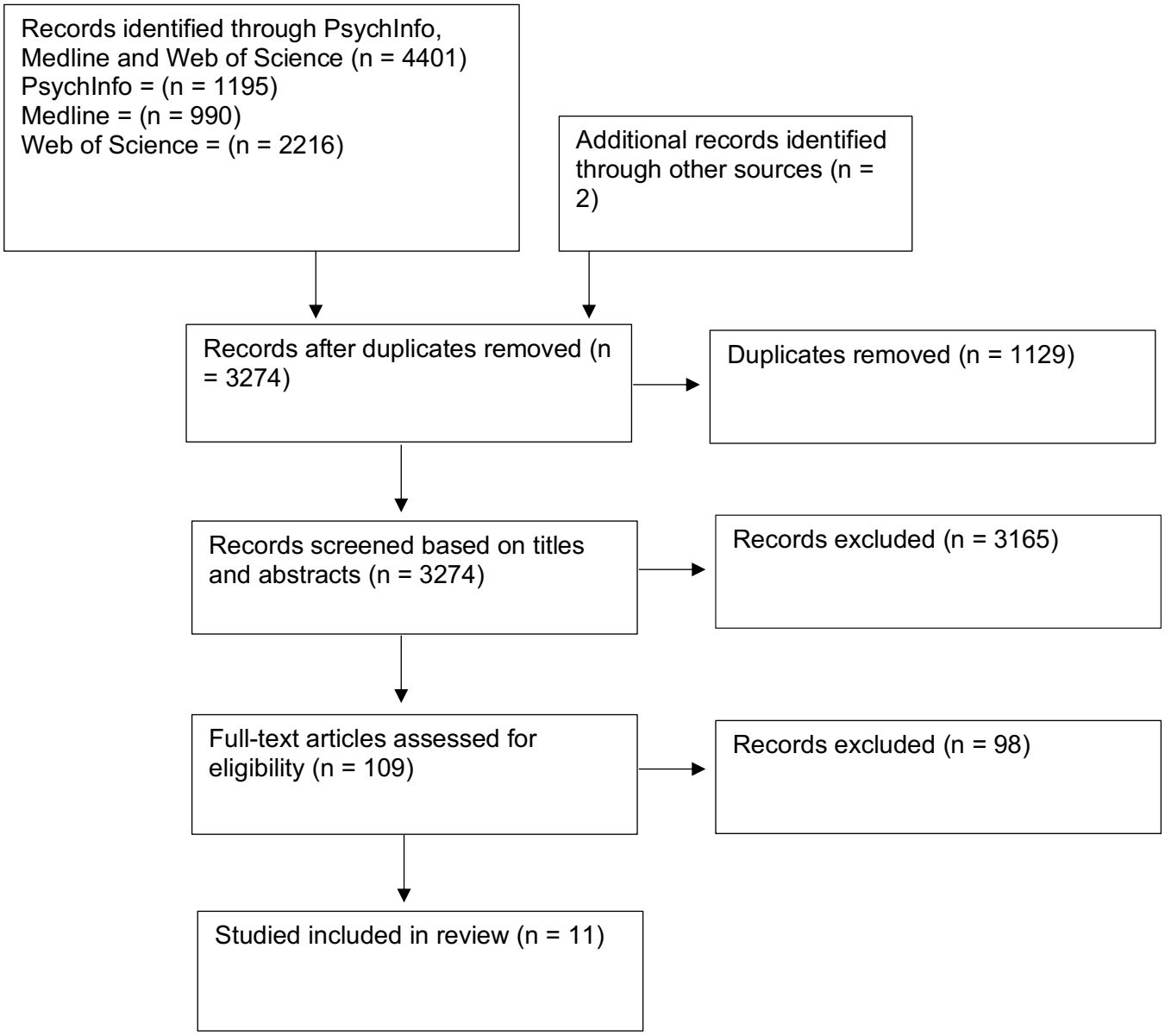

Table 2

Summary of the included studies

Study	N	Mean age	% female	Country	SNS site	Length of manipulation	Key SNS variable(s)	Mental health measure(s)	Main findings
Deters and Mehl (2013)	102	20.01	61	USA	Facebook	One week	Frequency of posting	CES-D	Increased posting did not affect participants' levels of depression, $p = .57$. Increased posting, in comparison to usual use, reduced levels of loneliness, $p = .04$, $d = -.31$.
Fardouly et al. (2015)	112	20.46	100	UK	Facebook	10 minutes	Passive browsing	Mood on a scale of 0-100	Browsing Facebook, in comparison to a control website, predicted more negative mood, $p = .013$. Appearance comparison tendency did not moderate the relationship between Facebook use and mood, $p = .976$.
Verduyn et al. (2015) Study 1	84	19.93	62	USA	Facebook	10 minutes	Active vs passive use	Mood on a scale of 0-100	Using Facebook passively, rather than actively, resulted in a delayed negative effect on participants' mood, $p = .02$, $\eta p2 = .06$. After immediately using Facebook there were no significant changes in mood. Gender did not moderate the effect of type of use on mood.
Vogel et al. (2015) Study 2	120	18.93	77	USA	Facebook	5 minutes	Passive browsing Locus of engagement	PANAS	After examining the Facebook profile of an acquaintance, in comparison to their own or a control condition, those high in social comparison orientation showed more negative affect, $p = .008$, and lower self-esteem, $p < .01$, than participants low in social comparison orientation.
Weinstein (2017)	588	15.26	48	USA	Instagram	Less than 30 minutes	Type of content	PANAS	Individuals who engage in more negative social comparisons when viewing another person's feed had less positive ($p = .001$) and more negative affect ($p = .039$). In comparison to viewing highlight reels on Instagram, individuals high in social comparisons were less likely to experience negative affect when they were reminded of the bias towards sharing positive information, $p = 0.009$, or viewed more balanced feeds, $p = 0.015$.
Hunt et al. (2018)	143	No mean Age range 18-28 with only one	76	USA	Facebook, Instagram and Snapchat	Three weeks	Restricted use	BDI and the Spielberger State-Trait	The limited use group showed reductions in depression in comparison to the group who continued using as usual, $p < .05$. Restricting usage was most impactful at reducing levels of depression with those who had higher baseline levels of depression, $p < .001$

		participant over 22.						Anxiety Inventory	Both the control and the experimental group showed significant reductions in levels of anxiety, p = .004 and p = .016 respectively.
Kenney (2018)	76	~ 19	75	USA	Facebook	30 minutes	Active vs passive use Locus of engagement	PANAS	There was no difference found between active or passive Facebook use on mood, p = .26, $\eta p2$ = .02. There was no significant difference found between self or other orientated locus of engagement on Facebook on mood, p = .93, $\eta p2$ = .0001.
Ward (2018)	82	16.02	73	USA	Facebook and Instagram	10 minutes	Platform comparison	CES-D	There was no difference between exposure to Facebook, Instagram or control on depression, p=.56, $\eta 2$ =.02.
Yuen et al. (2019)	312	18.80	79	USA	Facebook	20 minutes	Active vs Passive Locus of engagement	PANAS	Using Facebook, in comparison to the internet, resulted in significantly lower mood, p =.01, ηp2 = .02. There was a significant effect of type of engagement with Facebook, p =.02, ηp2 = .03, with passive use resulting in significantly lower mood than browsing the internet. There were no significant differences between active and passive use on mood (p > .05). There was a significant effect of activity on perceived meaningfulness, p = .01, ηp2 =.09, with Facebook perceived as less meaningful than internet use.
Mosquera et al. (2020)	167	20.59	N/A	USA	Facebook	One week	Restricted use	Depression on a scale of 0-10	Not using Facebook for a week, in comparison to usual use, significantly reduced levels of depression (p < .05). However, this effect was only present among male participants. There was a trend towards engagement in healthy activities following Facebook restriction (p < .10).
de Vries et al. (2018)	130	21.40	81	Netherl ands	Instagram	Not determined	Type of content	PANAS	For those high in social comparison orientation viewing strangers' positive Instagram posts, in comparison to no or neutral posts, led to less positive affect (p = .037). For those low in social comparison orientation viewing positive posts resulted in significantly more positive affect than viewing no or neutral posts (p = .037).

Two studies focused on multiple SNS: Hunt et al. (2018) focused on Facebook, Instagram and Snapchat and Ward (2018) focused on Instagram and Facebook. The remaining studies were conducted on single platforms, with Facebook being the most studied platform (n = 7) and two studies focusing on Instagram. All studies were conducted using randomised between-subjects experimental designs.

All of the studies included in the review focused on the impact on using SNS on participants' mental health. In terms of mental health outcomes, six studies included measures of depression and three used existing measures. Two studies used the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) and one used the Beck Depression Inventory (BDI-II; Beck et al., 1996). Three studies used single item rating scales to measure depression/negative mood. Only one study included a measure of anxiety, alongside depression, this measure was the Spielberger State-Trait Anxiety Inventory (Spielberger et al., 1970). The most common measure, used in five studies, was the PANAS (Watson et al., 1988). Whilst the PANAS focuses on measuring positive and negative affect, demonstrating good validity and internal reliability (Crawford & Henry, 2004), the positive affect (PA) scale has demonstrated strong negative correlations with depression measures and the negative affect (NA) scale has shown strong positive correlations (Díaz-García et al., 2020).

The time frame of studies varied between shorter periods of engagement with SNS to longer periods of varying the frequency of using SNS. Three studies focused on reducing the frequency of use of, or not using, SNS over a longer time frame between one to three weeks (Deters & Mehl, 2013; Hunt et al., 2018; Mosquera et al., 2020). The remaining eight studies focused on shorter exposure periods, ranging from five to 30 minutes, although one study did not specify the time frame

(de Vries et al., 2018). Of these eight studies the focus of the manipulation varied, with some focusing on more than one aspect of use. Three focused on comparing active vs passive use of SNS, two focused solely comparing passive browsing on SNS to other non-social media stimuli (e.g., other websites or magazines), three examined the locus of use on SNS, two looked at the type of content looked at on SNS and one compared two different social network site platforms.

Quality analysis

The majority of papers were rated has high quality (n = 9). The main reasons for losing points on the quality index were the method of subject selection, the lack of description of the process of random allocation, the lack of reporting of effect sizes and the attrition rate. In terms of subject selection, the majority of studies used convenience sampling methods to recruit undergraduate students (n = 8). The quality assessment summaries are presented in Table 3.

The amount of SNS use

Three studies examined the impact of restricting or changing the frequency of using SNS on participants' mental health (Deters & Mehl, 2013; Hunt et al., 2018; Mosquera et al., 2020). Of these, Hunt et al. (2018) and Mosquera et al. (2020) reported a positive effect of restricting the use SNS on mood, indicating that reducing levels of use may have a beneficial impact on depression. In contrast to restricting the use of SNS, increasing the frequency of posting on Facebook was not found to impact levels of mood (Deters & Mehl, 2013). However, in comparison to usual levels of use, Deters and Mehl (2013) found that participants who posted more on Facebook experienced fewer feelings of loneliness.

Specifically, Hunt et al. (2018) found that participants who restricted their Facebook, Instagram and Snapchat use for three weeks to 10 minutes a day each, showed

significant decreases in their levels of depression and loneliness, compared with those who continued as usual. The results highlighted that restriction most significantly reduced depression for those with higher levels of baseline depression. However, it is notable that this finding could be due to a floor effect (i.e., those with lower levels of depression at the start could not get any lower across the course of the study). Reductions in anxiety were observed in both groups after three weeks, which may be accounted for by the increased self-monitoring of use; however, this was not tested. Similarly, Mosquera et al. (2020) found that participants who stopped using Facebook for a week showed a reduction in their levels of mood and a trend towards an increase in engagement with healthy daily activities, compared to those who continued with usual use. However, when gender differences were explored this effect only remained for male participants.

Together, these findings suggest that reducing the use of SNS may have a positive impact on mood, reducing levels of depression. This pattern was consistent across both studies (Hunt et al., 2018; Mosquera et al., 2020), using different SNS platforms, time frames and measures of low mood. The results emphasize heterogeneous responses to SNS restriction, with the reduction in depression influenced by individual differences; specifically, those higher in depression and being male were found to have a greater influence on levels of depression after SNS restriction. However, given the low-quality rating of Mosquera et al. (2020) the finding about gender should be interpreted cautiously.

Table 3

Summary of evaluation of the quality of the studies

Study	RQ/objective stated	Study design appropriate	Participant selection	Study population defined	Randomisation	Blinding of investigators	Blinding of participants	Well defined outcome and exposure measures	Sample size justification	Analytic method appropriate
Deters and Mehl (2013)	2	2	1	2	1	N/A	N/A	2	2	2
Fardouly et al. (2015)	2	2	1	2	1	N/A	N/A	1	1	2
Verduyn et al. (2015) study 1	2	2	1	2	1	N/A	N/A	1	2	2
Vogel et al. (2015) study 2	2	2	1	2	1	N/A	N/A	2	2	2
Weinstein (2017)	2	2	2	2	2	N/A	N/A	2	2	2
Hunt et al. (2018)	2	2	1	2	1	N/A	N/A	1	2	2
Kenney (2018)	2	2	1	2	1	N/A	N/A	2	1	2
Ward (2018)	2	2	1	2	1	N/A	N/A	2	0	2
Yuen et al. (2019)	2	2	1	2	1	N/A	N/A	2	2	2
Mosquera et al. (2020)	1	2	0	1	1	N/A	N/A	1	0	1
de Vries et al. (2018)	2	2	1	2	1	N/A	N/A	2	2	2

Table 3
Continued

Study	Estimate of variance for main outcomes	Controlled for confounding	Results in sufficient detail	Conclusions supported by results	Measure of effect size for main outcomes	Outcomes assessed using valid and reliable measure of anxiety or depression	Complete outcome date	Adherence to protocol	Overall quality score	Rating
Deters and Mehl (2013)	2	2	2	2	2	2	1	2	90.63%	high
Fardouly et al. (2015)	2	2	2	2	0	0	0	2	68.75%	medium
Verduyn et al. (2015) study 1	2	2	2	2	2	0	0	2	78.13%	high
Vogel et al.(2015) Study 2	2	2	2	2	2	1	2	1	87.50%	high
Weinstein (2017)	2	2	2	2	0	1	1	1	84.38%	high
Hunt et al. (2018)	2	2	2	2	0	2	0	1	75.00%	high
Kenney (2018)	2	2	2	2	2	1	2	2	87.50%	high
Ward (2018)	2	2	2	2	2	2	2	1	84.38%	high
Yuen et al. (2019)	2	2	2	2	2	1	2	1	87.50%	high
Mosquera et al. (2020)	2	1	1	2	0	0	1	2	50.00%	low
de Vries et al. (2018)	2	2	2	2	0	1	2	2	84.38%	high

Active and passive use of SNS

Three studies examined the difference between active (e.g. posting own content or communicating with others) and passive (e.g. viewing posts or browsing without communicating) use of Facebook (Kenney, 2018; Verduyn et al., 2015; Yuen et al., 2019). These studies all utilised synonymous definitions of active and passive use, instructing participants to either create content or communicate with others on Facebook or to browse material on Facebook. Verduyn et al. (2015) examined the impact of actively versus passively browsing Facebook for 10 minutes on participants' mood. Immediately after browsing Facebook they found no differences between participants' mood, however at the end of the day those who passively used Facebook showed a significant drop in their mood. Similarly, Yuen et al. (2019) studied the difference on Facebook between participants who browsed the internet for 20 minutes versus those who used Facebook to passively browse, actively communicate with others, or actively update their own profile. The findings demonstrated that in comparison to browsing the Internet, using Facebook resulted in significantly lower positive mood, particularly when passively browsed. However, it is notable that Yuen et al. (2019) did not find any significant difference between active and passive Facebook use on levels of mood. Yuen et al. (2019) also examined the role of perceived meaningfulness of activity and envy as mediators in the relationship between online activity and mood. Levels of envy did not differ between groups; however, Facebook was perceived as a less meaningful activity than using the internet, which in turn resulted in lower positive mood. Kenney (2018) did not find any differences in mood between participants who used Facebook actively or passively for 30 minutes. However, these results should be interpreted with caution given the small sample size in this study.

Two studies focused solely on passive use of SNS (Fardouly et al., 2015; Vogel et al., 2015) and one study only examined active use (Deters & Mehl, 2013). Fardouly et al. (2015) compared female participants who passively browsed Facebook, a fashion magazine, or a homeware site for 10 minutes. They found that spending time on Facebook, in contrast to the control websites, resulted in lower levels of mood. The study also found that appearance related social comparison tendency did not moderate the effect of Facebook use on mood; however, women higher in appearance comparison tendency noted more appearance-related discrepancies after browsing Facebook than exposure to the control website. Using a comparable study design Vogel et al. (2015) examined the differences between participants assigned to passively browse the profile of an acquaintance, their own profile, or to read a product review for five minutes. No significant differences in mood were found between viewing an acquaintances profile and the non-Facebook control group. However, individuals high in social comparison orientation (SCO), compared with those low in SCO, were found to have more negative mood after viewing an acquaintances' profile in comparison to their own or a non-Facebook control. Contrastingly, Deters and Mehl (2013) examined the role of active Facebook usage, assigning participants to either post more or continue with normal use for a week. Posting more did not impact participants' levels of depression; however, it did reduce levels of loneliness, which was found to be mediated by an increase in feelings of social connectedness. It is important to note that all of these studies focused on Facebook and used university samples, which may limit the generalisability of the results.

Taken together these findings suggest that passively using SNS may have a negative impact on adolescents' mental health, especially when compared to engaging in other activities on the internet. In terms of the difference between active and passive use on mood, the findings are less clear with two studies finding no

difference between these types of use (Kenney, 2018; Yuen et al., 2019) and one highlighting a negative impact of passive relative to active use (Verduyn et al., 2015). However, with so few studies it is not possible to draw definitive conclusions. Verduyn et al. (2015) found a delayed, but not immediate, effect of passive use of SNS on mood, which was inconsistent with the other findings, which found an immediate change in levels of mood (Fardouly et al., 2015; Yuen et al., 2019). It is also notable that Verduyn et al. (2015) did not include a non-SNS control group, which might have masked an immediate effect.

Additionally, Vogel et al. (2015) did not find an overall difference between levels of mood after passively viewing Facebook in comparison to viewing a control condition. It is possible that a 5-minute exposure was not sufficient in length to produce a change in mood; however, the results also highlight the role of social comparisons as a potential moderator in the relationship between Facebook use and low mood. Whilst Fardouly et al. (2015) found that appearance tendency comparison did not moderate the effects of Facebook use on mood, it might be that appearance tendency comparison is too narrow a category and drawing social comparisons across multiple domains are required to witness an impact mood. On the other hand, these findings suggest that actively using Facebook does not negatively impact mood and may have a positive effect, for example by increasing feelings of social connectedness and thereby reducing feelings of loneliness (Deters & Mehl, 2013).

Locus of attention on SNS

The locus of use refers to the focus of participants' attention whilst using SNS, for example self-oriented locus involves viewing one's own profile. The locus of use was examined in three studies (Kenney, 2018; Vogel et al., 2015; Yuen et al., 2019). Vogel et al. (2015) found that participants who passively viewed the Facebook

profile of an acquaintance for five minutes, in contrast to those who viewed their own profile, had significantly lower mood (less positive affect). In addition, the study identified a role for SCO when viewing the profile of an acquaintance, with those high in SCO reporting lower mood (i.e. greater negative affect), lower self-esteem and trait self-perceptions, in comparison to those who were low in SCO. When viewing one's own profile levels of SCO did not influence mood. Kenney (2018) found that the locus of Facebook engagement (self vs other-oriented) did not impact participants' levels of mood. However, this finding should be interpreted cautiously due to the small sample size and the study being underpowered (N = 76). Yuen et al. (2019) also included self vs other oriented dimension; however, they did not compare these conditions in their analysis. The study did find that viewing information posted by acquaintances, in comparison to viewing their own account or a control website, was associated with lower levels of mood (lower positive affect). Yuen et al. (2019) also examined the impact of viewing a current or former romantic partner on participants' mood. Findings highlighted that viewing a current partner's profile was associated with increased positive mood, whilst a former partner's profile was associated with lower levels of mood (greater negative affect).

Taken together these findings indicate that the locus of attention on SNS may influence adolescents' mental health, although this relationship appears to be influenced by a number of factors. Viewing other-oriented content, relative to self-oriented, seems to result in greater levels of low mood; however, the relationship appears to be influenced by whose profile is being viewed and the individual characteristics of the user. Given that these studies looked at slightly different dimensions, these results will require further replication. These studies were all conducted using university student samples and a single social networking site, which may also limit their generalisability.

The content viewed on SNS

Two studies examined the impact of the type of content adolescents are exposed to on SNS on mental health (de Vries et al., 2018; Weinstein, 2017). These tended to explore the role of positive versus negative or neutral feeds. Thus, Weinstein (2017) compared the impact of browsing Instagram feeds presenting only positive information, also known as 'highlight reels', the same feeds preceded by a prime reminding the user of the biased nature of the information shared, or more balanced feeds on secondary school students' mood. Overall, the condition did not influence participants' levels of mood; however, individuals who engaged in more negative social comparisons were found to have lower mood (less positive affect and more negative affect) after browsing. After viewing the highlight reel feed, in comparison to primed or more balanced feed, individuals low in SCO had better levels of mood (lower negative affect), whilst individuals who were moderate or high in SCO had worse levels of mood (greater negative affect). This finding highlighted that individuals who are more prone to drawing social comparisons may experience greater negative effects when using SNS; however, it also underlined that reminding individuals who are prone to drawing social comparisons of bias, or getting them to view more balanced feeds, may reduce the impact of exposure on mood.

In a similar study among university students, de Vries et al. (2018) studied the impact of viewing positive, negative or no Instagram posts. The findings showed a differential response for participants who were high or low in their SCO, with those higher in SCO reporting lower mood (lower levels of positive affect) after viewing strangers' positive posts, in contrast to neutral or no posts. Whilst those lower in SCO showed higher mood (greater positive affect) after viewing positive posts. The type of content viewed on Instagram (i.e., positive, neutral or no content) was not found to influence participants' levels of negative affect. These two studies point to the role of individual differences, specifically the extent to which individuals draw

social comparisons, in the relationship between using SNS and adolescents' mood. Individuals who are higher in their SCO are more likely to experience negative effects when using SNS, and this is particularly pertinent when they are exposed to only positive content, in comparison to neutral or negative feeds. These studies show consistent findings across two different age groups, lending further support for these findings. However, both studies were conducted on a single social networking site (Instagram), which may limit the generalisability of the findings to other platforms.

Does the platform used make a difference?

Two studies included multiple SNS (Hunt et al., 2018; Ward, 2018), however only one study compared usage across sites. Ward (2018) initially planned to examine the impact of active and passive usage across two platforms (Facebook and Instagram) on school age students' levels of depression. However due to a lack of adherence to the active or passive instructions, groups were collapsed into Facebook, Instagram and a control. Findings suggested that using SNS did not impact levels of depression and there were no differences between using Facebook or Instagram. These results should be interpreted cautiously however, given that the study was underpowered and was unable to examine the active vs passive dimension, which might have resulted in an effect being masked.

Discussion

In recent years the research base into the association between using SNS and young people's mental health has grown exponentially; however, a causal relationship has not yet been established and the quality of the research base has been criticised (Frith, 2017; Orben, 2020). This review is the first to examine

experimental research solely, with a view to understanding more about the potential causal role of using SNS in adolescents' mental health.

With respect to the studies included, depression was more commonly studied than anxiety, with only one study focusing on anxiety. The reasons for this are not clear, however as a result of this no conclusions can be drawn about the impact of using SNS on adolescents' anxiety. Future research should address this gap. In contrast, whilst there were some inconsistencies in the literature, the studies reviewed *did* point to a causal relationship between using SNS and symptoms of depression. However, the relationship between using SNS and depression does not appear to be a straightforward causal one. Instead, the association is highly nuanced and influenced both by individual user characteristics and patterns of engagement, as a number of authors have suggested previously (Adelantado-Renau et al., 2019; Baker & Algorta, 2016; Frost & Rickwood, 2017; Marino et al., 2018; Seabrook et al., 2016;).

The key factors influencing the relationship between using SNS and depression identified in this review are passive use, exposure to positive content on SNS, having a higher propensity to draw social comparisons, the quantity of use, and other-oriented locus of engagement. This review highlights the interacting nature of these factors and starts to build a picture of the nature of the relationship between using SNS and adolescents' mental health. Further, it supports the importance of moving towards a more nuanced and contextual approach to our understanding and investigation of the role SNS in adolescents' mental health that goes beyond mere levels of use (Keles et al., 2020; Orben, 2020; Seabrook et al., 2016).

Passive use of SNS

Considering types of use first, the findings suggest that passively using SNS may negatively impact on adolescents' levels of depression when compared to browsing the internet (Fardouly et al., 2015; Yuen et al., 2019), whilst active use was not found to have a negative impact on mood (Deters & Mehl, 2013; Verduyn et al., 2015; Yuen et al., 2019). Although engaging in passive use on SNS seems to have a more negative effect on mood in contrast to general internet use, when compared to active use the nature of this relationship is less clear. Only three studies directly compared active and passive use and two found no difference between these types of use on mood (Kenney, 2018; Yuen et al., 2019), however one of these was limited by its small sample size (Kenney, 2018). The remaining study found a detrimental impact of passive use relative to active use (Verduyn et al., 2015); interestingly however, this effect was only present at the end of the day (i.e. a delayed effect) and not immediately after the intervention. Given this was the only study to include a follow-up measure of mood later in the day, it is possible that passive use has a delayed negative effect on mood, relative to active use; this clearly warrants further investigation.

One possible explanation for the difference in findings between active and passive use may be that individuals are more likely to engage in social comparisons when passively using SNS, which has been supported by existing research (Verduyn et al., 2020). Thus, upward online social comparisons have been linked to poor mental health (Hwnag, 2019; Yoon et al., 2019), and the findings reported here suggest that an individual's SCO may moderate the harmful effect of passive use (de Vries et al., 2018; Vogel et al., 2015; Weinstein, 2017), with those highly prone to making social comparisons experiencing greater low mood (i.e. negative affect). However, it is notable that appearance related comparisons on their own were not found to moderate the effect of passive use on mood (Fardouly et al., 2015), suggesting

multiple domains of comparison may be involved. It would therefore be interesting for future research to investigate the nature of social comparisons across different domains (e.g. appearance, wealth, intelligence and success). In terms of the delayed effect of passive use on mood, it is possible that after viewing information on SNS individuals may spend time ruminating on this content. In the case of drawing upward social comparisons this may evoke feelings of low self-esteem or envy, which may have a detrimental impact on mood. Indeed, both greater envy and low self-esteem have been linked to drawing upward social comparisons on SNS (Li, 2019; Vogel et al., 2014).

Another explanation of the detrimental impact of passive, rather than active, use could be these activities are driven by separate motivations, and thus passive use may be perceived to be less meaningful than active use. For example, active use of SNS may be driven by a motivation to maintain social connection with peers, which has been identified as a key motivation for using SNS among adolescents (Barker, 2009). Furthermore, perceived social support from peers has been linked to lower levels of depression among young people (Frison & Eggermont, 2015). Although Deters and Mehl (2013) found no impact of actively posting more on Facebook on mood, they did find increased posting reduced feelings of loneliness and this was mediated by enhanced feelings of social connectedness.

Contrastingly, passive use of SNS may be motivated by a desire to reduce feelings of boredom and help to pass time (Pempek et al., 2009; Stockdale & Coyne, 2020). It is possible that this may have a detrimental impact on mood when individuals evaluate this behaviour, for example adolescents may worry about how much time they are spending on SNS (Jiang, 2018). Although Yuen et al. (2019) did not compare the perceived meaningfulness of active and passive use of Facebook, overall Facebook use was perceived to be less meaningful than general internet

use, and the perceived meaning of the activity was found to mediate the relationship between the online and activity and mood. This highlights the importance of further research exploring the type of activity engaged in on SNS, alongside examining motivations for use and the perceived meaningfulness of activity. Overall, it seems likely that different patterns of engagement with SNS have divergent effects on the mental health of adolescents. However, further research is necessary to clarify the precise nature of these relationships.

Exposure to positive content on SNS

Individuals are frequently exposed to positive content on SNS, because users tend to present the more positive aspects of their lives on these platforms (Reinecke & Trepte, 2014). Previous research has suggested that individuals who are more frequently exposed to this content believe that other people are happier and have better lives than themselves (Chou & Edge, 2012) and experience lower mood (Steers et al., 2014). However, the findings of this review highlight that exposure to positive content is not directly linked to an increase in depression among adolescents, rather the impact of positive content on mood depends on the individual's propensity to draw social comparisons. Following exposure to positive content on SNS individuals who were high in SCO showed an increase in their levels of depression, whilst the opposite was found among individuals who were low in SCO, who demonstrated improvements in their mood (de Vries et al., 2018; Weinstein, 2017).

Social comparisons

In terms of social comparisons, Festinger (1954) originally put forward social comparison theory suggesting that humans have an innate drive to evaluate themselves and thus compare themselves with other individuals. These comparisons may take the form of upward (i.e. comparing to people who are

perceived to be better on some dimension), or downward (i.e. comparing to people who are perceived to be worse on some dimension) social comparisons (Buunk & Gibbons, 1997), with upward comparisons suggested to result in negative evaluations of an individual's personal circumstances (Frison & Eggermont, 2016). The findings of this review suggest that individuals who are highly prone to drawing social comparisons are more likely to experience the negative effects of using SNS, particularly increased levels of depression (de Vries et al., 2018; Weinstein, 2017).

The results also suggest that other-orientated and positive content may increase the susceptibility of individuals who are high in SCO to draw upward social comparisons (de Vries et al., 2018; Weinstein, 2017). Intuitively, it makes sense that exposure to positive content on SNS, which has been carefully selected and often involves self-enhancing information about the user (Verduyn et al., 2020), may increase the likelihood of drawing upward social comparisons. Though not investigated in this review, it is also notable that the quantity of use may increase the likelihood of drawing such comparisons on SNS. For example, the more time individuals spend online, the more content they consume and thus the more likely they are to encounter content that may trigger upward social comparisons (Chou & Edge, 2012).

Other oriented locus of engagement on SNS

With respect to the locus of engagement, exposure to other-orientated content (i.e. viewing someone else's profile) emerged as a factor that may increase adolescents' levels of depression. However, this relationship appears to be influenced by individual user characteristics, such as SCO. Previous research has suggested that individuals are more likely to engage in social comparisons when viewing the profile of a stranger, as opposed to a friend, which has been associated with greater depression (Lup et al., 2015). Due to the limited number of studies examining this

dimension of use the findings in this review are tentative and require further research.

None of the studies in this review directly compared viewing the profile of a stranger, in comparison to a friend. However, the findings suggest that viewing the profile of an acquaintance results in greater levels of depression for individuals who are highly prone to drawing social comparisons (Vogel et al., 2015). This lends further support to the role of social comparisons in the relationship between using SNS and depression and suggests that viewing the profile of an acquaintance may increase the likelihood of users high in SCO drawing social comparisons. An explanation for this may be that when viewing the profile of a stranger, or acquaintance, distorted comparisons may be more prominent than when viewing a friend's profile because individuals do not have counterevidence to the content they are viewing. This explanation fits with Nesi et al.'s (2018b) transformation framework, which highlights how SNS have transformed adolescents' relationships. It proposes that the publicness of information on SNS allows individuals to interact with strangers to a degree that would not be possible offline. It also emphasises the asynchronicity of online communication, which allows users more time to further enhance the information they present (e.g. editing their photos).

The findings of this review highlight that viewing the profile of a current vs a former romantic partner also has a differential impact on mood, with viewing a former partner resulting in lower levels of mood (Yuen et al., 2019). It is possible that the greater low mood experienced when viewing a former partner's profile could be accounted for due to activation of negative emotions, such as jealousy, regret or anger. These emotions may be linked to the relationship or the breakup; however, there may be other factors that account for this effect.

Quantity of use

Previous research has suggested that the quantity of SNS use plays a role in mental health outcomes, with the results of systematic reviews and meta-analyses highlighting a small correlation between higher SNS use and greater levels of depression (Huang, 2017; McCrae et al., 2017; Verduyn et al., 2017). Taken together, the findings of this review provide some evidence to suggest that limiting the frequency of, or refraining from, SNS use may improve levels of depression (Hunt et al., 2018; Mosquera et al., 2020). However, the results suggest that it may in fact be more beneficial for individuals to adapt their pattern of use (e.g. engaging more actively rather than passively or unfollowing accounts which may trigger social comparisons), and/or for particular groups of individuals, e.g. those who are high in SCO, to limit their use of SNS.

Theoretical underpinnings and future research

In terms of theoretical underpinnings of this review, in addition to social comparison theory the results also lend some support to the rich-get-richer hypothesis (Kraut et al., 2002). The rich-get-richer hypothesis suggests that using SNS increases pre-existing offline differences between people, offering further benefits to those who are more sociable and increasing difficulties for individuals who are more vulnerable. Thus, this review points to the role of social comparisons in exacerbating pre-existing differences in mood after engaging in certain types of activity on SNS, with those higher in SCO more likely to experience depression after engagement with SNS. In contrast, individuals lower in SCO did not seem to experience a deterioration in their mood after engaging with SNS and may in fact experience improvements in their mood after viewing positive content. The findings suggest that restricting the use of SNS is most beneficial for individuals with the greatest levels of depression, which suggests that these individuals may experience greater negative effects from engaging with these platforms. However, it is possible that this finding

could be explained by floor or ceiling effects and therefore this finding warrants further investigation.

In terms of potential for future interventions this review points to the role of individual differences, particularly SCO, which emerged as a robust moderator and could be screened for and then targeted. An interesting finding from this review was that for individuals high in SCO who were found to experience greater depression after viewing positive SNS posts, reminding them of the biased nature of posts reduced their levels of depression. This highlights an avenue for future research and might form the basis of an intervention to reduce the harmful effects of SNS.

Limitations of the existing evidence base

Consistent with the infancy of experimental research in this field, this review only identified a small number of relevant studies. This may limit the generalisability of the findings and highlights the importance of further experimental research to address this gap in the existing literature. Furthermore, most of the studies in this review focused solely on one social networking site. The most studied platform was Facebook, which accounted for 77% of the papers in this review. Existing research has been criticised for its predominant focus on Facebook (Schønning et al., 2020) and therefore, it is not clear whether the findings of this review would apply to different platforms. Given separate platforms have been associated with different motivations for use (Alhabash & Ma, 2017), coupled with the decline in popularity of Facebook (Anderson & Jiang, 2018) and rise in popularity of other platforms, such as TikTok and Snapchat (Piper Sandler, 2020), it is important for future research to examine the effect of different SNS on adolescents' mental health.

Regarding the sample characteristics of the included studies, the majority of studies were conducted on highly educated university samples and were recruited using

convenience sampling methods, which means that the results may not necessarily represent the wider population group of adolescents. Only papers with a mean age of <24 years were included; however, this did not preclude some papers from including individuals over 24 years. Additionally, only two studies focused on school age populations, meaning this group was under-represented, and therefore it is not clear whether the observed relationships remain consistent across the full period of adolescence. Moreover, all of the studies in this review were conducted in Western countries, which suggests that the findings may not apply to different cultural settings.

The aforementioned limitations are consistent with more general criticisms of the research, including the social media and wider psychology research base. Previous research has identified that the majority of research participants are from Western, educated, industrialised and democratic (WEIRD) societies (Henrich et al., 2010). This is problematic because these participants are not representative of wider society, for example in terms of levels of education and socio-economic status, and therefore the results may be biased and less likely to generalise to other populations (Medin et al., 2010). Therefore, it is important that future research is conducted using samples that are representative of the wider population to ensure that findings can be generalised.

Strengths and limitations of this review

The results of this review contribute to the existing evidence base and provide evidence for a nuanced relationship between using SNS and adolescents' depression, influenced by a number of different factors including patterns of use, locus of use, inter-individual differences and the type of content viewed. The studies included were generally rated of high quality. Given the research base has previously been criticised for being low quality and cross-sectional in nature (Orben,

2020) this review has taken a step in the right direction towards understanding more about causality and the mechanisms underlying the relationship between using SNS and adolescents' mental health. Despite this, it is important to acknowledge the limitations of this review.

A key limitation of this review was the variability in the range of outcome measures used to measure depression. Out of the 11 studies, three used existing, and well-validated, questionnaires for depression. Of the remaining studies, three assessed mood using a single-item scale, rather than using a validated questionnaire and five studies used a well-established measure of affect, which has demonstrated strong correlations with measures of depression. The inclusion of single item scales may have introduced bias in the form of measurement error, because this type of assessment has been considered to have less reliability and sensitivity (Loo, 2002; Postmes et al., 2013). Therefore, this may reduce confidence in some of the findings. Due to the lack of research in this area, it was deemed that by excluding these studies a fair proportion of the research conducted in this area could be missed. Therefore, on balance it was felt that they should be included in the review. It is important to note that the quality of each measure was considered both in the quality assessment of each study and rated accordingly. In future, it would be recommended for studies to use the same measures or to include only validated and reliable measures of depression, such as the CES-D.

Additionally, all of the studies in this review used self-report measures for mental health symptoms, which may introduce social desirability bias as participants may wish to portray themselves in a good light. However, it is notable that all participants completed the same measures in each study and therefore this is unlikely to influence the patterns of findings in this review, rather this bias may create a systematic shift in scores across all conditions. Therefore, in future it is

recommended that in addition to self-report measures, data is also collected from other informants (e.g. parents or carers) to increase confidence in the findings. A further limitation of this review is that the assessment of study quality was conducted by a single reviewer, which limits the ability to calculate inter-rater reliability. Lastly, it is notable that one of the inclusion criteria was 'written in English language', which is likely to have biased the papers identified in the search.

Conclusions

This paper aimed to synthesise experimental research exploring the impact of using SNS on adolescents' mental health, with a view to understanding more about the nature of this relationship and identifying any underlying mechanisms. Due to the small number of papers included in this review and the varying scope and focus of the papers, the findings should not be taken as definitive answers in terms of understanding the relationship between using SNS and adolescents' mental health. Rather, they should be used to inform future research and add to emerging understandings in this area. Taken together the results point to a relationship between using SNS and depression among adolescents; however, the findings suggest that this is not a direct relationship and is influenced by both individual user characteristics and patterns of engagement with SNS. The results of this review suggest that using SNS may be harmful for the mental health of some, but not all, users and highlights some key factors that potentially influence this relationship. Due to a limited number of papers including anxiety as an outcome measure, no conclusions could be drawn about the impact of using SNS on anxiety in adolescents.

In support of Frost and Rickwood (2017), the results of this review highlight the importance of moving away from dichotomous research focusing on whether using

SNS is good or bad. Instead, this review points to the importance of further research focusing on the role of individual differences and patterns of engagement with SNS, which may increase or reduce the risk of the effects of use on adolescents' mental health. Additionally, the results highlight the importance of future research examining, and comparing, the effects of different social network platforms on adolescents' mental health.

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Part 2: Empirical Paper

Exploring a preliminary model of the impact of Social Networking Sites on young people's mental health during the Covid-19 pandemic

Abstract

Aims: The relationship between social media and young people's mental health remains unclear, with existing research criticised for lacking a theoretical framework. This study sought to test a preliminary model of the impact of using social networking sites (SNS) on young people's mental health in the context of Covid-19. The model hypothesised that patterns of use that connect users would be associated with better mental health and patterns that disconnect users would be associated with poor mental health.

Methods: 162 secondary school aged students between 11-17 years were recruited from two schools. Participants were invited to complete an online self-report battery of questionnaires that assessed their patterns of use on SNS and symptoms of depression, generalised anxiety and social anxiety.

Results: Supporting disconnecting patterns of use, greater use of SNS use was directly and indirectly (via engagement in upward social comparisons) related to higher symptoms of depression, social anxiety, and generalised anxiety disorder. Findings offered partial support for connecting patterns of use, with higher use associated with less bridging social capital, which in turn was associated with greater symptoms of depression.

Conclusions: This study is one of the first in this field to test a theory-driven model of using SNS among young people, focusing on patterns of use associated with mental health outcomes. The results address gaps in understanding and shed light on new directions for understanding mental health in the context of using SNS. Findings highlight a need for further experimental and longitudinal research to further examine underlying mechanisms and draw conclusions about causality.

Introduction

The digital revolution has dramatically changed our lives and ways of interacting with each other, with social media use becoming increasingly pervasive in society. A recent report (Kemp, 2021) identified that presently there are 4.2 billion users of social media worldwide, representing more than 53% of the world's total population and a 13% increase over the last 12 months. Matching the trend of increased usership, people are also spending more time on social media (Twenge et al., 2019), with the average user spending 143 minutes per day (Mander & Kavanagh, 2019).

The most prolific users of social media are young adults and adolescents (Chen, 2020; Office for National Statistics, 2019). Social media plays an integral part in adolescent life, serving a key role in social lives, education and culture (Allen et al., 2014). However, with usage patterns significantly evolving, concerns have arisen about the implications of use and the risks adolescents are exposed to (Boyd, 2014). For example, a National Society for the Prevention of Cruelty to Children report (Lilley et al., 2014) highlighted that over a quarter of adolescents have experienced an upsetting experience online.

Defining social media

As much of the research on social media focuses on SNS, these terms are sometimes used synonymously, but there are important distinctions. The precise definition of social media has been debated; however, Obar and Wildman (2015) describe social media as Web 2.0 internet-based applications where users have user-specific profiles and generate their own content, which are designed to facilitate connection with others. Therefore, social media covers both messenger applications (such as WhatsApp), as well as SNS (such as Instagram). SNS may be

viewed as a subcategory of social media and have been defined as networked-communication platforms that allow users to: (1) construct uniquely identifiable profiles within a bounded system; (2) publicly articulate a list of connections that may be viewed by others; and (3) consume, generate and engage with content produced by their connections (Boyd & Ellison, 2007).

The relationship between SNS and mental health in young people

The existing research base paints a mixed picture of the relationship between using SNS and mental health in young adults and adolescents. Greater use of SNS has been linked to increased symptoms of depression and anxiety, lower self-esteem, subjective well-being, poor sleep and impaired academic performance in cross-sectional research (Espinoza & Juvonen, 2011; Kirschner & Karpinski, 2010; Kross et al., 2013; Lin et al., 2016; Woods & Scott, 2016). In addition, experimental studies examining restricting the use of SNS have found that reduced usage led to improvements in life satisfaction and lower levels of depression (Brailovskaia et al., 2020; Tromholt, 2016).

On the other hand, some research has found no associations between using SNS and symptoms of anxiety and depression (Jelenchick et al., 2013; Jensen et al., 2019; Stockdale & Coyne, 2020). Others have highlighted favourable outcomes of use, such as greater life satisfaction, subjective well-being and reduced loneliness (Pittman & Reich, 2016; Valenzuela et al., 2009). In general, the findings of systematic reviews and meta-analyses highlight a small positive association between using SNS and mental health (Keles et al., 2020; Marino et al., 2018; Piteo & Ward, 2020); however, they also highlight mixed findings within the evidence base and suggest that the relationship is too complex to discuss in terms of associations (Keles et al., 2020; Orben, 2020). One possible explanation for the mixed findings

within the evidence base, is that the relationship between using SNS and mental health encompasses both negative and positive effects (Arampatzi et al., 2018).

Critiques of the existing research base

The media frequently reports on the negative aspects of using SNS, a recent example being a Netflix documentary, *'The Social Dilemma'* (Orlowski, 2020). However, within the academic literature the relationship between using SNS and mental health is much more debated, and the risks and benefits are poorly understood (Frith, 2017; O'Reilly et al., 2018; Schønning et al., 2020). The current evidence base has been criticised for being mostly cross-sectional in nature, and therefore unable to draw conclusions about causality, as well as lacking in the inclusion of confounding factors (Best et al., 2014; Schønning et al., 2020). Furthermore, the evidence base predominantly focuses on screen-time, which has been criticised for assuming that this is the only factor involved in the relationship between using SNS and mental health (Kaye et al., 2020; Whitlock & Masur, 2019). Related to this critique, the importance of examining other factors alongside screen-time, such as patterns of using SNS and motivations for use has been highlighted (Adelantado-Renau et al., 2019). Additional criticisms include being 'concern centric' (Orben et al., 2020), an overall under reliance on theoretical frameworks (Frost & Rickwood, 2017; Odgers & Jensen, 2020) and an over reliance on non-standardised and self-report measures (Kaye et al., 2020).

Recent reviews emphasise that the relationship between using SNS and mental health appears to be nuanced, such that whether the effects are positive or negative may depend on patterns of use, rather than quantity of use (Baker & Algorta, 2016; Frost & Rickwood, 2017; Keles et al., 2020; Marino et al., 2018; Seabrook et al., 2016; Yoon et al., 2019). These reviews highlight that SNS seem to benefit users when they are used to facilitate social connections, engage in positive interactions,

and to access social support, and are linked to detrimental effects when users engage in excessive use or draw social comparisons. These usage patterns may be considered to be '*connecting'* or '*disconnecting'*. For example, the interpersonal-connections-behaviours framework (ICBF; Clark et al., 2018) proposes that the impact of using SNS on well-being is dependent on the extent to which it encourages, or discourages, meaningful social connections. In line with the findings of recent reviews, the ICBF suggests that connecting patterns of use (e.g. interpersonal interactions between users) have a beneficial impact on well-being, whilst disconnecting patterns of use (e.g. social comparisons) have a detrimental impact (Clark et al., 2018).

Disconnecting patterns of use

Festinger (1954) suggested that humans have an innate drive to evaluate themselves and thus compare themselves with other individuals, a process termed social comparison. Two primary types of social comparison exist, namely upward and downward social comparisons (Buunk & Gibbons, 1997; Wood, 1989). Upward comparisons occur when people compare themselves to individuals whom they believe to be superior to themselves on a certain dimension (e.g. wealth or attractiveness), while for downward comparisons the reverse is the case. Modern technologies and SNS have shifted several social relations from the private to the public domain (Nesi et al., 2018; Subrahmanyam & Greenfield, 2008), which has transformed the scale over which social comparisons can be made. Social comparisons require information about others; therefore, SNS provide frequent opportunities for this, as comparison information is more readily available (Haferkamp & Krämer, 2011).

Humans have a tendency to share positive information about themselves (Bond & Anderson, 1987). SNS give people time to consider what they share, further

enabling them to share more positive information (Verduyn et al., 2015) and present themselves in an overly flattering way (Newman et al., 2011; Vogel et al., 2014). These positivity biases may trigger upward comparisons in those receiving the information and amplify perceived disparities in status. Chou and Edge (2012) found support for this hypothesis, finding that individuals with greater Facebook usage were more likely to report that others were happier and had better lives. Additionally, the visual nature of SNS may be particularly pertinent during adolescence, because at this time individuals are highly aware of their own, and their peers', appearance and therefore they tend to make more appearance related social comparisons (de Vries et al., 2016). In addition to the visual nature of interactions on SNS, Nesi et al. (2018) proposed the transformation framework in relation to adolescent interactions on SNS. This framework posits a number of factors, including the permanence, public-nature and availability of information on SNS, which are suggested to have transformed adolescent interactions and may increase the likelihood for social comparisons to be drawn (Nesi et al., 2018).

Research highlights individual differences in the propensity to draw social comparisons, with those higher in social comparison orientation found to use SNS more excessively (He et al., 2020; Vogel et al., 2015). The type of social comparison being made also plays a key role, with upward social comparisons associated with greater levels of depression and downward social comparisons linked with lower levels of depression (Hwnag, 2019; Weinstein, 2017). However, the association between drawing upward social comparisons, as opposed to downward comparisons, and depression is more robust (Yoon et al., 2019), being more commonly researched. Drawing social comparisons on SNS has been found to partially mediate the relationship between the amount of time spent on SNS and depression in both cross-sectional (Hwnag, 2019) and longitudinal research (Steers et al., 2014). Experimental research has found that individuals who engage in more,

in contrast to those engaging in fewer, negative social comparisons on SNS present with lower mood and self-esteem after usage (Vogel et al., 2015; Weinstein, 2017). These findings suggest that the negative impact of engaging in social comparisons may depend on any individual's disposition to drawing such comparisons.

Connecting patterns of use

During adolescence, peer relationships are particularly important (Blakemore, 2018) and SNS are mostly used to interact with peers (Nesi et al., 2018). Using SNS has been found to support the development of relationships and facilitate the acquisition and maintenance of social capital (Ahn, 2012; Appel et al., 2020; Ellison et al., 2007). Social capital is a term used to describe the benefits individuals gain from their social relationships with others (Lin, 1999). Such resources, once obtained, can provide social and psychological benefits to the user (Williams, 2006). For example, in an experimental study Deters and Mehl (2013) found that greater SNS use increased feelings of social connectedness, which in turn reduced feelings of loneliness.

Social capital can be classified into two main categories: bridging and bonding (Putnam, 2000). Bonding social capital exists *within* "strong ties", such as relationships with friends and family, and is characterised by a sense of belonging. While bridging social capital describes connections *between* heterogenous groups, often known as "weak ties", which facilitate the exchange of resources and information (Pelling & High, 2005). These two categories are not mutually exclusive, however, Putnam (2000) having noted that bonding social capital supports individuals in "getting by", whilst bridging assists individuals in "getting ahead".

SNS enable users to create and maintain large social networks, which supports the accumulation of bridging social capital (Donath & Boyd, 2004). Research has also

highlighted that SNS may be used to enhance close offline relationships, which form the basis for bonding social capital (Ellison et al., 2011). In a study of adolescents, time spent on SNS was found to be associated only with greater bridging social capital, while the valence of interactions on SNS, in particular having more positive interactions, was only related to bonding social capital (Ahn, 2012). However, a recent meta-analysis found that using SNS was linked with both bridging and bonding social capital, although the association was slightly higher for bridging (Liu et al., 2016).

In terms of bonding social capital, communicating with strong ties online has been found to be associated with greater wellbeing in cross-sectional research (Valkenburg & Peter, 2007) and enhanced self-esteem in experimental studies (Wilcox & Stephen, 2012). Similarly bridging social capital has been associated with greater well-being in cross-sectional research, with findings suggesting that having more Facebook friends and greater network heterogeneity (networks involving communication and interaction with more heterogenous individuals) was associated with enhanced well-being (Kim & Kim, 2017; Kim & Lee, 2011). The beneficial effects of social capital on children and adolescents' mental health have also been supported in a systematic review, which found that having both greater family social capital (e.g. the quality of parent-child relations) and community social capital (e.g. peer relations) was associated with better mental health and fewer behavioural problems (McPherson et al., 2014). However, a recent longitudinal study suggested that the impact of social capital may vary based on the amount of social capital possessed by the user; for individuals with lower social capital greater use of SNS increased levels of depression, whilst for those with higher social capital it reduced loneliness and increased network size, which in turn enhanced life satisfaction (Yoo & Jeong, 2017). This is also known as the rich-get-richer hypothesis (Kraut et al.,

2002), which proposes that individuals with strong social skills and social networks gain the most from using SNS.

Mental health and the use of SNS in the context of the Covid-19 pandemic

Severe acute respiratory syndrome coronavirus 2, the virus that causes Covid-19, was discovered in December 2019 (Synowiec et al., 2021). Since then, Covid-19 has spread rapidly and resulted in a high number of fatalities globally (Sanders et al., 2020). The World Health Organisation [WHO] (World Health Organisation, 2020a) declared the Covid-19 outbreak a global pandemic on the 11th of March 2020. In the UK, this led to a national lockdown on the 23rd of March, which included the closure of schools, hospitality and introduced requirements for physical distancing and mask wearing (Han et al., 2020).

There have been widespread concerns about the impact of physical distancing on mental health (Holmes et al., 2020) and understanding the immediate and long-term impact of Covid-19 on mental well-being has been highlighted as a research priority (O'Connor et al., 2020). Emerging evidence in the context of the pandemic, from systematic reviews and meta-analyses, has highlighted elevated rates of anxiety, depression and stress across different countries (Rajkumar, 2020; Salari et al., 2020; Vindegaard & Benros, 2020). School closures have been found to have a considerable impact on the mental and physical well-being of adolescents, with a recent systematic review suggesting a greater negative impact among children from deprived backgrounds (Viner et al., 2021). Viner et al. (2021) reported evidence of higher rates of anxiety and depression, as well as greater screen-time and reduced physical activity. In another review, increased levels of social isolation and loneliness, which are likely to co-occur with disease containment measures, have been linked to greater risk of anxiety, depression and suicidal ideation (Loades et al., 2020).

The use of SNS significantly increased during the pandemic (Fischer, 2020). During this period spending more time on SNS has been associated with greater depression and suicidal ideation among adolescents (Murata et al., 2021), as well as elevated levels of anxiety and stress in young adults (Ahmad & Murad, 2020; Hoyt et al., 2020). Furthermore, stress related to the pandemic has been linked with increased SNS use (Pahayahay & Khalili-Mahani, 2020). However, SNS have also been used to stay connected with others in the context of the physical restrictions imposed by Covid-19 (Wong et al., 2020). During this time adolescents have turned to SNS to try to cope with feelings of loneliness and anxiety (Cauberghe et al., 2020).

Aims

In line with the demand for more sophisticated approaches to understanding the use of SNS (Prinstein et al., 2020), this research sought to test a preliminary model of using SNS on mental health among young people in the context of the Covid-19 pandemic. Drawing on the ICBF (Clark et al., 2018), the model proposes that connecting patterns (i.e. social capital) of use are associated with positive mental health and disconnecting patterns of use (i.e. upward social comparisons) are associated with negative mental health. Specifically, the primary hypotheses tested were:

H1: High levels of upward social comparisons will partially mediate an association between time spent on SNS and symptoms of depression. That is, the harmful effects of SNS on depression will be mediated by practices that leave individuals feeling more isolated.

H2 and H3: Bridging (H2) and bonding (H3) social capital will partially mediate an association between time spent on SNS and symptoms of depression. That is, the

effects of SNS on depression will be mediated by practices that bridge social divides and facilitate building and maintaining social connections with others.

In comparison to depression, social anxiety and GAD have received less attention in this area of research. Therefore, secondary hypotheses will explore whether findings described in H1-H3 hold for symptoms of social anxiety and GAD as outcome variables. Understanding how different patterns of using SNS influence young people's well-being is essential, as this will facilitate the future development of interventions and guidelines that will inform healthy use of such technologies. It also falls in line with current Government priorities (House of Commons Science and Technology Select Committee, 2019).

Methods

Recruitment and data collection

Ethical approval was granted for this study by the University College London (UCL) Research Ethics Committee (see Appendix 4). Participants were adolescents and children aged between 11 to 17 in Years 7 to 12 who were recruited from two secondary schools in London, capturing a broad demographic and socioeconomic population sample. For inclusion in the study participants were required to be students at one of the two schools and to consent, or assent, to take part. There were no exclusion criteria for participation; however, students were not contacted if their parents opted out of the research. A two-stage consent process was adopted: initially an opt-out parental consent process was undertaken, followed by an active student consent procedure.

The data collected in this study formed the baseline of a longitudinal study, conducted by another trainee clinical psychologist (Lois Miller). Therefore, as part of

the consent process participants where asked whether they were happy to be contacted to take part in the longitudinal component of this research. Using existing online communication networks within the school that had been established to support remote teaching during the pandemic, pupils and their parents, or carers, were provided with information sheets about the study (see Appendix 1). Parents were also provided with information about how to opt-out with respect to their child's participation and were given a two-week window to do so by email (see Appendix 2).

The questionnaire was circulated in September 2020, when students had temporarily gone back to school for the first time since the initial lockdown in March. Eligible students were given a link that directed them to the information sheet, the consent page on the REDCap (Research Electronic Data Capture) questionnaire platform (Harris et al., 2009) and the questionnaire. The questionnaire included a series of standardised validated questionnaires, as well as custom-written questions asking about demographic information and the use of SNS. To manage any potential risk, at the end of the questionnaire participants were asked if they were concerned about their own, or someone else's, well-being and were able to request to be contacted by a member of the research team. Participants were also provided with a list of resources focusing on maintaining well-being and signposting to additional resources, including emergency and crisis services. To identify any participants who scored above the clinical threshold for depression, participants' scores on the Major Depressive Disorder (MDD) subscale of the Revised Children's Anxiety and Depression Scale (R-CADS; Chorpita et al., 2000) were examined within 24 hours of completing the questionnaire. The threshold for risk on the RCADS was calculated using normative data considering participants' age and gender (Chorpita et al., 2000). To ensure participants confidentiality and anonymity were preserved, all identifiable information was stored separately on a password-

protected database located on the UCL Data Safe Haven. Anonymous unique identifier codes were generated for each participant to link pseudonymised databases and identify individuals to be contacted where risk was identified. This thesis was undertaken as part of a joint project, alongside another trainee clinical psychologist whose thesis focused upon exploring motivations for social media use (Bowri, 2021; Appendix 3).

Measures

Data was gathered on participant demographics, social media use and mental health. A copy of the full survey can be found in Appendix 5.

Demographics

Basic demographic information was collected including date of birth, gender, ethnicity and school year.

Social media use

To assess the nature of social media use, a series of questionnaires were administered based on standardised questionnaires commonly used in previous research. However, since most previous research in the field of social media has focused on individual social network platforms, such as Facebook (Sigerson & Cheng, 2018), questionnaires were adapted to enable a broader focus on cross-platform use (e.g. by substituting the word “Facebook” with “social media”), as has been described previously (Raudsepp, 2019; Worsley et al., 2018). Participants were asked: (i) if they used social media, and if they did not whether they could indicate why, (ii) to record up to three social media platforms they used most frequently, and (iii) approximately how much time per day, as an average across the

past week, they had spent on social media (less than 10 minutes, 10-30 minutes, 1-2 hours, 3-5 hours or more than 5 hours).

Social capital

To characterise the extent to which participants use SNS to build social capital an adapted version of the Internet Social Capital Scale (ISCS; Williams, 2006) was used. Since the publication of the ISCS fewer than 10% of studies have used the original version and most have used a revised version with ten items (Appel et al., 2014). Five items were used to measure bonding social capital and five for bridging; these have previously been used with an adolescent population and adapted to reflect the social media context (Ahn, 2012). Sample items from the bridging and bonding scales were “talking with people on social media makes me feel part of the larger community” and “there are people who I interact with on social media who I trust to solve my problems” respectively. Both subscales used a four-point Likert scale, ranging from 1 (*strongly disagree*) to 4 (*strongly agree*), with higher scores indicating greater social capital. A reliability analysis calculated for this study showed acceptable levels of internal consistency for the bridging (Cronbach’s $\alpha = .76$) and bonding scales (Cronbach’s $\alpha = .72$).

Social comparisons

Two questions adapted from Vogel et al. (2014) were used to assess the extent to which participants engage in online social comparative processing. These statements were “when comparing yourself to others on social media, to what extent do you focus on people who are [better off / worse off] than you?”. The same two questions were also asked with respect to offline relationships (“when comparing yourself to others offline (i.e. not on social media but in day-to-day interactions), to what extent do you focus on people who are [better off / worse off] than you”).

Responses were given using a five-point Likert scale ranging from 0 (*not at all*) to 4 (*a great deal*), with higher scores representing greater social comparisons.

Mental health

Mental well-being was assessed using subscales of the Revised Children's Anxiety and Depression Scale (R-CADS; Chorpita et al., 2000), which is aimed at young people aged 8-18. Specifically, the Generalised Anxiety disorder (GAD), Social Phobia (SP) and Major Depressive Disorder (MDD) subscales were used, which correspond with the Diagnostic and Statistical Manual (DSM) diagnostic categories (Chorpita et al., 2000; de Ross et al., 2002). This scale has shown good psychometric properties in clinical and community samples, demonstrating strong convergent and discriminant validity, as well as reliability in the form of good internal consistency and temporal stability (Chorpita et al., 2000, 2005; de Ross et al., 2002; Muris et al., 2002). The GAD, SP and MDD scales consist of six, nine and ten questions, respectively, and items are rated on a four-point Likert scale, ranging from 0 (*never)* to 3 (*always*), with higher scores representing more severe symptoms. Reliability analyses calculated for this study demonstrated good levels of internal consistency for the GAD (Cronbach's α = .82), MDD (Cronbach's α = .88) and SP scales (Cronbach's α = .88).

Sample size

The required sample size to maintain good statistical power in path analysis and structural equation modelling remains a point of debate (Iacobucci, 2010) and there is no simple formula to calculate sample size (Pan et al., 2018). At present there is no consensus in the literature, with theorists variably recommending minimum sample sizes in the range of 100-200 (Anderson & Gerbing, 1988; Boomsma, 1985; Kline, 2005; Tabachnick & Fidell, 2001; Weston & Gore, 2006). However, a sample

of 100-150 participants is typically considered the minimum (Boomsma, 1985; Tabachnick & Fidell, 2001).

A number of researchers have, however, criticised such rule-of-thumb based approaches, highlighting the importance of considering other factors such as model complexity, i.e. the number of parameters used within the analysis (Wolf et al., 2013). This rule has been termed the N:q rule (Jackson, 2003) and suggests that the sample size should be 20 times the number of parameters within the model for a conservative estimate, with a minimum of 10:1. However, Schreiber et al. (2006) recommend 10:1 as a general rule and Bentler and Chou (1987) suggested that for normally distributed data an N:q ratio of 5:1 is acceptable. Applying the 10:1 recommendation to this study, the most complex model run contained 9 parameters, indicating a minimum sample size of 90.

Data analyses

Descriptives and data distribution

Preliminary data analyses were undertaken using SPSS version 27. Descriptive statistics were calculated to describe the sample and bivariate correlational analyses performed to examine first-order correlations between the key variables. One-tailed tests were undertaken because unidirectional predictions were made based on existing research. Checks were performed to assess for univariate normality, including skewness and kurtosis, an examination of Q-Q plots and histograms, and Shapiro-Wilk tests. Scatterplots were used to examine linearity and identify any significant outliers. Values within the range of -2/+2 for skewness and kurtosis were considered to be acceptable (George & Mallery, 2010) and all variables fell within this range. However, the Shapiro-Wilk's tests were significant for all variables indicating that the distributions did not meet the assumption of normality. This was supported by an examination of the Q-Q plots and histograms.

Therefore, non-parametric tests were undertaken and reported throughout. Spearman's Rho correlation coefficients were conducted and reported for bivariate correlational analyses. Mann-Whitney U tests were undertaken to test for differences between users and non-users of social media and Likelihood-Ration chi-square tests were undertaken when the assumptions focusing on expected counts were violated.

Path analyses

To test the mediation hypotheses, a series of path analyses were conducted using the R package Lavaan (Rosseel, 2012). Path analysis is a method that, in comparison to multiple regressions, enables simultaneous testing of many regression paths between multiple predictor and outcome variables, as well as the calculation of indirect, direct and total effects. In this study the direct effects reflect pathways running directly from SNS use to mental health outcome variables (depression, GAD or social anxiety), with indirect effects running through intermediate mediator variables (upward social comparisons, bridging social capital and bonding social capital).

Prior to running path analyses, several steps were taken to check the data met the necessary assumptions. These include: (i) linearity of relationships, (ii) no multicollinearity, (iii) multivariate normality, (iv) independence of residuals and (v) identification. An initial examination of bivariate correlations between independent variables indicated that no independent variables were highly correlated (all $Rs<0.65$). Data did not show multicollinearity, with all variance inflation factor values less than 5 (Rogerson, 2001) and tolerance values above 0.10 (O'Brien, 2007). The Mardia's test was undertaken to test for multivariate normality; the data did not meet this assumption. This was managed by the choice of model estimator (see below).

To test hypothesised relationships between variables in the theoretical model, single path mediation analyses were run initially for each mediating variable (upward social comparisons, bridging and bonding social capital) to see if these relationships were significant. For each model the direct pathway was modelled first, with the mediating pathway added afterwards. Additional models were then run including both disconnecting (upward social comparisons) *and* connecting (bridging and bonding social capital mediation pathways). In line with the primary hypotheses, models were first tested using depression as an outcome variable and then rerun with GAD and social anxiety as the outcome variable.

The strength of relationships were estimated using standardised coefficients, with means of 0 and standard deviations of 1. In standardised units, the coefficient for the direct pathway is equal to standardised regression coefficients (i.e. β weights). The mediation/indirect, effect was calculated by multiplying the two standardised coefficients [(SNS use -> mediator) * (mediator -> mental health outcome)]. Total effects represent the sum of both the indirect and direct effect. $P < .05$ was used to indicate statistical significance.

Model estimation

Whilst the assumption of normality is frequently violated within path analysis (Cain et al., 2017) this may lead to greater variance of parameter estimates, particularly when common estimators are used. Thus, whilst the maximum likelihood (ML) estimator is the most commonly used in path analysis, when the data deviate from normality, alternative estimators are recommended (Karakaya-Ozyer & Aksu-Dunya, 2018). Due to the presence of non-normality and our inclusion of ordinal data, the diagonally weighted least squares estimator was selected, with robust corrections to standard errors and test statistics (WLSMV: Muthén et al., 1997). WLSMV was specifically designed for non-normal datasets including categorical/ordinal variables

(Li, 2016), and is considered the best option for modelling such data (Brown, 2006; Rhemtulla et al., 2012). Robust corrections are recommended in the presence of non-normality (Kline, 2015) and enable standard errors to better estimate the amount of sampling variability within the parameter estimates.

Identification and fit indices

The initial path models were all just-identified (i.e. saturated), meaning they had zero degrees of freedom (df). For this type of path model, hypotheses about specific paths within the model can be tested, but the adequacy of model fit cannot be evaluated (Ulman, 2006). To estimate model fit, a requirement is that there are more data points than parameters to be estimated, which is known as an over-identified model (Ulman, 2006). Reichardt (2002) suggested that just-identified models may in fact be preferential, because they impose fewer overidentifying restrictions. For the final model, however, which included two mediation pathways, fit statistics were calculated.

Assessing model fit has long been debated, because suggested cut-offs have mostly been based on research conducted using large df (Kenny et al., 2015) and they vary based on sample size (Marsh et al., 2004). Generally, however, it is recommended that more than one index is used to assess model fit (Hair et al., 2010; Holmes-Smith et al., 2006). Hu and Bentler (1999) recommend using the Standardized Root Mean Square Residual (SRMR; Jöreskog & Sörbom, 1989) and one other index. In line with this recommendation and that of Shi et al. (2020), the SRMR and the Bentler Comparative Fit Index (CFI; Bentler, 1990) were utilised as they are less susceptible to the effect of changes in df and offer greater utility when assessing models with small df (Shi et al., 2020). The Steiger–Lind root mean square error of approximation (RMSEA; Steiger, 1990), Tucker–Lewis index (TLI; Bentler & Bonett, 1980; Tucker & Lewis, 1973) and the Chi-square (χ^2) statistic were

also reported. It is notable that the RMSEA, despite being a commonly used statistic, has been found to be unreliable for models with small df (Shi et al., 2020), such as those used in mediation analyses.

Acknowledging that cut-offs may vary based on sample size, df and the estimator used (Xia & Yang, 2019), acceptable model fit was evaluated using the following commonly used cut-off values: CFI (> .90), TLI (>.90), SRMR (<.08) and RMSEA (<.08) (Bentler & Bonett, 1980; Cheung & Rensvold, 2002; Hu & Bentler, 1995, 1999; MacCallum et al., 1996; Taasoobshirazi & Wang, 2016). RMSEA, SRMR and Chi-square are absolute fit indices, in that they assess how far the proposed model is from a perfect model. The TLI and CFI are incremental fit indices, which compare the hypothesised model fit with the fit of a baseline model.

Results

Missing data and descriptive statistics

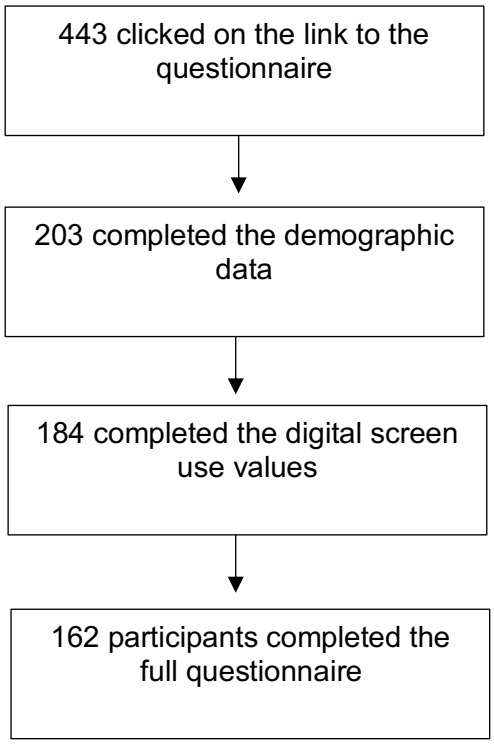
Of the 1282 pupils who were contacted, 443 initiated participation and 162 completed the full questionnaire. Complete analyses were therefore run on a final sample of 162, however of these only 142 used SNS (see Figure 1 for attrition rates). In total, parents of 51 children requested to opt their children out of the study. Additionally, after completing the questionnaire seven individuals (4.93%) requested to be contacted and another 14 (8.64%) scored above the risk threshold for the depression subscale of the RCADS (Chorpita et al., 2000). These individuals were contacted to discuss their concerns and conduct a full risk assessment.

The median age of the final sample was 13.52 (interquartile range = 2.90) and the ratio of females to males was 1.41 (93 females to 66 males; two unspecified). Most of the sample identified as White (56.8%), with Asian being the next most represented ethnicity (14.8%). Users of SNS represented 87.65% of the sample and

most participants spent between 1-2 hours daily on SNS (29%). Instagram, YouTube and Snapchat were the three most popular platforms, chosen by 52.82%, 48.59% and 36.62% respectively when participants were asked to list their three favourite sites (see Appendix 6 for full responses). For individuals who did *not* use SNS, the main reasons listed were that they were not allowed, did not enjoy or want to use it, or it took up too much time (see Appendix 7 for full responses). In terms of mental health, the median values for GAD, social anxiety and depression of the full sample (N = 162) were 6.50, 11.00 and 6.00 respectively.

Figure 1

Flow diagram of attrition for different stages of the questionnaire



Comparing users of SNS and non-users

A series of Mann-Whitney-U and Likelihood-Ratio chi-square tests were run to test for differences between users (n = 142) and non-users (n = 20) of SNS. On average, non-users were younger (*Mdn* = 12.64) than users (*Mdn* = 13.74), *U* = 1982, *p* = .004. No significant differences were found between users of SNS and

non-users in terms of ethnicity, G^2 (5, 162) = 4.40, p = .49, gender, G^2 (2, 162) = .66, p = .72, or GAD, U = 1693.5, p = .16. On average, users of SNS had higher levels of social anxiety (*Mdn* = 12.00) than non-users (*Mdn* = 6.00), U = 2001.5, p = .003. Similarly, users of SNS had higher levels of depression (*Mdn* = 6.50) than non-users (*Mdn = 2.50*), U = 2056.5, p = .001. See Table 1 for detailed descriptive data on demographics and mental health variables and Table 2 for descriptive data on the use of SNS.

Table 1

Descriptive statistics of individual level and mental health variables for users of SNS and the full sample.

Note. IQR = Interquartile range

Variable		Users of SNS n = 142	Full sample N = 162
Age, Median (IQR)		13.74 (3.08)	13.52 (2.90)
Year group, N (%)			
	7	26 (18.3)	33 (20.37)
	8	26 (18.3)	33 (20.37)
	9	27 (19.0)	32 (19.75)
	10	19 (13.4)	19 (11.73)
	11	17 (12.0)	17 (10.49)
	12	27 (19.0)	28 (17.28)
Gender, N (%)			
	Female	83 (58.5)	93 (57.41)
	Male	57 (40.1)	66 (40.74)
	Prefer not to say	2 (1.4)	2 (1.23)
Ethnicity, N (%)			
	White	81 (57.0)	92 (56.79)
	Mixed	19 (13.4)	23 (14.2)
	Asian	21 (14.8)	24 (14.81)
	Black	8 (5.6)	10 (6.17)
	Other	12 (8.5)	12 (7.41)
	Prefer not to say	1 (0.7)	1 (0.62)
Mental Health, Median (IQR)			
	Depression	6.50 (7.00)	6.00 (7.00)
	GAD	7.00 (6.00)	6.50 (6.00)
	Social anxiety	12.00 (9.00)	11.00 (9.00)

Table 2

Descriptive statistics of Social Networking Site use

Variable		
Social network site user, N (%)		
	Yes	142 (87.7)
	No	20 (12.3)
Total number of SNS used, mean (SD)		3.33 (1.79)
Daily time on SNS, N (%)		
	Less than 10 minutes	7 (4.8)
	10 - 30 minutes	28 (17.3)
	31- 60 minutes	35 (21.6)
	1-2 hours	47 (29.0)
	3-5 hours	19 (11.7)
	More than 5 hours	6 (3.7)
Social capital, Median (IQR)		
	Bridging	17.00 (4.00)
	Bonding	13.00 (3.00)
Social comparison, Median (IQR)		
	Upward SC online	1.00 (2.00)
	Upward SC offline	2.00 (1.00)
	Downward SC online	1.00 (2.00)
	Downward SC offline	1.00 (2.00)

Note. SC = social comparisons, SNS = social networking sites

Correlations

Bivariate Spearman's rho correlations were used to explore associations between key variables (see Table 3). Analyses indicated that spending more time on SNS was associated with engaging in greater upward social comparisons online, rs(142) = .34, $p < .01$, and with greater bonding social capital, rs(142) = .35, $p < .01$. In contrast, SNS use was negatively correlated with bridging social capital, rs(142) = -.20, $p < .05$, indicating that using SNS was associated with having less bridging social capital. SNS use was positively correlated with all mental health variables, showing that greater use was associated with higher symptoms of depression, rs(142) = .44, $p < .01$, social anxiety, rs(142) = .37, $p < .01$, and GAD, rs(142) =

0.31, $p < .01$. The same analyses were repeated using Pearson's rho correlations and these showed a similar pattern of results (see Appendix 8).

Primary mediation analyses - depression

A series of path analyses were used to test direct and indirect relationships between variables. Model 1 explored *disconnecting* pathways and included the direct path of SNS use on depression, as well as the indirect path mediated by upward social comparisons (see Figure 2). Firstly, the model was run without the mediating pathway to test the total effect of time on SNS on depression symptoms. As shown in Table 4, time on SNS was associated with greater depression severity, β = .44, SE = .34, z = 5.62, $p < .001$. Following this, the mediating pathway via upward social comparisons was added. Upward social comparison was found to significantly mediate the relationship between time on SNS and depression. Specifically, time on SNS was associated with greater upward social comparisons on SNS, β = .33, SE = .08, z = 4.20, $p < .001$, which in turn was linked to higher depression symptoms, β = .36, SE = .35, z = 4.56, $p < .001$ (supporting H1). The direct effect of time on SNS on depression remained significant with the inclusion of the mediating pathway, β = .32, SE = .34, z = 4.20, $p < .001$, suggesting a partial mediation effect. Overall, upward social comparisons accounted for 26.92% of the total effect of SNS use on depression severity.

Table 3

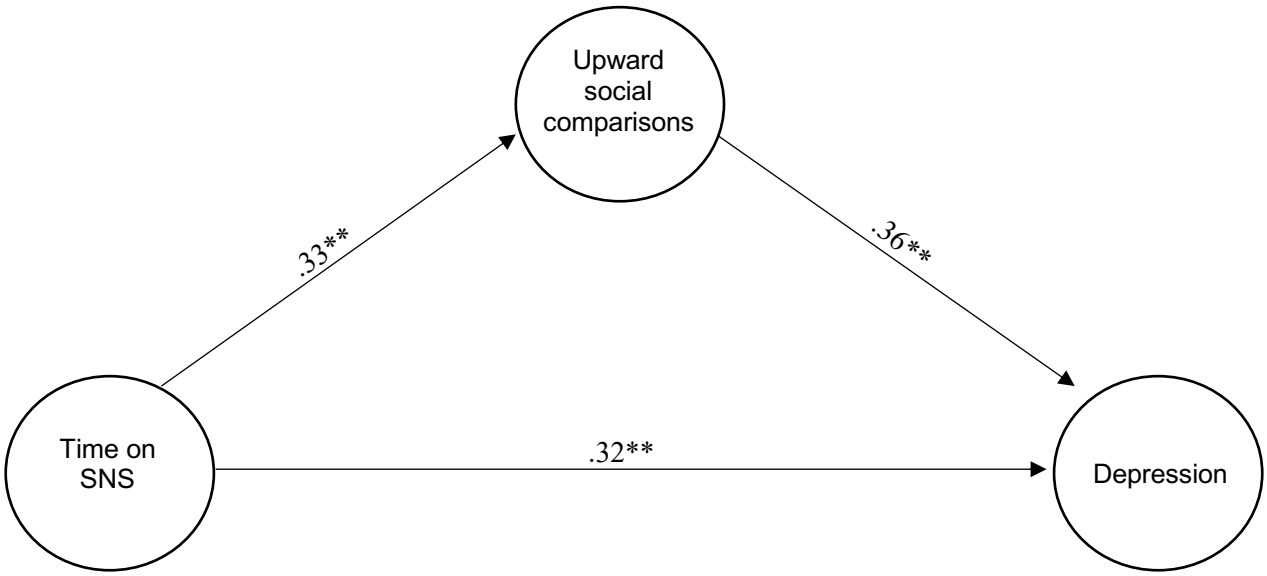
Spearman's correlations between main variables of interest

	Time on SNS	Upward SC online	Downward SC online	Upward SC offline	Downward SC offline	Bonding social capital	Bridging social capital	GAD	Depression	Social anxiety
Time on SNS	1									
Upward SC online	.34**	1								
Downward SC online	.25**	.60**	1							
Upward SC offline	.23**	.63**	.47**	1						
Downward SC offline	.22**	.43**	.65**	.59**	1					
Bonding social capital	.35**	.29**	.22**	.25**	.16	1				
Bridging social capital	- .20*	-.23**	-.13	-.10	-.04	.02	1			
GAD	.31**	.32**	.25**	.30**	.15	.24**	-.21*	1		
Depression	.44**	.42**	.28**	.21*	.17*	.22**	-.37**	.64**	1	
Social anxiety	.37**	.50**	.35**	.38**	.28**	.24**	-.17*	.64**	.64**	1

Note. SC = social comparisons
*p<.05, **p<.01

Figure 2

Results for Model 1 including the disconnecting mediation pathway via upward social comparisons.



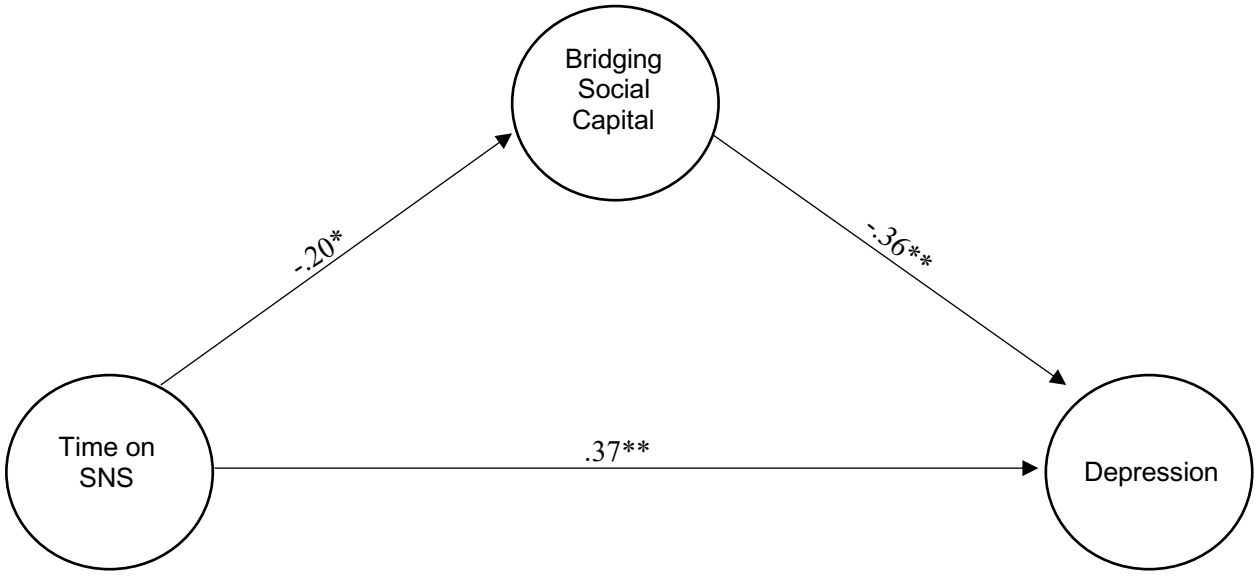
Note. * p-value <.01, **p-value <.001

Model 2 explored *connecting* pathways, and again included the direct path of SNS use on depression, as well as the indirect path mediated by bridging social capital (see Figure 3). As noted above, time on SNS was associated with greater symptoms of depression without the inclusion of the mediator variable. Bridging social capital was then added to the model as a mediating variable, with results supporting a significant mediation effect. Specifically, time spent on SNS was associated with less bridging social capital, β = -.20, SE = .20, z = -2.25, p = .03, and having less bridging social capital was associated with more depression symptoms, β = -.36, SE = .12, z = -5.70, p < .001. The direct effect of time on SNS on depression remained significant with the inclusion of the mediating pathway, β = .37, SE = .31, z = 5.23, p < .001, indicating a partial mediation effect. Overall, bridging social capital accounted for 16.29% of the total effect of SNS use on depression severity. These results provide partial support for H2, supporting the mediating role of bridging social capital and highlighting that greater bridging social

capital is associated with lower levels of depression. However, contrary to predictions time on SNS was associated with less, rather than more, bridging social capital and this reduction was associated with greater depression symptoms, rather than the predicted positive effect.

Figure 3

Results for Model 2 including the connecting mediation pathway via bridging social capital.



Note. * p-value <.01, **p-value <.001

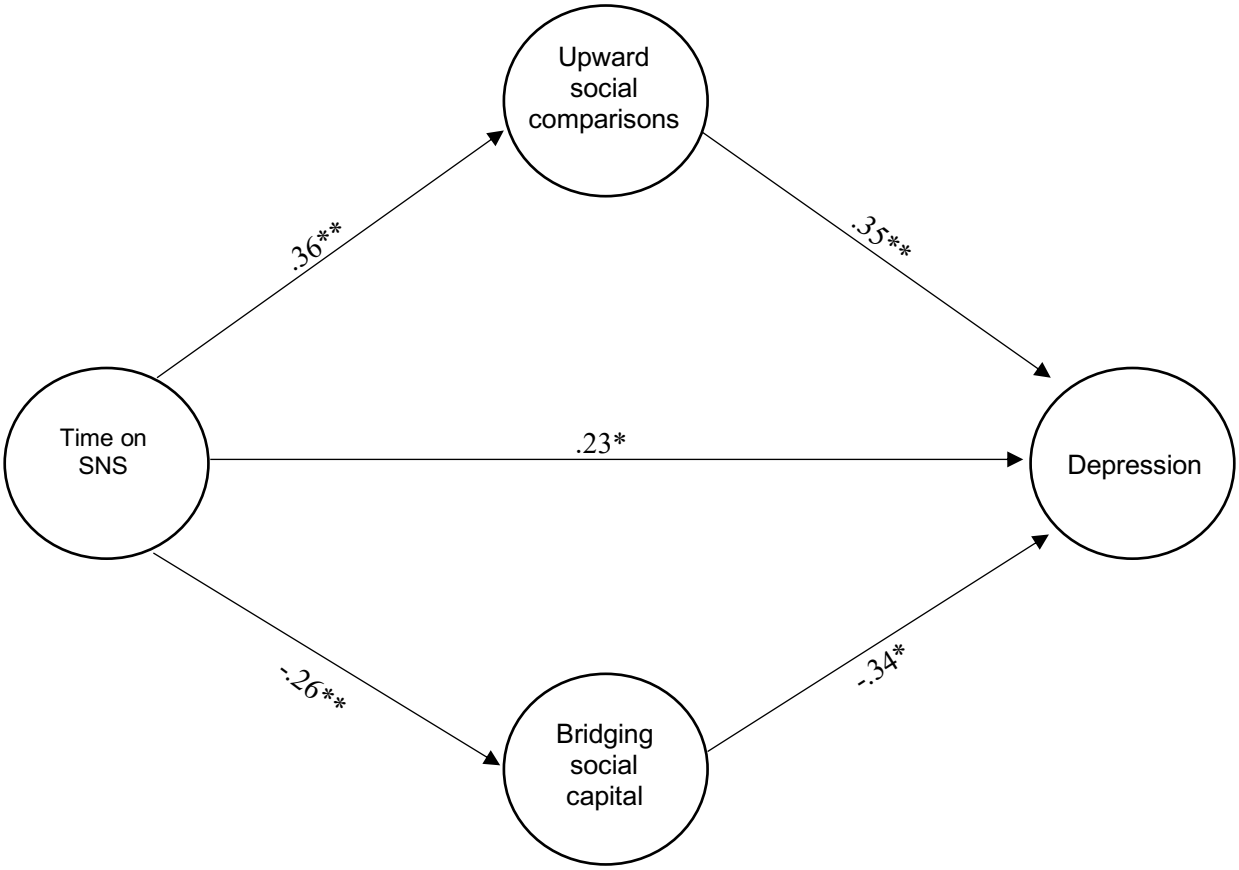
Model 3 explored *connecting* pathways, including the direct path of SNS use on depression, as well as the indirect path mediated by bonding social capital. Bonding social capital did not mediate the relationship between time on SNS and depression (rejecting H3). Finally, in Model 4 a full model was tested, which included *connecting* and *disconnecting* pathways, as well as the direct pathway (see Figure 4 and Table 4). This model only included bridging social capital in the *connecting* pathway, because bonding social capital was not found to be significant.

The results replicate the findings seen when the individual mediation pathways were analysed separately. Thus, they show two significant partial mediation effects of

time on SNS on depression via upward social comparisons and bridging social capital, which accounted for 48.09% of the total effect (28.54% and 19.55% respectively). In addition, the signs of these associations were preserved. However, the fit indices did not show a good fit to the data overall, $\chi 2(df = 1) = 6.50$, $p = .011$, CFI = .91, TLI = .47, SRMR = .07 and RMSEA = .20 (90% confidence interval = .08 - .35). Thus, whilst both the CFI and the SRMR indicated good fit, the TLI, RMSEA and Chi-square statistics were unsatisfactory. It should be acknowledged that RMSEA can be inflated and misleading for models with small df (Kenny et al., 2015), such as the present study, and the Chi-square test can perform poorly with non-normally distributed data (McIntosh, 2006). Despite these considerations, overall the fit statistics suggest inadequate model fit.

Figure 4

Results for the hypothesised path model including connecting and disconnecting mediation pathways (Model 4).



Note. * p-value <.01, **p-value <.001.

Table 4

Standardised estimates of direct, indirect and total effects of SNS use on depression.

	B	SE	z	p
Model 1				
SNS use -> depression (direct)	.32	.34	4.20	<.001
SNS use -> social comparisons -> depression (indirect)	.12	.19	2.70	.007
SNS use -> depression (total)	.44	.34	5.62	<.001
Model 2				
SNS use -> depression (direct)	.37	.31	5.23	<.001
SNS use -> bridging social capital -> depression (indirect)	.07	.16	2.00	.047
SNS use -> depression (total)	.44	.34	5.62	<.001
Model 3				
SNS use -> depression (direct)	.42	.38	4.84	<.001
SNS use -> bonding social capital -> depression (indirect)	.02	.13	0.81	.42
SNS use -> depression (total)	.44	.34	5.62	<.001
Model 4 with two mediation paths				
SNS use -> depression (direct)	.23	.35	2.89	.004
SNS use -> social comparisons -> depression (indirect)	.13	.21	2.65	.008
SNS use -> bridging social capital -> depression (indirect)	.09	.18	2.20	.03
SNS use -> depression (total)	.45	.35	5.58	<.001

Secondary mediation analyses - anxiety

In line with secondary hypotheses, these analyses were repeated using social anxiety and GAD as the outcome variable. Considering social anxiety first, Model 1_{SA} examined *disconnecting* pathways, including the direct path of SNS use on social anxiety, in addition to the indirect path mediated by upward social comparisons (see Figure 5). Initially, the model was run without the mediating pathway to test the total effect of time on SNS on social anxiety symptoms. As shown in Table 5, time on SNS was associated with greater symptoms of social anxiety, β = .37, SE = .40, z = 4.58, $p < .001$. Next the mediating pathway via upward social comparisons was added to the model, the results showed a significant indirect effect between time on SNS and social anxiety via upward social comparisons. Specifically, spending more time on SNS was linked to greater upward social comparisons, β = .33, SE = .08, z = 4.20, $p < .001$, which in turn was associated with greater social anxiety symptoms, β = .44, SE = .37, z = 6.18, $p < .001$. The direct pathway between time on SNS and social anxiety remained significant with the inclusion of the mediating pathway, β = .22, SE = .38, z = 2.84, $p = .004$, highlighting a partial mediation effect. Upward social comparison was found to account for 40.54% of the total effect of SNS use on social anxiety. However, there was no significant mediation effect of bridging (Model 2_{SA}) or bonding social capital (Model 3_{SA}) on social anxiety.

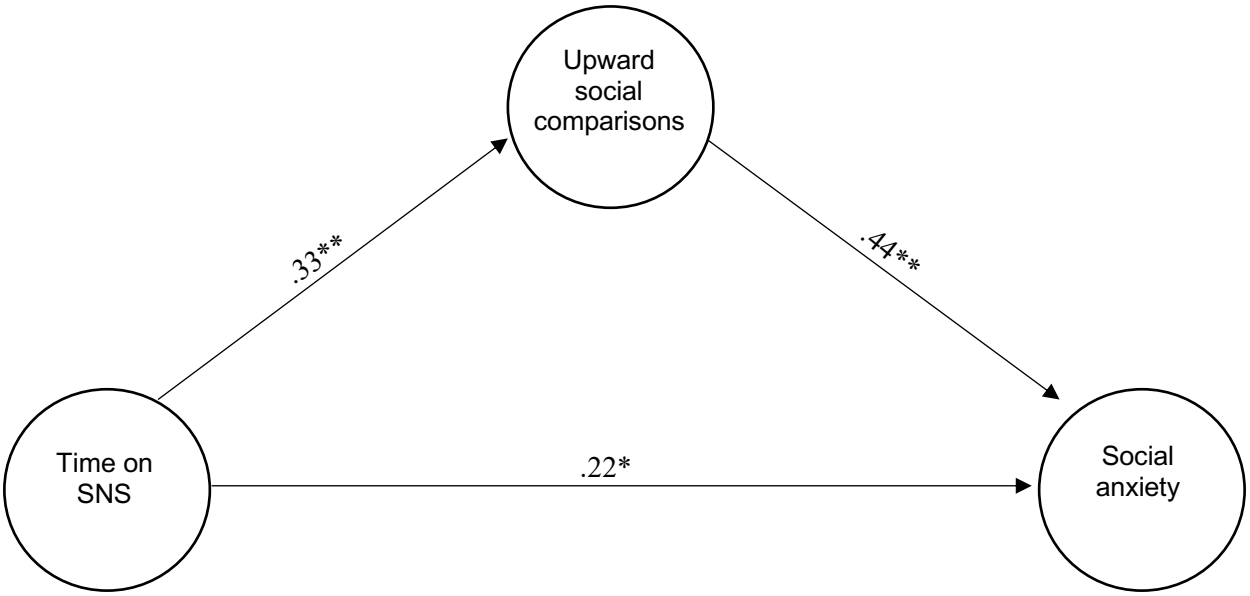
Table 5

Standardised estimates of direct, indirect and total effects of SNS use on social anxiety

	β	SE	z	p
Model 1_{SA}				
SNS use -> social anxiety (direct)	.22	.38	2.84	.004
SNS use -> social comparisons -> social anxiety (indirect)	.15	.22	3.30	.001
SNS use -> social anxiety (total)	.37	.40	4.58	<.001
Model 2_{SA}				
SNS use -> social anxiety (direct)	.34	.39	4.34	<.001
SNS use -> bridging social capital -> social anxiety (indirect)	.02	.10	1.13	.26
SNS use -> social anxiety (total)	.37	.40	4.58	<.001
Model 3_{SA}				
SNS use -> social anxiety (direct)	.32	.40	4.05	<.001
SNS use -> bonding social capital -> social anxiety (indirect)	.04	.15	1.34	.18
SNS use -> social anxiety (total)	.37	.40	4.58	<.001

Figure 5

Results for Model 1$_{SA}$ including the disconnecting mediation pathway via upward social comparisons.



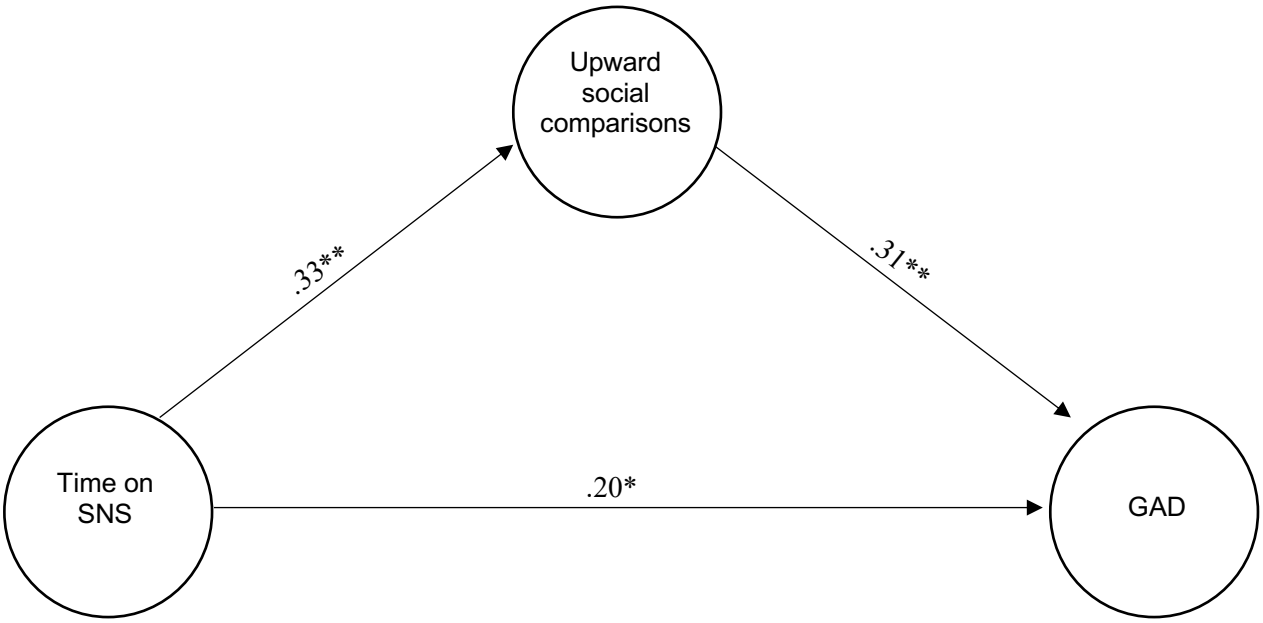
Note. * p-value <.01, **p-value <.001

Finally, analyses were run with GAD scores as the outcome variable. Model 1$_{GAD}$ explored dis*connecting* pathways, containing the direct path of SNS use on GAD, in addition to the indirect path mediated by upward social comparisons (see Figure 6). The model was run first without the mediating pathway, to test the total effect of time on SNS on the severity of GAD symptoms. As presented in Table 6, time on SNS was associated with higher symptoms of GAD, β = .30, SE = .25, z = 4.12, p < .001. After this upward social comparisons was added to the model as a mediator and was found to significantly mediate the relationship between time on SNS and GAD. Time spent on SNS was associated with greater upward social comparisons, β = .33, SE = .08, z = 4.20, p < .001, and greater upward social comparisons were linked with higher symptoms of GAD, β = .31, SE = .30, z = 3.63, p < .001. The direct pathway between time on SNS and GAD remained significant with the inclusion of the mediating pathway, β = .20, SE = .28, z = 2.44, p = .02, suggesting

a partial mediation effect. Overall, upward social comparisons accounted for 34.11% of the total effect of SNS use on symptoms of GAD. However, bridging (Model 2_{GAD}) and bonding social capital (Model 3_{GAD}) were not found to significantly mediate the relationship between time on SNS and GAD.

Figure 6

Results for Model 1_{GAD} including the disconnecting mediation pathway via upward social comparisons.



Note. * p-value <.01, **p-value <.001

Table 6

Standardised estimates of direct, indirect and total effects of SNS use on GAD

	β	SE	z	p
Model 1_{GAD}				
SNS use -> GAD (direct)	.20	.28	2.44	.02
SNS use -> social comparisons -> GAD (indirect)	.10	.14	2.50	.01
SNS use -> GAD (total)	.30	.25	4.12	<.001
Model 2_{GAD}				
SNS use -> GAD (direct)	.27	.25	3.72	<.001
SNS use -> bridging social capital -> GAD (indirect)	.03	.07	1.54	.12
SNS use -> GAD (total)	.30	.25	4.12	<.001
Model 3_{GAD}				
SNS use -> GAD (direct)	.25	.25	3.39	.001
SNS use -> bonding social capital -> GAD (indirect)	.06	.10	1.88	.06
SNS use -> GAD (total)	.30	.25	4.12	<.001

Discussion

This study aimed to elucidate patterns of SNS use associated with positive and negative mental health among secondary school-age children. Specifically, drawing on existing literature and theory, it sought to examine two proposed mechanisms underlying this relationship, namely social comparisons and social capital. With respect to the *primary* hypotheses, two out of three were supported. Thus, the findings show that whilst social comparisons (H1) and bridging social capital (H2) partially mediated the relationship between time on SNS and depression, bonding social capital did not (H3).

With respect to our secondary hypotheses regarding social anxiety and GAD, the findings partially mirrored those for depression. Thus, similar to depression, upward social comparisons partially mediated a relationship between time spent on SNS and GAD as well as time spent on SNS and social anxiety, with higher levels of social comparisons associated with higher symptom scores. However, neither bonding nor bridging social capital were found to be significant mediators. Overall, these results provide partial support for the ICBF (Clark et al., 2018), reinforcing the association between upward social comparisons (i.e *disconnecting* patterns of use) and poor mental health. However, the findings for social capital (i.e. *connecting* patterns of use) and greater well-being were only somewhat consistent with the framework. The results are consistent with another paper exploring the relationship between using SNS and self-esteem, which similarly showed that the association between *connecting* patterns of use and positive wellbeing seems to be less robust than the association between *disconnecting* patterns and poor wellbeing (Tibber et al., 2020). Thus, whilst *bridging* social capital emerged as a significant mediator in this study, *bonding* social capital did not. Further, whilst higher levels of *bridging*

social capital were associated with lower depression symptom levels, higher levels of using SNS were in fact associated with *lower* levels of bridging social capital (contrary to expectations). More on this below.

This research provides further evidence to suggest that engaging in upward social comparisons on SNS, underlies a deleterious relationship between using SNS and mental well-being (Hwnag, 2019; Vogel et al., 2015; Weinstein, 2017; Yoon et al., 2019). The findings of this study are consistent with the notion that spending more time on SNS offers opportunities for young people to engage in more upward social comparisons, which in turn is linked to higher symptoms of depression (assuming a direction of causality; however, more on this below). In addition, they are consistent with a recent meta-analysis of 33 studies with five focusing on social comparisons, which highlighted a significant relationship between drawing social comparisons on SNS and depression (Yoon et al., 2019), as well as research highlighting the mediating role of upward social comparisons in the relationship between Facebook use and depression (Appel et al., 2016; Feinstein et al., 2013).

In light of the bias towards selectively sharing positive information on SNS (Newman et al., 2011), one explanation for the relationship between time on SNS and drawing more upward social comparisons is that as time increases, young people are more likely to be exposed to SNS content that triggers such comparisons. However, it is not possible to establish the direction of causality from the results of the current study. Therefore, it could be that people who experience greater symptoms of depression are more likely to engage in upward social comparisons on SNS or are more likely to spend greater lengths of time on SNS. An alternative explanation is that individuals with higher levels of depression may be more likely to self-report greater levels of SNS usage, in comparison to those with lower levels of depression. However, this explanation has been challenged by recent research which found that

all users systematically over-estimate their levels of SNS use, and that this over-estimation of SNS use was unrelated to mental well-being or personality trait variables (Johannes et al., 2021). Johannes et al. (2021) therefore emphasised that it is important not to dismiss utility of these measures before understanding the source of the bias they introduce.

This is the first study, as far as the author is aware, to explore the impact of drawing upward social comparisons on SNS on social anxiety and GAD among adolescents. Adding to the existing literature, the findings highlight that drawing upward social comparisons on SNS partially mediates a relationship between time on SNS and greater symptoms of social anxiety and GAD. One explanation for upward social comparisons being a mediator in the relationship between using SNS and all three mental health outcomes (symptoms of depression, GAD and social anxiety), is that engaging in upward social comparisons may drive low self-esteem. The association between drawing upward social comparisons on SNS and lower self-esteem has been supported by previous research (Tibber et al., 2020; Vogel et al., 2014). Additionally, low self-esteem has been identified as a transdiagnostic factor (Fennell, 1997) and linked with many different mental health difficulties, including anxiety and depression (Keane & Loades, 2017; Nguyen et al., 2019; Trzesniewski et al., 2006). Therefore, it is possible that engaging in upward comparisons on SNS may act as a general driver of poor mental health via its suggested negative impact on low self-esteem.

Alternatively, it is also possible that drawing upward social comparisons on SNS may act on different mechanisms for depression, GAD and social anxiety. For example, engaging in upward social comparisons may drive negative feelings about oneself and trigger feelings of low self-worth. Feelings of low self-worth have previously been linked to higher levels of depression among adolescents (Burwell &

Shirk, 2006; Harter & Jackson, 1993). Additionally, engaging in upward social comparisons may trigger negative self-evaluations, such as perceiving oneself to be different, or inferior, to others which may lead to greater social anxiety in social contexts. Negative self-evaluations have been identified as a key feature and maintaining factor of social anxiety (Clark et al., 2005; Gilboa-Schechtman et al., 2017). In relation to the ICBF framework (Clark et al., 2018), perceiving oneself as different to others may further enhance feelings of social disconnectedness. Although not tested in this study, these processes may be exacerbated on SNS due the availability and permanence of features on such platforms (Nesi et al., 2018). Lastly, the process of drawing upward comparisons may trigger more general worries among young people, such as they will never be as happy as others (The Prince's Trust, 2019) or perceiving others as better off than themselves (Bonnette et al., 2019). The presence of such worries whilst drawing social comparisons on SNS has been associated with symptoms of GAD (Bonnette et al., 2019).

In terms of social capital, bridging social capital was found to partially mediate the relationship between time on SNS and symptoms of depression. However, bridging social capital was not found to mediate the relationship between time on SNS and symptoms of GAD or social anxiety. It is notable that having greater bridging social capital was associated with lower levels of GAD and social anxiety, but it was more strongly associated with lower levels depression. One explanation for bridging social capital being more strongly linked with lower levels of depression, in contrast to GAD and social anxiety, is that higher levels of depression are associated with reduced engagement in pleasurable activities (Lewinsohn & Graf, 1973), loneliness (Erzen & Çikrikci, 2018) and withdrawal from social activity (Rubin et al., 2009). Therefore, it is possible that engaging with weak ties on SNS may generate positive affect, thus reducing depression symptoms, countering social withdrawal, reducing loneliness, and/or being seen as an achievement or a pleasurable activity. This

explanation fits with one of the treatments for individuals experiencing depression, namely behavioural activation, which focuses on reducing avoidance and withdrawal by increasing engagement with pleasurable and valued activities (Martell et al., 2001).

In line with predictions, as well as the ICBF (Clark et al., 2018), having greater bridging social capital on SNS was linked with lower levels of depression. This finding is consistent with previous research showing that greater bridging social capital on Facebook is associated with better well-being (Kim & Kim, 2017; Kim & Lee, 2011). However, contrary to predictions the more time people spent on SNS the less bridging social capital they reported. This finding is inconsistent with the results of a meta-analysis across all age groups (Liu et al., 2016) and a study of children and adolescents (Ahn, 2012), which found that the more people used SNS the greater bridging social capital they had.

One reason for this inconsistency with previous findings is that the environment of SNS, and the nature of information being shared, may have changed in the context of the Covid-19 pandemic. A recent survey (Wold, 2020) reported that the tone of content on SNS has shifted; prior to the pandemic people noted that their feeds were more positive, whereas during the pandemic people described content as overwhelming, stressful, and an overload of information. Furthermore, the presence of information, and misinformation, about Covid-19 on SNS throughout the pandemic has been noted (Cordo & Bolboacă, 2020) and during this time the WHO recommended limiting the consumption of news related to the pandemic (World Health Organisation, 2020b). SNS were criticised for the spread of misinformation and increasing mistrust about the pandemic, which was termed an ‘infodemic’, and resulted in widespread anxiety (Depoux et al., 2020; Larson, 2020). The Covid-19 pandemic was also linked to an increase in xenophobia and racism on SNS (Chou &

Gaysynsky, 2021; Croucher et al., 2020; Ziems et al., 2020). Such behaviours during the pandemic have been associated with elevated fear and greater mistrust of others (Mamun & Griffiths, 2020). Alongside this, SNS were also associated with an increase in stockpiling behaviour in this time period (Arafat et al., 2021; Naeem, 2021). It is plausible that this context may have created an environment in which young people experienced the wider community as daunting. Thus, it is possible that during this time young people were less likely to seek connections with weak social ties, and/or were more likely to disengage from connections with such ties. This is consistent with a recent finding by Rodela et al. (2020), which indicated that the pandemic might have made it harder for individuals to build bridging social capital offline.

Opposing the predictions, as well the ICBF (Clark et al., 2018), there were no significant mediation effects with regards to *bonding* social capital. It was hypothesised that bonding social capital would be a partial mediator in the pathway between SNS use and depression, having a protective impact against symptoms of depression. Although no mediation effects were found, in line with previous research (Liu et al., 2016), bonding social capital was positively associated with time spent on SNS, i.e. the more time spent on SNS the more bonding capital participants reported. Intuitively, it makes sense that at a time when face-to-face contact was limited, people used SNS to connect with close social connections, and further, that this may have been preserved at a time when *bridging* social capital was not.

Contrary to predictions, however, bonding social capital was positively associated with symptoms of depression, GAD and social anxiety, i.e. as bonding social capital increased so did levels of depression, GAD and social anxiety. This finding is inconsistent with previous research, which has found that bonding social capital is associated with greater well-being and self-esteem (Valkenburg & Peter, 2007;

Wilcox & Stephen, 2012). However, it is notable that these outcome measures are not synonymous with anxiety and depression.

Within the context of the pandemic, one explanation of this surprising finding is that connecting with close connections on SNS may make people realise how much they miss them. This may highlight feelings of loneliness and serve as a reminder of the restrictions imposed by the pandemic. Alternatively, recent research conducted has highlighted that people have found it more difficult to access support from bonding social capital in the context of Covid-19 (Rodela et al., 2020). Therefore, it is possible that despite connecting with their close connections online, young people may feel less supported or able to access support from these interactions during the pandemic. This may have a detrimental impact on their mental health, because higher social support has been associated with lower levels of depression and anxiety among young people (Dumont & Provost, 1999; Scardera et al., 2020).

An alternative interpretation of this finding, which posits a reverse direction of causality, is that individuals who experience high mental health symptoms may turn to SNS to cultivate social connections, and hence may actually have greater bonding social capital. One explanation for this may be that young people who experience poor mental health may also be struggling with their familial relationships (Moore et al., 2018), and therefore they may seek out more connections online. Indeed, there is some evidence to suggest that individuals from at risk groups, e.g. individuals who experience low self-esteem, depression and anxiety, may stand to benefit more from online social capital (Ellison et al., 2007; Indian & Grieve, 2014), which has sometimes been called the ‘poor get richer’, or social compensation, hypothesis (Zywica & Danowski, 2008).

More generally it is important that the findings of this research are situated within the context of the Covid-19 pandemic and associated social restrictions. Thus, at the time of the questionnaire administration pupils at both schools were attending school classes in person. Pupils had returned to school in September 2020 for the first time since the initial lockdown in March 2020. However, at this point in time there were concerns about a second wave of the virus due to a surge in cases (BBC News, 2020) and on the 14th of September rules were re-introduced to limit social contact, including no gatherings of more than six people (Public Health England, 2020). Additionally, schools were required to adhere to strict regulations regarding social distancing and other measures, such as wearing face masks in the classroom (Department for Education, 2020). These restrictions would be expected to have considerable impact on the nature of social interactions.

Undertaking research during this unique period of history has positive and negative aspects. Previous research focusing on patterns of using SNS has taken place under 'normal' circumstances, when young people were able to easily access forms of communication both off and online. Therefore, it is not clear whether reduced face-to-face interactions might have impacted the results and if this pattern will hold as restrictions are lifted. Nonetheless, the study offers an invaluable snapshot young peoples' use of SNS during the pandemic, and at a time when the use of SNS were elevated (Fischer, 2020).

Limitations

There are a number of limitations to the current study. Firstly, the design is cross-sectional and therefore is unable to draw causal inferences. This is a common limitation in this area of research (Keles et al., 2020). Whilst the findings show that engaging in upward social comparisons is linked to worse mental health, the direction of causality could not be inferred. For example, the research could not

clarify whether greater upward social comparisons on SNS does indeed lead to higher levels of depression, or if individuals who are more depressed are more prone to drawing upward social comparisons. Future research into patterns of using SNS would benefit from employing experimental or longitudinal approaches, as they would offer greater insight into the nature of such effects and provide grounds for causal inferences. However, it is notable that this research will provide the baseline data for a longitudinal study conducted by another trainee clinical psychologist.

Another limitation lies in the use of self-report assessment to assess the use of SNS, which have previously been criticised for lacking accuracy (Ernala et al., 2020; Scharkow, 2016), including a high degree of measurement error and failing to consider how usage may change over time (Kaye et al., 2020). However, it is notable that the questions and estimates of time spent using SNS are similar to those utilised in other large-scale surveys in the UK (Booker et al., 2018; Ofcom, 2017). Improved measurement of social networking site use, such as tracking the hours of use directly via screen-time measures on telephone applications and experiencing sampling methods, may provide more consistent measurement, reduce bias and shed greater understanding on causality. However, it is notable that these types of measurement are more resource intensive and have their own limitations (Orben, 2020). Additionally, use of SNS was assessed by the amount of time spent daily on these platforms. However, other aspects of use may be important, such as how frequently individuals check their profile (Anderson et al., 2012).

Although this research included multiple SNS it did not differentiate between different SNS; therefore, it is not able to establish whether findings reported are consistent across platforms or specific to a subset of platforms. Nesi et al. (2018) highlighted that different SNS vary in their features and the functions they offer (e.g.

the ability to send a private message or to post a picture), suggesting that these variations may have a differential impact on patterns of engagement and user well-being. Furthermore, a study showed that Instagram and Twitter had differential effects on loneliness, suggesting that users may interact with image and text-based platforms differently (Pittman & Reich, 2016). Given the visual nature of image-based SNS, it is possible that this may increase the propensity to draw social comparisons when compared with text-based platforms. A recent scoping review exploring the impact of highly visual SNS, such as SnapChat or Instagram, on young people's mental health emphasised the paucity of research that has been conducted in this area (McCrory et al., 2020), highlighting the importance of further research.

Additionally, the nature of the relationship between SNS and social capital also appears to vary across platforms. For example, Snapchat has been suggested to be more useful for bonding social capital (Piwek & Joinson, 2016), while Facebook has been associated more with bridging social capital (Ellison et al., 2007). Therefore, it is possible that studying patterns across platforms might mask some of these more nuanced relationships and it would be useful for future research to focus on comparing different types of platforms.

The study proposed and tested a model of using SNS on depression, including *connecting* and *disconnecting* patterns of use. The results indicated that this model did not fit the data adequately. However, it is notable that the mediation pathways in this final model did explain a reasonably large amount of variance in the overall effect of using SNS on depression symptoms. Furthermore, as mentioned previously, the hypothesised model had small df and this has been identified as a limitation when it comes to assessing model fit (Kenny et al., 2015). Additionally, the sample size was relatively small for this type of analysis. Although the study

originally aimed to recruit a minimum of 200 participants, the final sample of 142 may have limited the power to detect effects and increase the chance of type II errors. Related to this, there was a significant attrition rate between clicking on the link and completing the full questionnaire. Therefore, it is possible that the results may be influenced by attrition bias (i.e. the participants who completed the study may differ from those who did not complete it).

A further limitation is that the research was conducted with a Western sample; therefore, it is not clear whether the results would generalise across cultures. For example, in a recent meta-analysis (Liu et al., 2016) a stronger relationship between using SNS and bridging social capital was found among Western, as opposed to Eastern, populations. It would be helpful for future research to explore the role of cultural differences in patterns of using SNS. Lastly, the study sample size is relatively small compared to previous research conducting similar analyses (Fritz & MacKinnon, 2007).

Implications of the findings

With respect to the strengths of the study, it adds to the current evidence base around the association between using SNS and secondary school age children's mental health. The study addressed a number of limitations within this area of research, which have previously limited the generalisability of findings. Most notably, the study was firmly embedded within theory, exploring proposed mediating pathways between using SNS and mental health rather than focusing exclusively (and reductionistically) on screen time or related use of simple measures of SNS use (rather than more a focus on patterns of use); explored use across multiple platforms rather than single platforms (e.g. Facebook); focused mainly on multiple symptoms within the same population.

A reason for the previously mixed findings on the relationship between using SNS and mental well-being may be that the use of SNS is often conceptualised as a single homogenous activity, neglecting the many different ways in which individuals engage with SNS. The findings reported here offer a more nuanced understanding of the underlying mechanisms involved in the relationship between using SNS and young people's mental health during Covid-19. They highlight the negative impact of drawing upward social comparisons on symptoms of anxiety and depression and shed light on the role of social capital. The results suggest that having higher bridging social capital was associated with lower symptoms of depression, but that spending more time on SNS was linked with lower bridging social capital. Therefore, the overall effect of this reduction in bridging social capital on depression was detrimental, with bridging social capital associated with greater depression contrary to the predicted positive effective. Overall, this research suggests that while the amount of time spent on SNS is associated with the symptoms of anxiety and depression, the way in which individuals interact with platforms also plays a key role. This is consistent with the findings of a number of recent systematic reviews, which suggest that the impact of using SNS on mental health may depend more upon the behaviours engaged in whilst using platforms, rather than merely the quantity of use (Baker & Algorta, 2016; Frost & Rickwood, 2017; Keles et al., 2020; Marino et al., 2018; Seabrook et al., 2016).

These findings have potential implications for young people's mental health, which could be applied to both clinical and educational settings. Consistent with previous research, the negative association between drawing upward social comparisons on SNS and mental health is particularly notable. In light of this, young people should be aware of the negative repercussions that engaging in upward social comparisons can have upon their mental health. Therefore, it would be helpful to educate parents, teachers and young people on the role of social comparisons, so that they

can engage in conscious consumption of SNS. One such recommendation may be encouraging young people to review the accounts they are following and un-follow accounts that trigger upward comparisons, as well as reviewing the privacy settings of their own accounts. Previous experimental research has found that reminding young people about the inherent positivity bias on SNS, in contrast to viewing positive content without being reminded of bias, reduces negative affect and the number of social comparisons that are drawn (Weinstein, 2017). Therefore, this could be explored in future intervention studies.

In terms of clinical practice, it may be helpful for psychologists and other healthcare professionals to incorporate asking about social network site use as part of their routine practice. For example, young people could be asked about their patterns of engagement with SNS and if they engage in upward social comparisons. The use of cognitive reframing may be helpful in this setting, for example reminding young people that other individuals tend to only share their successes and supporting them to remind themselves of their own achievements.

Conclusions

This study is one of the first to test a model of using SNS, based on the ICBF (Clark et al., 2018), including connecting and disconnecting patterns of use on the mental health of children and adolescents. Critically, the results highlight the mediating role of upward social comparisons in the relationship between time spent on SNS and depression, social anxiety and GAD. The results supported the mediating role of bridging social capital in the relationship between time spent on SNS and depression. However, the overall impact on depression was negative because time spent on SNS was associated with less bridging social capital. In contrast we did not find any significant mediation effect of bonding social capital. Overall, the results

provide partial support for the ICBF. By examining patterns of using SNS, the study also highlights the importance of the *quality* of engagement with SNS (i.e. what behaviours are engaged in) on young people's mental health, rather than simply the *quantity* of use. The need for further experimental and longitudinal research to provide further insight into the mechanisms underlying the relationship between using SNS and mental health and to establish causal relationships is also emphasised, as well as examining these findings after the Covid-19 pandemic.

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Part 3: Critical Appraisal

This critical appraisal represents my reflections on undertaking this research project, which I have completed as part of the Doctorate in Clinical Psychology. It starts by describing my background to contextualise my experiences and reflections, as well as how these influenced my selection of this project. The main section focuses on the process of carrying out the research and the different obstacles that I faced at each stage, including considerations and adjustments made due to the Covid-19 pandemic. Throughout this appraisal I reflect on the professional and personal difficulties I faced, as well as what I learnt from these.

Background and reflections on project choice

Prior to commencing clinical training, I had a mixture of research and clinical experience. Most recently, I had worked for two years as an assistant psychologist in physical health settings and in a national specialist service for adults with autism spectrum conditions and attention-deficit hyperactivity disorder. However, before this I worked as a research assistant in the area of addiction and undertook a master's degree in Mental Health Research at the University of Nottingham. The bulk of my clinical experience had involved working with adults, however my

undergraduate and master's theses were undertaken with pre-school and primary school aged children respectively.

At the start of clinical training, I was hoping to pursue a career working with children and adolescents. Therefore, I was keen to undertake my thesis working with this population group. I was drawn to a project focusing on social media, having witnessed the rapidly changing landscape of social media throughout my teens and whilst at university. Although I used apps such as Facebook and Bebo during my teenage years, other popular apps such as Snapchat, Instagram and TikTok were either in their infancy or did not exist at that time. Additionally, the ease of access to such apps has changed dramatically in line with advances in technology, particularly mobile phones. I was curious about the role social networking sites (SNS) might play in adolescent mental health; particularly given the large amount of media coverage it receives.

When I discussed my project with friends, colleagues and family it always generated a lot of interest. However, I noticed that the focus of conversations mostly revolved around the harmful aspects of use and this was consistent with the way SNS were was presented in the media. During my first-year placement working within an Improving Access to Psychological Therapies service (IAPT, Clark et al., 2008) I undertook some outreach work in local colleges, which involved discussing stress, anxiety and depression. In these workshops, the topic of SNS consistently arose as a source of stress and anxiety for young people, who frequently reported that using SNS triggered a fear of missing out (FOMO). FOMO has been described as anxiety around missing out on enjoyable experiences and has been suggested as a driver for using SNS (Przybylski et al., 2013). Furthermore, my penultimate training placement working in Plastics and Reconstructive Surgery highlighted the negative

impact that SNS and appearance related comparisons can have on body image, which has been supported by research (Fardouly & Vartanian, 2016).

Aside from these potentially harmful aspects of use, I was also drawn to exploring the beneficial aspects of using SNS; an area which has received far less coverage. During the context of the Covid-19 pandemic, when face-to-face contact has not been possible, the utility of SNS as a medium to connect with friends and family has become increasingly pertinent. These interests were aligned with that of my supervisor, Marc Tibber, and lead us to focus on a proposed model focusing on using SNS, namely the Interpersonal connections behaviour framework (ICBF, Clark et al., 2018), which focused on the role of social connections in relation to helpful and harmful patterns of use. As an active user of SNS, I was also interested in exploring the beneficial aspects of usage. Reflecting on my own patterns of use, I noted that there were many things I enjoyed about using SNS (e.g. connecting with my friends, following people who inspire me and engaging with profiles linked to my hobbies) and I struggled to see how every aspect of use could be harmful.

The research process

Systematic literature review

The biggest challenge I faced with regards to the systematic literature review was finding a suitable topic. Following a discussion with Marc Tibber, I initially decided to explore intervention studies targeting the 'healthy' use of social networking sites. However, after an initial search of the literature I realised that this topic was potentially problematic for two main reasons. Firstly, I struggled to find any papers on this topic and secondly, many intervention studies across different disciplines have used SNS as platforms to deliver interventions. The latter reason meant that the number of irrelevant papers pulled up by the search was extremely large.

Due to the illegibility of my initial topic choice, I had to find a new one. Linked to my empirical paper, and the desire to understand more about the underlying mechanisms involved in the relationship between using SNS and mental health, I decided to focus on experimental research conducted in this area. I found finding a new topic stressful and frustrating, because I wanted to move onto the next stage of the process and I had not considered, or factored into my research timeline, how long this might take. I decided on my second topic in August, however I was concerned that I would not be able to meet the suggested November deadline for the literature review if I did not start sifting through papers early enough.

Initially I approached the literature review with a sense of trepidation, being aware from previous experience, of how laborious the process of whittling down the papers can be. Although screening 4401 papers and reducing their number to the final 11 was challenging, I actually enjoyed the process more than I thought I might. Overall, the process complimented and provided a strong foundation for writing my empirical paper. I found it an incredibly useful way to become immersed in the existing research and I uncovered so many useful papers, which I might not have otherwise found, for use in the introduction of my empirical paper.

The empirical paper

Ethical approval, Covid-19 and research design

One of the greatest challenges I faced throughout the research process was obtaining ethical approval for the study. This research was part of a joint project, as mentioned in Appendix 3, and therefore Maya Bowri (my thesis partner) and I completed the ethics application together. We submitted our application promptly at the start of January 2020 and received feedback and some minor amendments in

March. However, the research landscape dramatically changed with the emergence of Covid-19 and particularly the UK's lockdown on the 23rd of March 2020 (Han et al., 2020).

The changes caused by Covid-19 meant that what appeared initially to be a relatively smooth process became much more complicated. For our project we had received feedback on our initial application, but we had not yet been granted ethical approval. Therefore, rather than applying for an amendment for changes related to Covid-19 we had to adapt the whole application and re-submit. At this time, the majority of other projects also had to make adaptations, and this meant that the process of receiving feedback took longer. On reflection, another challenge posed by this delay was that I lost time that I had planned to dedicate to starting my systematic review.

Originally, this project planned to adopt a longitudinal design with a baseline and follow up assessment a few months later. We planned to undertake a baseline assessment in Easter 2020, however due to the delay in ethical approval this was moved to September. After discussion with Marc Tibber, we decided to opt for a cross-sectional design instead, because we were mindful of the time frames imposed by the DClinPsy and wanted to ensure that we completed the research within this period. Although I think this was the right decision, it was also a shame because a key critique of this area of research is that most studies adopt a cross-sectional design (Keles et al., 2020). A longitudinal study would have enabled us to understand more about the direction of relationships between key variables.

Whilst Covid-19 was an unexpected fork in the road (to say the least), the process of making adjustments and further methodological decisions helped me to view research as a journey. I realised the importance of not being too firmly wedded to

original ideas and the value of having a 'plan B'. It also made me realise that each decision made in the research process has its own advantages and disadvantages. It further highlighted the value of being part of a research team and having a space to talk about these decisions with others. As my thesis was undertaken in parallel to another DClinPsy thesis, Maya Bowri, Marc Tibber and I had several discussions about how to proceed with the research and make adjustments to the project in the context of Covid-19. In this case three heads were better than one and I appreciated being able to make decisions as a group. Moving forward in my professional career, it has highlighted how helpful it can be to discuss with and consult with colleagues when conducting research. I hope to adopt this practice when I undertake future research.

Data collection

Due to Covid-19 our data collection took place online, rather than face-to-face using paper questionnaires as was initially planned. Although this would have been resource intensive with regards to data entry, moving the data collection online involved creating an online questionnaire and other considerations around data protection. On balance, I think these tasks would have taken similar lengths of time. One disadvantage of moving data collection online was that we struggled to recruit as many participants as we had hoped to. For the face-to-face data collection, the schools had agreed to allocate a short period of time within the school day for students who had consented to participate. However, the new method meant that participants were emailed a link to complete the questionnaire at home. Despite time being allocated within homework hours on the day the link was circulated, the study did not receive as much uptake as we had anticipated.

One potential reason for the lack of uptake was that the length of the questionnaire was off-putting to the young people. Despite effort made to reduce the length of the

questionnaire, without impacting its quality, the time taken to complete it was estimated to be about 25-30 minutes. Another difficulty with regards to online recruitment is that unless participants complete the study that day, they may forget about it. There was certainly a large drop in the numbers of participants who completed the survey as time increased after it was sent. Moving forward, I have learnt the impact that such decisions can have on recruitment and will consider balancing measure selection against questionnaire length in the future. However, I think this decision is always likely to be a challenging one in research, particularly given the length of some existing measures.

Analyses

Although I had a reasonable grasp of basic statistical analysis from the course teaching and prior research projects, the bulk of my experience was on SPSS. I had never used R before, or undertaken path analysis, and this left me feeling out of my comfort zone and evoked higher anxiety than other aspects of the research process. One of the biggest challenges was learning how to code using R, which felt daunting. However, I tried to break it down and I gave myself plenty of time to get to grips with the software. To try and get a good grasp of the area I also did a lot of reading of relevant book chapters. Furthermore, I discovered the utility of YouTube tutorials, focusing on how to code and undertake more complex analyses on R. A favourite of mine was the rather aptly named Statistics of Doom YouTube channel! Admittedly the process of getting the correct code to run the analyses was one of trial and error. However, I did learn a lot by doing this and I tried to approach it as if I were trying to complete a puzzle. This process also made me reflect on my learning style and I realised how much I learn by ‘doing’ and putting something into practice. At this stage, my frequent consultation with Marc Tibber was invaluable. I was very grateful for his skills in statistical analysis, and this felt containing when I was undertaking something new and unfamiliar.

I found making pivotal decisions about the analyses quite difficult, such as the choice of estimator, and I was concerned about whether I was making the right choice. These decisions needed to be informed by theory and initially I did not have the necessary level of understanding to make well-informed decisions. I ended up doing extensive reading on the area and, on reflection, I went around in circles for some time. I found it helpful to focus on the costs and benefits of each decision and came to realise that most decisions have some downsides. Retrospectively, if I were going to undertake this project again, I would have enrolled on a statistics course focusing on undertaking path analysis using R. I think this would have helped me to feel more confident throughout the analysis stage and may have saved me a considerable amount of time.

Other reflections

The empirical paper was part of a joint project with Maya Bowri. Having a good working relationship, and friendship, was invaluable throughout the project. Throughout the process we were able to discuss and navigate problems as they arose, sharing different perspectives and ideas, and drawing on each other's strengths. I personally found it motivating to be working alongside someone else; it helped me to meet the deadlines and juggle the various demands involved in conducting research. The importance of peer support on clinical psychology training has been highlighted in managing stress and the emotional demands of training (Cushway, 1992; Kuyken et al., 2003). This was certainly something that resonated with me, particularly during the context of Covid-19 when our lectures were moved online, and we were not seeing our peers in person. Social support has been proposed to protect individuals against the negative effects of stress (Cohen & Wills,

1985) and having frequent check-ins with Maya helped me to manage my own stress.

Perfectionism has been identified as a common personality trait among trainee clinical psychologists, which can result in feelings of low mood and burnout (Richardson et al., 2020). I certainly identify as a perfectionist and tend to set very high standards for myself both in my clinical work and research. Due to my perfectionism, I have always found the write up stage of research challenging and slow. In the past, when undertaking my undergraduate and master's theses, I noticed a tendency to be self-critical when my perfectionism kicked in and slowed things down. When this occurred, I also noted that my work-life balance tended to become quite lopsided with work becoming the predominant focus.

Throughout this doctorate I have come to realise that my perfectionism is not always a weakness, rather a key personality trait that has helped me to get where I am today. I am also aware that this trait is related to my own passion and enthusiasm for undertaking work in the field of mental health, and the potential to have a positive impact on the well-being of others. To balance my perfectionism throughout this process I have approached myself with more self-compassion, which I think this has helped to sustain me and prevent feelings of burnout.

At the start of training, I spent time reflecting on the importance of maintaining a healthy work life balance throughout the course. Although I have often had to work during the weekends in my final year, I have found making time to see friends beneficial to my own mental health. I feel grateful that I live near a few fellow trainees, with the regular walks, coffee breaks and space to reflect on the DClinPsy journey/rollercoaster being invaluable. I also think that the process of balancing the multiple roles and competing demands of training (e.g., being a researcher,

therapist, supervisee and student) has enabled me to sit with uncertainty better and accept being good enough, rather than always pushing myself to do more. The DClinPsy has been an intense but rewarding journey of personal and professional growth.

Another sustaining factor throughout training, especially during the process of writing up my thesis, has been running. The benefits of running for physical and mental well-being are well-documented, supporting improved cardiovascular health, better mood, and reduced levels of stress (Callen, 1983; Lee et al., 2014; Markotiü et al., 2020). Running has been a long-standing passion of mine, in particular long distance and marathon running. With most races cancelled over the last year due to the pandemic, in December 2020 I decided to sign up for my first ultra-marathon scheduled for two weeks after the hand-in date of this thesis. I have found going on long runs at weekends has complimented thesis writing, had a positive impact on my overall well-being and helped to reduce my screen time. Whilst running, I have also reflected upon the role of the mind in endurance activities and have drawn parallels between crossing the finish line of this project and running the ultra-marathon.

Conclusions

I have found this project incredibly thought-provoking, and it has been exciting to be undertaking research in such a rapidly evolving field. More broadly, the research has highlighted the need for a more nuanced understanding of using SNS, and I hope it will inspire future research examining different patterns of use. Personally, I have valued gaining a better understanding of the relationship between using SNS and mental health and moving forward I hope to integrate my knowledge into my clinical work. Lastly, it has helped me to appreciate how clinical practice and

research complement each other, and I feel grateful for being trained in both of these skills sets.

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Appendix 1 - Information sheets about the study for young people and their parents/carers

PARTICIPANT INFORMATION SHEET FOR YOUNG PEOPLE

Social media use in young people

Would you help us with our research?

We are researchers and clinical psychologists at University College London and would like to ask you to help us by taking part in a research study. Please read this information sheet carefully, talk to other people about it if you would like, and ask any questions before you decide.

Why are we doing this study?

Social media use is common in young people. The purpose of our research is to increase our understanding of how young people use social media and how young people's social media use is related to their wellbeing. We will also look at whether social media use impacts upon young people's learning by asking for your permission for your school to share your grades with us. If you agree to this, your school will share your school grades with us. We are particularly interested in the relationship between social media use and wellbeing during Covid-19 since young people's usual routine has changed.

Who is invited to take part in this study?

We are inviting students to participate from across year groups between Year 7 and Year 12 at [redacted]

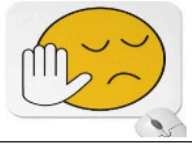
What will happen if I take part?

1. If you and your parents/carers agree to you taking part, you will be asked to complete a series of questionnaires online. You must complete the questionnaire within 10 days of receiving the link to the questionnaire if you wish to take part. The questionnaires will take you about 30 minutes to complete. You can contact members of our research team by email in case you have any questions or wish to arrange to speak with them. If your parents/carers do not agree to you taking part, you will not be sent the link to the online questionnaires.
2. If you agree, we will also contact you in 3-6 months' time and again in 12-18 months' time and ask you to complete the same questionnaires again, so that we can explore how social media use might change as the Covid-19 situation changes, and can begin to see whether social media use now affects mental health and wellbeing later. At all three stages of the study, we will ask you whether you agree to take part. <u>You do not have to agree to take part in the study at any stage.</u>

The questionnaires will ask you about:

- Your age, school year, gender and ethnicity.
- Your sleep, leisure and study habits and time spent with family.
- Your social media and digital screen use, including time spent on apps/websites and your reasons for use
- Your social networks and social relationships.
- Your emotional wellbeing (anxiety and depression symptoms).

Do I have to take part?
No! It is up to you whether you take part. If you do not want to take part that is fine, and your decision won't affect your education or anything else in any way. You can stop taking part at any time during the study and don't have to say why. We have also informed your parents/carers about the study and asked them if they have any objection to you taking part. You don't have to take part even if your parents/carers agree. If you wish to remove your data from the study, please contact Dr Marc Tibber (Principal Researcher) up to one month following data collection at each stage of the study (contact details below).



What happens to information you collect about me?

- Nobody except the researchers will have access to the information we collect about you and what you tell us.
- Your information will be labelled with a number code which can't identify you. Your name and contact details will be kept separately from the information you provide and will only be used in order to contact you in 3-6 and 12-18 months' time if you agree. We will ask you again at these times whether you agree to participate in the study.
- When we finish the research we will write a report about the study and our findings. We hope to publish these in scientific journals so that other researchers and professionals can benefit from what we have learnt too.
- We will share all anonymous data from the study with Dr Emma Silver, which can then be requested by your school. Your school won't be able to identify you from this data.
- Your name and other information that might make it possible for people to guess who you are will not appear anywhere in the data or the report of the study.
- Your anonymous information will be kept for up to 10 years as it might be needed to help with future research.

Are there any risks in taking part in this study?
There should not be any risks with this study. However, sometimes answering questions about wellbeing can remind people of difficult experiences they've had. These might be things that happened in the past, or things happening now.

If you find answering any if the questions upsetting, you can speak with a member of the research team during or after the study. We can then make sure that you have the support that you need. For example, we can arrange for you to speak with a psychologist from our research team.

Your safety and wellbeing If we have concerns about your safety/wellbeing from your questionnaire answers, this information will be shared with Dr Emma Silver, who may arrange for a member of the research team to contact you.

What are the benefits of taking part?
Your participation will be very important in helping us to understand more about young people's social media use, particularly during Covid-19. We would like to use the findings from this research to develop an intervention to support young people to use social media in ways that supports their wellbeing.

Data Protection privacy notice
UCL's Data Protection Officer is Alexandra Potts and she can be contacted at data-protection@ucl.ac.uk. You can read UCL's privacy notice at: https://www.ucl.ac.uk/legal-services/privacy/participants-health-and-care-research-privacy-notice and details of your rights at: https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/individuals-rights/

All questionnaires will be completed online on the RedCAP (Research Data Collection Service) web-based survey tool, which is General Data Protection Regulation (GDPR) compliant.

If I have any questions, who can I ask?
If you have any questions, please contact us:
Dr Marc Tibber (Principal Researcher)
m.tibber@ucl.ac.uk
[redacted]

PARTICIPANT INFORMATION SHEET FOR PARENTS/CARERS

Study title: Social media use in young people in the context of COVID-19

What is this study? We are inviting your child to take part in a research study that is investigating young people's digital screen and social media use, and how this is related to their mental health and academic attainment. We are particularly interested in how this may have changed as a result of COVID-19, e.g. time away from school. Before you decide if you agree to your child taking part in the study, it is important that you understand why the research is being done and what it will involve. Please read this information sheet carefully.

Why are we doing this study? Researchers have become interested in both the positive and negative consequences of young people using social media, with controversy concerning whether social media use exposes young people to harm or helps them to develop relationships. Furthermore, it has been suggested that social media use may impact upon young people's learning and academic achievement. However, much of the research until now has only looked at overall levels of use, i.e. how many hours per day young people use social media, rather than how young people use social media. In this study, we want to explore how different ways of using social media impact on young people's mental health and wellbeing, as well as whether or not it has any impact on academic performance. We are also interested in how these effects change over time, as well as the relationship between young people's social media use and their emotional wellbeing in the context of COVID-19 given associated changes to young people's routines. It is hoped that the information we gather from this study will help us

design resources to help young people use social media in a way that maximises its positive effects and minimizes it negative effects.

Why has my child been invited to take part? Your child has been invited to take part because they are a student attending one of our collaborating schools.

Does my child have to take part? No. Taking part is completely voluntary. The nature of the study will be explained to them in a separate age-appropriate participation information sheet and they will be given two weeks to read through it and contact a member of the research team to ask any questions they might have about the study. If you would like we can also arrange a time to speak to you or your child by phone about the study. If they would like to participate they will be sent an online link where they will be asked to consent / assent to take part in the study before being directed to the questionnaires. Your child is free to stop taking part at any time during the study without giving a reason. As their parent/carer, you are also free to decide whether or not they should take part in the study. ***Unless we hear from you within two weeks, we will assume that you are happy for them to participate (if they choose to)***. To opt-out with respect to their participation, please scroll down the email and **click on Reply for the opt-out form**. This will alert [removed for anonymity] with the name of your child, and your child's name and any other information will not be shared with anyone. If you choose to opt-out with respect to your child's participation, your child will not be sent the link to the online questionnaire. If you or your child decide not to take part, or to stop taking part at any point, this will not affect the education or care they receive, now or in the future.

What will my child have to do if they decide to take part? Your child will complete some questionnaires online via the RedCAP (Research Data Collection Service) web based survey tool, which is compliant with General Data Protection Regulation (GDPR). If your child agrees to take part, after being sent a link to the questionnaires, they will have one month within which to complete these. We anticipate that the questionnaires will take your child approximately 30 minutes to complete. Before assenting/consenting to

participate they will be asked to contact a member of the research team by email if they require any support with completing the questionnaires or to answer any questions they might have.

The questionnaires will ask your child about:

- Their age, school year, gender and ethnicity.
- Sleep, leisure and study habits and time spent with family.
- Their social media and digital screen use, including time spent on apps/websites and their reasons for use.
- Their social networks and social relationships
- Their emotional wellbeing/mental health (anxiety and depression symptoms).

To investigate whether social media use impacts upon young people's learning and academic attainment, we will also ask you and your child for your permission to access your child's exam grades from school. If you and your child agree to this, your child's school will share your child's exam grades with us. After they have completed the questionnaires, your child will be provided with a number of educational resources about social media, mental health and emotional wellbeing, which have been developed by the researchers in collaboration with their school. These resources will be made available to all students regardless of their participation in the study.

As part of the study, your child will be asked to complete the questionnaires again in 3-6 months' time. If you and your child agree, you will also be contacted in 12-18 months' time to ask whether you consent to your child completing the original questionnaires again as part of a 'follow-up' study. This will enable us to explore how the relationship between social media use and mental health and wellbeing might change as the COVID-19 situation develops, and will enable us to begin to understand whether current social media use impacts on mental health and wellbeing in the future, i.e. whether one might truly cause the other. At all three time points of the study, your child will be asked whether or not they wish to participate and will be able to refuse participation in the study even if you consent to their taking part. If you do not wish for you or your child to be contacted in the future for this purpose, please

let us know using the opt-out form. Please note, that by allowing us to contact you for this express purpose in the future, you are in no way consenting to ongoing contact, only for the follow-up study. In addition, you will be able to withdraw participation from this at a later date also. If you wish to withdraw your child's data from the study, you or your child should contact Dr Marc Tibber (contact details below) within one month following data collection at each stage of the study to remove their data.

Are there any risks in taking part in this study? There are no major risks to your child in taking part in this study. However, if for any reason your child experiences any emotional discomfort or distress by answering any of the questions, they will have the opportunity to speak with a clinical member of the team (a qualified or trainee clinical psychologist) in order to discuss this further and think about whether any further support is needed. Questionnaires about mental health and emotional wellbeing that will be used in the study are used in standard routine research and clinical practice.

Are there any benefits to taking part? Your child's participation in the study will be very important in helping us to understand more about young people's social media use, its relation to mental health, and more specifically, in the context of social isolating. The hope is that the findings of the study will be published in professional and academic journals in order to help inform the work of other researchers, clinicians and educators. However, your child's anonymity will be preserved, and no identifiable information will be included in any published materials. The study is being undertaken in partnership with the school's wellbeing programme and all findings from the study will also be shared with the school to help the school consider how best to manage social media use amongst its pupils. We would also like to use the findings from this research to develop resources and interventions to support young people to use social media in ways that supports their wellbeing. As part of the study, your child will be provided with educational resources on social media and mental health, contributing to the school's ongoing wellbeing program.

Who is organising and funding the research? This research is being undertaken by participating schools in collaboration with the research

department of Clinical, Educational and Health Psychology at University College London. The project is not externally funded. However, a small amount of funding has been given by the department within UCL as part of a fund that helps finance trainee research. The research will contribute to the doctoral thesis of two training clinical psychologists within the department who are funded by the NHS.

Who has reviewed the research? The research has been reviewed by the UCL Research Ethics Committee.

What happens to information you collect about my child? All the information you and your child provide will be treated as confidential and will be stored securely on the UCL network and will be accessible only to members of the research team. Any identifiable data will stored separately from the questionnaire response data, and will only be accessed by members of the research team in order to invite your child to participate at the follow-up time-points (where consent has been given for this), to contact your child if there are concerns about their safety and/or wellbeing on the basis of their questionnaire responses, or if they indicate on the questionnaire that they would like to schedule a meeting with a clinical member of the research team to discuss any concerns they might have about their mental health or wellbeing.

The anonymised data from the study will be shared with [removed for anonymity] (contact details below), who will share this data with the schools if this is requested. Anonymised data may be shared with other researchers at UCL or other institutions, to help answer further research questions, but they will never be given your child's name, contact details or any other identifiable information. Once names and contact details are no longer required for the research project, they will be deleted, and all data will then become fully anonymised.

We will keep a digital record of your child's anonymous information for up to 10 years, as it may be required for future research. All information will be destroyed once it is no longer required for research purposes. If you or your

child decide that they want to stop taking part in the study their information can be removed if this is requested within one month following data collection.

What will happen to the findings of the study? When the study is finished, the findings will be written up and presented as part of Clinical Psychology doctoral theses and as scientific articles to be published in peer-reviewed journals or conference abstracts. A summary of the findings will be shared with parents / guardians, young people, and the schools that took part. We think it is important to inform you about the information we found out and what will happen next. As mentioned above, it will not be possible to identify your child from findings in these publications.

What if there is a problem during the study? If you wish to raise a complaint then please contact Dr Marc Tibber (the Principal Investigator for the study) at m.tibber@ucl.ac.uk. If you feel that your complaint has not been handled to your satisfaction, you can contact the Chair of the UCL Research Ethics Committee at ethics@ucl.ac.uk. If something happens to your child during or following their participation in the project that you think may be linked to taking part, please contact the Principal Investigator**.**

Thank you for taking the time to read this information and to consider participation in the study.

Local Data Protection Privacy Notice: The controller for this project will be University College London (UCL). The UCL Data Protection Officer provides oversight of UCL activities involving the processing of personal data, and can be contacted at data-protection@ucl.ac.uk. This 'local' privacy notice sets out the information that applies to this particular study. Further information on how UCL uses participant information can be found in our 'general' privacy notice: For participants in health and care research studies, click here. The information that is required to be provided to participants under data protection legislation (GDPR and DPA 2018) is provided across both the 'local' and 'general' privacy notices. The lawful basis that will be used to process your personal data are: 'Public task' for personal data and' Research purposes' for special category data. UCL will keep identifiable information about you for three months after the study has finished. To safeguard your rights, we will use the minimum personally identifiable information possible. If you are concerned about how your personal data is being processed, or if you would like to contact us about your rights, please contact UCL in the first instance at data-protection@ucl.ac.uk

Research Contact: Dr Marc Tibber (Principal Investigator for the study). m.tibber@ucl.ac.uk

Address: Research Department of Clinical, Educational and Health Psychology, University College London, Gower Street, London, WC1E 6BT

School Contacts: [redacted]

Please note: *While UCL systems are secure and updated regularly, UCL cannot ensure the security of external email systems, by using email communication you are accepting of these potential risks. If you would like more information on this please ask and more details can be provided before you send on any confidential data*

Appendix 2 - Parental opt-out consent form

PARTICIPANT OPT-OUT FORM: PARENT/CARER

Please ONLY complete this form and email it to maya.bowri.18@ucl.ac.uk or ghiselle.green.18@ucl.ac.uk if, after you have read the Information Sheet, you DO NOT consent for your child to participate.

Title of Study: Social media use in young people in the context of COVID-19.

Department: Clinical, Educational and Health Psychology, University College London (UCL).

Researcher(s): Maya Bowri (maya.bowri.18@ucl.ac.uk); Ghiselle Green (ghiselle.green.18@ucl.ac.uk)

Principal Researcher: Dr Marc Tibber, Lecturer in Clinical Psychology (m.tibber@ucl.ac.uk)

School Contacts: [redacted]

UCL Data Protection Officer: [redacted] (data-protection@ucl.ac.uk)

This study has been approved by the UCL Research Ethics Committee

Project ID number: 17383/001

Thank you for considering to allow your child to take part in this research. If you have any questions arising from the Information Sheet, please contact a member of the research team (details above) before you decide whether to allow your child to participate. Your child will automatically have the opportunity to take part in the research unless you complete this opt-out form. However, your child will also be provided with a separate (age-appropriate) information sheet and given opportunities to contact the research team to ask questions before they are asked whether they would like to participate.

I confirm that I understand that by initialling a box below, I *withdraw* consent for my child to participate in that part of the study. I understand that it will be assumed that unticked/non-initialled boxes mean that I consent to my child participating in that part of the study. I also understand that if I do not return this form or contact the research team, I consent to my child participating in all sections of the study.

		Initial Box
1.	I do not consent to my child participating in any part of the study.	
2.	I do not agree to me or my child being contacted in 3-6 months' time as part of the study.	
3.	I do not agree to me or my child being contacted in 12-18 months' time as part of the study.	
4.	I do not consent to my child's academic grades for the relevant year being accessed as part of the research.	

Name of young person:

_____

Name of school:

_____

Parent / Guardian Name:

_____

Date:

_____

Contact for further information:

Contact: Dr Marc Tibber (Chief Investigator for the study)
Address: Research Department of Clinical, Educational and Health Psychology, University College London, Gower Street, London, WC1E 6BT
Email: marc.tibber@ucl.ac.uk

Please note: *While UCL systems are secure and updated regularly, UCL cannot ensure the security of external email systems, by using email communication you are accepting of these potential risks. If you would like more information on this please ask and more details can be provided before you send on any confidential data.*

Appendix 3 – Joint Thesis Declaration

This thesis was a joint project working alongside Maya Bowri. Maya's project explored the relationship between motivations for social media use and mental health among young people, in the context of the Covid-19 pandemic (Bowri, 2021).

Systematic Review: The systematic review was undertaken independently. When this review is written up for publication, there are plans for Maya Bowri to act as the second rater of the studies included in the review. However, at present the ratings have been undertaken solely by the author of this thesis.

Empirical Paper: The selection of relevant questionnaires for the study, ethics application, and recruitment process were undertaken jointly. Additionally, the initial data cleaning and descriptive analyses were undertaken jointly. Each trainee had an equal role in the aforementioned stages. All subsequent processes were undertaken independently, including analysis and write up of the findings of this study.

Appendix 4 - Letter of ethical approval

UCL RESEARCH ETHICS COMMITTEE
OFFICE FOR THE VICE PROVOST RESEARCH

2nd June 2020

Dr Marc Tibber
Research Department of Clinical, Educational and Health Psychology
UCL

Cc: Ghiselle Green & Maya Bowri, Trainee Clinical Psychologists, UCL Research Department of Clinical, Educational and Health Psychology

Dear Dr Tibber

Notification of Ethics Approval with Provisos
Project ID/Title: 17383/001: The impact of social media on young people's mental health in the context of the COVID-19 pandemic: testing a preliminary model and exploring patterns of use.

Further to your satisfactory responses to the Committee's comments, I am pleased to confirm in my capacity as Chair of the UCL Research Ethics Committee (REC) that your study has been ethically approved by the UCL REC until **1st September 2021.**

In view of the fast developments of the pandemic, the numerous projects being initiated and the constantly changing framework, please provide us with regular updates **every 3 months (with the 1st report due on 2nd September)** regarding the ethical aspects of your project and the specific problems (if any) that you have encountered. At the end of the study, as part of the final report you have to submit to the UCL REC, please include alongside a brief outline of the research outcomes, any experiences which would be valuable for informing the fast-track COVID review process, and in turn subsequent fast-tracked studies.

Ethical approval is also subject to the following conditions:

Notification of Amendments to the Research
You must seek Chair's approval for proposed amendments (to include extensions to the duration of the project) to the research for which this approval has been given. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing an 'Amendment Approval Request Form'
http://ethics.grad.ucl.ac.uk/responsibilities.php

Adverse Event Reporting – Serious and Non-Serious
It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator (ethics@ucl.ac.uk) immediately the incident occurs. Where the adverse

Office of the Vice Provost Research, 2 Taviton Street
University College London
Tel: +44 (0)20 7679 8717
Email: ethics@ucl.ac.uk
http://ethics.grad.ucl.ac.uk/

incident is unexpected and serious, the Joint Chairs will decide whether the study should be terminated pending the opinion of an independent expert. For non-serious adverse events the Joint Chairs of the Ethics Committee should again be notified via the Ethics Committee Administrator within ten days of the incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Joint Chairs will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

Final Report

At the end of the data collection element of your research we ask that you submit a very brief report (1-2 paragraphs will suffice) which includes in particular issues relating to the ethical implications of the research i.e. issues obtaining consent, participants withdrawing from the research, confidentiality, protection of participants from physical and mental harm etc.

In addition, please:

- ensure that you follow all relevant guidance as laid out in UCL's Code of Conduct for Research: https://www.ucl.ac.uk/srs/file/579
- note that you are required to adhere to all research data/records management and storage procedures agreed as part of your application. This will be expected even after completion of the study.

With best wishes for the research.

Yours sincerely

Professor Michael Heinrich
Joint Chair, UCL Research Ethics Committee

Appendix 5 – Study questionnaires

Questionnaire

Thank you for agreeing to take part in the study. This questionnaire takes about 30 minutes to complete. There are no right or wrong answers. Please contact a member of the research team if you have any questions or if anything is not clear.

For the multiple-choice questions, please select the answer that describes you the best.

1.1. What is your name? _____

1.2. What is your date of birth? _____

1.3. What year group are you in?
[ ] Year 7
[ ] Year 9
[ ] Year 10
[ ] Year 12

1.4. Are you attending school at the moment (i.e. since schools closed on Friday 20th March)?
[ ] Yes
[ ] No
[ ] Remotely

1.5. What gender were you assigned at birth?
[ ] Male
[ ] Female
[ ] Prefer not to say

1.6. What gender do you self-identify as now?
[ ] Male
[ ] Female
[ ] Other (please specify:_____)
[ ] Prefer not to say

1.7. What is your ethnicity? (Please choose one)
[ ] White (British; Irish; Any Other White Background)
[ ] Mixed (White and Black Caribbean; White and Black African; White and Asian; Any Other Mixed Background)
[ ] Asian or Asian British (Chinese; Indian; Pakistani; Bangladesh; Any Other Asian Background)
[ ] Black or Black British (Caribbean; African; Any Other Black Background)
[ ] Any Other Ethnic Group
[ ] Prefer not to say

1.8. On a <u>weekday (Monday-Friday) how many hours</u> do you typically spend…?
[ ] Sleeping per night
[ ] Studying or doing school-related activity during the day
[ ] Exercising during the day
[ ] Spending time with family (face-to-face) during the day

2. Digital Screen Use

We would like to ask you some questions about your digital screen use, including your use of social media, video-gaming, video chatting and messaging apps.

2.1. In the past week, on an average weekday (i.e. Monday to Friday), approximately how much time per day have you spent using messaging apps (e.g. WhatsApp and Messenger)?

[ ] Less than 10 minutes
[ ] 10-30 minutes
[ ] 31-60 minutes
[ ] 1-2 hours
[ ] 3-5 hours
[ ] More than 5 hours

2.2. In the past week, on an average weekday (i.e. Monday to Friday), approximately how much time per day have you spent using video chatting apps (e.g. House Party and Skype)?

[ ] Less than 10 minutes
[ ] 10-30 minutes
[ ] 31-60 minutes
[ ] 1-2 hours
[ ] 3-5 hours
[ ] More than 5 hours

2.3 In the past week, on an average weekday (i.e. Monday to Friday), approximately how much time per day have you spent gaming? *Note: this includes standard computer games as well as virtual social worlds (e.g. Second Life) and virtual game worlds (e.g. Fortnite, Minecraft, World of Warcraft).*

[ ] Less than 10 minutes
[ ] 10-30 minutes
[ ] 31-60 minutes
[ ] 1-2 hours
[ ] 3-5 hours
[ ] More than 5 hours

2.4 Did this include multiplayer gaming (i.e. playing with others over the internet?)

[ ] Yes
[ ] No

2.5. Do you use social media? *Note: We are defining social media broadly to include social networking sites (like Facebook and Instagram), blogs and microblog sites (like Tumblr and Twitter) and content communities (like YouTube).*

[ ] Yes → please continue to 2.6
[ ] No → please can you tell us why not before continuing to 3.1

_____
_____
_____
_____
_____

2.6. Which top three social media sites / apps do you use? Please state up to three. If you only use one or two, please just name those and leave other spaces blank.

1. _____ 2. _____ 3. _____

2.7. How many social media sites / apps do you use in total? [ ]

2.8. In the past week, on average, approximately how much time per day have you spent using social media sites?

[ ] Less than 10 minutes
[ ] 10-30 minutes
[ ] 31-60 minutes
[ ] 1-2 hours
[ ] 3-5 hours
[ ] More than 5 hours

For each statement below, please select the answer that describes you the best.

2.9. When comparing yourself to others on social media, to what extent do you focus on people who are better off than you?	Not at all	Very little	Somewhat	Quite a bit	A great deal
2.10. When comparing yourself to others on social media, to what extent do you focus on people who are worse off than you?	Not at all	Very little	Somewhat	Quite a bit	A great deal
2.11. When comparing yourself to others offline (i.e. not on social media but in day-to-day interactions), to what extent do you focus on people who are better off than you?	Not at all	Very little	Somewhat	Quite a bit	A great deal
2.12. When comparing yourself to others offline (i.e. not on social media but in day-to-day interactions), to what extent do you focus on people who are worse off than you?	Not at all	Very little	Somewhat	Quite a bit	A great deal

3. Social Relationships

Please circle the answer that shows how much you agree or disagree with the following statements:

3.1. There are people who I interact with on social media who I trust to help solve my problems.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.2. There are people who I interact with on social media who I can turn to for advice about making important decisions.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.3. There is no one I interact with on social media that I feel comfortable talking to about my personal problems.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.4. When I feel lonely, there are several people on social media who I can talk to.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.5. If I needed to borrow some money, I know there are people who I interact with on social media that I could turn to.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.6. Interacting with people on social media makes me interested in things that happen outside of my community.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.7. Interacting with people on social media makes me want to try new things.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.8. Talking with people on social media makes me curious about other places in the world.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.9. Talking with people on social media makes me feel part of a larger community.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree
3.10. Interacting with people on social media makes me feel connected to the bigger picture.	Strongly disagree	Somewhat disagree	Somewhat agree	Strongly agree

3. Emotional Wellbeing

For each statement below, please select the answer that describes you the best. Your answers will remain confidential, although we may need to speak to you about your answers if we feel concerned about them. If you experience any discomfort, distress or negative feelings by answering these questions and wish to discuss this, please contact a member of the research team.

4.1. I feel sad or empty.	Never	Sometimes	Often	Always
4.2. Nothing is much fun anymore.	Never	Sometimes	Often	Always
4.3. I have trouble sleeping.	Never	Sometimes	Often	Always
4.4. I have problems with my appetite.	Never	Sometimes	Often	Always
4.5. I have no energy for things.	Never	Sometimes	Often	Always
4.6 I am tired a lot.	Never	Sometimes	Often	Always
4.7. I cannot think clearly.	Never	Sometimes	Often	Always
4.8. I feel worthless.	Never	Sometimes	Often	Always
4.9. I feel like I don't want to move.	Never	Sometimes	Often	Always
4.10. I feel restless.	Never	Sometimes	Often	Always
4.11. I worry about things.	Never	Sometimes	Often	Always
4.12. I worry that something awful will happen to someone in my family.	Never	Sometimes	Often	Always
4.13. I worry that bad things will happen to me.	Never	Sometimes	Often	Always
4.14. I worry that something bad will happen to me.	Never	Sometimes	Often	Always

4.15. I worry about what is going to happen.	Never	Sometimes	Often	Always
4.16. I think about death.	Never	Sometimes	Often	Always

4.17. If after having completed this questionnaire you are concerned about your safety or mental wellbeing, or someone else's safety or mental wellbeing, and would like to access further help or talk to a mental health professional, please tick yes and a member of the research team will contact you.

[ ] Yes

[ ] No

Appendix 6 – Supplementary table of most used social media sites

Supplementary Table 1

Responses to the question "which three social media sites do you use the most?"

Site	Count	Percentage
Amino	2	1.41
DebateIsland.com	1	0.70
Depop	1	0.70
Discord	7	4.93
Facebook	1	0.70
FaceTime	1	0.70
Hatena Blog	1	0.70
Houseparty	3	2.11
Instagram	75	52.82
Messages	2	1.41
Pinterest	7	4.93
Quora	1	0.70
Reddit	7	4.93
Roblox	1	0.70
Snapchat	52	36.62
Tellonym	2	1.41
TikTok	45	31.69
Twitch	3	2.11
Twitter	11	7.75
WhatsApp	43	30.28
YouTube	69	48.59
Yubo	1	0.70

Appendix 7 – Reasons provided for not using social media

Reasons participants reported for not using social media (N = 20)

1. I'm not interested in social media.
2. I've deleted social media from my phone until I turn 14
3. My parents think I am too young to have Instagram as there are hackers but also some pretty weird people on social media.
4. It is a distraction to my education.
5. I don't feel like it.
6. Phone is too old to download it.
7. I do not want to see inappropriate images, am not allowed and do not have much time or interest for those kinds of things.
8. I don't really want to and I don't really like it.
9. I don't have any social media apps or games and my parents don't allow it.
10. I'm not allowed and I don't see much point in them.
11. I'm not allowed to and I don't really want to.
12. I haven't got those apps.
13. I do not take part in any social media sites because I am not the sort of person who is on their phone all the time.
14. Because it takes over your life!
15. Not interested and not allowed.
16. Too much effort.
17. My parents won't allow me to use it (apart from WhatsApp).
18. I am not allowed to use social media.
19. I don't really enjoy it.
20. I'm not old enough for most of them. And my mum says no.

Appendix 8 – Supplementary Pearson's pairwise correlations

Supplementary Table 2

Pearson's correlations between main variables of interest

	Time on SNS	Upward SC online	Downward SC online	Upward SC offline	Downward SC offline	Bonding social capital	Bridging social capital	GAD	Depression	SP
Time on SNS	1									
Upward SC online	.33**	1								
Downward SC online	.22**	.54**	1							
Upward SC offline	.22**	.62**	.45**	1						
Downward SC offline	.23**	.41**	.65**	.59**	1					
Bonding social capital	.38**	.31**	.27**	.25**	.19*	1				
Bridging social capital	- .20*	-.31**	-.10	-.10	.01	.01	1			
GAD	.30**	.38**	.27**	.30**	.16*	.24**	-.22*	1		
Depression	.44**	.47**	.26**	.21*	.17*	.22**	-.43**	.59**	1	
SP	.37**	.52**	.32**	.38**	.29**	.23**	-.18*	.63**	.63**	1

Note. SC = social comparisons
*p<.05, **p<.01