# Social Media and Loneliness: Comparing individuals with varying features of Borderline Personality Disorder

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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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## Thesis Overview

This thesis examines the relationship between social networking site (SNS) use and loneliness in people with and without features of Borderline Personality Disorder (BPD). Part 1 is comprised of a systematic review of existing literature that examines the relationship between SNS use and loneliness. 45 studies were identified as exploring the relationship using adult samples and quantitative methodology. The review examines the potential factors influencing the relationship between SNS use and loneliness.

Part 2 is comprised of an empirical paper that investigates the relationship between SNS use and loneliness in people with and without features of BPD. The paper also investigates the possible mechanisms affecting the relationship between SNS use and loneliness in people with and without features of BPD. It involves the analysis of data gathered from an online survey containing a number of measures.

Part 3 consists of a critical appraisal of the research process. Reflections are made regarding the development of the research topic and the experience of conducting research during the COVID-19. Learning taken from the research process is also summarised.

## Impact Statement

The thesis explores the experience of social networking site (SNS) use and loneliness in people with and without features of Borderline Personality Disorder (BPD). The analysis presented in this thesis appears timely, as the world has found itself in the midst of a global pandemic and a reduction in social contact has been recommended and, at times, enforced. People have found themselves turning to the internet and SNSs to interact with others, and the trajectory of the pandemic is unclear.

The research presents a detailed review of the current literature on the relationship between SNS use and loneliness. A substantial number of studies have investigated the associations between SNS use and loneliness, and the review describes the aspects of SNS use that may, or may not, be associated with elevated loneliness.

The empirical paper furthers the literature presented in the review by expanding the research to include people with features of Borderline Personality Disorder (BPD). There is limited research exploring loneliness in people with features of BPD, which is surprising when considering the diagnostic criteria of disorder. It is important that the relationships between BPD features, loneliness, and SNS use are examined alongside potential mechanisms operating on, and between, the variables. The paper examines potential mechanisms influencing relationships between BPD features, SNS use, and loneliness, with the purpose of informing future interventions aimed at reducing loneliness.

The existing loneliness research suggests loneliness is associated with a number of maladaptive psychological and physical health effects. Clinical and public health interventions must be informed by an evidence-base and the thesis aims to add to the existing evidence pertaining to loneliness. The systematic review, empirical paper, and critical appraisal represent a step towards improving the understanding of how SNS use and loneliness interact, especially in people with features of BPD. The researcher will seek to

disseminate the findings more broadly via publications in research journals, presentations at conferences, and to other interested parties.

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Part 1: Systematic review

# Does a #hashtag a day keep loneliness at bay? A systematic review.

**Daniel Morrissey**

## Abstract

### Aims

To evaluate the existing research exploring the relationship between loneliness and social networking site (SNS) use.

### Method

A systematic literature search was conducted on MEDLINE, PubMed, and PsychINFO databases. 45 studies met inclusion criteria and were included in this review. Studies were evaluated with respect to research question, design, analysis, and conclusion.

### Results

17 studies primarily examined the direct relationship between SNS use and loneliness, and the findings were mixed. 28 studies investigated different factors that might explain the relationship, including addictive SNS use, SNS friendships and experiences, how SNSs were used, and personal variables. Addictive SNS use consistently predicted loneliness whereas the quality of interactions appeared pertinent when considering SNS friendships and experiences. Social comparison orientation (SCO), 'vaguebooking', and self-disclosure were SNS behaviours found to be related to loneliness. Personal variables, such as personality traits, shyness, and attachment were also correlated with loneliness.

### Conclusion

SNS use appears to be associated with loneliness but the direction, and strength, of the relationship depends on other variables, such as how SNSs are used and the personal traits of the user. The research is limited by a reliance on cross-sectional and correlational methodology. Further research should investigate variables that may influence the relationship between SNS use and loneliness, as well as employ more diverse research designs.

## Introduction

Loneliness is defined in the Oxford Dictionary as "sadness because one has no friends or company" or "the fact of being without companions" (Oxford University Press, 2020). Researchers have teased apart this definition further by separating the objective and subjective and found no difference in the time spent alone between those reporting to be more or less lonely (Hawkley et al., 2003). Therefore, aloneness can be thought of as an objective state of isolation (Heinrich & Gullone, 2006) whereas loneliness can be viewed as an aversive state that is subjectively experienced when an individual recognises a wish to feel closer to others (Peplau, 1955). Utz et al. (2014) explain that two people with similar social resources may have quite different subjective experiences of loneliness. For example, a person with a large social network may believe that they lack meaningful connections with those that surround them and experience a greater amount of loneliness than someone whom has a small social network with meaningful ties. In research, the term 'perceived social isolation' (PSI) has also been used to describe loneliness (Primack et al., 2017).

Loneliness has been found to be associated with a number of adverse psychological and physical health outcomes. Cacioppo et al. (2006) conducted two studies that used both cross-sectional and longitudinal designs. The authors found that higher levels of reported loneliness were associated with elevated depressive symptoms. The authors also found that loneliness predicted individual differences in depressive symptoms two years later. Other studies have found higher levels of reported loneliness to be related to anxiety (Alasmawi et al., 2020; Wang et al., 2018), personality disorders (Alasmawi et al., 2020; Liebke et al., 2017), low self-esteem (Brage et al., 1993; Inderbitzen et al., 1992; Ludwig et al., 2020) and poor social skills (Inderbitzen-Pisaruk et al., 1992). Loneliness has also been linked to poorer sleep quality (Cacioppo et al., 2002a), increased blood pressure (Cacioppo et al., 2002b), diabetes (Richard et al., 2017), and lifestyle factors such as smoking and physical inactivity

(Richard et al., 2017). There is even evidence of a relationship between subjective feelings of loneliness and mortality (Olsen et al., 1991; O'Súilleabháin et al., 2019; Penninx et al., 1997).

Loneliness has also been found to be associated with certain demographics, namely those who are unmarried or widowed (Dahlberg et al., 2018; de Koning et al., 2017; Franssen et al., 2020), live alone (Bu et al., 2020; Savikko et al., 2005), or have a low household income (Bu et al., 2020; Savikko et al., 2005).

**Social media**

Social media, or social networking sites (SNSs), have been described as "virtual communities where users can create individual public profiles, interact with real-life friends, and meet other people based on shared interests" (Kuss & Griffiths, 2011). SNSs focus on connecting others (Kuss & Griffiths, 2017). Facebook, Instagram, Twitter and Snapchat are examples of commonly used SNSs that are particularly accessible due to the development of smartphones that have become a key part of the daily lives of many (Brown & Kuss, 2020). In 2015, 65% of American adults used SNSs (Pew Research Center, 2015) which was up from 7% when first measured by the same author in 2005. In the UK, 71% of women report using SNSs compared to 64% of men (Office for National Statistics, 2019).

SNSs offer an opportunity for users to connect and communicate with others and different sites allow users to do this in various ways (Waterloo et al., 2018). For example, Instagram focuses more heavily on users uploading picture-based content and Twitter limits the number of characters that can be used when publishing posts. The ability to "like" other users' post has also become a common feature across SNSs (Rosenthal-van der Pütten et al., 2019).

**Loneliness and SNS use: theory**

The belongingness hypothesis (Baumeister & Leary, 1995) proposes that humans have a "pervasive drive to form and maintain at least a minimum quantity of lasting, positive,

and significant interpersonal relationships". When interactions are pleasant and take place in the context of an enduring concern for each other's welfare, the drive is considered to be satisfied. SNSs offer the opportunity for bonds to be maintained when close proximity is not possible and therefore offer opportunities for individuals to develop significant and positive relationships with others. If this were the case, it would be expected that SNS use would be associated with a decrease in loneliness, particularly for individuals lacking in meaningful offline social relationships.

Some have posited that the use of media may compensate for deficiencies existing in an individual's life (Davis & Kraus, 1989). In the case of SNSs, it has been suggested that SNSs are used to compensate for deficient levels of social contact. This social compensation hypothesis implies that individuals who struggle in offline social contexts use SNSs online to offset aversive experiences associated with few, or ineffective, offline social contacts. However, this may not be the case and an alternative hypothesis is that the 'rich get richer', meaning that individuals with affluent offline social relationships expand on this using SNSs (Zywica & Danowski, 2008). There have also been suggestions that SNS use may lead to greater exposure to bullying (Lin et al., 2016), the neglect of offline social interactions (Moretta & Buodo, 2020), and reduced satisfaction in romantic relationships (Griffiths et al., 2014).

**Aim of this review**

The aim of this review was to identify and evaluate the existing research on the relationship between loneliness and SNS use. Previous reviews have focused on the relationship between SNS use and depression and anxiety (Seabrook et al., 2016) and psychosis (Lim et al., 2018), as well as the use SNSs in older adults (Leist, 2013). However, one meta-analysis conducted by Liu and Baumeister (2016) investigated SNS use in relation

to personality, self-esteem, and loneliness. To my knowledge, this is the first review of literature exclusively focusing on loneliness and SNS use.

## Method

### Search strategy

Keyword searches of PsycINFO, PubMed, and MEDLINE electronic databases were performed. Search terms related to loneliness (e.g. "exp loneliness", "social isolation", "lonel*") and social media (e.g. "exp social media", "smartphone", "facebook"). A full list of search terms can be found in Appendix A. The reference lists of included papers were then reviewed to identify any further relevant papers.

### Inclusion and exclusion criteria

The first criterion was that the studies had to attempt to answer the question of this review. Therefore, the studies were required to explore relationships between the use of social media and loneliness. The second criterion was that the studies had to include an adult sample as this was the population of interest for the review and the cut-off of 18 years was used to define an adult. This cut-off was used as it is the age that is commonly used to define the lower age-limit for accessing adult mental health services, and upper limit for accessing child and adolescent mental health services (CAMHS), in the UK (Singh et al., 2008). There was no upper-age limit criterion used in the review. The third criterion was that the study had to be peer reviewed and fourthly had to be written in English. A fifth criterion was that the studies had to use quantitative methodology.

The search was run on the 7th of August 2020 and returned 1602 papers. After duplicates were removed, 996 papers remained. Titles and abstracts were then screened for suitability and full papers were reviewed for papers that were deemed suitable. 102 titles and abstracts were deemed suitable and the full papers were subsequently reviewed. At this point, 54 did not meet the inclusion criteria and were excluded from the review, which left the 45

studies included in the review. A flow chart summarising the study selection process is included in Appendix B.

**Quality appraisal**

The "Standard Quality Assessment Criteria" tool developed by Kmet et al. (2004) was used to assess quality of the studies and is included in Appendix C. Quality assessment allows us to weight the evidence and consider the factors contributing to differences in findings. The tool includes rating scales for both quantitative and qualitative reports but only the quantitative scale was used in this review. The scale consists of 14 items that assess various aspects of research, including the research question, design, analysis and conclusion. Each item is scored by the degree to which the criteria are met. A score of 2 is given if the criteria have been met and a score of 1 is given if partially met. A score of 0 is given if the criteria were not met and items that are not applicable to a particular study design are marked "n/a". An overall "summary score" is calculated by summing the total score obtained across relevant items and dividing it by the total possible score. The summary score is presented as a percentage in this review, denoting the percentage of total marks awarded. Kmet et al. reported an inter-rater agreement of between 82-100% for the summary scores. 10% of the papers were also reviewed by a peer and out of the 42 items that were rated, 92.8% of ratings were identical. Three items had a difference of one mark and the three disparities were found across three different studies. The disparities were resolved after discussion.

## Results

After reading the 45 papers it was discovered that some papers focused solely on understanding whether there was a relationship between social media use and loneliness. Other papers went beyond this and attempted to explore factors that were potential mechanisms in the relationship between social media use and loneliness. It was decided that the papers would be separated into those that attempted to answer the question 'what is the

relationship' (17 studies) and those that attempted to answer 'how is the relationship' (28 studies).

**What is the relationship?**

The 17 studies primarily focused on exploring the relationship between SNS usage and loneliness are described in Table 1.

***Quality appraisal of included studies***

The quality ratings were mixed with summary scores ranging between 71-100% and the maximum score possible for 15 out of the 17 studies was 22. Two studies (Hunt et al., 2018; Vally & D'Souza, 2019) were experimental designs and were eligible for ratings on all 14 items of the quality assessment tool. Therefore, the maximum possible summary score for these studies was 28. For the domain of participant characteristic, the ratings were particularly variable with five studies (Hunt et al., 2018; Kross et al., 2013; Lou et al., 2012; Ryan et al., 2011; van Ingen et al., 2017) not providing relevant demographic information of the sample. Five studies (Brusilovskiy et al., 2016; Clayton et al., 2013; Kross et al., 2013; Lou et al., 2012; Reissmann et al., 2018) did not provide sufficient information regarding outcome measures, leaving room for subjectivity and difficulties with study replication. Six studies (Brusilovskiy et al., 2016; Kross et al., 2013; Lou et al., 2012; Mackson et al., 2019; Ryan et al., 2011; Ye & Lin., 2015) were deemed to lack appropriate consideration of potential confounding and dependencies between variables, meaning that the chances of detecting spurious associations may have been greater. All studies were rated as having appropriate designs. Two studies used experimental designs but both studies (Hunt et al., 2018; Vally & D'Souza, 2019) did not report blinding of either investigators or participants and lost marks on associated items.

***Study design***

Of the 17 studies, two studies (Hunt et al., 2018; Vally & D'Souza, 2019) used experimental designs and both used a non-intervention control group. Both studies also gathered baseline measures to control for baseline scores when analysing the manipulation effect. Participants in the experimental groups were instructed to abstain from SNS use whilst the control groups were instructed to continue using SNSs as usual. Two studies (Kross et al., 2013; Reissmann et al., 2018) used experience sampling methodology (ESM) whereby participants were instructed to complete a battery of measures at different times during the day for a period of two weeks. The remaining 13 studies (Aarts et al., 2014; Brusilovskiy et al., 2016; Chopik et al., 2016; Clayton et al., 2013; Lou et al., 2012; Mackson et al., 2019; Phu & Gow, 2019; Primack et al., 2017; Ryan & Xenos, 2011; Stieger, 2019; van Ingen, 2017; Whaite et al., 2018; Ye & Lin, 2015) applied correlational designs whereby participants completed surveys at one timepoint.

A methodological strength of nearly all of these studies was their relatively large sample sizes. For example, many of the studies that used surveys managed to recruit samples sizes of between 204 (Mackson et al., 2019) and 3,353 (Stieger, 2019) participants. The two studies that used an ESM design recruited 65 (Reissman et al., 2018) and 77 (Kross et al., 2013) participants and gathered many data points per participant. The two experimental studies recruited 78 (Vally & D'Souza, 2019) and 143 (Hunt et al., 2018) participants.

***Sample characteristics***

Of the 17 studies, seven were conducted using samples from the U.S (Chopik et al., 2016; Clayton et al., 2013; Hunt et al., 2018; Kross et al., 2013; Lou et al., 2012; Primack et al., 2017; Whaite et al., 2018). The other studies used samples recruited in Australia (Ryan & Xenos, 2011), Austria (Stieger, 2019), China (Ye & Lin, 2015), Germany (Reissman et al., 2018), the Netherlands (Aarts et al., 2014; van Ingen et al., 2017), the United Arab Emirates (Vally & D'Souza, 2019), and the UK (Phu & Gow, 2019). Two studies (Brusilovskiy et al.,

2016; Mackson et al., 2019) did not report where the samples were recruited from. Most studies included relatively young samples with the exception of two studies that used older adult samples with mean ages of 66.94 (Aarts et al., 2014) and 68.18 (Chopik et al., 2016).

Out of the studies that reported ethnicity, most were conducted in the United States and reported between 57-74% of the sample identifying as Caucasian. Nine studies reported over 60% of the sample to be female, none reported over 60% of the sample to be male and one study did not report gender (van Ingen et al., 2017).

***A #hashtag a day keeps loneliness at bay: The good***

Of the 17 studies that focused on the relationship between social media use and loneliness, five reported a positive, adaptive relationship between social media use and loneliness.

Three studies used correlational designs and found support for the relationship between SNS use and reduced loneliness (Chopik et al., 2016; Lou et al., 2012; Mackson et al., 2019). Chopik et al. (2016) conducted a study that involved a survey being completed by participants sampled from a longitudinal panel study that surveyed Americans aged 50 and older every two years. The survey contained measures that assessed the amount of technology used for enhancing social connection, including social networking sites, and how often the participants experienced loneliness (Hughes et al., 2004). Chopik et al. found that greater technology use was associated with lower loneliness scores and loneliness was inversely correlated with self-rated health and subjective wellbeing. The authors conducted mediational analysis and found that greater technology use predicted lower loneliness, which in turn predicted better health ratings. Chopik et al. proposed that technology use for social connection may keep older adults engaged with others, increasing the opportunity for emotional support, which may buffer against loneliness.

Mackson et al. (2019) recruited participants through social media platforms. Participants completed a number of measures, including the UCLA Loneliness Scale (Russell, 1996), and were asked to indicate the amount of time they spent using Instagram. The authors found that participants who had an Instagram account reported being less lonely and higher in self-esteem than participants who did not. Participants who had an Instagram account also reported significantly fewer anxiety and depression symptoms. The authors conducted mediation analysis and found the association between having an Instagram account and depression became nonsignificant when loneliness and self-esteem were added to the model. The same was found for the relationship between having an Instagram account and anxiety. Loneliness and self-esteem significantly mediated the association between having an Instagram account and anxiety and depression. To summarise, having an Instagram account was associated with fewer anxiety and depression symptoms in part due to the buffering effect that having an Instagram account had on loneliness. Mackson et al. (2019) echoed the hypothesis of Chopik et al. (2016) that SNSs create a sense of community and perceived social support, which reduces the experience of loneliness and other mental health difficulties.

Lou et al. (2012) found that Facebook use was a significant negative predictor of loneliness but loneliness was not a significant predictor of Facebook use. These findings suggest that SNS use may predict a reduction in loneliness whereas loneliness is less able to predict variance in SNS use.

Reissmann et al. (2018) used ESM to explore the relationship between feelings of loneliness and SNS use. Reissmann et al. found that state loneliness was associated with subsequent Facebook use, meaning that higher levels of state loneliness were associated with greater subsequent SNS use. Further, the authors found that trait loneliness was a statistically significant predictor of Facebook use and state loneliness was a stronger predictor of

Facebook use for those with higher levels of trait loneliness. Reissmann et al. interpreted these findings as supporting the view that SNS use was to some extent in response to the state of an individual's social needs and may be an important tool for the loneliest of individuals to satisfy their social needs.

A strength of Reissmann et al. (2018) is that the ESM design involves data collection from repeated assessments as opposed to one and involves the assessment of daily experiences rather than stable traits (Larson & Csikszentmihalyi, 2014). However, Reissmann et al. recognised that ESM designs attempt to interpret causality with non-experimentally manipulated variables. Vally and D'Souza (2019) conducted an experiment to test the effect of abstinence from SNS on loneliness and found that participants who abstained reported significantly higher levels of loneliness after controlling for baseline scores. The evidence from this experimental manipulation suggests that SNS buffers against loneliness.

**Summary of outcomes.** The findings from the five studies support the notion that SNS use is related to reduced loneliness. Mackson et al. (2019) found that Instagram users were less lonely when compared to non-users and the experiment conducted by Vally and D'Souza (2019) found that participants who abstained from using SNSs reported significantly higher levels of loneliness. Lou et al. (2012) found that Facebook use predicted reduced loneliness but loneliness did not significantly predict Facebook use. The findings from Chopik et al. (2016) suggest that the potential buffering effect of SNS use is also experienced in adults aged 50 and above. Reissman et al. (2018) found that state loneliness predicted subsequent SNS use and this finding was stronger for those with higher levels of trait loneliness, suggesting that those high in trait loneliness may be more inclined to turn to SNS use when feeling lonely.

***Back away from the SNS: The bad***

Out of the 17 studies focusing predominantly on the relationship between social media use and loneliness, five studies (Hunt et al., 2018; Kross et al., 2013; Primack et al., 2017; Whaite et al., 2018; Ye & Lin, 2015) reported a negative, maladaptive relationship between SNS use and loneliness.

Primack et al. (2017) recruited participants from a research panel. Participants completed an online survey that contained measures of SNS use and perceived social isolation (PSI). Primack et al. found that relationship status and yearly household income were two covariates associated with loneliness. Participants that were married or had household incomes of greater than $75,000 had lower odds of increased PSI. Primack et al. also found that when compared to participants who reported the least SNS use, those who reported the most SNS use were two times more likely to report increased PSI. When compared to participants who visited SNS's least, those who visited the most had about triple the odds of increased PSI. The effects held even when two covariates of PSI, relationship status and yearly household income, were controlled for. The authors highlighted the difficulties ascertaining directionality of the association but suggested mechanisms through which social media could lead to social isolation. One suggestion was that SNS use may displace other real-life social experiences that might otherwise reduce isolation. Another suggestion was that the content of SNSs may contribute to PSI as the individual is exposed to content, such as photographs, that may evidence that they were not invited to social gatherings. The content may also represent idealised representations of the lives of others, which may contribute to PSI.

Whaite et al. (2018) also recruited participants from a research panel that completed an online survey. The survey contained a number of measures, including the Patient-Reported Outcomes Measurement Information System (PROMIS; Hahn et al., 2014) Social Isolation 4a scale that measured PSI. Importantly, the scale assesses perceptions of exclusion and

being disconnected rather than objective social isolation. Whaite et al. found a significant association between SNS use and PSI. Further, participants in the highest quartile of time spent on SNS had significantly greater odds of PSI when compared to those in the lowest quartile.

Three other studies concluded that SNS use was associated with elevated loneliness (Hunt et al., 2018; Kross et al., 2013; Ye & Lin, 2015). Kross et al. used an ESM design and found that loneliness was positively associated with Facebook use for both within- and between-person correlations. Kross et al. also found that loneliness predicted changes in Facebook use. Hunt et al. (2018) used an experimental design and asked one group of participants to limit their SNS use to ten minutes per day whilst the control group used SNS as usual. The authors found the participants in the experimental group (limited use) reported significantly lower loneliness scores at the end of the intervention even after controlling for baseline loneliness and actual usage. Additionally, Ye and Lin (2015) investigated whether loneliness was associated with a preference for online social interaction. Participants completed a survey that measured preference for online social interaction and loneliness. Preference for online social interaction was measured using items based on an instrument developed by Caplan (2010) and loneliness was measured using the Revised UCLA Loneliness Scale (Russell et al., 1980). The authors found loneliness to be a significant predictor of preference for online social interaction ($\beta = .19$, $p < .05$). The findings from these three studies imply that greater use of SNSs is associated with higher scores on loneliness measures.

**Summary of outcomes.** The five studies suggest that SNS use is related to elevated loneliness. Primack et al. (2017) found that participants who reported the greatest SNS use were two times more likely to report increased PSI. Additionally, participants who reported visiting SNSs most had about triple the odds of increased PSI. Whaite et al. (2018) also found

significantly greater odds of PSI in participants who reported spending the most time on SNSs. Ye and Lin (2015) found that loneliness predicted a preference for online social interaction and Kross et al. (2013) found that loneliness predicted changes in SNS use. Hunt et al. (2018) used an experimental design and found that participants who limited SNS usage reported lower loneliness.

***Mixed bag: The ugly***

Of the 17 studies, four studies (Clayton et al., 2013; Phu & Gow, 2019; Ryan & Xenos, 2011; Stieger, 2019) offered mixed findings for the relationship between SNS use and loneliness whilst three correlational studies found no significant relationship between SNS use and loneliness (Aarts et al., 2014; Brusilovskiy et al., 2016; van Ingen et al., 2017).

Aarts et al. (2014) found no significant relationship in a sample of older adults aged 60 and above. Brusilovskiy et al. (2016) also found no significant relationship in a sample of people with 'serious mental health problems' such as schizophrenia-spectrum disorders. van Ingen et al. (2017) found SNS use had no direct relationship with social loneliness in a large sample residing in the Netherlands. All three studies collected self-reported data using surveys and varied in their quality summary scores (82-100%).

Phu and Gow (2019) conducted a correlational study which involved participants completing an online questionnaire. The results revealed a negative correlation between loneliness and number of Facebook friends and a positive correlation between loneliness and persistence. Persistence was described as having some emotional connectedness towards, and reliance on, Facebook. Regression results with loneliness as the outcome variable revealed that number of Facebook friends was a significant predictor ($\beta = -.124$, $p < .001$) as was persistence ($\beta = .174$, $p < .01$). The authors concluded that those with more Facebook friends were less lonely and those with high persistence were lonelier.

Stieger (2019) conducted an online survey and gathered a large sample across two studies. Stieger found that the number of Facebook friends and amount of Facebook use were not significant predictors of loneliness. However, frequency of logging into Facebook and number of close offline friends were significant predictors. The author hypothesised that the frequency of logins could be a proxy for addictive use, which may be related to elevated levels of loneliness.

Two other studies have also found mixed results (Clayton et al., 2013; Ryan & Xenos, 2011). Clayton et al. used a survey to gather data on loneliness, emotional connectedness to Facebook and use of connection strategies on Facebook. Items from the Facebook Intensity (FBI; Ellison et al., 2007) and Facebook Connections Strategies (FCSs; Ellison et al., 2007) scales were used to measure emotional connectedness and connection strategies. The UCLA Loneliness scale (Russell, 1996) was used to measure loneliness. Loneliness did not significantly predict participants' emotional connectedness to Facebook but did predict the use of Facebook connection strategies. Thus, individuals that reported high levels of loneliness were more likely to use Facebook as a tool to connect with others. Ryan and Xenos found that Facebook non-users were significantly more likely to experience social loneliness and Facebook users were significantly more likely to experience family loneliness when compared to each other. These findings suggest that the relationship between SNS use and loneliness is nuanced.

**Summary of outcomes.** Three studies found no significant relationship between SNS use and loneliness (Aarts et al., 2014; Brusilovskiy et al., 2016; van Ingen et al., 2017). Four studies reported mixed findings, including Phu and Gow (2019) who found that the number of Facebook friends was inversely related to loneliness whereas persistence was positively related to loneliness. However, Stieger (2019) found that the number of Facebook friends did not predict loneliness but the frequency of logging onto Facebook did predict loneliness.

Clayton et al. (2013) found that loneliness did not predict emotional connectedness to Facebook but high loneliness scores predicted the use of Facebook as a tool to connect with others. Ryan and Xenos (2011) found that the experience of loneliness was different for Facebook users and non-users. Ryan and Xenos found that Facebook users were more likely to experience family loneliness whereas non-users were more likely to experience social loneliness.

When the findings of all 17 studies described so far are considered, it is clear that the findings are varied and do not provide definitive support to the adaptive or maladaptive relationship between social media use and the experience of loneliness. However, many studies found some form of statistically significant relationship. Phu and Gow (2019) and Stieger (2019) suggest that the relationship can be teased apart through differentiating SNS use with addictive use. Addictive use and other variables will be explored in greater depth in the following section of the review.

**Table 1**

*Studies that investigated the relationship between loneliness and SNS use*

| Study | Sample | Design | Key measures | Key findings | Quality rating |
|---|---|---|---|---|---|
| Aarts et al. (2014) | 626 individuals residing in Netherlands | Correlational. Explored association between social media usage and loneliness in older adults | Measure created for survey to measure social media usage. The 6-item Loneliness Scale. | Social media usage unrelated to loneliness ($\beta = .01$, $p = .915$). | 100% |
| Brusilovskiy et al. (2016) | 232 participants receiving mental health services recruited by reaching out to services. | Correlational. Assessed association between social media use and loneliness in those with severe mental illness | Four-item version of UCLA Loneliness Scale. | Frequency ($t(116) = 1.53$, $p = .13$, $d = .23$) and intensity ($t(64.35) = .05$, $p = .96$, $d = .01$) of SNS use not found to be associated with loneliness. | 82% |
| Chopik et al. (2016) | 591 individuals from nationally representative sample in US. Participants recruited from a longitudinal panel study. | Correlational. Explored association between social media usage and loneliness in older adults | Measure created to measure social media usage. 11-item short scale for measuring loneliness in large surveys. | Greater technology use, including SNSs, associated with reduced loneliness ($r = -.10$, $p < .05$). Lower loneliness scores associated with better self-rated health | 95% |
| Clayton et al. (2013) | 229 undergraduates | Correlational. | Facebook Intensity Scale. | Individuals with high levels of loneliness were more likely to use | 95% |

| | | | | | |
|---|---|---|---|---|---|
| | studying at U.S university. | Explored loneliness and relationship with emotional connectedness to Facebook and connection strategies used on Facebook | Facebook Connections Strategies (FCSs)<br>UCLA Loneliness Scale | Facebook to connect with others ($\beta = .20$, $p < .01$). Loneliness did not predict emotional attachment to Facebook. | |
| Hunt et al. (2018) | 143 undergraduates studying at U.S university | Experiment<br>Social media usage manipulated to observe its effect on loneliness. | UCLA Loneliness Scale<br>Social media use measured by using data tracked by iPhone. | After controlling for baseline loneliness and SNS usage, individuals that limited social media usage reported lower loneliness scores at end of intervention ($F(1, 111) = 6.896$, $p = .01$) | 71% |
| Kross et al. (2013) | 77 participants recruited throughout flyers posted in one U.S state | Experience-sampling. Participants completed measures several times per day. | Single item measured loneliness.<br>UCLA Loneliness Scale.<br>Items measuring Facebook usage created for study. | Loneliness positively associated with Facebook use for both within- ($r = .22$, $p < .001$) and between-person ($r = .22$, $p < .05$) correlations.<br>Loneliness predicted Facebook use ($\beta = .07$, $p < .01$)<br>The lonelier people felt at one time point, the more people used Facebook.<br>Facebook use predicted declines in affective wellbeing even when loneliness controlled for. | 82% |
| Lou et al. (2012) | 340 undergraduates studying at two | Correlational. | College Student Facebook Use Questionnaire | Facebook users reported lower loneliness scores than non-users. | 73% |

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| | universities in U.S | Explored Facebook use and loneliness. | UCLA Loneliness Scale<br>Facebook Intensity Scale<br>Motive for Using Facebook Scale | Loneliness and Facebook Intensity were inversely correlated ($r$ = -.15, $p$ < .05).<br>Facebook intensity significantly predicted loneliness ($\beta$ = -.21, $p$ < .05) but loneliness did not predict Facebook intensity ($\beta$ = .02, ns). | |
| Mackson et al. (2019) | 204 participants recruited through social media platforms | Correlational. Explored use of Instagram and reported loneliness. | UCLA Loneliness Scale<br>Items created for study measured Instagram usage. | Participants that used Instagram were less lonely than non-users ($F$(1, 2020) = 18.87, $p$ < .001, $\eta^2$ = .09).<br>Having an Instagram account significantly predicted loneliness ($\beta$ = -.15, $p$ = .018)<br>Loneliness and self-esteem were significant mediators between Instagram use and depression and anxiety symptoms. | 91% |
| Phu and Gow (2019) | 332 participants (student and non-student) recruited in UK. | Correlational. Explored aspects of Facebook usage associated with loneliness. | Multidimensional Facebook Intensity Scale (MFIS)<br>Two items measuring number of friends and time spent on Facebook | Loneliness and number of Facebook friends were negatively correlated ($r$ = -.21. $p$ < .01).<br>Loneliness and persistence were positively correlated ($r$ = .12, $p$ < .05).<br>Number of Facebook friends ($\beta$ = .12, $p$ < .001) and persistence ($\beta$ = .174, $p$ < .01) were significant predictors of loneliness.<br>Loneliness significant mediator between Facebook friends and happiness. | 100% |

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| Primack et al. (2017) | 1,787 participants recruited from U.S research panel | Correlational. Assessed associations between social media usage and perceived social isolation. | Patient-Reported Outcomes Measurement Information System (PROMIS; Hahn et al., 2014) Social Isolation 4a scale Items asked participants to estimate social media usage | Participants that used social media most had double the odds (OR = 2.0, 95% CI = 1.4, 2.8, $p <$ .05) for increased PSI compared to the group that used SNSs least. Those who visited SNSs most had about triple the odds of increased PSI (OR = 3.4, 95% CI = 2.3, 5.0, $p < .05$). | 100% |
| Reissmann et al. (2018) | 65 participants recruited from German university | Experience-sampling. Assessed associations between loneliness and Facebook use. | The Multidimensional Loneliness Scale (MLS) Bergen Facebook Addiction Scale (BFAS) | Feelings of loneliness positively associated with subsequent Facebook use ($\beta = .0878$, $p =$ .0006). Trait loneliness predictive of Facebook use ($\beta = .17$, $p =$ .0368). | 95% |
| Ryan and Xenos (2011) | 1,324 participants recruited online forums and Facebook | Correlational. Assessed associations between loneliness and social media use. | Questions adapted from The Facebook Questionnaire The Social and Emotional Loneliness Scale for Adults – Short Version (SELSA-S; | Facebook non-users more likely to experience social loneliness ($F(1, 1322) = 4.22$, $p = .04$, $\eta^2 =$ .01). Facebook users reported higher levels of family loneliness ($F(1, 1322) = 4.08$, $p = .044$, $\eta^2 = .01$). | 86% |

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| | | | DiTommaso et al., 2004) | | |
| Stieger (2019) | 3,353 participants recruited over two studies | Correlational. Explored Facebook usage and life satisfaction. | Facebook-specific items used created for the study<br>Three-item Loneliness Scale (TILS; Hughes et al., 2003) | Number of Facebook friends and Facebook use were not significant predictors of loneliness.<br>Frequency of logging into Facebook ($\beta$ = .15, $p$ < .01) and the number of close offline friends ($\beta$ = -.11, $p$ < .01) were significant predictors. | 95% |
| Vally and D'Souza (2019) | 78 undergraduates studying in UAE. | Randomised controlled design<br>Tested abstinence from social media and its effect loneliness | Social and Emotional Loneliness Scale for Adults-Short (SELSA-S) | After controlling for baseline scores, participants who abstained from SNS use reported substantially more loneliness ($F$(1, 75) = 8.558, $p$ = .005, $\eta^2$ = .10). | 86% |
| van Ingen (2017) | 2,162 participants recruited from longitudinal survey in the Netherlands | Correlational. Assessed time spent using social media and relationship with social loneliness. | De Jong Gierveld Loneliness scale | Social media use had no direct effect on social loneliness ($\beta$ = .022, ns)<br>Negative effect of functional disability on social loneliness is smaller for social media users ($\beta$ = -.051, $p$ < .05) | 91% |
| Whaite et al. (2018) | 1,768 participants recruited from panel survey. | Correlational. Assessed personality characteristics, social media use | Patient-Reported Outcomes Measurement Information System (PROMIS; Hahn | Participants that spent most time on social media had greater chance of social isolation. Odds ratios ranged between 1.87-3.20 in models including different personality traits. | 100% |

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| | | and social isolation | et al., 2014) Social Isolation 4a scale. | | |
| Ye and Lin (2015) | 260 undergraduates studying at four different Chinese universities. | Correlational. Explored association between loneliness and preference for online social interaction | Revised UCLA Loneliness Scale | Significant positive correlation between loneliness and preference for online social interaction ($r = .12$, $p < .05$). Loneliness predicted POSI ($\beta = .19$, $p < .05$) | 86% |

**How is the relationship?**

28 studies went beyond answering the question whether SNS usage is associated with loneliness. These studies looked at different variables hypothesised to be related loneliness and included: addictive use, SNS friends and experiences, how SNSs are used, and personality traits. The study details are presented in Table 2.

***Quality appraisal of included studies***

The quality ratings were mixed for the 28 studies discussed in this part of the review. The maximum possible summary score for 26 of the studies was 22. The two studies (Deters & Mehl, 2012; Lim & Kim, 2018) using experimental designs had a maximum possible summary score of 28. The quality scores for the 28 studies ranged between 15-22 and therefore the summary scores were between 68-100%. The ratings were especially varied across domains that assessed how well the outcome and exposure measures were defined and whether the studies controlled for confounding. 12 studies (Aalbers et al., 2018; Baek et al., 2013; Baek et al., 2014; Baker & Oswald, 2010; Bruce et al., 2019; Burke & Kraut, 2016; Deters & Mehl, 2012; Greitemeyer et al., 2014; Jin, 2013; Lee et al., 2013; Seo et al., 2016; Thomas et al., 2020a) were rated as providing incomplete information about outcome and exposure measures. 13 studies (Atroszko et al., 2018; Baker & Oswald, 2010; Greitemeyer et al., 2014; Guo et al., 2014; Lee et al., 2013; Petrocchi et al., 2015; Pittman, 2015; Ponnusamy et al., 2020; Rajesh & Rangaiah, 2020; Seo et al., 2016; Shettar et al., 2017; Skues et al., 2012; Thomas et al., 2020a) were rated as either not at all considering, or as incompletely controlling for, confounding variables. Both studies using experimental designs did not provide sufficient information regarding the process of randomisation and blinding in order to receive maximum scores for the design-specific items.

***Study design***

Two studies (Deters & Mehl, 2012; Lim & Kim, 2018) used experimental designs and both used non-intervention control groups. Two studies (Aalbers et al., 2018; Thomas et al., 2020b) used ESM and the remaining 24 studies used correlational designs. The sample sizes across the studies were quite varied. The sample sizes for the experimental studies were 86 (Deters & Mehl, 2012) and 255 (Lim & Kim, 2018). The two studies that used ESM (Aalbers et al., 2018; Thomas et al., 2020b) had samples sizes of 125 and 65, respectively. The sample size range of the correlational studies using survey designs was 100 (Shettar et al., 2017) to 20,096 (Bruce et al., 2019).

***Sample characteristics***

Of the 28 studies, 10 (Baker & Oswald, 2010; Berryman et al., 2018; Bruce et al., 2019; Deters & Mehl, 2012; Meshi et al., 2020; Petrocchi et al., 2015; Pittman et al., 2015; Primack et al., 2019; Thomas et al., 2020b; Yang, 2016) used samples recruited in the United States. The other studies recruited their samples in Australia (Skues et al. 2012), Austria (Greitemeyer et al., 2014), India (Rajesh & Rangaiah, 2020; Shettar et al., 2017), Italy (Biolcati et al., 2018), Japan (Guo et al., 2014), Malaysia (Ponnusamy et al., 2020), the Netherlands (Aalbers et al., 2018), Poland (Atroszko et al., 2018), South Korea (Baek et al., 2013; Baek et al., 2014; Jin, 2013; Lee et al., 2013; Seo et al., 2016), and the United Kingdom (Thomas et al., 2020a). The country of residence for the remaining three samples was unclear (Burke et al., 2016; Lim & Kim, 2018; Sheldon, 2012). The studies that reported on age of their samples tended to recruit young adult students with the exception of one study with an average of 63 years (Meshi et al., 2020).

Of the studies that reported ethnicity, most were conducted in the United States and all but one study reported the majority of participants identified as Caucasian. In these studies, between 57-86% of the sample identified as Caucasian. Thomas et al. (2020b) was the only study to report a non-Caucasian majority sample, with 39% of the sample identifying

as Latino/Hispanic. 13 studies (Aalbers et al., 2018; Baker & Oswald, 2010; Berryman et al., 2018; Biolcati et al., 2018; Greitemeyer et al., 2014; Guo et al., 2014; Meshi et al., 2020; Petrocchi et al., 2015; Pittman et al., 2015; Primack et al., 2019; Skues et al., 2012; Thomas et al., 2020a; Yang, 2016) reported over 60% of their sample identifying as female and three studies (Baek et al., 2014; Rajesh & Rangaiah, 2020; Seo et al., 2016) reported over 60% of their sample identifying as male.

***Addictive use***

Six studies measured addictive use of SNSs and all studies used the Bergen Facebook Addiction Scale (BFAS; Andreassen et al., 2012). The measure is comprised of 18-items that covers six features of addiction, including mood modification, withdrawal and conflict. The items are scored on a five-point scale. The measure has been demonstrated as having a Cronbach's alpha of 0.83, test-retest correlation coefficient of 0.82 and good convergent and discriminative validity (Andreassen et al., 2012).

Biolcati et al. (2018) hypothesised that social and emotional loneliness would be predictive of Facebook addiction. Participants were recruited via mailing lists, newsgroups and SNSs, and were asked to complete an online survey. Loneliness was measured by the short version of the Social and Emotional Loneliness Scale (SELSA-S; DiTommaso et al., 2004). The results indicated that social ($\beta = .16$, $p < .001$), romantic ($\beta = .12$, $p = .001$) and familial loneliness ($\beta = .08$, $p = .031$) were significant predictors of Facebook addiction. The authors concluded that lonely individuals turn to SNSs to meet psychological and emotional needs.

Meshi et al. (2020) also conducted a correlational study that measured PSI, time spent using SNS, depression and SNS addiction in older adults. Participants were aged 50 and above and were recruited via community centres, activity clubs and religious organisations. PSI was measured using the PROMIS Social Isolation 4a scale (Hahn et al., 2014) and the

PROMIS Emotional Distress-Depression 4a scale (Pilkonis et al., 2011) measured depression. The regression analysis found that estimated daily minutes on SNS was not significantly associated with PSI, whereas addictive SNS use ($\beta = .16$, $p < .05$) was significantly associated with PSI over and above the effect of depression. Meshi et al. recognised that they were unable to say with confidence whether PSI was caused by, or an effect of, addictive SNS use, or whether the relationship was a product of an unmeasured variable. A weakness of this study is that the fairly homogeneous sample, 80% female and 95% Caucasian, limited the generalisability of the findings.

Astroszko et al. (2017) and Ponnusamy et al. (2020) applied similar correlational designs to the aforementioned studies and used surveys to collect data. Astroszko et al. did so with a larger sample of 1,157 undergraduate students and found loneliness to be a significant predictor of Facebook addiction ($\beta = .07$, $p < .05$). Ponnusamy et al. focused on addictive Instagram use rather than Facebook and found addictive Instagram use to be significantly related to loneliness ($\beta = .211$; $p < .01$). Therefore, both studies lend support to the hypothesis that addictive SNS use is associated with elevated feelings of loneliness but both also are unable to determine causality.

Two other correlational studies (Rajesh & Rangaiah, 2020; Shettar et al., 2017) researched the relationship between addictive SNS use and loneliness and both studies found that addictive SNS use was significantly correlated with loneliness. However, the quality ratings for these two studies were much lower than the ratings for the other studies. Rajesh and Rangaiah obtained a small sample size of 114 participants and also did not demonstrate consideration of confounding variables, which contributed to the lower quality rating. Shettar et al. also had a small sample size of 100 participants and did not provide adequate estimations of variance nor did they demonstrate the consideration of confounding variables

in the study. Therefore, the conclusions drawn from these two studies should be viewed tentatively due to their lower quality ratings.

**Summary of outcomes.** The results from the studies that measured addictive use all found support for a significant relationship between addictive SNS use and loneliness. This finding was found across two SNSs and in both younger and older adults. All studies are correlational, which limits the conclusions that can be drawn from the studies. Correlational research cannot make unequivocal inferences about causation and causal influences between variables may be suggested but cannot be firmly established (Barker et al., 2002). Conversely, it is clear that the results from these studies support the conclusion that addictive use is associated with greater loneliness but the direction of the relationship is unknown. Therefore, it is unclear whether addictive use leads to elevated loneliness or whether loneliness leads to addictive use of SNSs.

### *Friends and experiences online*

Eight studies (Baek et al., 2013; Burke & Kraut, 2016; Deters & Mehl, 2012; Greitemeyer et al., 2014; Jin, 2013; Primack et al., 2019; Seo et al., 2016; Skues et al., 2012) investigated the influence of SNS friendships and interactions on loneliness. Seven of the studies used correlational designs and one study (Deters & Mehl, 2012) used an experimental design.

Primack et al. (2019) examined associations between positive and negative SNS experiences and PSI. Primack et al. recruited a large sample to complete an online survey containing a number of measures. The survey included the PROMIS Social Isolation 4a (Hahn et al., 2014) scale to measure PSI and participants were asked to estimate the proportion of their SNS experiences that were positive and negative. When both positive and negative experiences were in the same model, the authors found that each 10% increase in positive experiences was associated with a 3% decrease in PSI but this finding was not

statistically significant. Whereas, each 10% increase in negative experiences was associated with a 13% increase in the odds of PSI, which was statistically significant. All sociodemographic variables recorded were controlled for in this analysis. The authors concluded that negative SNS experiences may have a greater influence on loneliness.

Jin (2013) investigated the relationship between features of Facebook use and loneliness. Specifically, Jin investigated the number of Facebook friends, duration of Facebook experience, and the degree to which Facebook friends overlapped with offline friendships. Length of Facebook experience was measured in time and the mean duration of Facebook experience was 11.6 months. Jin predicted that loneliness would be negatively related to the number of Facebook friends and length of Facebook experience, and positively related to time typically spent using Facebook. The results from the survey were that Facebook experience was not significantly related to loneliness. The number of SNS friends and overlapping friends were significantly associated with loneliness. Time spent using Facebook was nonsignificant. Thus, having more SNS friends and a greater proportion of SNS friends whom were also offline friends were associated with reduced loneliness.

Interestingly, these findings were contradicted by the findings of Skues et al. (2012). Skues et al. administered a number of measures including the UCLA Loneliness Scale (Russell, 1996) and The Facebook Questionnaire (FQ; Ross et al., 2009) to 393 undergraduates. The regression analysis included other personality variables and the results showed that loneliness positively predicted the number of FB friends ($\beta = .13$, $p < .05$). The authors hypothesised that this finding may suggest that lonelier individuals use SNS to interact with others to compensate for the lack of offline relationships. However, offline relationships were not measured in this study.

Burke and Kraut (2016) investigated whether the volume and type of communication were related to loneliness and wellbeing. Burke and Kraut defined three different types of

SNS communication: targeted, one-click, and broadcast. Targeted communication consisted of text written for a specific person such as a SNS wall post or comment. One-click communication consisted of low-effort, targeted actions like a SNS 'like' (Rosenthal-van der Pütten et al., 2019) and broadcast communication comprised of SNS communication that was aimed at a wide audience such as a status update. The authors were also interested in the strength of relationship ties and hypothesised that communication with stronger ties on SNSs would predict greater improvements in wellbeing. Tie strength was measured by participants selecting a number of close SNS friends and software randomly selecting additional SNS friends. Participants rated tie strength on a seven-point scale. Burke and Kraut used seven measures that measured aspects of social and psychological wellbeing. The authors found that the seven measures correlated and confirmatory factor analysis suggested that a one-factor solution was acceptable. The measures that correlated, which included loneliness, were used to construct a single measure for the single variable named 'wellbeing'.

The authors found that receiving more Facebook communication was not significantly associated with wellbeing but receiving communication from strong ties was. Receiving targeted communication was marginally related to wellbeing whereas receiving one-click or viewing broadcast communication was not. When the interaction between communication type and tie strength was analysed, the results showed that receiving targeted communication from strong ties was significantly related to wellbeing whereas weak ties were nonsignificant. Burke and Kraut concluded that the findings provided evidence that the effect of SNS interaction on wellbeing depended on the types of communication, as well as the relationship with the communicator. A weakness of this study is that wellbeing, a proxy of loneliness, was analysed rather than loneliness specifically. Although the variables that were combined into a one-factor variable were correlated, the range of associations was between .33 to .82 and therefore quite large.

Seo et al. (2016) conducted a survey on the numerous variables related to Facebook usage and responsiveness of friends. Seo et al. found that the number of Facebook friends was not predictive of perceived social support from friends but the speed of feedback received and the number of interactions on posts were significant predictors of perceived social support. Perceived social support was a significant negative predictor of loneliness.

Research conducted by Baek et al. (2013) considered the type of relationships that SNS users form and distinguished between parasocial and social relationships. Parasocial relationships were described as unidirectional in nature, lacking reciprocity and genuineness. For example, parasocial relationships may be formed with celebrities who may occasionally respond to communication but not in a mutually interactive exchange of communication. The findings were that SNS users' self-reported loneliness was negatively related to a reliance on social relationships ($\beta = -.18$, $p < .01$) and positively related with parasocial relationships ($\beta = .14$, $p < .001$). Thus, a greater reliance on parasocial relationships was associated with greater self-reported loneliness.

Two other papers researched the relationship between loneliness and friendships on SNSs. Greitemeyer et al. (2014) conducted two studies using two different samples and both studies involved participants completing various measures. In study one, Greitemeyer et al. found that the number of birthday greetings on Facebook was a significant, negative predictor of loneliness but the number of Facebook friends was nonsignificant. In study two, the number of responses to participants' last three status updates significantly inversely predicted loneliness. Interestingly, the number of Facebook friends was also a significant inverse predictor of loneliness, which contradicted the findings of the first study. The average tone of responses was nonsignificant.

Deters and Mehl (2012) conducted an experiment to test the effect of increasing frequency of status updating on Facebook. Deters and Mehl found participants in the

experimental condition who increased frequency of posting status updates reported a significant decrease in loneliness however the effect size was small ($d$ = -.31). The authors concluded that status updating may reduce loneliness irrespective of whether others interact with the posts. Deters and Mehl scored the lowest quality summary score out of the studies described in this section. The study did not describe the process of randomization used when allocating participants to conditions and did not state whether the investigators were blinded to the intervention. Additionally, the study did not completely describe the outcome measures and analytic methods. Despite these limitations, the use of an experimental design allowed for the authors to more confidently make conclusions about causality compared to the other studies.

**Summary of outcomes.** The findings from these eight studies present mixed findings. Four studies investigated the relationship between the number of SNS friends and loneliness and all studies found mixed results. For example, Jin (2013) found that the number of SNS friends was inversely correlated with loneliness whereas Skues et al. (2012) found the opposite relationship. The findings from Deters and Mehl (2012) suggest that the act of status updating may decrease loneliness irrespective of interaction from other users. However, the findings from three studies (Burke & Kraut, 2016; Greitemeyer et al., 2014; Seo et al., 2016) found that engagement from friends on Facebook was inversely associated with reported loneliness. The studies found that receiving targeted communication, particularly from close ties, birthday wishes, and comments on status updates from SNS friends were associated with reduced loneliness. Additionally, Primack et al. (2019) support the view that engagement online is associated with loneliness, specifically that experiencing negative interactions is associated with elevated loneliness. Thus, there appears to be some support for the role of the engagement received from others and number of negative SNS experiences when considering

loneliness. The findings also suggest that the relationship between the number of SNS friends and loneliness is less clear.

***How SNSs are used***

Nine studies (Aalbers et al., 2018; Berryman et al., 2018; Guo et al., 2014; Jin, 2013; Lee et al., 2013; Petrocchi et al., 2015; Pittman, 2015; Thomas et al., 2020a; Yang, 2016) investigated whether the way that SNSs are used was related to the experience of loneliness. One study (Aalbers et al., 2018) used ESM and the other studies used surveys to gather data.

Yang (2016) recruited undergraduates and investigated how different SNS activities related to loneliness. Yang hypothesised that the tendency of the SNS users to compare themselves with others would moderate the relationship between SNS activities and loneliness. This tendency was termed social comparison orientation. The study specifically focused on the use of Instagram and used exploratory factor analysis to create a measure of Instagram activities. Three types of activities were suggested by the analysis: interaction, browsing, and broadcasting. Interaction included communication directly involving other people whereas browsing measured how often the user reviewed their newsfeed or checked others' profiles. Broadcasting measured activities that involved the sharing of information that was not directed at specific individuals. Social comparison orientation was measured by items from the Iowa-Netherlands Comparison Orientation Measure (INCOM; Gibbons & Buunk, 1999). The INCOM was found to have good internal consistency ($\alpha = .83$) and was tested in 22 different samples in the United States and Netherlands. The regression analysis was carried out with demographic variables controlled for. Instagram interaction ($\beta = -.18$, $p = .018$) and browsing ($\beta = -.17$, $p = .023$) were related to lower loneliness scores, whereas broadcasting ($\beta = .21$, $p = .006$) was related to higher loneliness scores. Social comparison orientation moderated the association between Instagram interaction and loneliness ($\beta = .17$, $p = .018$), meaning that interaction was related to lower loneliness for participants who were

less inclined to compare themselves to others. Social comparison orientation was not a significant moderator for both Instagram browsing or broadcasting. These findings lend support to the idea that SNSs can buffer against loneliness when used to interact with others but this potential benefit was suppressed among those with a greater tendency to compare self to others. Conversely, when SNSs are used to share undirected communication, users may experience greater loneliness. A weakness of this study is that 78% of the sample were female, which may limit the generalisability of these findings.

Like Yang (2016), Aalbers et al. (2018) were interested in how SNSs were used. The authors recruited undergraduates and implemented an ESM design to investigate the associations between active social media use, passive social media use, and loneliness. Passive use was defined as the user scrolling through newsfeeds or browsing profiles of friends but the study did not define active use. Aalbers et al. analysed two different types of relationships: contemporaneous and temporal. Contemporaneous associations referred to how variables were related within the same timeframe whereas temporal associations referred to the relationships between variables from one point in time to the next. Timeframes consisted of two-hour intervals. The results showed that passive use was positively associated with loneliness ($r = .03$, $p < .05$) within the same timeframe after controlling for other variables. Furthermore, loneliness and active use positively predicted passive use when temporal associations were considered but passive use did not predict loneliness within the next timeframe. This meant that passive use was more likely to occur following the times when participants reported greater loneliness or active use. The authors concluded that passive use is associated with loneliness within the same timeframe but were unable to ascertain the direction of this relationship. Further, it was concluded that loneliness predicted subsequent passive use in the next timeframe but passive use did not predict subsequent loneliness. These findings suggest that passive use may be used to alleviate loneliness however no significant

reduction in subsequent loneliness was found, which opposes Yang's finding that SNS browsing is associated with reduced loneliness.

Berryman et al. (2018) investigated another form of SNS use, which was termed 'vaguebooking'. Vaguebooking was defined as "social media posts that contain little actual and clear information, but are worded in such a way as to solicit attention and concern from readers". The authors conducted a survey and found most social media variables were poor predictors of loneliness with vaguebooking being an exception. These results support the view that how SNSs are used is important when considering the relationship between SNS use and loneliness. However, it is unclear whether vaguebooking is a behaviour that causes an individual to feel lonelier or whether pre-existing loneliness is a risk factor for vaguebooking, which may be used to elicit support from others.

Two studies have investigated the role of self-disclosure when using SNS (Jin, 2013; Lee et al., 2013). Jin (2013) hypothesised that loneliness would be negatively associated with positive self-disclosure and positively associated with negative self-disclosure. These predictions were based on the assumptions that lonely people tended to be less competent in social interactions and are less likely to self-disclose (Solano et al., 1982). The results were that loneliness was negatively related to positive self-disclosure ($\beta = -.26$, $p < .001$) and positively to negative self-disclosure ($\beta = .22$, $p < .001$). To summarise, those who reported being lonelier tended to engage in more negative and less positive self-disclosure whilst using Facebook.

Lee et al. (2013) also used a survey to collect data using a different measure of self-disclosure. The authors were interested in the relationships between loneliness, self-disclosure, social support and wellbeing. Loneliness was measured using five-items adopted from the UCLA Loneliness Scale (Russell, 1996) and wellbeing was measured using the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999). Lee et al. used a structure

equation modelling approach and found loneliness to positively influence self-disclosure, which in turn was associated with social support. Social support was also associated with increased wellbeing. The authors concluded that lonely people tend to lack social skills and rely on SNSs to compensate.

In addition to the studies already discussed, four other studies investigated different ways in which people may use SNSs and how they were related to loneliness. These four studies were methodologically weaker than the others described earlier in this section, scoring 17/22 (Petrocchi et al., 2015; Pittman, 2015; Thomas et al., 2020a) and 15/22 (Guo et al., 2014) on the quality assessment tool. Petrocchi et al. (2015) investigated the differences between individuals who used only Facebook versus those who used both Facebook and Twitter. For users of both Facebook and Twitter, the intensities of both Facebook ($\beta = -.33$, $p < .05$) and Twitter use ($\beta = -.29$, $p < .05$) were significantly predicted by loneliness scores. Additionally, users of only Facebook reported significantly higher loneliness scores compared to those who used both SNSs. Pittman (2015) examined whether there was a significant difference in self-reported loneliness between those who created or consumed social media. The results were that loneliness was significantly negatively correlated with creation and consumption on both Twitter and Instagram. Facebook creation and consumption were not significantly correlated with loneliness.

Thomas et al. (2020a) used a survey to gather data on loneliness in first-year undergraduates. Thomas et al. found social information seeking to be indirectly related to loneliness through 'social capital'. Social information seeking items referred to whether participants used SNSs to learn more about offline connections and relationships. Social capital referred to "resources that are accumulated through social relationships". Therefore, the authors suggested that using SNSs to learn more about offline relationships increases social capital, which in turn reduces loneliness. Finally, Guo et al. (2014) also recruited

students to complete a survey that measured self-reported loneliness, SNS use, and social capital. Guo et al. found that use of SNSs for entertaining recreational purposes was related to increased loneliness ($\beta = .30$, $p < .01$). Entertaining recreational purposes were measured by items that referred to using SNSs to look at what had happened to others and for fun or entertainment.

**Summary of outcomes.** The nine studies present an array of findings that suggest different uses of SNSs are related to varied experiences of loneliness. Many studies focused on different ways in which SNS functions can be used. For example, whether users tend to post, upload and create content, or prefer to browse and seek information. Three studies focused on the role of self-disclosure and vaguebooking, which consider the content of what users may be sharing with others.

Overall, there appears to be mixed evidence concerning the relationship between passive use of SNSs, including browsing newsfeeds and friends' profiles, with Yang (2016) finding negative associations with loneliness and Aalbers et al. (2018) finding positive contemporaneous associations. Further, using SNSs to learn more about offline connection may be more adaptive and buffer against loneliness (Thomas et al., 2020a), whereas using SNSs for entertainment purposes may be a catalyst for loneliness (Guo et al., 2014).

The findings from the studies do suggest that the way in which users interact with others may be related to greater loneliness. For example, greater loneliness would be expected if users engage in greater negative self-disclosure (Jin, 2013), little overall self-disclosure (Lee et al., 2013), or if the user engages in ways that are attempts to solicit concern from others (Berryman et al., 2018). Additionally, the findings suggest that the type of SNS may also be of importance when considering loneliness (Petrocchi et al, 2015; Pittman, 2015).

***Personal variables***

Eight studies (Baek et al., 2014; Baker & Oswald, 2010; Bruce et al., 2019; Lim & Kim, 2018; Petrocchi et al., 2015; Sheldon, 2012; Skues et al., 2012; Thomas et al., 2020b investigated relationships between loneliness, SNS use and personal variables. One study (Thomas et al., 2020b) used ESM and another study (Lim & Kim, 2018) used an experimental design. The rest of the studies used survey designs.

Thomas et al. (2020b) investigated associations between SNS use, solitude and psychological adjustment and were interested in whether individual differences in extraversion influenced these associations. Thomas et al. used an ESM design and participants provided information regarding their mood, SNS usage and whether they were alone or with others. The authors used cluster analysis and found the best model fit three-groups: extraverts, high-functioning introverts and low-functioning introverts. Low-functioning introverts were defined based on their higher scores on loneliness and solitude that was not self-determined, and lower scores on identity development. Solitude that was sought for reasons such as anxiety when around others was defined as not self-determined and identity development referred to the exploration and experimentation with alternate options for an individual's current and future identity (Goossens & Marcoen, 1999). High-functioning introverts were less likely to use SNSs than low-functioning introverts. Extraverts did not differ significantly from either introvert cluster. The analysis also revealed that loneliness significantly predicted SNS use generally ($\beta = .14$, $p < .05$) and there was a marginally significant relationship between loneliness and participants' being on their device alone ($\beta = -.07$, $p < .10$). Low-functioning introverts spent the most time using SNS, the least amount of time being truly alone without SNS use, and reported the greatest loneliness. Thomas et al. hypothesised that this could be due to the fact that their loneliness was less self-determined when compared to their high-functioning counterparts, which potentially was a product of social anxiety or a lack of offline close relationships. The authors concluded that

loneliness predicted SNS use and solitary behaviours better than the personality variable of extraversion-introversion.

Lim and Kim (2018) investigated the relationship between personality variables, SNS use and loneliness. Specifically, Lim and Kim were interested in the relationship between the grandiosity of a SNS post, other users' envy, and loneliness. The authors explained that malicious envy leads to attempts to reduce the other's standing through an evaluation as to whether the achievement is deserved. Participants were provided with a scenario and were exposed to either a high or low level of grandiosity. Lim and Kim found that perceived grandiosity was associated with an increase in malicious envy, which in turn was associated with greater loneliness.

Another variable considered was shyness. Bruce et al. (2019) recruited participants from an existing representative pool of survey panel members. One item measured shyness ("I find it difficult to approach others") whilst other items measured variables such as SNS usage and perceived problematic SNS use. The shyness item had the strongest association with loneliness in the analysis ($\beta = .20$, $p < .01$). This finding suggests that shyness is more related to loneliness than perceived problematic SNS use and actual SNS use. A strength of this study is that the sample consisted of 20, 096 participants. However, a weakness is that only one-item was used to measure shyness, which is unlikely to assess different facets of shyness. The study did not test whether SNS use interacted with the association between shyness and loneliness.

Baker and Oswald (2010) also investigated shyness, recruiting undergraduates to complete a battery of measures, including the Revised Cheek and Buss Shyness Scale (RCBSS; Cheek & Melchior, 1985) and UCLA Loneliness Scale (Russell, 1996). The authors found that shyness positively predicted loneliness but there was no significant interaction between shyness and Facebook use. As predicted, shyness negatively predicted friend

satisfaction. Facebook use positively predicted satisfaction with Facebook friends among relatively shy participants ($\beta$ = .19, $p$ = .04) but not for those lower in shyness ($\beta$ = -.06, $p$ = .60). Facebook usage also predicted greater importance of Facebook friends among relatively shy participants ($\beta$ = .19, $p$ = .04) and predicted less importance among less shy participants ($\beta$ = -.18, $p$ = .10). Regarding closeness to Facebook friends, Facebook use positively predicted ($\beta$ = .44, $p$ < .01) closeness in relatively shy participants but was nonsignificant in less shy participants ($\beta$ = -.12, $p$ = .25). The authors concluded that these results supported the view that SNS use in relatively shy individuals was associated with better quality friendships. Although Facebook use was not related to lower loneliness scores in relatively shy individuals, it was also not associated with higher scores.

Another study which investigated the relationship between SNS, loneliness and shyness was conducted by Sheldon (2012) but it scored comparatively lower on the quality assessment tool. Sheldon found that when compared to Facebook users, non-users scored significantly higher on both shyness and loneliness measures. Further, loneliness and shyness were significant predictors of Facebook non-use. A weakness of this study was that the non-user sample consisted of only 44 participants compared to 283 SNS users. Therefore, the non-user sample may have been influenced by extreme scores or may not represent the wider Facebook non-user population.

Baek et al. (2014) investigated how SNS use and loneliness differed across four attachment styles: fearful, dismissive, secure and anxious. The online survey contained a measure of attachment that consisted of 10 items adapted from Brennan et al. (1998). Measures of SNS use and loneliness (UCLA; Russell, 1996) were also used. In the results, the fearful group spent significantly more time using SNSs than the dismissive group. The fearful group also reported using SNSs for social interaction significantly more than all other attachment groups. Further, the dismissive group used SNSs for parasocial interaction

significantly more than the other three groups. The use of SNSs for informational purposes was associated with a reduction in loneliness among the fearful group, but was also associated with SNS addiction in the fearful and anxious groups. In the secure group, SNS use for social interaction and entertainment were associated with decreases in loneliness. The authors concluded that the findings, despite their complexity, offered support for the role of attachment in moderating the effects of SNS use on loneliness.

A study described in an earlier section also investigated the associations between personality traits, SNS use and loneliness. Skues et al. (2012) surveyed participants using the Australian Personality Inventory (API; Murray et al., 2009), Narcissism Personality Inventory (NPI; Ames et al., 2006), Facebook Questionnaire (FQ; Ross et al., 2009) and UCLA Loneliness Scale (Russell, 1996). The results showed that openness was the only personality trait to be a significant predictor of time spent using Facebook per day ($\beta = .18$, $p < .05$) and number of friends ($\beta = .13$, $p < .05$).

As described earlier in the review, Petrocchi et al. (2015) compared the differences between participants who only used Facebook and those who used both Facebook and Twitter. The authors found that none of the personality variables were significant predictors of Facebook use intensity in the Facebook-only group. In the Facebook and Twitter use group, Facebook intensity was significantly predicted by lower conscientiousness, higher extraversion, and higher agreeableness scores. Twitter intensity was significantly predicted by lower conscientiousness scores. The authors suggested that users of both SNSs may be motivated to use SNSs for reasons outside of escaping loneliness, particularly, as discussed earlier in the review, as lower loneliness scores predicted greater use in this group. The authors suggested that the use of both SNSs may serve a procrastination function in light of the relationship found between their use and conscientiousness.

**Summary of outcomes.** The eight studies described offer several findings that suggest personal variables may influence the relationship between loneliness and SNS use. The studies explored the role of personality traits, shyness, and attachment.

The finding that low-functioning introverts reported higher SNS use and loneliness (Thomas et al., 2020b) is interesting as it suggests that that identity development and not self-determined solitude were more important than the personality trait of extraversion-introversion. The authors hypothesised that higher levels of solitude that is not self-determined could be related to an individual's shyness. There was some support for the influence of shyness in this review. Baker and Oswald (2010) found better outcomes were associated with SNS use in relatively shy individuals, which suggests that SNS use may ameliorate loneliness for shy individuals. Bruce et al. (2019) found that loneliness was positively associated with shyness but the relationship was not disentangled. Therefore, it is unclear whether SNS use contributes to loneliness experienced by relatively shy individuals or whether it is used to cope with or protect against pre-existing loneliness. The findings by Sheldon (2012) muddy the water further as they found greater shyness in Facebook non-users rather than users. However, the non-user sample was small in this study and overall the study was rated as methodologically weak.

Although Thomas et al. (2020b) did not find support for the role of personality traits, Petrocchi et al. (2015) found mixed support that SNS use may be positively predicted by agreeableness and extraversion and negatively predicted by conscientiousness. Lim and Kim (2018) found that malicious envy in response to a grandiose SNS post was associated with elevated loneliness. These findings may suggest that an individual's propensity to experience malicious envy and compare themselves to others may influence how lonely they feel whilst using SNSs. Baek et al. (2014) suggest that attachment style may impact on loneliness

depending on what motivation the user has for SNSs. This means that certain uses of SNSs may be more or less adaptive when considering loneliness.

**Table 2**

*Studies that investigated how loneliness and SNS were related*

| Study | Sample | Design | Key measures | Key findings | Quality rating |
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| Aalbers et al. (2018) | 125 undergraduates studying at a university in the Netherlands. | Experience-sampling method. Assessed differential outcomes of active and passive SNS use. | Modified existing measures to assess loneliness. | Passive SNS use positively associated with loneliness within the same timeframe ($r$ = .03, $p$ < .05). Loneliness and active SNS use predicted passive SNS use in the next timeframe but passive only predicted active SNS use in the next timeframe. | 86% |
| Astroszko et al. (2018) | 1,157 students studying at a university in Poland. | Correlational. Assessed correlates of Facebook addiction scale. | Bergen Facebook Addiction Scale (BFAS). Short Loneliness Scale. | Loneliness was a significant predictor of Facebook addiction ($\beta$ = .07, $p$ < .05). | 91% |
| Baek et al. (2013) | 404 South Korean participants recruited from national survey. | Correlational. Evaluated relationship between loneliness and engagement in social and parasocial relationships whilst on SNSs. | UCLA Loneliness Scale Korean Internet addiction scale. | Loneliness was negatively associated with dependency on social ($\beta$ = - .18, $p$ < .01) and positively associated with dependency on parasocial relationships ($\beta$ = .14, $p$ < .001). | 91% |

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| Baek et al. (2014) | 384 undergraduate students studying at university in South Korea. | Correlational. Evaluated effects of SNS use across different attachment styles. | UCLA Loneliness Scale. Self-Report Measurement of Adult Attachment. | Fearful group spent significantly longer using SNSs than dismissive group ($F(3, 377) = 3.33$, $p < .05$). Fearful group used SNSs for social interaction significantly more than all other groups ($F(3, 377) = 7.10$, $p < .001$). Dismissive group used SNSs for parasocial interaction significantly more than other groups ($F(3,377) = 6.32$, $p < .001$). SNS use for informational purposes was associated with lower loneliness scores in fearful group ($\beta = -.20$, $p < .05$) SNS use for social interaction associated with reduced loneliness in secure group ($\beta = -.45$, $p < .01$). | 86% |
| Baker & Oswald (2010) | 207 undergraduates studying at university in the United States. | Correlational. Evaluated the relationships between shyness, Facebook use and loneliness. | 20-item Revised Cheek and Buss Shyness Scale UCLA Loneliness Scale. | Shyness positively predicted loneliness ($\beta = .58$, $p < .01$) For shy individuals, Facebook use was associated with greater closeness with friends ($\beta = .44$, $p < .01$). For shy individuals, Facebook use predicted greater importance of Facebook friends ($\beta = .19$, $p = .04$). | 82% |

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| | | | | These findings were nonsignificant in less shy individuals. | |
| Berryman et al. (2018) | 467 undergraduates studying a university in the United States. | Correlational. Examined links between SNS use and mental health outcomes. | UCLA Loneliness Scale. | SNS variables poor predictors of negative outcomes. Vaguebooking predicted loneliness ($\beta = .099$, $p < .05$). | 86% |
| Biolcati et al. (2018) | 755 participants recruited via SNS and mailing lists. | Correlational. Examined whether personality variables and loneliness predicted Facebook addiction. | The Bergen Facebook Addiction Scale (BFAS)<br>Big Five Inventory (BFI-10)<br>Short version of Social and Emotional Loneliness Scale for Adults (SELSA-S). | Social ($\beta = .16$, $p < .001$), romantic ($\beta = .12$, $p = .001$) and familial loneliness ($\beta = .08$, $p = .031$) were significant predictors of Facebook addiction. Conscientiousness, Extraversion, Neuroticism and loneliness were all significant predictors of Facebook Addiction. | 95% |
| Bruce et al. (2019) | 20,096 participants in United States recruited through email lists and advertisements. | Correlational. Assessed correlates of loneliness. | UCLA Loneliness Scale. | Strongest associations with loneliness were shyness ($\beta = .20$, $p < .01$) and expressing worry about SNS use ($\beta = .05$, $p < .01$). | 95% |
| Burke and Kraut (2016) | 1,910 English-speaking participants recruited | Correlational. Assessed relationship between | UCLA Loneliness Scale. | Receiving more Facebook communication not associated with changes in wellbeing ($\beta = .01$, $p = .493$). | 86% |

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| | through Facebook advertisement. | communication on SNSs and wellbeing. | | Receiving communication from strong ties ($\beta$ = .04, $p$ = .003) was associated with improvements in wellbeing. Receiving composed communication ($\beta$ = .02, $p$ = .063) marginally predicted wellbeing. Receiving composed communication from strong ties also predicted wellbeing ($\beta$ = .02, $p$ = .04). | |
| Deters and Mehl (2012) | 86 undergraduates recruited from a university in the United States. | Experiment. Tested whether increased status updating affected loneliness. | UCLA Loneliness Scale | Participants that increased frequency of status updates reported a decrease in loneliness ($t$(36) = 2.15, $p$ = .04, $d$ = -.31). Induced changes in feelings of loneliness were statistically explained by the degree to which participant felt connected with others. | 75% |
| Greitemeyer et al. (2014) | Study 1: 458 students recruited from a university in Austria Study 2: 1,244 students recruited from same pool using | Correlational. Examined whether interpersonal neglect on SNS affected loneliness. | UCLA Loneliness Scale. | Part one findings: Number of received birthday greetings significantly predicted loneliness ($\beta$ = -.22, $p$ < .01) but number of Facebook friends did not ($\beta$ = -.05, $p$ = .56). Part two findings: Number of responses to last three Facebook wall posts ($\beta$ = | 82% |

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| | different mailing list. | | | -.13, $p < .001$) and number of Facebook friends ($\beta = -.07$, $p < .05$) significantly predicted loneliness.<br>Tone of responses was nonsignificant ($\beta = -.05$, $p = .11$). | |
| Guo et al. (2014) | 149 Chinese international students recruited online and at international centre. | Correlational. Assessed whether SNS use associated with elevated levels of loneliness. | Three-items from UCLA Loneliness Scale. | Entertaining recreational purposes of SNS use predicted loneliness ($\beta = .30$, $p < .01$). | 68% |
| Jin (2013) | 536 participants were recruited from a panel in South Korea. | Correlational. Examined the relationship between loneliness and a number of variables indicative of Facebook use. | UCLA Loneliness Scale. | Number of Facebook friends ($\beta = -.11$, $p = .005$) and overlapping friends ($\beta = -.11$, $p = .005$) were significantly associated with loneliness.<br>Time spent on Facebook was not related to loneliness ($\beta = .03$, $p = .540$).<br>Loneliness negatively related to positive self-disclosure ($\beta = -.26$, $p < .001$) and positively to negative self-disclosure ($\beta = .22$, $p < .001$). | 95% |
| Lee et al. (2013) | 265 students recruited from a university in South Korea. | Correlational. Examined the relationship between loneliness and | 5-items from UCLA Loneliness Scale. | Loneliness positively influenced self-disclosure and self-disclosure positively associated with social support.<br>Increased social support | 86% |

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| | | self-disclosure. on SNSs. | Subjective Happiness Scale | associated with elevated self-reported wellbeing. | |
| Lim and Kim (2018) | 255 participants recruited online | Experiment. Assessed the effect of observing a grandiose post on SNS on loneliness. | 5-items from UCLA Loneliness Scale (translated) Pathological Narcissism Inventory. | No significant effect of grandiosity on loneliness ($\beta$ = -.024, $p$ = .719). Significant covariate effect of malicious envy on loneliness and malicious envy positively predicted loneliness ($\beta$ = .393, $p$ < .001). Mediation effect of malicious envy on the effect of grandiosity on loneliness. | 75% |
| Meshi et al. (2020) | 213 participants recruited via senior centres, activity clubs and other organisations in the United States. | Correlational. Evaluated the relationship between perceived social isolation and SNS use. | Patient-Reported Outcomes Measurement Information System (PROMIS; Hahn et al., 2014) Social Isolation 4a scale. PROMIS Emotional Distress-Depression 4a scale (Pilkonis et al., 2011). Bergen Social Media Addiction Scale (adapted from BFAS). | Addictive SNS use significantly associated with perceived social isolation after controlling for depression ($\beta$ = .16, $p$ < .05). | 95% |

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| Petrocchi et al. (2015) | 205 students recruited from a university in the United States. | Correlational. Assessed the differences between users of Facebook and users of both Facebook and Twitter. | Facebook Intensity Scale<br>Twitter Intensity Scale<br>UCLA Loneliness Scale. | In the users of both Facebook and Twitter group, a negative association between the intensity of usage for Facebook ($\beta$ = -.33, $p$ < .05) and loneliness was found. The same was found for Twitter ($\beta$ = -.29, $p$ < .05).<br>Facebook only group reported significantly higher loneliness scores ($F$(1, 199) = 4.27, $p$ < .05, $\eta^2$ = .02).<br>In the users of both Facebook and Twitter, conscientiousness ($\beta$ = -.24, $p$ < .05), extraversion ($\beta$ = .43, $p$ < .01) and agreeableness ($\beta$ = .21, $p$ < .05) significantly predicted Facebook intensity. Conscientiousness predicted Twitter intensity in the dual-SNS group ($\beta$ = .21, $p$ < .05). | 77% |
| Pittman (2015) | 432 undergraduates recruited via email. Participants studied at a university in the United States. | Correlational. Examined the relationship between creating and consuming SNS content and loneliness. | College Student Facebook Use Questionnaire<br>UCLA Loneliness Scale. | Loneliness significantly correlated with Twitter creation ($r$ = -.264, $p$ < .001) and consumption ($r$ = -.23, $p$ = .001).<br>Loneliness significantly correlated with Instagram creation ($r$ = -.146, $p$ = .027) and consumption ($r$ = -.171, $p$ = .009). | 77% |

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| | | | | No significant differences between content consumers or creators. | |
| Ponnusamy et al. (2020) | 364 undergraduate students recruited from a university in Malaysia. | Correlational. Explored the relationship between Instagram addiction and loneliness. | Modified version of Bergen Facebook Addiction Scale UCLA Loneliness Scale. | Instagram addiction positively influenced loneliness ($\beta$ = .211; $p$ < .01). | 91% |
| Primack et al. (2019) | 1,178 students recruited from one university in United States. | Correlational. Examined associations between positive and negative SNS experiences and perceived social isolation. | Patient-Reported Outcomes Measurement Information System (PROMIS) Social Isolation Scale. | Positive experiences did not significantly predict changes in perceived social isolation (OR = .97, 95% CI = .93-1.005) but negative experiences did (OR = 1.13, 95% CI = 1.05-1.21). | 100% |
| Rajesh and Rangaiah (2020) | 114 participants recruited through social media. | Correlational. Assessed associations between Facebook addiction and loneliness. | UCLA Loneliness Scale Bergen Facebook Addiction Scale Facebook Intensity Scale | Loneliness significantly predicted Facebook addiction. | 73% |
| Seo et al. (2016) | 285 students recruited from three universities in South Korea. | Correlational. Examined the association between | 17-items from the UCLA Loneliness Scale. | Participants who had more interactions with their Facebook postings perceived stronger emotional ($\beta$ = .50, $p$ | 86% |

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| | | perceived support from Facebook friends and loneliness | | < .001) and confidant ($\beta$ = .33, $p$ < .01) social support. The average time taken to receive responses to Facebook postings significantly predicted emotional ($\beta$ = -.24, $p$ < .05) and marginally predicted confidant ($\beta$ = -.21, $p$ = .07) social support. Both perceived emotional ($\beta$ = -.33, $p$ < .001) and confidant ($\beta$ = -.23, $p$ < .001) social support significantly negatively predicted loneliness. | |
| Sheldon (2012) | 327 participants recruited from colleges and further snowball sampling by the student participants. | Correlational. Examined the differences in loneliness and shyness between Facebook users and non-users. | Revised Cheek and Buss Shyness and Sociability Scale UCLA Loneliness Scale. | Facebook non-users reported greater shyness ($F$(1, 325) = 9.25, $p$ < .005, $\eta^2$ = .028) and loneliness ($F$(1,325) = 10.14, $p$ < .005, $\eta^2$ = .03). | |
| Shettar et al. (2017) | 100 postgraduates recruited from a university in India. | Correlational. Assessed the association between Facebook use and loneliness. | Bergen Facebook Addiction Scale. UCLA Loneliness Scale. | Higher Facebook addiction scores were significantly associated with higher loneliness scores ($r$ = .239, $p$ < .005). | 68% |
| Skues et al. (2012) | 393 undergraduates recruited from a university in Australia. | Correlational. Examined the associations between loneliness, | UCLA Loneliness Scale. The Facebook Questionnaire. | Openness predicted time spent on Facebook per day ($\beta$ = .18, $p$ < .05) and number of friends ($\beta$ = .13, $p$ < .05) | 91% |

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| | | personality traits and Facebook use. | Australian Personality Inventory. Narcissism Personality Inventory. | Loneliness positively predicted number of Facebook friends ($\beta$ = .13, $p$ < .05). | |
| Thomas et al. (2020a) | 510 undergraduates recruited through a market research company. | Correlational. Examined the predictors of loneliness in first-year students. | UCLA Loneliness Scale. | Social information seeking was a positive predictor of loneliness ($\beta$ = .081, $p$ < .05). | 77% |
| Thomas et al. (2020b) | 69 undergraduates recruited from a university in the United States. | Experience sampling method. Assessed the relationships between social media use, identity development and loneliness. | Preference for Solitude Scale. Big Five Personality Questionnaire. Eight-items from the UCLA Loneliness Scale. | High-functioning introverts were less likely to use social media than low-functioning introverts. Loneliness significantly predicted social media use in general ($\beta$ = .14, $p$ < .05). | 95% |
| Yang (2016) | 208 undergraduates recruited from a university in the United States. | Correlational. Examined the relationship between different SNS activities and loneliness. | Iowa-Netherlands Comparison Orientation Measure. UCLA Loneliness Scale. | Instagram interaction ($\beta$ = -.18, $p$ = .018) and browsing ($\beta$ = -.17, $p$ = .023) were associated with lower loneliness scores whereas broadcasting ($\beta$ = .21, $p$ = .006) was associated with higher loneliness scores. Social comparison orientation moderated the relationship between Instagram interaction | 95% |

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| | | and loneliness ($\beta$ = .17, $p$ = .018).<br>Instagram interaction was related to lower loneliness only in those who were less inclined to compare to others. |

## Discussion

The aim of this review was to summarise and evaluate the existing literature investigating the relationship between loneliness and SNS use. 45 studies that examined this relationship using some measure of loneliness and SNS use in an adult population were included.

17 studies predominantly examined the relationship between SNS use and loneliness. Five studies reported SNS use to be associated with lower levels of loneliness, five studies found it to be associated with higher levels of loneliness, four studies found mixed findings and three found no significant relationship. The research was predominantly correlational with the exception of two experimental studies.

28 studies evaluated different factors that could explain the mixed findings and the studies. Six studies researched addictive use of SNSs, eight studies researched friends and experiences online, nine studies investigated how SNSs are used, and eight studies evaluated personal variables.

The research investigating addictive use provided the clearest convergence of results across studies. All studies found a significant positive relationship between loneliness and addictive SNS use. Most studies used addictive SNS use as their predictor variable in regression analyses but one study (Biolcati et al., 2018) used loneliness variables as predictors. Overall, the findings from the addictive use research suggest that SNS use that is associated with withdrawal, conflict and other features of addiction, may lead to greater loneliness. This is somewhat unsurprising, as the nature of an addiction implies some level of strife or difficulties functioning (Goodman, 1990; Grant & Chamberlain, 2016) and significant impairment or distress is a central criterion for diagnosis of non-substance-related disorders in the diagnostic and statistical manual of mental disorders (5th ed.; DSM-5; American Psychiatric Association, 2013).

The research that examined the role of SNS friends and experiences presented mixed findings. The relationship between number of SNS friends and loneliness appears unclear with one study finding an inverse relationship (Jin, 2013), one finding a positive relationship (Skues et al., 2012), and one finding an inverse or no relationship in the same study (Greitemeyer et al., 2014). Primack et al. (2019) found that negative experiences were significantly predictive of increased odds of loneliness. With regards to users' behaviour online, Baek et al. (2013) found that loneliness negatively predicted reliance on online social relationships and positively predicted reliance on online parasocial relationships, suggesting that greater loneliness may lead to a dependence on relationships that lack reciprocity and congruence. Another study found that experimentally increasing the frequency of status updating on a SNS led to a decrease in loneliness (Deters & Mehl, 2013). These findings lend support to the idea that interactions with others online, including SNS friends, can influence the individual's experience of loneliness. It appears that the quality of the interaction is more important than the number of potential interactions. In particular, it seems important for SNS users to engage with reciprocal, genuine relationships whilst avoiding negative interactions with others if they are to ameliorate feelings of loneliness.

Findings from studies that investigated the ways in which SNSs are used by users varied. Yang (2016) found that interacting with other users and browsing on a SNS predicted lower loneliness scores whereas broadcasting predicted higher scores. Interestingly, Yang found that social comparison orientation moderated the association between interaction and loneliness, meaning that interacting with others was associated with lower loneliness scores for those less inclined to compare themselves with others. Another study found that passive SNS use, including browsing, was positively associated with loneliness within the same timeframe and passive use was more likely to occur after participants reported feeling lonely (Aalbers et al., 2018), which suggests a possible feedback loop between loneliness and SNS

browsing. Other behaviours such as vaguebooking (Berryman et al., 2018) and self-disclosure (Jin, 2013; Lee et al., 2013) were investigated. Vaguebooking, or posting updates to solicit attention, was a significant predictor of loneliness whilst self-disclosure appears to protect against loneliness unless what is being disclosed is typically negative. Other studies found use of two SNSs predicted lower loneliness scores (Petrocchi et al., 2015), consumption and creation of SNS content was inversely correlated with loneliness for two SNSs but nonsignificant for the other (Pittman, 2015), and using SNSs to learn more about offline relationships was associated with reduced loneliness (Thomas et al., 2020a) whilst entertainment recreational purposes predicted elevated loneliness (Go et al., 2014).

Overall, these findings suggest that the ways in which individuals use SNSs can lead to differential effects on loneliness. If browsing, it appears that the users' tendency to compare themselves to others may be important to consider. If sharing information on SNSs, the content of the disclosure may also be of importance, whether it be positive, negative, or attempting to gain attention. Finally, it appears that the type of SNS being used may lead to disparate effects on loneliness.

Personal variables may influence the relationship between loneliness and SNS. Thomas et al. (2020b) found greater differences in SNS use between low- and high-functioning introverts than between introverts and extraverts. This suggests that the personality trait of extraversion may not be a variable that influences the relationship between loneliness and SNS use. Conversely, Petrocchi et al. (2015) found conscientiousness to negatively predict intensity of SNS use. The role of shyness was supported by findings from Bruce et al. (2019) who found shyness to be the most significant predictor of loneliness within a large sample. Baker & Oswald (2010) found that for shy individuals, Facebook use was associated with greater closeness with others but was not significantly associated with loneliness. Although this failed to support the hypothesis that SNS use may buffer against

loneliness for particularly shy individuals, SNS use was not associated with greater loneliness in shy individuals. Sheldon (2012) found that Facebook non-users reported greater shyness and loneliness than Facebook users, which may suggest that SNS use brings individuals closer to others, lessening the burden of loneliness. Baek et al. (2014) found evidence for differential effects of SNS use on loneliness across different attachment styles. This lends support for the role of attachment in influencing the relationship between SNS use and loneliness. Lim and Kim (2018) found that SNS posts high in grandiosity were more likely to attract malicious envy in other users, which was associated with greater loneliness. This suggests that personality traits of users can interact and influence loneliness when using SNSs.

## Limitations

The research included in this review has a number of methodological limitations. Firstly, all studies included in this review were cross-sectional which made it difficult to determine causality (Levin, 2006). For example, in studies that found a positive relationship between loneliness and SNS use it was difficult to disentangle whether those who scored higher on loneliness measures experienced this prior to, or as a consequence of, using SNSs. Another limitation is that all studies used self-reported measures. Self-report measures can introduce bias into data through demand characteristics, social desirability, reliance on the accurate recall of participants, and their psychometric properties (Barker et al., 2002; Chan, 2009; Spector, 1994). Some studies gathered data by accessing the SNS profiles of participants, which reduced the reliance on purely self-reported data, but self-report measures were used in all studies described in this review.

Additionally, many studies used fairly homogenous samples which may bias findings. For example, many studies used predominantly female samples whilst some had very few females included in the sample. Many samples relied on younger student participants and this

may obscure differences in SNS use and loneliness between different age and educational groups of people. Furthermore, studies exploring loneliness in undergraduate samples may observe relationships that tell us more about the experiences that are typical for many undergraduates. For example, becoming an undergraduate may be marked by an individual leaving home, becoming more distant with childhood friends, and developing their sense of identity (Bauer & Rokach, 2004; Lou et al., 2012; Scanlon et al., 2007), The studies included in this review vary in quality and this is another limitation of the review. Some studies used unvalidated measures or provided little detail about the measures, which makes study replication difficult. Some studies did not consider confounding variables.

Another limitation of the review pertains to the measurement of loneliness. The UCLA Loneliness Scale (Russell, 1996) was often used to measure loneliness. The scale has been described as a unidirectional measure of loneliness that assumes loneliness is a phenomenon which varies in frequency and intensity (DiTommaso & Spinner, 1993). For example, it assumes that loneliness experienced from bereavement and not seeing friends are experienced in the same way. The Social and Emotional Loneliness Scale (SELSA; DiTommaso & Spinner, 1993) is a measure that aims to measure loneliness from a multidimensional perspective, including the separation of social and emotional loneliness. The measurement of loneliness is important to consider as SNS use, as well as the other variables explored in this review, may have varied effects on social and emotional loneliness. A final limitation is that SNSs are constantly evolving, waxing and waning in popularity. This does not mean that they should not be studied at all but findings from research conducted on a specific SNS should not be indiscriminately applied to other SNSs without consideration of this caveat.

## Implications

The findings from this review suggest that the question 'does a hashtag a day keep loneliness at bay' is too simple. Although the research is mixed, several studies included in this review suggest there is a significant relationship between loneliness and SNS use depending on the variables that were measured. Furthermore, there are many studies that report associations between greater SNS use and lower self-reported loneliness. These findings suggest that a unidirectional view of SNS use being the path to loneliness is inaccurate.

These findings are important as they offer opportunities for further research and the development of evidence-based interventions that incorporate SNS usage and aim to reduce loneliness. For example, if a client reports feeling lonely healthcare professionals may be able to formulate whether SNS use is helpful or unhelpful for the client. If the SNS use is deemed to be addictive, then it might be advisable for the client to reduce their use of SNSs. Internet Gaming Disorder is a disorder recommended for future study in the DSM-5 (American Psychiatric Association, 2013) and it could be that research on SNS use may inform future diagnosis and set of criteria for addictive SNS use. Alternatively, if a client is shy, or socially anxious, the recommendation may be to consider whether they might benefit from using SNSs more. The client's approach to self-disclosure online may also be assessed and social skills training considered if deemed appropriate. The findings could also inform future psychoeducational workshops that advise individuals how best to use SNSs in order to diminish loneliness and increase awareness of the effects of negative experiences online.

**Further research**

The 45 studies included in this review shed light on the relationship between loneliness and SNS use. The studies provide evidence for the role of different factors that may increase or decrease the loneliness experienced by SNS users. Further research should attempt to replicate and expand on these findings through the use of randomised controlled

trials. Longitudinal designs would also be welcomed to better understand the associations between loneliness and differential SNS usage over time. Additionally, many of the studies described in this review used undergraduate samples and future research should consider studying SNS use and loneliness in other samples, including non-student and older adult samples. Future research should also consider the use of both unidimensional and multidimensional measures of loneliness to explore the possibility for varied effects on loneliness. Furthermore, many studies researched loneliness in relation to Facebook use, which is one specific SNS, but other SNSs exist. Other SNSs have their own functions and norms (Waterloo et al., 2018) and future research should consider the differential effects these differences may have on loneliness.

## Conclusion

This systematic review evaluates the current literature exploring the relationship between SNS use and loneliness. The review suggests that the question 'does a hashtag a day keep loneliness at bay' is too simple but the relationship between SNS use and loneliness appears clearer when other variables, such as addictive use, friendships and online experiences, SNS behaviours, and personal traits are considered. The research is limited by a reliance on cross-sectional and correlational methodology, and undergraduate samples. Future research would benefit from considering these constraints.

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Part 2: Empirical Paper

# Social Media and Loneliness: Comparing individuals with varying features of Borderline Personality Disorder

**Daniel Morrissey**

## Abstract

### Aims

To investigate social networking site (SNS) use and loneliness in people with varying features of Borderline Personality Disorder (BPD).

### Method

227 participants from the general population completed measures of BPD features, loneliness, SNS use, addictive SNS use, social comparison orientation (SCO), mentalization, social anxiety and depression.

### Results

BPD features were associated with higher loneliness and SCO scores. SNS use predicted loneliness scores and SCO did not moderate the relationship between SNS use and loneliness. Addictive SNS use did not predict loneliness but SNS broadcasting behaviour was a predictor of loneliness. Hypomentalizing predicted loneliness but did not mediate the relationship between BPD features and loneliness.

### Conclusion

People with many features of BPD reported feeling lonelier, above and beyond the effects of social anxiety, depression, marital status, employment status, and social distancing status. SNS use was associated with greater loneliness but the size of the relationship was small. SNS broadcasting and hypomentalizing may be variables of interest for further research.

## Introduction

Borderline Personality Disorder (BPD) is characterised by a pattern of instability in interpersonal relationships, affect, and self-image, and impulsivity (American Psychiatric Association, 2013). The pattern of instability includes frantic efforts to avoid real or imagined abandonment, alternating between idealisation and devaluation, and chronic feelings of emptiness. The prevalence of BPD in a community sample was found to be 0.7% in the UK (Coid et al., 2006) and studies conducted in Norway (Torgersen et al., 2001) and the Netherlands (Ten Have et al., 2016) have reported similar prevalence rates. Coid et al. (2006) found that a BPD diagnosis was more prevalent in males, younger age groups, separated or divorced individuals, and those in a lower social class. Grant et al. (2008) found no difference in the prevalence of BPD between males and females, but also found BPD to be more prevalent in young adults, separated and divorced adults, and those with lower incomes and education. Research conducted in an outpatient clinic found the prevalence of BPD to be 22.6% and 74.1% of those diagnosed with BPD were female (Korzekwa et al., 2008). It is noted that a number of biases may have contributed to variation in prevalence estimates and a misperception that BPD is more prevalent in females (Sansone & Sansone, 2011).

Loneliness was defined by Hawkley and Cacioppo (2010) as a distressing feeling that accompanies an individual's perception that their social needs are not being met. The authors described loneliness as synonymous with perceived social isolation but not objective social isolation. For example, a person can be surrounded by others but still feel lonely (Hawkley & Cacioppo, 2010; Yanguas et al., 2018). Loneliness has been found to be related to mental health difficulties, such as depression (Achterbergh et al., 2020; Cacioppo et al., 2006; Meltzer et al., 2013; Singh & Misra, 2009;) and social anxiety (Anderson & Harvey, 1988; Caplan, 2007; Eres et al, 2020; Lim et al., 2016).

Very little has been written about the experience of loneliness in people with BPD, yet Adler and Buie (1979) observed that people with BPD were particularly vulnerable to feelings of abandonment and loneliness. Further, avoidance of abandonment, unstable interpersonal relationships and chronic feelings of emptiness are included in the diagnostic criteria of BPD in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5; American Psychiatric Association, 2013). Chronic feelings of emptiness have in particular been found to correlate with feelings of hopelessness, loneliness, and isolation (Klonsky, 2008). These criteria suggest that loneliness is a key clinical feature of BPD.

Liebke et al. (2017) investigated social networks and the experience of loneliness in people diagnosed with BPD. A translated version of the Social Network Index (SNI; Cohen et al., 1997) was used to measure the size and diversity of the social network. Larger networks included a large number of people with whom the participants interacted with on at least a fortnightly basis. Diversity of network was defined by the total number of domains of social relationships in which the participant had regular contact. The domains included spouses, parents, workmates, and others. Liebke et al. found that people with BPD reported higher levels of loneliness than age-matched controls, as well as smaller and less diverse social networks. Loneliness was inversely correlated with social network size in both the BPD and control groups, such that smaller networks were associated with higher loneliness scores. Social network diversity was inversely correlated with loneliness in the BPD group but not the control group. Lacking network diversity could mean living alone or being unemployed and the authors highlighted that the BPD group reported living alone and being unemployed more often than controls. However, neither unemployment nor living alone were correlated with loneliness. Finally, the differences between the loneliness scores for the BPD and control groups were significant even when controlling for social network features and

social functioning. Liebke et al. concluded that the loneliness experienced by people with BPD went beyond the features of their social networks or level of social functioning.

**Mentalization**

Mentalization is a leading theory of BPD whereby "a fragile mentalizing capacity vulnerable to social and interpersonal interaction is considered a core feature of the disorder" (Bateman & Fonagy, 2010a). Mentalizing is the process by which an individual makes sense of themselves and others in terms of their thoughts, feelings, wishes, and desires of that person (Bateman & Fonagy, 2010b). An indicator of high quality mentalization is the awareness that an individual cannot definitively know what is in somebody else's mind (Fonagy & Bateman, 2007). It has been proposed that the capacity to mentalize is dependent on the quality of attachment relationships and quality of affect mirroring (Fonagy & Luyten, 2009). Maltreatment or abuse is likely to limit the amount of reflective communication between parent and child and may undermine the development of mentalising in a child which may continue into adulthood (Fonagy et al., 2007).

It has been observed that people with BPD tend to think concretely and this has been described as treating what is inside the mind as equivalent to what is in the physical world (Fonagy & Luyten, 2009). This inability to consider complex models of mind is also known as psychic equivalence or hypomentalizing. (Fonagy & Luyten, 2009; Fonagy et al., 2016; Target & Fonagy, 1996). Hypermentalizing is another impairment in mentalization that describes the tendency to excessively mentalize without appropriate evidence to support the model (Fonagy, et al., 2016). Adverse life events, like childhood abuse, have been reported by BPD patients (Fossati et al., 1999; Laporte et al., 2012; Leichsenring et al., 2011) and the frequency of emotional abuse has also been found to be correlated with BPD symptoms (Kuo et al., 2015). If an individual's ability to mentalize, and interpret others' behaviour as meaningful, is less developed, it may affect how isolated or lonely they feel. For example, if

a friend were to cancel a social gathering, mentalization may influence how the individual experiences this situation. Very little has been written about the relationship between loneliness and mentalization. A recent study by Caputi et al. (2021) on children aged around nine years old found that an intervention aimed at facilitating the understanding of different perspectives and mental states led to decreased loneliness scores one week later when compared to a control group.

**The social media question**

The findings from Liebke et al. (2017) suggest that loneliness and social isolation may be related, even if they are conceptually different, and studies have found loneliness to be related to indicators of social isolation (Ge et al., 2017; Petersen et al., 2016). The belongingness hypothesis (Baumeister & Leary, 1995) posits that humans are driven to form lasting interpersonal relationships and social networking sites (SNSs) are virtual communities where users connect and interact with other people (Kuss & Griffiths, 2017). If an individual is lonely, irrespective of their level of social isolation, it could be hypothesised that SNSs may be used to alleviate this aversive state. It has also been suggested that individuals with deficient levels of offline social contact might attempt to compensate for the lack of social contact using SNSs (Barker, 2012; Davis & Kraus, 1989). Pittman and Reich (2016) suggest that elevated interpersonal connectivity should be associated with an overall increase in wellbeing and reduction in loneliness. However, a meta-analysis conducted by Liu and Baumeister (2016) found that total SNS use was higher among those high in loneliness and research has also found addictive SNS use to be related to loneliness (Biolcati et al., 2018; Meshi et al., 2020. There is a paucity of research investigating whether people with BPD use SNSs differently than those without features of BPD. One study found a high prevalence of personality disorder traits in individuals reporting internet addiction (Wu et al., 2016) and

another found BPD symptoms to be positively correlated with internet addiction (Lu et al., 2017). However, it is unclear whether these findings extend to the use of SNSs.

A number of suggestions have been made as to why SNS use may be related to loneliness. Yang (2016) conducted a study that investigated how different SNS activities and social comparison orientation (SCO) may be associated with loneliness. SCO refers to an individual's tendency to compare themselves with others. Yang conceptualised three different types of SNS activities: broadcasting, interaction and browsing. Broadcasting was defined as the sharing of information that was not directed to specific individuals such as uploading a status update on a SNS profile without tagging others in it. Interaction referred to communication that was directed towards others such as commenting on others' posts whereas browsing referred to when the user reviewed their SNS profile home page or the profile of others. Yang found that interaction and browsing were associated with lower loneliness whereas broadcasting was associated with higher loneliness. Additionally, Yang found that SCO moderated the relationship between SNS interaction and loneliness, meaning that SNS interaction was related to lower loneliness scores for individuals who scored low on SCO. These findings lend support to the view that when considering the relationship between SNSs and loneliness, how SNSs are used may be more important than how often SNSs are used.

Additionally, the findings provide some support for the role of SCO in moderating the relationship between SNS use and loneliness. A recent study investigated the relationship between BPD symptoms, SCO and self-esteem (Richmond et al., 2021). Richmond et al. found that BPD symptoms were inversely related to self-esteem in those who scored high, or at the mean, on a measure of SCO.

**Aims and hypotheses**

The first aim of the current study was to better understand the experience of loneliness in people with features of BPD during the COVD-19 pandemic. We were interested in whether people with many features of BPD report higher levels of loneliness than those with fewer features of BPD. Secondly, the study aimed to better understand the relationship between SNS use and loneliness during the pandemic. We were interested in whether the social connectivity offered by SNSs ameliorated or perpetuated loneliness. The study was also interested in whether people with many features of BPD use SNSs more or less than people with fewer features. The variables that may influence the relationship between SNS use and loneliness were also of interest to the study; specifically, the different types of SNS activities as described in Yang (2016), SCO, addictive SNS use and ability to mentalize. As described earlier, social anxiety and depression symptoms have been found to correlate with loneliness thus these variables were measured to control for their effect on loneliness.

***Hypotheses***

On the basis of past research and theoretical frameworks, we proposed a number of hypotheses. As observed by Liebke et al. (2017), we expected people with higher BPD scores to report greater loneliness (H1). When considering the belongingness hypothesis (Baumeister & Leary, 1995) and social compensation hypothesis (Davis & Kraus, 1989), we anticipated that people with higher BPD scores would report greater SNS use (H2). In line with past research (Biolcati et al., 2018; Liu & Baumeister, 2016; Meshi et al., 2020), we expected greater SNS use (H3) and addictive SNS use (H4) to be related to higher levels of loneliness. In accordance with the findings from Yang (2016) and Richmond et al. (2021), we expected that BPD scores would be associated with SCO (H5) and SCO to be a moderating variable between SNS use and loneliness (H6). We also anticipated that using SNSs to interact with others and browse would be associated with lower loneliness, whereas

broadcasting would be associated with higher loneliness scores (H7). Finally, the theory of mentalization informed our expectation that individuals who tended to hypo-mentalize would report greater loneliness (H8).

H1: People with higher BPD scores will report higher levels of loneliness.

H2: People with higher BPD scores will report greater SNS use.

H3: People who report greater SNS use will report higher levels of loneliness.

H4: People reporting greater addictive SNS use will report higher levels of loneliness.

H5: People with higher BPD scores will report higher scores on SCO.

H6: SCO will be a moderating variable between social media use and reported loneliness.

H7: The use of SNSs to interact with others and browse will be associated with lower loneliness scores, whereas broadcasting will be associated with higher loneliness scores.

H8: Those that report a tendency to hypo-mentalize will report higher loneliness scores.

## Method

### Design

The current study employed a cross-sectional study design and used an online survey to gather data. The use of an online survey allowed for data to be gathered during a period of enforced social distancing in the UK due to COVID-19 (Williams et al., 2020).

### Participants

Using convenience sampling, participants were recruited online from the general public and were required to be aged 18 and older. The study was promoted predominantly on SNSs including Facebook, Twitter and Instagram. The advertisements on SNSs included posts on a public profile made for the study and paid for advertisements through Facebook. The study was also included in a charity newsletter. A website was created to advertise the study, as well as provide a space where the findings of the study could be posted. An image of the website landing page and address can be found in Appendix D.

A total of 450 participants started the study and 227 (50.4%) completed the study. Of the participants that partially completed the study, the large majority discontinued the study early in the survey and only three participants completed most of the survey. It was decided that data only from participants that had completed the entire survey would be included in the main analyses. Completers were compared with non-completers and Table 3 presents the results. Chi-square analysis suggested that there were some differences in education ($X^2(4) = 3.921$, $p = .012$) and marital status ($X^2(5) = 11.73$, $p = .039$) between completers and non-completers. Completers were more educated at higher education level (69% versus 52.6%) and less likely to be married (22.6% versus 34.8%). No significant differences were found in sex, ethnicity, employment, or social distancing status between completers and non-completers.

Participants (completers) mean age was 44.42 ($SD = 16.316$). Descriptive statistics for the demographic variables are included in Table 4. 46 participants (20.2%) met the diagnostic cut-off for BPD (Zanarini et al., 2003). The frequencies and spread of BPD features in the sample are presented in Table 5 (Appendix E).

**Table 3**

*Chi-square analysis of the differences in demographics between completers and non-completers*

| Demographic | Degrees of freedom | $X^2$ | $p$-value |
|---|---|---|---|
| Sex | 2 | 2.147 | .342 |
| Ethnicity | 4 | 3.921 | .417 |
| Education | 4 | 12.780 | .012 |
| Employment | 6 | 4.498 | .610 |
| Marital | 5 | 11.730 | .039 |
| Social distancing | 2 | 5.647 | .059 |

**Table 4**

*Descriptive statistics for demographic variables*

| Variable | | M (SD) | N (%) |
|---|---|---|---|
| Age | | 44.42 (16.316) | |
| Gender | Male | | 36 (15.9%) |
| | Female | | 189 (83.3%) |
| | Other | | 2 (.9%) |
| Ethnicity | White | | 207 (91.2%) |
| | Asian | | 9 (4%) |
| | Black | | 1 (.4%) |
| | Middle Eastern | | 2 (.9%) |
| | Other | | 8 (3.5%) |
| Employment | Full-time | | 90 (39.6%) |
| | Part-time | | 23 (10.1%) |
| | Self-employed | | 14 (6.2%) |
| | Unemployed | | 37 (16.3%) |
| | Student | | 18 (7.9%) |
| | Retired | | 37 (16.3%) |
| | Full-time carers or parents | | 8 (3.5%) |
| Marital | Single | | 78 (34.4%) |
| | Married or civil partnership | | 51 (22.5%) |
| | Cohabiting | | 49 (21.6%) |

| | | |
|---|---|---|
| | Divorced | 34 (15%) |
| | Separated | 7 (3.1%) |
| | Widowed | 8 (3.5%) |
| Education | Primary | 4 (1.8%) |
| | GCSEs or equivalent | 34 (15%) |
| | A-Levels or equivalent | 31 (13.7%) |
| | Higher education | 156 (68.7%) |
| | None | 2 (.9%) |
| Social distancing | Normal | 21 (9.3%) |
| | Essential activities only | 123 (54.2%) |
| | Beyond essential activities but had reduced frequency | 81 (35.7%) |
| | Missing | 2 (.9%) |

**Ethics and informed consent**

Ethical approval was provided by the UCL Research Ethics Committee (REC reference 18127/001) and can be viewed in Appendix F. Participants were informed of the study aims, potential benefits and harms of participating and their right to withdraw from the study. The information was provided on a downloadable document and participants were asked to confirm that they had read the document and consented to participate.

**Procedure**

The online survey was created using Qualtrics software package. Participants were able to access the online survey through SNS posts and a charity newsletter. The SNS posts included links to both the online survey and study website, which included information about the study and a link to the online survey. Once on the landing page for the survey, participants were asked to read the participant information, participant distress and consent form documents (Appendix G).

The 'participant distress' document was also downloadable and participants were asked to review this prior to participating in the study. If participants experienced distress during or after completion of the study, the participant distress document provided recommendations for self-soothing and emergency support numbers (Appendix G).

If participants were happy to continue, they were asked to confirm that they had read and understood the documents, understood their right to withdraw, and consented to participating in the study. Participants were then taken through demographic questions before completing a number of measures related to aims and hypotheses of the study. Participants did not receive payment for participating but a £1 donation was made per completed survey. Information pertaining to the donation was detailed in the participant information document.

The study was open to participants from August 2020 to March 2021 and this meant that data collection occurred throughout the SARS-CoV-2 (COVID-19) global pandemic (Cucinotta & Vanelli, 2020). In the United Kingdom, the period of November to March was marked by stay-at-home orders that instructed people to remain indoors and not mix with other households (Institute for Government, n.d.; Pfefferbaum & North, 2020).

**Measures**

Participants completed a brief demographic questionnaire that contained questions about participants' age, gender, ethnicity, level of education, and employment status. One question asked participants about their current social distancing status and could be

responded in one of three ways ("I am living my life as normal", "I am only leaving home for essential activities (e.g. food, health appointments, exercise and work) due to COVID-19", or "I am leaving my home for reasons beyond essential activities but I have reduced the frequency of my usual activities as a precaution due to COVID-19").

Participants were then asked to complete nine questionnaires that measured the variables of interest to the study. The measures are described below and included in the Appendix H.

***The McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini et al., 2003)***

The questionnaire is a 10-item screening tool for BPD that was based on the DSM-IV (American Psychiatric Association, 2000) diagnostic criteria for BPD. Eight criteria are assessed by one item apart from the ninth criterion which is assessed by two items. Participants are able to respond to each item with either a 'yes' or 'no' and for each 'yes' a score of one is given. The MSI-BPD score range is between 0-10. Zanarini et al. (2003) found that a cut-off score of seven was deemed optimal for separating between individuals with and without BPD as it provided both high sensitivity (.81) and specificity (.85). The MSI-BPD has good test-retest reliability (.72) and internal consistency ($\alpha$ = .74).

***UCLA-R Loneliness Scale (Version 3; Russell, 1996)***

The measure contains 20 items and respondents are asked to indicate how often each statement is descriptive of them. There are four possible responses: never, rarely, sometimes and often. Each response is given a score of between 1 and 4 and higher overall scores indicate greater degrees of loneliness. The measure was administered to four different groups (nurses, students, elderly, teachers) and the Cronbach's $\alpha$ ranged between .89 and .94 across the groups (Russell, 1996). The measure was found to have a test-retest correlation of .73 when the elderly sample were re-administered the measure 12 months later and a paired t-test

found no significant change in scores during this period. The measure was also found to positively correlate with other loneliness measures and negatively correlate with measures of self-esteem and social support, suggesting convergent and discriminant validity.

***The Media and Technology Usage and Attitudes Scale (MTUAS; Rosen et al., 2013)***

The questionnaire contains 60 items that ask respondents to indicate the frequency of their internet and social media usage. The questionnaire also contains a number of items assessing respondents' attitudes towards technology usage. The measure was tested with a demographically diverse sample of 942 participants and the subscales had Cronbach's α ratings of between .61 and .97 (Rosen et al., 2013). The subscales also correlated with other measures of time spent using different media and technologies. The social media usage subscale contains nine items that measure SNS usage with a 10-point frequency scale (never, once a month, several times a month, once a week, several times a week, once a day, several times a day, once an hour, several times an hour, all the time).

***The Social Media Disorder Scale (van den Eijnden et al., 2016)***

The scale was developed to measure SNS addiction and was based on the proposed DSM-5 criteria for Internet Gaming Disorder. The shorter nine-item version of the scale was used rather than the full 27-item version. The scale was found to have moderate test-retest reliability (.50) and Cronbach's α of .81 (van den Eijnden et al., 2016). Respondents are asked whether they recognise the presence of each item during the past year. For example, "during the past year, have you often felt bad when you could not use social media?" Respondents answer with 'yes' or 'no' and each 'yes' is scored as 1. In accordance with the cut-off proposed for Internet Gaming Disorder, a score of five indicates addictive use.

***Social media activities (Yang, 2016)***

Social media activities were measured using the questionnaire from Yang (2016). Yang developed items that measured the frequency of engaging in various Instagram

activities and exploratory factor analysis suggested that there were three types of Instagram activities; interaction, browsing and broadcasting. Interaction consisted of two items that measured communication that directly involved other individuals and the items had a Cronbach's α of .79. Browsing consisted of two items that measured how often an individual reviewed their newsfeed and checked out others' profiles. The items had a Cronbach's α of .77. Broadcasting consisted of two items that measured how often an individual shared information that was not directed to specific individuals and the items had a Cronbach's α of .60. Respondents are asked to rate how often they engage in the aforementioned activities using five-point Likert scale (1 = Never, 5 = A lot).

***Iowa-Netherlands Comparison Orientation Scale (INCOM; Gibbons & Buunk, 1999)***

The scale consists of 11 items of which Yang (2016) adopted eight and the full 11-item scale was used in the current study. The scale measures individual differences in SCO by asking respondents to indicate how much they agree with each item (1 = disagree strongly, 5 = agree strongly). The scale was found to have a Cronbach's α of .83 (Gibbons & Buunk, 1999).

***The Reflective Functioning Questionnaire (RFQ; Fonagy et al., 2016)***

The questionnaire is a self-report measure of mentalizing. The measure consists of eight statements and respondents state how much they agree or disagree with each statement (1 = strongly disagree, 7 = strongly agree). The statements assess certainty (RFQ_C) and uncertainty (RFQ_U) about mental states. The RFQ was found to have satisfactory internal consistency, ranging between .63 and .77 (Fonagy et al., 2016). The study used the RFQ_U subscale to measure hypomentalizing.

***Mini-Social Phobia Inventory (Mini-SPIN; Connor et al., 2001)***

The Mini-SPIN is a brief, three-item questionnaire that measures symptoms of generalised social anxiety disorder and was derived from the 17-item Social Phobia Inventory

(SPIN; Connor et al., 2000). The respondent rates each item on a 5-point scale in terms of how much the statement applied to them over the past week (0 = not at all, 4 = extremely). A score of 6 was deemed optimal cut-off, delivering a sensitivity of 88.7% and specificity of 90% (Connor et al., 2001).

***The Patient Health Questionnaire-2 (PHQ-2; Kroenke et al., 2003)***

The PHQ-2 is a two-item measure of depression severity that is derived from the PHQ-9 (Kroenke et al., 2001). Respondents are asked to indicate how often they have been bothered by "little interest or pleasure in doing things" and "feeling down, depressed or hopeless" over the past two weeks (0 = not at all, 3 = nearly every day). A score of 3 was deemed to be the optimal cut-off, delivering a sensitivity of 83% and specificity of 90% (Kroenke et al., 2003).

**Analysis**

The data were gathered using Qualtrics and the relevant scoring, including reverse scoring, was completed within the software. Data were extracted from Qualtrics and inputted into SPSS (Version 26, IBM). Demographic variables were analysed using one-way analysis of variance (ANOVA) and an independent samples t-test. Post-hoc Bonferroni correction tests were performed where necessary and the alpha level used was $p < .01$. The alpha level was selected as a compromise as the test can be too conservative if the number of pairwise tests are large (Bender, 1999). Normality and outliers were checked in all analyses conducted on demographic variables and violations of assumptions are noted where applicable. A Kruskal-Wallis test was performed when loneliness scores across marital groups were analysed. The Kruskal-Wallis test was used as there appeared to be some violation of the parametric assumption of normality. Correlation and regression analyses were used for all hypotheses apart from hypothesis six, where a moderation analysis was conducted. Post-hoc mediation analysis was conducted for hypothesis eight and a post-hoc t-test was implemented

for hypothesis one. The PROCESS macro for SPSS (Rockwood & Hayes, 2020) was used to conduct both moderation and mediation analyses.

Correlation analysis was used to understand the relationships between variables and univariable regression analysis was used to understand the specific contributions of the predictor, or independent, variable on the outcome, or dependent, variable. Multivariable regression analysis was used to understand the unique contributions of each predictor variable on the outcome variable. Moderation analysis was used to understand the effect of a third variable on the relationship between the predictor and outcome variables. Mediation analysis was used to understand whether a third variable explained the relationship between the predictor and outcome variables.

In all regression analyses, a number of assumptions were tested. Cook's distance was used to detect possible outliers (Stevens, 1984). Residual plots were used to check whether the errors of prediction were normally distributed and homoscedasticity was checked by plotting predicted values against standardised residuals (Field, 2018). Autocorrelation was checked using the Durbin-Watson test (Durbin & Watson, 1951). Unless indicated in the results section, all assumptions were met.

All variables used in the main analyses were continuous apart from demographic variables included in the analyses. Marital status, employment status, and social distancing status were included as covariates in all regression analyses where loneliness was the dependent variable and this intended to control for the effect of covariates on loneliness. As these variables were categorical, dummy coded variables were used to create binary values for each variable subgroup. For example, marital status subgroups (e.g. single, divorced) were coded separately and a reference group was required for each variable although differences between subgroups were not a focus of the study.

**Power calculation**

Power analysis was completed during the preliminary stage of study design using G*Power software (version 3.1). The effect size used for the power analysis was gathered from the Liebke et al. (2017) and appeared to be quite large (d = 2.73). Based on this calculation, a sample size of 10 was recommended in order to detect this effect. Sensitivity analysis was conducted using a more conservative value for the effect size in order to observe the effect it had on the recommended sample size. When an effect size of d = .80 was used in the analysis, the recommended sample size was 84 and the sample size changed to 210 when d = .50 was used. The purpose of using more conservative effect sizes in the power analysis was to provide an estimate of sample size required to detect an effect should it be smaller than that cited in Liebke et al. Post-hoc power analysis found that the study had the power to detect an effect size of $\rho = .18$.

Finally, BPD scores were analysed as a continuous variable rather than grouping participants using the recommended clinical cut-off. As the study sampled participants from the general population, it was assumed that more participants would score below the clinical cut-off for BPD and this could leave the clinical sample underpowered. This assumption was supported by the data.

## Results

A total of 227 participants completed the study and the demographic variables were analysed in relation to loneliness scores to identify significant differences between groups.

A one-way ANOVA was conducted and found no differences in loneliness scores based on sex ($F(2, 224) = 1.023$, $p = .361$). Correlation analysis was used to investigate the relationship between age and loneliness scores. The relationship was not significant ($r = .065$, $p = .327$). A univariable regression analysis was conducted with age as the predictor variable and loneliness as the outcome variable. The model accounted for 0.4% of the variance and was nonsignificant ($F(1, 225) = .964$, $p = .327$).

The sample predominantly identified as white British/white other and only 8% of the sample identified as non-white (n = 20). Therefore, a decision was taken to compare loneliness scores between white and minority ethnic participants rather than comparing between specific ethnic groups due to lack of power. An independent samples t-test found no significant difference in loneliness scores between white ($M$ = 48.97, $SD$ = 13.605) and minority ethnic ($M$ = 48.65, $SD$ = 12.419) participants ($t(225) = -.100$, $p = .920$). 68.7% of the participants (n = 156) reported that higher education was the highest level of education they had completed. A one-way ANOVA found no significant difference in loneliness scores across the educational attainment groups ($F(4, 222) = 1.719$, $p = .147$).

A one-way ANOVA was conducted and found a significant difference in loneliness scores across the employment groups ($F(6, 220) = 4.627$, $p < .001$). Post-hoc Bonferroni correction was used to analyse the findings further. The tests found that those who were employed full-time reported significantly lower loneliness scores ($M$ = 43.89, $SD$ = 12.44) than those who were unemployed ($M$ = 55.86, $SD$ = 12.945).

The loneliness scores across marital groups were broadly normally distributed with low levels of kurtosis and skewness. However, the separated group had a kurtosis value of 2.977, which was greater than the recommended level (Field, 2018), but the Kolmogorov-Smirnov test was nonsignificant ($D(7) = .272$, $p = .127$). It was decided that a Kruskal-Wallis test would be conducted alongside a one-way ANOVA to check for potential disparities in results. A one-way ANOVA was conducted to compare differences in loneliness across marital status groups. The finding was significant ($F(5, 221) = 10.938$, $p < .001$) and post-hoc Bonferroni correction was used to analyse the findings further. The tests revealed that participants who identified as single ($M$ = 53.68, $SD$ = 12.678) were significantly lonelier than those who were married or in a civil partnership ($M$ = 44.31, $SD$ = 12.396) and cohabiting ($M$ = 40.78, $SD$ = 11.345). Participants who were married or in a civil partnership

($M$ = 44.31, $SD$ = 12.396) reported significantly less loneliness than those who were divorced ($M$ = 55.94, $SD$ = 12.78). Furthermore, those who identified as cohabiting ($M$ = 40.78, $SD$ = 11.345) reported significantly lower loneliness scores than those who were divorced ($M$ = 55.94, $SD$ = 12.78). The Kruskal-Wallis test was also significant ($H(5) = 46.780$, $p < .001$) and the aforementioned pairwise comparisons remained significant.

Participants were also asked about their social distancing status at the time of survey completion in response to the COVID-19 pandemic. A one-way ANOVA found a significant difference in loneliness scores across social distancing status groups ($F(2, 222) = 7.258$, $p$ = .001). Post-hoc Bonferroni correction was used to analyse the results further and the tests found that participants who were only leaving home for essential activities ($M$ = 51.30, $SD$ = 13.559) reported significantly higher loneliness scores than participants who were leaving home for reasons beyond essential activities but had reduced the frequency of these activities due to COVID-19 ($M$ = 44.44, $SD$ = 12.195).

**Hypothesis 1: People with higher BPD scores will report higher levels of loneliness.**

Correlation analysis was conducted on BPD and loneliness scores, and found a significant correlation ($r$ = .565, $p < .001$). Correlations between all study variables are presented in Table 6 (Appendix I). A univariable regression analysis was conducted with BPD scores as the predictor variable and loneliness as the outcome variable. The model accounted for 31.9% of the variance ($R^2$ = .319) and was significant ($F(1, 225) = 105.579$, $p < .001$). BPD scores significantly predicted loneliness scores ($\beta$ = .565, $p < .001$), which supports the hypothesis that higher BPD scores are related to higher loneliness scores. A multivariable regression analysis including covariates was conducted and the Mini-SPIN and PHQ-2 scores were added as continuous predictor variables. Employment, marital, and social distancing variables were also added as categorical predictors due to the significant differences in loneliness scores found between subgroups. The model accounted for 58.7% of

the variance (*adjusted* $R^2$ = .587) and was significant ($F(16, 210) = 21.116$, $p < .001$). BPD scores continued to predict loneliness ($\beta = .213$, $p < .001$) independently of all other variables in the model (Table 7).

Exploratory analysis was also conducted to examine whether there were differences in loneliness scores when the data were split by the clinical threshold recommended by the MSI-BPD. The data were split into two groups with participants that scored 7, or above, being grouped into the 'clinical group' that met the diagnostic threshold for BPD. The groups were normally distributed and the skewness, kurtosis, and Kolmogorov-Smirvov tests indicated that transformations were not required. A t-test was conducted and found that participants that did not meet the diagnostic criteria for BPD were significantly less lonely ($t(83.503) = -6.422$, $p < .001$) than those that met diagnostic criteria. This further supports the hypothesis that features of BPD are associated with loneliness.

**Table 7**

*Multivariable regression analysis output for hypothesis 1.*

| Variable | Group | Unstandardised coefficient | Standardised coefficient | *t* | *p*-value |
|---|---|---|---|---|---|
| (Constant) | | 39.142 | | 15.213 | < .001 |
| BPD | | .925 | .213 | 3.885 | < .001 |
| Mini-SPIN | | 1.208 | .265 | 5.152 | < .001 |
| PHQ-2 | | 2.112 | .304 | 5.711 | < .001 |
| Employment | Full-time | * | * | * | * |
| | Part-time | .903 | .020 | .422 | .673 |
| | Self-employed | 7.017 | .126 | 2.723 | .007 |

| | | | | | |
|---|---|---|---|---|---|
| | Parent or carer | 2.343 | .032 | .705 | .482 |
| | Unemployed | 2.555 | .070 | 1.375 | .171 |
| | Student | .352 | .007 | .152 | .879 |
| | Retired | 5.104 | .140 | 2.623 | .009 |
| Marital | Single | * | * | * | * |
| | Married | -7.419 | -.230 | -4.405 | < .001 |
| | Cohabiting | -8.685 | -.266 | -5.129 | < .001 |
| | Separated | -4.251 | -.055 | -1.210 | .228 |
| | Divorced | .391 | .010 | .196 | .845 |
| | Widowed | -8.146 | -.112 | -2.395 | .017 |
| Social distancing | Normal | * | * | * | * |
| | Essential | -1.503 | -.056 | -.722 | .471 |
| | Beyond | -4.054 | -.144 | -1.915 | .057 |

*Note.* * denotes categorical variable used as reference variable.

**Hypothesis 2: People with higher BPD scores will report greater SNS use.**

Correlation analysis was conducted on the variables of BPD scores and SNS use and found BPD scores and SNS use were not significantly correlated ($r$ = .084, $p$ = .217). A univariable regression analysis was conducted with BPD scores as the predictor variable and SNS use as the outcome variable. The model accounted for .70% of the variance ($R^2$ = .007) and was not significant ($F$(1, 214) = 1.531, $p$ = .217). BPD scores did not significantly predict SNS use ($\beta$ = .084, $p$ = .217). This did not support the hypothesis that higher BPD scores are associated with greater SNS use.

**Hypothesis 3: People who report greater SNS use will report higher levels of loneliness.**

Correlation analysis found no significant relationship between SNS use and loneliness ($r$ = .101, p = .138). A multivariable regression analysis was conducted with SNS use and the covariates as the predictor variables and loneliness scores as the outcome variable (Table 8). The overall model accounted for 56.1% of the variance (*adjusted* $R^2$ = .561) and the model was significant ($F(16, 199) = 18.178$, $p < .001$). SNS use predicted loneliness scores ($\beta$ = .102, $p$ = .032) independently of all other covariates. This provided support for the relationship between SNS use and loneliness.

**Table 8**

*Multivariable regression analysis output for hypothesis 3.*

| Variable | Group | Unstandardised coefficient | Standardised coefficient | *t* | *p*-value |
|---|---|---|---|---|---|
| (Constant) | | 36.316 | | 10.166 | < .001 |
| SNS use | | .111 | .102 | 2.165 | .032 |
| Mini-SPIN | | 1.492 | .326 | 6.340 | < .001 |
| PHQ-2 | | 2.681 | .387 | 7.403 | < .001 |
| Employment | Full-time | * | * | * | * |
| | Part-time | 1.765 | .040 | .784 | .434 |
| | Self-employed | 7.720 | .137 | 2.804 | .006 |
| | Parent or carer | 1.869 | .026 | .542 | .588 |
| | Unemployed | 3.284 | .091 | 1.694 | .092 |
| | Student | 1.763 | .035 | .729 | .467 |
| | Retired | 6.049 | .165 | 2.867 | .005 |

| | | | | | |
|---|---|---|---|---|---|
| Marital | Single | * | * | * | * |
| | Married | -7.767 | -.240 | -4.413 | < .001 |
| | Cohabiting | -8.889 | -.270 | -4.978 | < .001 |
| | Separated | -4.963 | -.066 | -1.368 | .173 |
| | Divorced | .108 | .003 | .052 | .958 |
| | Widowed | -9.886 | -.140 | -2.850 | .005 |
| Social distancing | Normal | * | * | * | * |
| | Essential | -3.532 | -.131 | -1.515 | .131 |
| | Beyond | -6.136 | -.220 | -2.622 | .009 |

*Note.* * denotes categorical variable used as reference variable.

**Hypothesis 4: People reporting greater addictive SNS use will report higher levels of loneliness.**

Correlation analysis found that addictive SNS use and loneliness were significantly correlated ($r = .275$, $p < .001$). The homoscedasticity assumption was not completely met, meaning that the regression analysis should be interpreted with caution. A univariable regression analysis was conducted with addictive SNS use as the predictor variable and loneliness as the outcome variable. The model accounted for 7.5% of the variance ($R^2 = .075$) and was significant ($F(1, 225) = 18.344$, $p < .001$). Addictive SNS use significantly predicted loneliness ($\beta = .275$, $p < .001$), lending support to the hypothesis that addictive SNS use would be related to greater loneliness.

A multivariable regression analysis was conducted with covariates added to the model. The model accounted for 56.2% of the variance (*adjusted* $R^2 = .562$) and was significant ($F(16, 210) = 19.145$, $p < .001$). Addictive SNS did not significantly predicted

loneliness ($\beta$ = .071, $p$ = .145) independently of the covariates included in the model. Therefore, the findings do not support the hypothesis that addictive SNS use is significantly associated with loneliness when social anxiety, depression, employment status, marital status, and social distancing status are taken into consideration.

**Hypothesis 5: People with higher BPD scores will report higher scores on SCO.**

Correlation analysis found a significant correlation between BPD and SCO scores ($r$ = .146, $p$ = .028). A univariable regression was conducted with BPD scores as the predictor variable and SCO as the outcome variable. The model accounted for 2.1% of the variance ($R^2$ = .021) and was significant ($F$(1, 225) = 4.889, $p$ = .028). BPD scores significantly predicted SCO ($\beta$ = .146, $p$ = .028) and this supported the hypothesis that participants with higher BPD scores would score higher on SCO.

**Hypothesis 6: SCO will be a moderating variable between social media use and reported loneliness.**

The conceptual model is presented in Figure 1. As described earlier, SNS use and loneliness scores were not significantly correlated ($r$ = .101, $p$ = .138) and neither were SCO and loneliness scores ($r$ = .023, $p$ = .726). Moderation analysis was conducted using PROCESS (Rockwood & Hayes, 2020). SNS scores were inputted as the predictor variable, SCO as the moderator variable, and loneliness scores as the outcome variable. The covariates were included in the model and the overall model accounted for 59.8% of variance ($R^2$ = .598) and was significant ($F$(18, 197) = 16.269, $p$ < .001) . The interaction effect was nonsignificant ($B$ = -.007, $p$ = .225) and the results are presented in Table 9 and Figure 3 (Appendix J).

**Figure 1**

*Diagrammatic representation of hypothesised moderation model.*

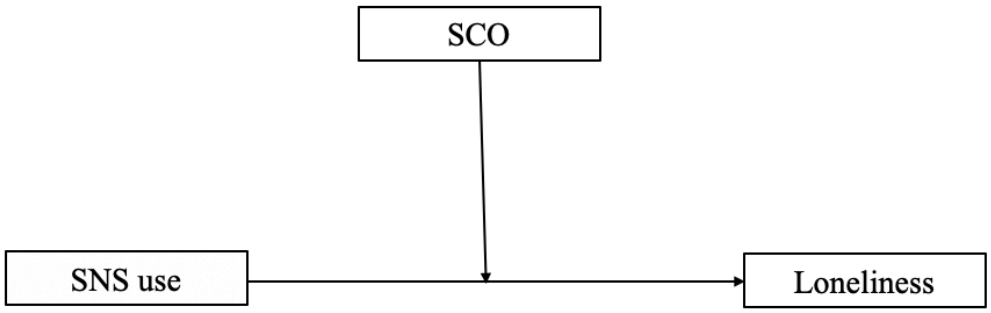



**Table 9**

*Moderation analysis output for the moderating effect of SCO on SNS use and loneliness*

| Variable | | *Unstandardised coefficient* | *Standard error* | *t* | *p* |
|---|---|---|---|---|---|
| (Constant) | | 25.411 | 11.208 | 2.267 | .025 |
| SNS use | | .380 | .224 | 1.695 | .092 |
| SCO | | .288 | .299 | .960 | .338 |
| SNS use x SCO | | -.007 | .006 | -1.216 | .225 |
| Mini-SPIN | | 1.511 | .243 | 6.219 | < .001 |
| PHQ2 | | 2.666 | .363 | 7.346 | < .001 |
| Employment | Full-time | * | * | * | * |
| | Part-time | 1.789 | 2.251 | .795 | .428 |
| | Self-employed | 7.578 | 2.760 | 2.746 | .007 |
| | Parent or carer | .857 | 3.530 | .243 | .808 |
| | Unemployed | 3.037 | 1.947 | 1.560 | .120 |
| | Student | 1.604 | 2.446 | .656 | .513 |

| | | | | | |
|---|---|---|---|---|---|
| | Retired | 5.759 | 2.121 | 2.715 | .007 |
| Marital | Single | * | * | * | * |
| | Married | -7.628 | 1.764 | -4.323 | < .001 |
| | Cohabiting | -9.092 | 1.793 | -5.070 | < .001 |
| | Separated | -5.447 | 3.662 | -1.487 | .139 |
| | Divorced | .227 | 2.083 | .109 | .913 |
| | Widowed | -10.015 | 3.482 | -2.876 | .005 |
| Social distancing | Normal | * | * | * | * |
| | Essential | -2.940 | 2.371 | -1.240 | .216 |
| | Beyond | -5.568 | 2.375 | -2.375 | .020 |

*Note.* * denotes categorical variable used as reference variable.

**Hypothesis 7: The use of SNSs to interact with others and browse will be associated with lower loneliness scores, whereas broadcasting will be associated with higher loneliness scores.**

Correlation analysis was conducted on the specific social media activities items and loneliness scores. Interaction ($r$ = .038, $p$ = .573) was not significantly related to loneliness whereas the relationship between browsing and loneliness ($r$ = .121, $p$ = .068) approached significance. Broadcasting was significantly associated with loneliness ($r$ = .203, $p$ = .002). A multivariable regression analysis was conducted with the social media activities entered as predictor variables and loneliness as the outcome variable. The overall model accounted for 4.3% of the variance (adjusted $R^2$ = .043) and was significant ($F$(3, 223) = 4.36, $p$ = .005). The independent effects of both interaction and browsing were nonsignificant, whereas the independent effect of broadcasting was significant ($\beta$ = .227, $p$ = .002). Therefore, the

behaviour of broadcasting significantly predicted loneliness scores, over and above the effects of interaction and browsing.

Another multivariable regression analysis was conducted with covariate predictors added to the model. The model accounted for 57.8% of the variance (*adjusted* $R^2$ = .578) and was significant ($F(18, 208) = 18.210$, $p < .001$). Broadcasting continued to significantly predict loneliness ($\beta = .172$, $p = .001$) independently of interaction ($\beta = -.049$, $p = .344$), browsing ($\beta = .034$, $p = .708$) and other covariates. The results can be found in Table 10. This finding provided partial support for the hypothesis as broadcasting was significantly predictive of loneliness. However, interaction and browsing were not and therefore complete support for the hypothesis was not found.

**Table 10**

*Multivariable regression analysis output for hypothesis 7.*

| Variable | Group | Unstandardised coefficient | Standardised coefficient | *t* | *p*-value |
|---|---|---|---|---|---|
| (Constant) | | 34.106 | | 8.862 | < .001 |
| SNS behaviours | Interaction | -.401 | -.049 | -.948 | .344 |
| | Browsing | .230 | .034 | .708 | .479 |
| | Broadcasting | .987 | .172 | 3.252 | .001 |
| Mini-SPIN | | 1.464 | .322 | 6.332 | < .001 |
| PHQ-2 | | 2.653 | .382 | 7.667 | < .001 |
| Employment | Full-time | * | * | * | * |
| | Part-time | 2.545 | .057 | 1.169 | .244 |
| | Self-employed | 6.179 | .111 | 2.341 | .020 |

| | | | | | |
|---|---|---|---|---|---|
| | Parent or carer | 3.056 | .042 | .895 | .372 |
| | Unemployed | 3.537 | .097 | 1.865 | .064 |
| | Student | 2.204 | .044 | .942 | .347 |
| | Retired | 6.521 | .179 | 3.258 | .001 |
| Marital | Single | * | * | * | * |
| | Married | -8.509 | -.264 | -4.983 | < .001 |
| | Cohabiting | -8.700 | -.266 | -5.008 | < .001 |
| | Separated | -5.095 | -.065 | -1.425 | .156 |
| | Divorced | -.446 | -.012 | -.218 | .827 |
| | Widowed | -8.145 | -.112 | -2.351 | .020 |
| Social distancing | Normal | * | * | * | * |
| | Essential | -1.535 | -.057 | -.727 | .468 |
| | Beyond | -3.509 | -.125 | -1.618 | .107 |

*Note.* * denotes categorical variable used as reference variable.

**Hypothesis 8: Those that report a tendency to hypo-mentalise will report higher loneliness scores.**

Correlation analysis was conducted and found a significant relationship between RFQ_U and loneliness scores ($r = .498$, $p < .001$). A univariable regression analysis was conducted with RFQ_U as the predictor variable and loneliness as the outcome variable. The model accounted for 24.8% of the variance ($R^2 = .248$) and was significant ($F(1, 225) = 74.044$, $p < .001$). RFQ_U scores predicted loneliness scores ($\beta = .498$, $p < .001$).

A multivariable analysis was conducted with the covariates added to the model (Table 11). The model accounted for 57.5% of the variance (*adjusted* $R^2$ = .575) and was significant ($F(16, 210) = 20.146$, $p < .001$). RFQ_U significantly predicted loneliness scores ($\beta = .166$, $p = .004$) independently of the covariate predictors in the model. This supported the hypothesis that hypomentalizing is associated with greater loneliness.

Exploratory mediation analysis was conducted using PROCESS (Rockwood & Hayes, 2020) to test whether RFQ_U mediated the relationship between BPD and loneliness found in hypothesis 1. The model included BPD as the predictor variable, RFQ_U as the mediator, and loneliness as the output variable. Covariates were included in the model and the overall model accounted for 61.7% of the variance ($R^2$ = .617) and was significant ($F(17, 209) = 20.114$, $p < .001$). As Figure 2 illustrates, RFQ_U did not significantly mediate the relationship between BPD and loneliness scores. RFQ_U accounted for 17.98% of the overall effect of BPD scores on loneliness.

**Table 11**

*Multivariable regression analysis output for hypothesis 8.*

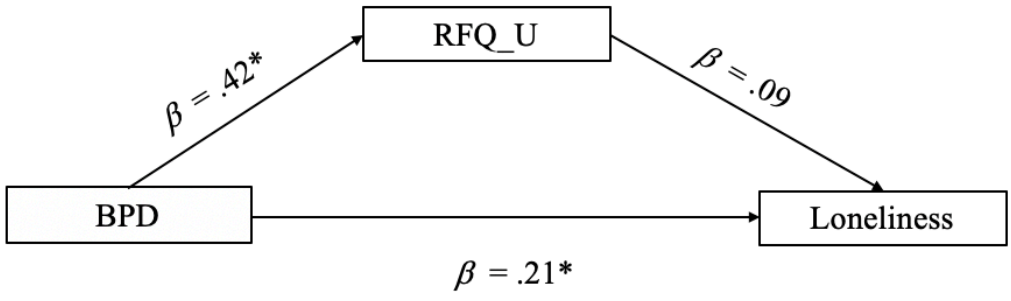
| Variable | Group | Unstandardised coefficient | Standardised coefficient | *t* | *p*-value |
|---|---|---|---|---|---|
| (Constant) | | 41.032 | | 15.818 | <.001 |
| RFQ_U | | 2.964 | .166 | 2.953 | .004 |
| Mini-SPIN | | 1.162 | .255 | 4.620 | <.001 |
| PHQ-2 | | 2.337 | .336 | 6.427 | <.001 |
| Employment | Full-time | * | * | * | * |
| | Part-time | 1.117 | .025 | .516 | .607 |
| | Self-employed | 6.493 | .116 | 2.463 | .015 |

| | | | | | |
|---|---|---|---|---|---|
| | Parent or carer | 2.342 | .032 | .694 | .489 |
| | Unemployed | 2.342 | .064 | 1.231 | .220 |
| | Student | .521 | .010 | .222 | .825 |
| | Retired | 5.027 | .138 | 2.539 | .012 |
| Marital | Single | * | * | * | * |
| | Married | -8.034 | -.249 | -4.737 | <.001 |
| | Cohabiting | -9.481 | -.290 | -5.540 | <.001 |
| | Separated | -3.700 | -.048 | -1.037 | .301 |
| | Divorced | .147 | .004 | .073 | .942 |
| | Widowed | -10.506 | -.144 | -3.067 | .002 |
| Social distancing | Normal | * | * | * | * |
| | Essential | -2.149 | -.080 | -1.023 | .308 |
| | Beyond | -4.802 | -.171 | -2.244 | .026 |

*Note.* * denotes categorical variable used as reference variable.

**Figure 2**

*Mediation model depicting the mediating effect of RFQ_U on BPD and loneliness scores.*




*Note.* * means significant at $p < .001$.

## Discussion

The present study aimed to explore the relationships between social media and loneliness, particularly in those with features of BPD. The study found that BPD features were associated with elevated loneliness and predicted loneliness scores independently of other known correlates of loneliness, such as depression, social anxiety, and demographic variables. Furthermore, this finding held even when BPD scores were split into clinical and non-clinical groups. The study also found that BPD features were not associated with SNS use but were associated with SCO, meaning that people with more features of BPD were more likely to compare themselves to others.

The study found SNS use to be associated with loneliness over and above the effect of the covariates included in the study. Conversely, addictive SNS use predicted loneliness scores until covariates of loneliness were added to the model. This is interesting as previous studies have found addictive SNS use to be significantly associated with elevated loneliness (Biolcati et al., 2018; Meshi et al., 2020). This suggests that addictive SNS use may not have been the driving force behind the relationship between SNS use and loneliness in the current study. When SCO was analysed as a moderating variable between SNS use and loneliness, the moderation effect was nonsignificant.

When considering specific SNS behaviours, broadcasting was found to be a significant predictor of loneliness, which suggests that individuals who engage in frequent broadcasting on SNSs are likely to feel lonelier. This behaviour is akin to ‘vaguebooking’, which has also been found to be a predictor of loneliness (Berryman et al., 2018). SNS interaction and browsing were not significantly related to loneliness and therefore the results of the study only partially replicated the findings from Yang (2016).

Finally, the relationship between mentalization and loneliness was examined and hypomentalizing was found to be associated with loneliness. Further, when a post-hoc

mediation model was performed, hypomentalizing did not significantly mediate the relationship between BPD scores and loneliness. This suggests that hypomentalizing, commonly associated with BPD, is associated with loneliness but hypomentalizing does not mediate the relationship between BPD features and loneliness.

## Implications

The findings from the current study have a number of implications. Firstly, this study contributes to the paucity of loneliness research in people with features of BPD. The findings suggest that people with features of BPD experience loneliness above and beyond what can be explained by other comorbidities, such as depression and social anxiety, as well as demographic variables associated with loneliness. The findings are important as they can be used to raise awareness of the extent of loneliness experienced by people with features of BPD. Loneliness has been found to be related to hopelessness and hopelessness has been found to be a risk factor for suicidal ideation (Dixon et al., 1994; Hagan et al., 2015; Joiner & Rudd, 1996; Qiu et al., 2017) and suicide attempts (Beck et al., 1990; Rifai et al., 1994). Loneliness has also been linked to poorer physical health, such as physical inactivity and poor dietary habits (Kobayashi & Steptoe, 2018; Newall et al., 2012), sleep quality (Yu et al., 2018), and diabetes (Richard et al., 2017). Additionally, physical health conditions have been found to be associated with mental health problems (Prince et al., 2007). Therefore, the research suggests potentially stark psychological and physical effects of loneliness. Healthcare professionals working with people with features of BPD should consider loneliness in their psychological assessments and interventions, and explore whether it would be important for clients to feel less lonely.

Psychological interventions may be informed by some of the findings of this study. Dialectical Behavioural Therapy (DBT; Linehan, 1993) is one psychological therapy that includes relationships and interpersonal effectiveness as a central focus (Linehan & Wilks,

2015; May et al., 2016). As findings from Liebke et al. (2017) suggested, loneliness may be related to the quantity and diversity of social contact available despite social isolation and loneliness being conceptually different. Interpersonal effectiveness skills in DBT aim to support individuals to develop, and maintain, relationships with others and skills aimed at supporting the goal of 'finding friends' are specifically explored within interpersonal effectiveness (Linehan, 2015). These skills may also reduce loneliness but research examining the effectiveness of DBT has tended to focus on mood- and risk-related outcomes (Panos et al., 2014; Rudge et al., 2020). Studies measuring changes in BPD symptom severity have found that DBT was associated with significant reductions in BPD symptoms (Rudge et al., 2020; Soler et al., 2009; Stepp et al., 2008). Although the studies did not directly measure loneliness, reductions in BPD symptoms may indicate reductions in loneliness as the BPD diagnostic criteria, such as avoidance of abandonment, unstable interpersonal relationships and chronic feelings of emptiness, suggest loneliness is key clinical feature in BPD. One review found cognitive-behavioural therapy (CBT) targeted at social cognition led to a greater reduction in loneliness compared enhancing social support, skills, and opportunity for social intervention (Masi et al., 2011). The 'social cognition' CBT approach involved identifying negative thoughts about others and attempting to change maladaptive beliefs or 'faulty' attributions (Cacioppo et al., 2015). This finding suggests that CBT may be effective in reducing loneliness.

The finding that people with many features of BPD are more inclined to compare themselves with others could be incorporated into interventions. Although the relationship between SCO and loneliness was not supported in the current study, research suggests it could be a key component in loneliness (Yang, 2016). SCO is conceptually similar to the 'non-judgemental' approach taught in DBT. The non-judgemental approach involves describing 'what is' without adding evaluations onto the description (Linehan, 2015). The

findings from the current study suggest that BPD features are predictive of SCO and interventions aimed at reducing SCO may reduce symptoms of BPD. The potential impact of a reduction in SCO on loneliness is less supported by the findings but this may have been influenced by the sample. Richmond et al. (2021) found BPD features to be positively associated with SCO and this finding was replicated in the current study. These findings suggest that SCO may be more prevalent in clinical samples and therefore a different relationship may have been found between SCO and loneliness if the sample were drawn from a clinical population.

The findings of the current study also suggest that the inclusion of SNS use and behaviours in psychological assessments and treatments may be useful. For example, the study found evidence to support the hypothesis that greater SNS use is related to elevated loneliness; although, the relationship between SNS use and loneliness was not particularly strong. The study also found that the behaviour broadcasting on SNSs to be associated with elevated loneliness. Psychological interventions may benefit from targeting SNS behaviour, such as broadcasting, to promote interactions that may lead to more fulfilling interactions on SNSs. Interpersonal effectiveness skills in DBT teach individuals how to skilfully converse with others and self-disclose (Linehan, 2015). Berryman et al. (2019) suggest that broadcasting, or 'vaguebooking', involves the sharing of private information or overly emotional content, which may be deemed a violation of online or offline 'norms'. Broadcasting behaviour could therefore be considered 'ineffective' self-disclosure that attempts to solicit attention and studies have found that the frequency and content of self-disclosure may be related to loneliness (Jin, 2013; Lee et al., 2013). Thus, healthcare professionals may wish to explore with clients how SNSs are used and whether SNS behaviours are adding to their loneliness.

The finding that hypomentalizing predicted elevated loneliness is interesting as mentalization is a prominent theory of BPD (Bateman & Fonagy, 2010a). However, hypomentalizing did not significantly mediate the relationship between BPD features and loneliness. The finding that hypomentalizing was predictive of greater loneliness suggests that mentalization-based therapy (MBT; Bateman & Fonagy, 2013) may offer a solution for reducing loneliness in people with many and few features of BPD. Research has found MBT to be effective in reducing the frequency of self-injury, hospitalisation, and symptoms of mood disorders, such as anxiety and depression (Bateman & Fonagy, 2009; Jørgensen et al., 2012; Vogt & Norman, 2019). It is less clear whether MBT would reduce loneliness in people with features of BPD but the findings from this study suggest a reduction in hypomentalizing may contribute to a reduction in loneliness.

## Limitations

The current study had a number of limitations. Firstly, the data gathered was correlational and therefore causality cannot be completely determined (Levin, 2006). The data was gathered through self-report and self-report data is open to demand characteristics and social desirability bias; although, the participation was completely anonymous and participants had no contact with the researcher, which may have reduced the likelihood of social desirability bias.

The sample was not diverse and contained many participants who identified as white, female and highly educated. Furthermore, some demographic subgroups contained few participants. This limits the application of the study findings to groups that were underrepresented in the sample and limits the comparisons of loneliness scores between demographic subgroups. Another limitation to the study is that the findings may be biased by the absence of non-completers. Non-completers were more likely to be married and less

likely to have been educated to higher education level, which may mean that the results of the study are less representative of these groups.

The study collected data from the general population rather than a clinical sample, meaning that the number of participants that met diagnostic criteria for BPD were relatively small. Similarly, floor effects on measures of addictive SNS use, social anxiety and depression were also found, and this suggests that the sample may not be reflective of people with clinical levels of SNS addiction, social anxiety, and depression. Although the data were treated as continuous in order to weaken the impact of this, it is still a limitation of the study.

Additionally, the lack of support for the relationship between SCO and loneliness may be a consequence of the sample. The sample was taken from the general population and BPD scores were positively correlated with SCO. Richmond et al. (2021) also found BPD features positively correlated with SCO but the study investigated the effect of SCO on self-esteem rather than loneliness. As only 20.2% of the sample met or surpassed the diagnostic cut-off for BPD, it may be that the sample did not adequately represent people with BPD. As a consequence, participants may have also had a lower average SCO, which may have influenced its relationship with loneliness. However, Richmond et al. also reported low mean scores on a measure of BPD features (Pfohl et al., 2009). Richmond et al. used an entirely undergraduate sample and it is unclear whether this contributed to the contrasting findings.

Finally, the study was completed during the COVID-19 pandemic and therefore the application of its findings may be limited when applied beyond this context. As described earlier, the pandemic has significantly changed how often people are able to meet each other in-person. This context may have had an effect on the experience of loneliness of people beyond usual circumstances. For example, UK-based studies found between 27-36% of participants reported feeling lonely during the implementation of social distancing guidance

(Groarke et al., 2020; Li & Wang, 2020) compared to 6% in an earlier study (Victor & Yang, 2012).

## Further research

This study contributes to our understanding of the relationship between SNS use and loneliness in people with and without features of BPD. Further research should further examine this relationship in a post-COVID-19 society to see whether the findings are replicated. Samples gathered would also benefit from being more diverse in order to understand whether the current findings are replicated in different demographics. For example, future research would benefit from increasing representation from ethnic groups who do not identify as white, as well people with lower educational attainment. Further research using clinical samples would also be welcomed in order to further examine loneliness in people with features of BPD. Research on mental health clinical samples could help to understand whether SCO interacts differently with loneliness in this population. It would also help to examine the effects of other clinical comorbidities, such as depression and social anxiety, on loneliness. The potential mechanisms of the relationship between features of BPD and loneliness should also be explored. For example, the role of hypomentalizing and SCO may be important factors to investigate.

Further research exploring the effects of current psychological treatments available to people with features of BPD, such as DBT, MBT, and CBT (Choi-Kain et al., 2017; Matusiewicz et al., 2010), on loneliness would also be welcomed. For example, studies may investigate whether psychological interventions that incorporate 'making friends', a non-judgemental mindset, or skills aimed at maintaining relationships, have any benefit for feelings of loneliness. Furthermore, it may also be important to investigate the effect of interventions that consider the role of SNS broadcasting and skills for self-disclosure on loneliness.

Future studies may also benefit from using other research methodologies, such as randomised control trials and longitudinal designs. Randomised control trials would aid understanding of the causal relationship between SNS use and loneliness through the manipulation of variables whereas longitudinal designs would aid understanding of loneliness and its association with SNS usage over time.

## Conclusion

The findings support the suggestion that people with BPD experience greater loneliness when compared to people without BPD. SNS use was found to be associated with greater loneliness but SCO did not moderate this relationship. The SNS behaviour of broadcasting and the tendency to hypomentalise predicted loneliness, which may suggest opportunities for interventions aimed at reducing loneliness. The study data were collected during the COVID-19 pandemic and therefore this limits the generalisability of the findings beyond this context. Further research is necessary to understand the experience of loneliness in people with BPD. Further research could also explore the causal relationship between SNS and loneliness, as well as how the relationship manifests over time. Future research could also investigate the effectiveness of current psychological treatments on loneliness.

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Part 3: Critical appraisal

## Introduction

This critical appraisal represents a reflection on my experience of conducting research for the systematic review and empirical study of the thesis. Firstly, I reflect on my background and what drew me to the research topic. I consider next the experience of conducting research during a global pandemic and then reflect on various stages of the research process. I conclude with remarks on what was learnt throughout the process of conducting the research.

## Background

Prior to clinical training the majority of my professional experience was gained in healthcare services. I had worked for four years in an Improving Access to Psychological Therapies (IAPT) service (Clark, 2011) and briefly worked on an acute mental health hospital ward. I had experience of delivering low-intensity cognitive behavioural interventions (Papworth et al., 2013) to people experiencing mild-to-moderate symptoms of anxiety and depression, but had less experience working with people presenting with more complex needs and distress. With respect to academia, I had very little experience beyond my undergraduate degree in psychology.

## Why BPD?

As I had relatively little experience at working with disorders beyond anxiety and depression, I was keen to research a different clinical group and this is why I was particularly interested in researching personality disorders. As I reviewed extant literature on personality disorders, I found myself curious about Borderline Personality Disorder (BPD; American Psychiatric Association, 2013) and studies investigating the social aspects of BPD. One study that piqued my interest was Beeney et al. (2018). The authors sampled participants from the community and were asked to provide information about their social network. Participants listed up to 30 individuals in their social network and provided information regarding the

relationship (e.g. length, nature). The authors found that BPD features were associated with less closeness, trust, and support from others. BPD features were also associated with more frequent arguments and perceived criticism from those in their support network. Additionally, participants with many BPD features were more likely to be closer to people less integrated and central to their own social network, which the authors hypothesised might be due to interpersonal difficulties within relationships or defensive avoidance.

The findings from Beeney et al. suggested that people with BPD features experienced relationships differently compared with people without BPD features and this made sense to me when considering the Diagnostic and Statistical Manual of Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013) criteria for BPD. For example, efforts to avoid real or imagined abandonment, unstable and intense interpersonal relationships, intense anger, and chronic feelings of emptiness are all criteria that may relate to how relationships are experienced. My reflections on this study, and discussions with my research supervisors, then led me to consider the experience of loneliness in BPD. I wondered whether the findings in Beeney et al. indicated that people with BPD may also feel quite lonely. My review of the literature on BPD and loneliness found few papers on the topic. It was at this point that I had the idea of researching predictors of loneliness in people with BPD and the idea centred around researching features of relationships that had been found to be related to BPD features, such as arguments, criticism, and trust in relationships.

## The digital age

After settling on the idea of researching predictors of loneliness in people with features of BPD, I started to further consider what these predictors might be and it was at this point I started to think about social networking sites (SNSs).

Between 2002-2010, one study found that internet access increased from 43.1% to 71.8% in the UK (White & Selwyn, 2013). Furthermore, smartphones allow access to the

internet and applications that were once only available on desktop computers (Islam & Want, 2014) and in the UK research recently found smartphone ownership to be at 76% (Pew Research Center, 2019). The start of the 21st century also happened to be a time in which SNSs increased in popularity and diversity (Boyd & Ellison, 2007; Edosomwan et al., 2011). Altogether, in recent years it has become easier for people to access the internet and SNSs. I reflected on how much my life had been touched by the changes in internet, smartphone, and SNS accessibility, and I wondered whether these changes had influenced the experience of loneliness in the 'digital age'. It was at this point that the research idea transitioned into exploring SNS use and loneliness in people with and without features of BPD.

**COVID-19**

The coronavirus SARS-CoV-2 (COVID-19) was first detected in the latter part of 2019 (Shereen et al., 2020) and the UK Government implemented a 'lockdown' in March 2020, which restricted social contact between people. The outbreak occurred during the planning phase of the research project but the study had planned to be an online survey and therefore the design was unaffected by the outbreak. The biggest change to the study was the context in which loneliness was being explored. The research aimed to explore the experience of loneliness during a period of enforced restrictions on social contact and this meant that the context had to be included in the study. Although there are conceptual differences between loneliness and social isolation, research suggests that they are related (Coyle & Dugan, 2012; Liebke et al., 2017; Petersen et al., 2016). Therefore, the research suggests that loneliness, and therefore loneliness research, is likely to be impacted by population-level changes in social contact.

My experience of conducting loneliness research during a pandemic and period of enforced restrictions on social contact led to learning. For example, I learned to consider the broader environment when conducting research and reflect on how this may influence the

study. The concept of 'Zeitgeist' has been a source of reflection. Zeitgeist translates literally as 'spirit of the times' (Krause, 2019) and van der Bles et al. (2015) suggest that the term describes a global-level, collective evaluation of the state of society. Since the outbreak of COVID-19, I have wondered how the pandemic has impacted the current collective evaluation of society in the UK and how this may have interacted with the findings of the study. For example, I have wondered whether people were more cognisant of loneliness during periods of enforced 'social distancing'. Research conducted during the pandemic found some groups, such as young adults and adults living alone, reported greater loneliness during the COVID-19 pandemic compared to data collected prior to the pandemic (Bu et al., 2020). These findings support the suggestion that COVID-19 may have had real effects on peoples' experience of loneliness. The context of COVID-19 therefore potentially limits the generalisability of study findings to pandemic-free periods.

**Reflections on the systematic review**

The systematic review was the biggest challenge of the thesis and there is one change I would have made in hindsight. The purpose of the review was to evaluate the extant research on the relationship between loneliness and SNS use. The question excited me but as I conducted my literature searches, I realised that more studies met the inclusion criteria of the review than I had anticipated. Framing a question for review is an important first step to conducting a systematic review (Khan et al., 2003). In hindsight I believe that my question may have been too broad and an apt summary of this dilemma was provided by Counsell (1997) when they stated "the number of possible questions for systematic reviews is limitless, but the time and resources with which to answer them are limited". If I were faced with conducting the review again, I would likely focus the review on a specific aspect of SNS use, such as posting updates, or time spent on SNSs. On the other hand, I believe that the review ended up being a more comprehensive synthesis of the extant literature and will hopefully be

a more useful resource for future researchers interested in the relationship between SNS usage and loneliness.

## Reflections on the empirical paper

### Methodology

The research methodology was restricted by COVID-19 and associated social distancing guidelines, yet the findings of the systematic review have led to some personal reflection pertaining to the use of self-report data in the study. Self-report methodology is open to demand characteristics and social desirability bias. Demand characteristics refer to participants being aware of what the researcher is trying to investigate and using this to infer how they are expected to behave (McCambridge et al., 2012). Social desirability bias refers to the tendency for participants to underreport less socially desirable attributes (Latkin et al., 2017). Demand characteristics and social desirability are two examples of the potential risks associated with self-report methodology, but they are not biases limited to self-report methods. The credibility of self-reports has also been questioned with motivations to seek consistency and self-enhance (Robins & John, 1997), as well as difficulties with accurate recall (Paulhus & Vazire, 2009), possibly affecting credibility. These are also potential problems associated with self-report methods that should be considered when conducting research.

Reflection also led me to consider the use of self-report data when studying people with features of BPD. It has been suggested that people with BPD have difficulties with defining a stable sense of their own identity (Linehan, 1993), which may limit the information that can be conveyed through self-report methods (Balsis et al., 2018). Additionally, research has found disparities between self- and informant-reports for symptoms of BPD, with informants more likely to endorse BPD items (Balsis et al., 2018). However, research conducted by Carlson et al. (2013) found neither self- nor informant-

reports were more strongly associated with BPD features but differences were found in ratings on 'Five-Factor Model' personality traits (Lynam & Widiger, 2001). Further, Hopwood et al. (2008) found no significant benefit of a structured interview over a self-report measure in predicting a composite BPD measure, but found both methods had relative strengths for particular symptoms. The authors also found that self-report produced greater endorsement of BPD features than interview. Thus, the research suggests that outcomes may be influenced by method of BPD feature assessment but there appears to be less support for the idea that self-report methods may lead to wholly inaccurate assessments of BPD features.

**Data collection**

My experience of data collection was mixed. As the study used an online survey to gather data, it meant data collection did not necessarily place a consistent burden on my time. However, after some time I began to realise the challenges I faced with advertising the study. Engagement with online advertisements can come in the forms of 'clicks' and emotional engagement (Liu-Thompkins, 2019). As I attempted to advertise the study on websites, forums, and SNSs, I noted how difficult it was to get engagement online. According to Jaakonmäki et al. (2017), SNS engagement is driven by factors pertaining to the post's creator (e.g. age, number of followers), context (e.g. time, location), and content (e.g. images, tags). For example, research conducted by Suh et al. (2010) found a strong linear relationship between the number of followers and retweet rate. It is unsurprising that larger audiences lead to greater engagement and throughout I found it difficult to get much engagement on my SNS posts. 'Hashtags' have become an integral part in how users communicate on SNSs and they allow users to link their posting to other content around the same topic (Rauschnabel et al., 2019). I used 'hashtags' to increase reach of posts as this has also been found to increase engagement of posts (Suh et al., 2010) but the process of data collection was slower than anticipated. The learning I took from this experience was to build a SNS presence and

followership prior to advertising the study. Further, I learned that I may have benefitted from a more 'evidence-based' approach to my SNS advertising and in the future, I would review the relevant literature to understand the most effective methods of SNS advertising.

**Data analysis**

The process of data analysis was a rewarding process as I was finally able to interpret the data. The preparation and cleaning of the data went well despite my initial apprehension about introducing any form of human error into the data. I re-learned SPSS (Version 26, IBM) functions, which was supported by Field (2018), and this made the preparation for data analysis simpler. The most challenging part of the data analysis was learning how to incorporate categorical predictor variables into regression analyses using 'dummy variables' (Lunt, 2015; Field, 2018). It was important to include demographic variables in the regression analyses when significant differences in loneliness between subgroups were found. If variables that correlate with the dependent variable are not included in the analyses, the results may not be reflective of the actual relationship and may even be reversed once the covariate is included (Appleton et al., 1996). However, the demographic variables that appeared to affect loneliness were categorical variables, such as marital, employment, and social distancing status. Categorical predictors with two categories can be included in a linear model but predictors with more than two categories should be converted into several variables each with two categories (Field, 2018). I had not anticipated the extra reading and research required for this part of the analysis but by the end of it I found it a valuable learning experience. I learned how to incorporate categorical variables into a regression analysis and it felt satisfying to know that all predictor variables likely to influence loneliness were included in the model.

**Measuring loneliness**

The concept of loneliness has also been a source of reflection throughout conducting the research. The systematic review opened my eyes to the different ways in which loneliness had been measured in research and it made me think about how this may influence the findings of the study. For example, DiTommaso and Spinner (1993) suggested that a unidirectional approach to loneliness assumes there is a "fundamental commonality in the experience of loneliness" irrespective of the cause (e.g. bereavement or relationship dissolution). Whereas, the authors suggested that the multidimensional perspective implies that a unidirectional measure is unable to completely capture the experience of loneliness. This made me think about the importance of how researchers define concepts and how it inevitably influences the way in which the concept is measured. The Social and Emotional Loneliness Scale for Adults (SELSA; DiTommaso & Spinner, 1993) was developed to assess social and emotional loneliness. Social loneliness was defined as loneliness resulting from an inadequate social network whereas emotional loneliness arises from the absence of a close emotional attachment relationship. In the future, I think that I would spend more time considering the definition and conceptualisation of the dependent variable. In retrospect, I believe that I spent more time reviewing psychometric properties of loneliness measures rather than considering how the measure conceptualised loneliness. The UCLA-R Loneliness Scale (Version 3; Russell, 1996) was used in many studies outlined in the systematic review and the measure was reported as having good psychometric properties, including internal consistency, test-retest reliability, convergent validity, and discriminant validity. On reflection, I am content with the inclusion of the UCLA-R Loneliness Scale in the current study but in the future, I would benefit from considering how measures conceptualise the dependent variable, as well as the psychometric properties of the measure.

## Conclusion

This research has taught me the importance of planning when reviewing and conducting research. I have learned that the time spent considering the question and inclusion criteria of a systematic review is vital to the process, especially as it informs the scope of the review. I have also learned about the potential weaknesses associated with self-report data and the mixed findings associated with self-report methods in BPD research. I have also learned from the difficulties faced when advertising the study on SNSs. In the future, I intend to build a SNS followership prior to data collection and review the extant research on advantageous methods for SNS engagement. Data analysis taught me how to include categorical variables, such as demographics, in regression analyses and I also learned the importance of considering how the dependent variable is conceptualised when selecting an appropriate measure. Conducting research during a global pandemic reminded me of the importance of context and how extraneous variables should be considered when conducting research. Overall, the experience of review and conducting research has been a fruitful experience and I look forward to applying the learning in future pursuits.

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## Appendix A

*The search strategy used for the literature search.*

1 - ((social media or smartphone or facebook or instagram) and (loneliness or social isolation or isolat* or aloneness or lonel*)).mp.[mp=title, abstract, heading word, table of contents, key concepts, original title, test & measures, mesh]

2 - Limit 1 to ((“300 adulthood <age 18 yrs and older” or 320 young adulthood <age 18 to 29 yrs> or 340 thirties <age 30 to 39 yrs> or 360 middle age <age 40 to 64 yrs> or “380 aged <age 65 yrs and older>”) and (“0100 journal” or “0110 peer-reviewed journal” or “0120 non-peer reviewed journal” or “0130 peer-reviewed status unknown”) and English)

3 - Exp loneliness/

4 - Exp social media/

5 - 1 or 4

6 - (social media or smartphone or facebook or Instagram).mp. [mp=title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]

7 - (loneliness or social isolation or isolate* or aloneness or lonel*).mp. [mp= title, abstract, heading word, table of contents, key concepts, original title, tests & measures, mesh]

8 - 4 or 6

9 - 3 or 7

10 - 8 and 9

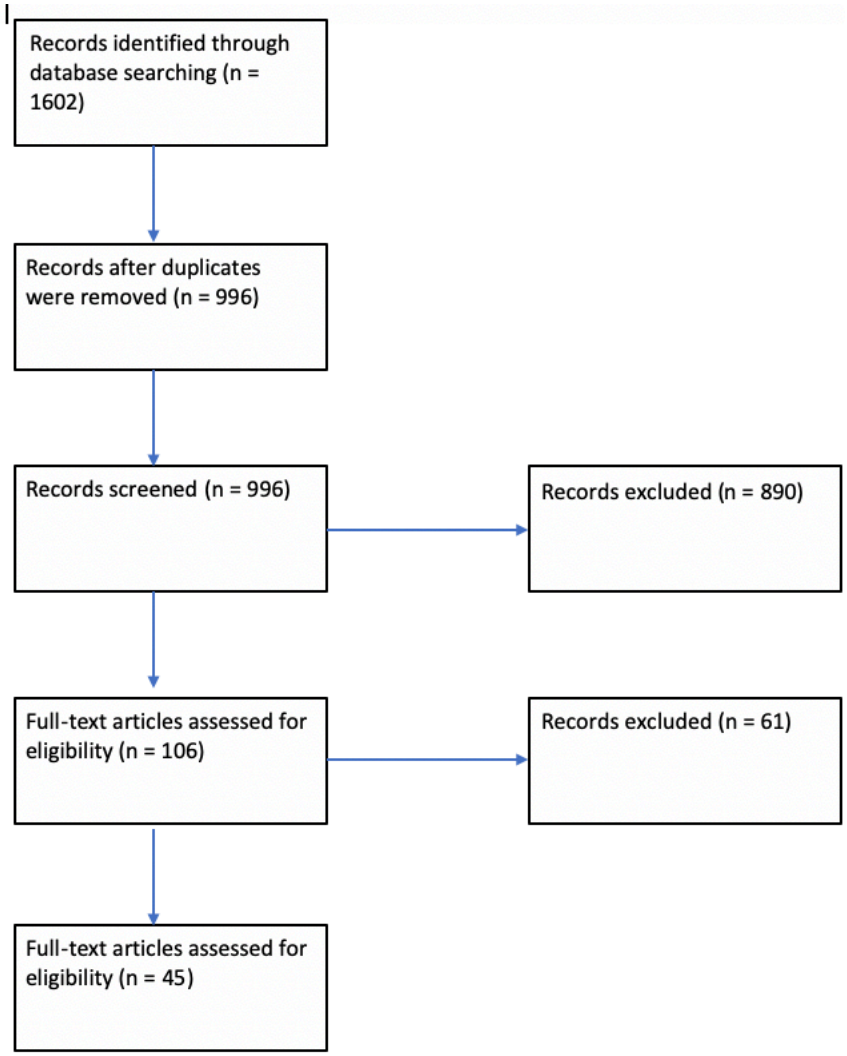
11 - Limit 10 to ((“300 adulthood <age 18yrs and older” or 320 young adulthood <age 18 to 29 yrs> or 340 thirties <age 30 to 39 yrs> or 360 middle age <age 40 to 64 yrs> or “380 aged <age 65 yrs and older>” or “390 very old <age 85 yrs and older>”) and journal article and English)

12 - Limit 11 to “0110 peer-reviewed journal”

13 - Limit 12 to last 10 years.

## Appendix B

*A flow chart demonstrating the process of inclusion and exclusion of studies*



## Appendix C

*The "Standard Quality Assessment Criteria" tool (Kmet et al., 2004).*

| Criteria | | Yes (2) | Partial (1) | No (0) | N/A |
|---|---|---|---|---|---|
| 1 | Question/objective sufficiently described? | | | | |
| 2 | Study design evident and appropriate? | | | | |
| 3 | Method of subject/comparison group selection *or* source of information/input variables described and appropriate? | | | | |
| 4 | Subject (and comparison group, if applicable) characteristics sufficiently described? | | | | |
| 5 | If interventional and random allocation was possible, was it reported? | | | | |
| 6 | If interventional and blinding of investigators was possible, was it reported? | | | | |
| 7 | If interventional and blinding of subjects was possible, was it reported? | | | | |
| 8 | Outcome and (if applicable) exposure measure(s) well defined and robust to measurement/misclassification bias? Means of assessment reported? | | | | |
| 9 | Sample size appropriate? | | | | |
| 10 | Analytic methods described/justified and appropriate? | | | | |
| 11 | Some estimate of variance is reported for the main results? | | | | |
| 12 | Controlled for confounding? | | | | |
| 13 | Results reported in sufficient detail? | | | | |
| 14 | Conclusions supported by the results? | | | | |

**Appendix D**

*An image of the landing page on the study website. The website address is:*

*https://ucjudmo.wixsite.com/lonelinessstudy.*

## Appendix E

*Table representing MSI-BPD scores in the sample.*

**Table 5**

*Frequencies for MSI-BPD total scores*

| MSI-BPD total scores | N (%) |
|---|---|
| 0 | 52 (22.9%) |
| 1 | 35 (15.4%) |
| 2 | 16 (7.0%) |
| 3 | 22 (9.7%) |
| 4 | 17 (7.5%) |
| 5 | 24 (10.6%) |
| 6 | 15 (6.6%) |
| 7 | 15 (6.6%) |
| 8 | 13 (5.7%) |
| 9 | 7 (3.1%) |
| 10 | 11 (4.8%) |

## Appendix F

*Ethics documentation for the study.*

**UCL RESEARCH ETHICS COMMITTEE**
**OFFICE FOR THE VICE PROVOST RESEARCH**

UCL

17th July 2020

Dr Janet Feigenbaum
Research Department of Clinical, Educational and Health Psychology
UCL

Cc: Daniel Morrissey, Trainee Clinical Psychologist

Dear Dr Feigenbaum

**Notification of Ethics Approval with Provisos**
**Project ID/Title: 18127/001: Social Media and Loneliness: Comparing individuals with and without feat Borderline Personality Disorder during the Covid-19 pandemic.**

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 **17th July 2021.**

To: Morrissey, Daniel

18127.001 Amendment Appli...
74 KB

Dear Daniel

The REC has approved your attached amendment request. Please take this email as confirmation of that approval.

***IMPORTANT: For projects collecting personal data only***
*You should inform the Data Protection Team – data-protection@ucl.ac.uk of your proposed amendments to include a request to extend ethics approval for an additional period.*

Best wishes,
Lola

Lola Alaska
Research Evaluation Administrator

Office of the Vice-Provost (Research)
University College London, Gower Street, London WC1E 6BT

## Appendix G

*Participant forms used in the study, including the consent, information sheet, and distress sheet.*

### Participant Consent Form

**Social Media and Loneliness: Comparing individuals with and without features of Borderline Personality Disorder during the Covid-19 pandemic.**

**Please complete this form after you have read the Participant Information Sheet.**

**Department:** Research Department of Clinical, Educational and Health Psychology
**Name and Contact Details of the Researcher:** Daniel Morrissey, Trainee Clinical Psychologist: daniel.morrissey.15@ucl.ac.uk
**Name and Contact Details of the Principal Researcher:** Dr Janet Feigenbaum, Associate Professor: j.feigenbaum@ucl.ac.uk
**Name and Contact Details of the UCL Data Protection Officer:** Alexandra Potts: data-protection@ucl.ac.uk
**This study has been approved by the UCL Research Ethics Committee. Project ID number: 18127/001.**

**I confirm that I understand that by inserting a 'X' in each box below I am consenting to this element of the study.**

### Study Consent Form

| | Please Tick |
|---|---|
| I confirm that I have read and understood the study information sheet | |
| I understand that my participation in this study is voluntary and that I am not obliged to give consent | |
| I understand that if I do not give consent to take part, there will be no consequences | |
| I understand that I can withdraw my participation in this survey at any time without consequences | |
| I understand that I do not have to answer all the questions if I do not wish to | |
| I understand that once I have contributed information to the survey and clicked "submit", that information cannot be withdrawn from this study | |
| I understand that if I am adversely affected the sources of support that will be available to me | |
| I understand that all contributions I make to this study will be anonymous | |

| | |
|---|---|
| I understand that the contributions I make to this study will be included in the researcher's thesis and may be published in a scientific journal | |
| I agree to take part in this study | |

NEXT

## Participant Information Sheet

**Study Title: Social Media and Loneliness: Comparing those with and without features of Borderline Personality Disorder during the COVID-19 pandemic.**

**Department:** Research Department of Clinical, Educational and Health Psychology
**Name and Contact Details of the Researcher:** Daniel Morrissey, Trainee Clinical Psychologist: daniel.morrissey.15@ucl.ac.uk
**Name and Contact Details of the Principal Researcher:** Dr Janet Feigenbaum, Associate Professor: j.feigenbaum@ucl.ac.uk
**Name and Contact Details of the UCL Data Protection Officer:** Alexandra Potts: data-protection@ucl.ac.uk
**This study has been approved by the UCL Research Ethics Committee. Project ID number: 18127/001.**

Local Data Protection Privacy Notice

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.

Your personal data will be processed so long as it is required for the research project. If we are able to anonymise or pseudonymise the personal data you provide we will undertake this, and will endeavour to minimise the processing of personal data wherever 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.

### Part 1 of the information sheet

We would like to invite you to take part in our research study. Before you decide we would like you to understand why the research is being done and what it would involve for you. Please

read the information on this sheet carefully before deciding whether you would like to take part.

**What is the purpose of the study?**
This study aims to understand the experience of loneliness during the COVID-19 pandemic. Specifically, we aim to better understand the experience of loneliness in people with and without symptoms of Borderline Personality Disorder (BPD). The study is particularly interested in the use of social media and how it relates to loneliness during periods of worldwide social distancing measures.
**Why have I been invited? Is this study for me?**
We are inviting members of the general public who are 18 years old or above to participate in the study. We are also inviting people who may have symptoms consistent with a diagnosis of BPD, and are also 18 years old or above, to participate.
**Do I have to take part?**
It is up to you to decide to join the study. If you agree to help with this research, consent will be assumed through completion of the questionnaires. You are free to withdraw at any time, without giving a reason.
**What will happen to me if I take part?**
If you decide to take part in this study, we will ask you to complete a series of questionnaires. We will ask you to think about your experience of loneliness and your use of social media since March 2020. Many questions will ask you about how much time you spend on social media and what types of activities you do on social media. The questionnaires should take no longer than 20 minutes to complete but you may complete them more quickly than this.
Your participation in this study will be anonymous and we will not ask for your name or any other information that can be used to identify you.
Once you have completed the questionnaires we will not be asking anything further of you.
**What will I have to do?**
If you decide to take part, we recommend that you find a quiet and private space to complete the questionnaires.
**What are the possible disadvantages of taking part?**
We will be asking you to think about your experience of loneliness, which you may find distressing. If this occurs you are able to withdraw from the study at any time by just leaving the website.
A 'Participant Distress Sheet' is available on this website if at any time you feel distressed. It can also be used if you would like some support or suggestions for how to manage your distress. The 'Participant Distress Sheet' will encourage you to manage any difficult thoughts or feelings that you may have after completing the questionnaires. It will also signpost you to where you can access additional support.
**What are the possible benefits of taking part?**
The results of the study will help improve our understanding of loneliness and its relationship to social media use. It will also help us understand more about loneliness in people with BPD. Individuals with BPD often reported intense loneliness prior to the Covid-19 pandemic. In order to identify how best to help to reduce loneliness in the current and future pandemics where social distancing is required, we need to better understand what is the current experience. Your responses to this study will assist us with developing this support.
We will also donate £1 to a UK mental health charity (Rethink Mental Illness) for every person that takes part and completes the questionnaires (up to a maximum of £400).
**What happens when the research study stops?**
The results of the study will be written up as part of the researcher's dissertation for the Doctorate in Clinical Psychology at University College London (UCL). UCL is a university in

central London. The full report of the study will be published on the study's website in September 2021. The report may also be published in relevant scientific journals. Preliminary data that could help with the immediate response to loneliness will be made available as soon as possible upon completion of the study. As previously mentioned, you will not be identifiable from these results.

**Will my information be kept confidential?**

Yes. We follow ethical and legal practice regarding confidentiality. As stated previously, no personally identifiable data will be collected in this study so there is no possibility of a loss of confidentiality. However, if you choose to contact the research team by email, your email address would be available to the chief investigator. The chief investigator will make contact by email. Your email address will not be retained once the query has been addressed. There is no means of connecting your email address to the questionnaires.

The data from this study will be stored in accordance with the University College London Data Protection and Records Management policies.

**Part 2 of the information sheet**

**What will happen if I don't want to carry on with this study?**

You have the right to withdraw from the study at any time up to the final page and 'submit' button. As the data you provide will be anonymous, it will not be possible for us to identify and remove your data specifically once you have clicked 'submit' on the final page.

**Who is organising and funding the research?**

The research has been organized by Daniel Morrissey under the supervision of Dr Janet Feigenbaum. Daniel Morrissey is a trainee clinical psychologist at UCL and Dr Janet Feigenbaum is a clinical psychologist. Dr Janet Feigenbaum is also an expert in the provision of psychological therapies for people with a personality disorder. The research is funded by University College London (UCL).

**What if there is a problem or something goes wrong?**

If you have a concern about any aspect of this study, you may email the chief Investigator, Dr Janet Feigenbaum at j.feigenbaum@ucl.ac.uk. You may also contact the Chair of the UCL Research Ethics Committee if you feel that the problem has not been dealt with to your satisfaction. The Research Ethics Committee is contactable by emailing ethics@ucl.ac.uk.

**What next?**

By clicking 'continue', you confirm that you have understood the information provided above. Do you wish to proceed? If so, please click 'continue'. If you decide not to participate please click 'finish'.

Local Data Protection Privacy Notice

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.

Your personal data will be processed so long as it is required for the research project. If we are able to anonymise or pseudonymise the personal data you provide we will undertake this, and will endeavour to minimise the processing of personal data wherever 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.

**Participant Distress Sheet**

**Contacts for further support within the UK**

If you are currently under the care of a local mental health team you might find it helpful to contact your therapist/worker. Alternatively you may find it helpful to contact your GP if your distress is ongoing after participating in the study.
If you want feel you would like to speak to someone about the way you feel you can call the **Samaritans** on **08457 90 90 90** or visit their website at **http://www.samaritans.org**. They provide a confidential listening service.
There are also additional listening services available including:
**CALM (the Campaign Against Living Miserably)** who provide support via a helpline, webchat and website. You can call them on 0800 58 58 58 or visit their website at www.thecalmzone.net

**HOPELineUK** who provide confidential support and advice service for anyone under the age of 35yrs having thoughts of suicide. Calls are free. Texts cost standard rates. They aim to reply to emails within 24 hours. You can call then on 0800 068 41 41; text on 07860039967 and visit their website at https://papyrus-uk.org/hopelineuk/

**Support Line** who provide a confidential telephone helpline offering emotional support to any individual on any issue. It's particularly aimed at people who are isolated, at risk, vulnerable and victims of any form of abuse. You can call them on 01708 765 200 or visit their website at www.supportline.org.uk

**If you need help immediately and are in an emergency, you can call the emergency services on 999.**

**Contacts for further support outside of the UK**

**CheckPoint** is a charity that provides mental health resources for gamers and the gaming community. International mental health support services can be accessed on their website at https://checkpointorg.com/global/
**CALM (the Campaign Against Living Miserably)** who provide support via a helpline, webchat and website for people within the UK. However, their website also provides links to international services that offer similar support and these are broken down into different countries: https://www.thecalmzone.net/2019/10/international-mental-health-charities/
**Suicide Hotline** is a website where international suicide support and local emergency numbers across different countries can be found: https://suicidehotline.org
**Befrienders Worldwide** is a charity that has a global network of emotional support centres in 32 countries. The charity provides support via telephone helplines, SMS messaging, face-to-face and internet chat. Local helplines can also be accessed through their website: https://www.befrienders.org
**Crisis Text Line** is a free service for those in crisis and can be accessed by anyone in the US, Canada, UK or Ireland. Text 'HOME' to 741741 (US and Canada), 85258 (UK), 086 1800 280 (Ireland) to be connected with a Crisis Counselor. More information can be found here: https://www.crisistextline.org/text-us/

**Suggestions for how to manage your distress**

**Sometimes we can feel distressed and the following suggested strategies can help soothe us and reduce our distress. They are aimed at reducing some of the difficult feelings and thoughts that can arise when feeling upset. These thoughts can include thoughts of self-harm. The strategies can be helpful during times of distress but can also sometimes take a bit of practise to get the hang of using them.**

**Visualisation**

This is a quick way of getting away from a situation without physically leaving.

- Imagine yourself walking to a door.

- Open the door and walk down the 3 steps, taking a deep breath for each of the steps.

- You walk into an environment where you feel relaxed and calm. This could be a familiar place, a happy memory, or somewhere in your dream.

  - **What can you see?**
  - **What can you hear?**
  - **What can you smell?**
  - **What can you touch?**

Spend a few minutes in this place, enjoying the feeling of relaxation.
When you feel ready, start to make your way back up the three steps, take a breath for each of the three steps. Make your way back through the door and back into the present.

**Mindfulness -** "Leaves on a Stream" Exercise

(1) Sit in a comfortable position and either close your eyes or rest them gently on a fixed spot in the room.

(2) Visualize yourself sitting beside a gently flowing stream with leaves floating along the surface of the water. Pause 10 seconds.

(3) For the next few minutes, take each thought that enters your mind and place it on a leaf… let it float by. Do this with each thought – pleasurable, painful, or neutral. Even if you have joyous or enthusiastic thoughts, place them on a leaf and let them float by.

(4) If your thoughts momentarily stop, continue to watch the stream. Sooner or later, your thoughts will start up again. Pause 20 seconds.

(5) Allow the stream to flow at its own pace. Don't try to speed it up and rush your thoughts along. You're not trying to rush the leaves along or "get rid" of your thoughts. You are allowing them to come and go at their own pace.

(6) If your mind says "This is dumb," "I'm bored," or "I'm not doing this right" place those thoughts on leaves, too, and let them pass. Pause 20 seconds.

(7) If a leaf gets stuck, allow it to hang around until it's ready to float by. If the thought comes up again, watch it float by another time. Pause 20 seconds.

(8) If a difficult or painful feeling arises, simply acknowledge it. Say to yourself, "I notice myself having a feeling of boredom/impatience/frustration." Place those thoughts on leaves and allow them float along.

(9) From time to time, your thoughts may hook you and distract you from being fully present in this exercise. This is normal. As soon as you realize that you have become side-tracked, gently bring your attention back to the visualization exercise.

## Distraction Techniques

These are some ideas for helping people delay or avoid self-harm that you might wish to consider- they've been suggested by people who self-harm. Some ideas might seem ridiculous, but others might work. Different people find that different things help, and it isn't failure if you try something and it doesn't help. You will be able to add things which you have discovered.

**Expressing Feelings**

**Letting it out PHYSICALLY**

- Scream as loud as you can
- Hit a cushion/punch bag/throw a cushion against a wall
- **Smash** a water melon
- Kick a football against a wall
- **Squeeze** a stress ball
- **Tear up** a newspaper/phone directory
- Play loud music and dance energetically- be as wild as you like
- Draw on the place you want to cut with red maker pen, fake blood or watered down food colouring
- *Write words* on yourself with red marker pen
- Spend some ***energy***- go for a walk/swim/go to gym/ride a bike/go running.

**Trying to work out how you are feeling….**

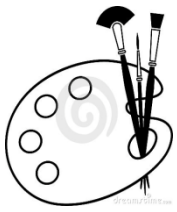
- Ask yourself 'Do I feel ANGRY'? 'Do I feel anxious'? 'What about?'
- Ask yourself 'What would the razor blade say if it could talk to me?'
- **Write a letter** to someone you're angry with (hurt by etc.) saying how you feel (NO need to send it).
- Write a list of your **achievements**
- Write a letter to yourself saying 'I love you because……'

- **Make a list** of things you're thankful for
- Make a wish list

**Talking about it…**

- Talk to a **friend**
- Call the Samaritans or other helpline (see below)
- Allow yourself to **cry** (if you can)

**Using your Creativity**



- Draw / paint / collage/ paper mache / finger paint / sculpt in clay- to express what you want to do or what you are feeling
- Write a poem / **story** / song / joke / autobiography / parody / musical
- Write a **DIARY** / journal / read old diaries (unless there might be triggers)
- Go to Facebook.com and write an online journal
- **Scribble** a word again and again to say how you're feeling e.g. 'lonely', 'angry'
- Deface a magazine (preferably your own)
- Paint with ***red paint*** using your fingers
- Draw yourself in MS office
- Write a message in a self-harm newsgroup on the internet
- *Take some photos*
- Play an **instrument** / Sing to music as LOUD as you can
- Put on music which *expresses* how you are feeling
- Write out the **soundtrack** to your life if it were a film
- Imagine a colour which expresses your feelings then change it in your mind to another colour
- Make a **memory box /** scrapbook
- Write an **alternative** ending to a story
- Watch a foreign language channel and make up your own interpretations
- **Create** your own cartoon characters / legends
- Create a SECRET CODE

**Self-Soothe**

**with the Five Senses**

**Things You See**

Make a part of your room look just the way you want it to. Look at nature around you. Watch stars, the moon, sunrise or sunset. Look at pictures or a poster that you like. Take a walk in a park or in your neighbourhood. Really look at and notice what is nice.

**What You Hear**

Listen to relaxing, soothing, or energetic music. Pay attention to the sounds of nature (waves, birds, rain, and leaves rustling). Sing your favourite songs. Hum a soothing tune. Learn to play an instrument. Call a friend. Listen to your cat purr.

**Odours You Smell**

Use your favourite aftershave, cologne, or perfume. Put potpourri in a bowl in your room. Boil cinnamon sticks. Bake cookies, cake or bread. Smell roses. Be mindful of the smells of nature; try smelling a pinecone.

**Foods You Taste**

Have a good meal. Have a favourite soothing drink such as herbal tea or hot chocolate. Treat yourself to dessert. Sample ice cream flavours. Chew your favourite gum or candy. Really taste the food you eat. Eat one thing mindfully.

**Things You Touch**

Pet your dog or cat. Take a bubble bath. Put clean sheets on the bed. Soak your feet. Put lotion on. Put a cold compress on your forehead. Sink into a really comfortable chair in your home. Brush your hair for a long time. Hug someone. Hold a pinecone. Hold a basketball, football, or baseball.

## Appendix H

*Measures included in the study*

**McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD; Zanarini, Vujanovic, Parachini, & Villatte, 2003)**

1. Have any of your closest relationships been troubled by a lot of arguments of repeated breakups? 1 = yes, 0 = no.
2. Have you deliberately hurt yourself physically (e.g. punched yourself, cut yourself, burned yourself)? How about made a suicide attempt? 1 = yes, 0 = no.
3. Have you had at least two other problems with impulsivity (e.g. eating binges and spending sprees, drinking too much and verbal outbursts)? 1 = yes, 0 = no.
4. Have you been extremely moody? 1 = yes, 0 = no.
5. Have you felt very angry a lot of the time? How about often acted in an angry or sarcastic manner? 1 = yes, 0 = no.
6. Have you often been distrustful of other people? 1 = yes, 0 = no.
7. Have you frequently felt unreal or as if things around you were unreal? 1 = yes, 0 = no.
8. Have you chronically felt empty? 1 = yes, 0 = no.
9. Have you often felt that you had no idea of who you are or that you have no identity? 1 = yes, 0 = no.
10. Have you made desperate efforts to avoid feeling abandoned or being abandoned (e.g. repeatedly called someone to reassure yourself that he or she still cared, begged them not to leave you, clung to them physically)? 1 = yes, 0 = no.

**UCLA-R Loneliness Scale (Version 3; Russell, 1996)**

Indicate how often each of the statements below is descriptive of you.

| **Statement** | **Never** | **Rarely** | **Sometimes** | **Often** |
|---|---|---|---|---|
| 1. How often do you feel that you are "in tune" with the other people around you?* | | | | |
| 2. How often do you feel that you lack companionship? | | | | |
| 3. How often do you feel that there is no one you can turn to? | | | | |
| 4. How often do you feel alone? | | | | |
| 5. How often do you feel part of a group of friends?* | | | | |
| 6. How often do you feel that you have a lot in common with the people around you?* | | | | |
| 7. How often do you feel that you are no longer close to anyone? | | | | |
| 8. How often do you feel that your interests and ideas are not shared by those around you? | | | | |
| 9. How often do you feel outgoing and friendly?* | | | | |
| 10. How often do you feel close to people?* | | | | |
| 11. How often do you feel left out? | | | | |
| 12. How often do you feel that your relationships with others are not meaningful? | | | | |
| 13. How often do you feel that no one really knows you well? | | | | |
| 14. How often do you feel isolated from others? | | | | |
| 15. How often do you feel you can find companionship when you want it?* | | | | |
| 16. How often do you feel that there are people who really understand you?* | | | | |
| 17. How often do you feel shy? | | | | |
| 18. How often do you feel that people are around you but not with you? | | | | |
| 19. How often you feel that there are people you can talk to?* | | | | |
| 20. How often do you feel that there are people you can turn to?* | | | | |

**The Media and Technology Usage and Attitudes Scale (Rosen, Whaling, Carrier, Cheever, & Rokkum, 2013).**

10-point frequency scale: 1 (Never), 2 (Once a month), 3 (Several times a month), 4 (Once a week), 5 (Several times a week), 6 (Once a day), 7 (Several times a day), 8 (Once an hour), 9 (Several times an hour), 10 (All the time).

Please indicate how often you do each of the following e-mail activities on any device (mobile phone, laptop, desktop, etc.)

*Emailing subscale*

1. Send, receive and read e-mails (not including spam or junk mail)
2. Check your personal e-mails
3. Check your work or school e-mail
4. Send or receive files via e-mail

Please indicate how often you do each of the following activities on your mobile phone.

5. Send and receive text messages on a mobile phone (Text messaging subscale)
6. Make and receive mobile phone calls (Phone calling subscale)
7. Check for text messages on a mobile phone (Text messaging subscale)
8. Check for voice calls on a mobile phone (Phone calling subscale)
9. Read e-mail on a mobile phone (Smartphone usage subscale)
10. Get directions or use GPS on a mobile phone (Smartphone usage subscale)
11. Browse the web on a mobile phone (Smartphone usage subscale)
12. Listen to music on a mobile phone (Smartphone usage subscale)
13. Take pictures using a mobile phone (Smartphone usage subscale)
14. Check the news on a mobile phone (Smartphone usage subscale)
15. Record video on a mobile phone (Smartphone usage subscale)
16. Use apps (for any purpose) on a mobile phone (Smartphone usage subscale)
17. Search information with a mobile phone (Smartphone usage subscale)
18. Use your mobile phone during class or work time (Text messaging subscale)

How often do you do each of the following activities?

19. Watch TV shows, movies, etc. on a TV set (TV viewing subscale)
20. Watch video clips on a TV set (TV viewing subscale)
21. Watch TV shows, movies, etc. on a computer (Media sharing subscale)
22. Watch video clips on a computer (Media sharing subscale)
23. Download media files from other people on a computer (Media sharing subscale)
24. Share your own media files on a computer (Media sharing subscale)
25. Search the Internet for news on any device (Internet searching subscale)
26. Search the Internet for information on any device (Internet searching subscale)
27. Search the Internet for videos on any device (Internet searching subscale)
28. Search the Internet for images or photos on any device (Internet searching subscale).
29. Play games on a computer, video game console or smartphone BY YOURSELF (Video gaming subscale)
30. Play games on a computer, video game console or smartphone WITH OTHER PEOPLE IN THE SAME ROOM (Video gaming subscale)
31. Play games on a computer, video game console or smartphone WITH OTHER PEOPLE ONLINE (Video gaming subscale)

Do you have a Facebook account? If the answer is "yes", continue with item 32; if "no", skip to the *Attitudes subscales* below. NOTE: The word "social media" may be substituted for Facebook in the question stem above and in items 32-34.

How often do you do each of the following activities on social networking sites such as Facebook?

32. Check your Facebook page or other social networks (General social media usage subscale)
33. Check your Facebook page form your smartphone (General social media usage subscale)
34. Check Facebook at work or school (General social media usage subscale)
35. Post status updates (General social media usage subscale)
36. Post photos (General social media usage subscale)
37. Browse profiles and photos (General social media usage subscale)
38. Read postings (General social media usage subscale)
39. Comment on postings, status updates, photos, etc. (General social media usage subscale)
40. Click "Like" to a posting, photo, etc.

Please answer the following questions about your Facebook and other online friends. NOTE: In items 41 and 42 the words "social media" (or any specific media site) may be substituted for Facebook.

9-point scale for items 37-40: 1 (0), 2 (1-50), 3 (51-100), 4 (101-175), 5 (176-250), 6 (251-375), 7 (376-500), 8 (501-750), 9 (751 or more).

41. How many friends do you have on Facebook (Facebook friendships subscale)
42. How many of your Facebook friends do you know in person (Facebook friendships subscale)
43. How many people have you met online that you have never met in person (Online friendships subscale)
44. How many people do you regularly interact with online that you have never met in person (Online friendships subscale)

Please indicate how much you agree with the following statements using the following 5-point scale:

1 (strongly disagree), 2 (disagree), 3 (neither agree or disagree), 4 (agree), 5 (strongly agree)

45. I feel it is important to be able to find any information whenever I want online (Positive attitudes)
46. I feel it is important to be able to access the Internet any time I want (Positive attitudes)
47. I think it is important to keep up with the latest trends in technology (Positive attitudes)
48. I get anxious when I don't have my cell phone (Anxiety/dependence)
49. I get anxious when I don't have the Internet available to me (Anxiety/dependence)
50. I get dependent on my technology (Anxiety/dependence)
51. Technology will provide solutions to many of our problems (Positive attitudes)
52. With technology anything is possible (Positive attitudes)
53. I feel that I get more accomplished because of technology (Positive attitudes)
54. New technology makes people waste too much time (Negative attitudes)
55. New technology makes life more complicated (Negative attitudes)
56. New technology makes people more isolated (Negative attitudes)
57. I prefer to work on several projects in a day, rather than completing one project and then switching to another (Preference for task switching)

58. When doing a number of assignments, I like to switch back and forth between them rather than do one at a time (Preference for task switching)
59. I like to finish one task completely before focusing on anything else* (Preference for task switching)
60. When I have a task to complete, I like to break it up by switching to other tasks intermittently (Preference for task switching).

*Scoring for these items is reversed on all subscales.

**The Social Media Disorder Scale (van Den Eijnden, Regina, Lemmens, Jeroen, Valkenburg, Patti, 2016)**

Please answer with a "yes" or "no" to the following items:

During the past year, have you…

1. …regularly found that you can't think of anything else but the moment that you will be able to use social media again? (Preoccuptation)
2. …regularly felt dissatisfied because you wanted to spend more time on social media? (Tolerance)
3. …often felt bad when you could not use social media? (Withdrawal)
4. …tried to spend less time on social media, but failed? (Persistence)
5. …regularly neglected other activities (e.g. hobbies, sport) because you wanted to use social media? (Displacement)
6. …regularly had arguments with others because of your social media use? (Problem)
7. …regularly lied to your parents or friends about the amount of time you spend on social media? (Deception)
8. …often used social media to escape from negative feelings? (Escape)
9. …had serious conflict with your parents, brother(s) or sister(s) because of your social media use? (Conflict)

**Reflective Functioning Questionnaire (Fonagy et al., 2016)**

**Please work through the next 8 statements. For each statement, choose a number between 1 and 7 to say how much you disagree or agree with the statement, and write it beside the statement. Do not think too much about it – your initial responses are usually the best. Thank you.**

**Use the following scale from 1 to 7:**

| Strongly disagree 1 | 2 | 3 | 4 | 5 | 6 | 7 Strongly agree |
|---|---|---|---|---|---|---|

1. __ People's thoughts are a mystery to me **(original item 1)**

2. __ I don't always know why I do what I do **(original item 17)**

3. __ When I get angry I say things without really knowing why I am saying them **(original item 22)**

4. __ When I get angry I say things that I later regret **(original item 29)**

5. __ If I feel insecure I can behave in ways that put others' backs up **(original item 35)**

6. __ Sometimes I do things without really knowing why **(original item 36)**

7. __ I always know what I feel **(original item 8)**

8. __ Strong feelings often cloud my thinking **(original item 27)**

**Social Media activities and social comparison orientation (Yang, 2016)**

Social media activities subscale:
How often do you engage in the following activities on social media (Instragram, Facebook, etc.)
1 (Never), 2 (Rarely), 3 (Sometimes, 4 (Often), 5 (A lot)

1. Comment on or reply to others' posts
2. Tag others in your posts or comments
3. Browse the homepage/newsfeed without leaving comments
4. Check out others' profiles without leaving comments
5. Post/Upload on your profile without tagging anyone
6. Post something that is not directed to specific people

**Iowa-Netherlands Comparison Orientation Scale (Gibbons & Buunk, 1999)**

Response scale for items: 1 (disagree strongly), 2 (disagree), 3 (neither disagree or agree), 4 (agree), 5 (agree strongly).

Most people compare themselves from time to time with others. For example, they may compare the way they feel, their opinions, their abilities, and/or their situation with those of other people. There is nothing particularly 'good' or 'bad' about this type of comparison, and some people do it more than others. We would like to find out how often you compare yourself with other people. To do that we would like to ask you to indicate how much you agree with each statement below.

1. I often compare myself with others with respect to what I have accomplished in life
2. If I want to learn more about something, I try to find out what others think about it
3. I always pay a lot of attention to how I do things compared with how others do things
4. I often compare how my loved ones (boy or girlfriend, family members, etc.) are doing with how others are doing
5. I always like to know what others in a similar situation would do
6. I am not the type of person who compares often with others
7. If I want to find out how well I have done something, I compare what I have done with how others have done
8. I often try to find out what others think who face similar problems as I face
9. I often like to talk with others about mutual opinions and experiences
10. I never consider my situation in life relative to that of other people
11. I often compare how I am doing socially (e.g., social skills, popularity) with other people

**Mini-Social Phobia Inventory (Mini-SPIN; Conner et al., 2001)**

Response scale for items: 0 (not at all), 1 (a little bit), 2 (somewhat), 3 (very much), 4 (extremely).

Please read each statement and click the column that indicates how much the statement applied to you over the past week.

1. Fear of embarrassment causes me to avoid doing things or speaking to people
2. I avoid activities in which I am the centre of attention
3. Being embarrassed or looking stupid are among my worst fears

**The Patient Health Questionnaire-2 (PHQ-2; Kroenke et al, 2003)**
Over the last 2 weeks, how often have you been bothered by any of the following problems?

Response options: 0 (not at all), 1 (several days), 2 (more than half the days), 3 (nearly every day)

1. Little interest or pleasure in doing things
2. Feeling down, depressed, or hopeless

**Appendix I**

*Table presenting results from correlation analysis of all study variables.*

**Table 6**

*Presentation of correlations between all study variables*

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. BPD | 1 | | | | | | | | | | |
| 2. Loneliness | .565*** | 1 | | | | | | | | | |
| 3. SNS use | .084 | .101 | 1 | | | | | | | | |
| 4. Addictive | .313*** | .275*** | .262*** | 1 | | | | | | | |
| SNS use | | | | | | | | | | | |
| 5. SCO | .146* | .023 | .074 | .369*** | 1 | | | | | | |
| 6. Interaction | .052 | .038 | .475*** | .093 | -.003 | 1 | | | | | |
| 7. Browsing | .156* | .121 | .339*** | .241*** | .217** | .104 | 1 | | | | |
| 8. Broadcasting | .131* | .203** | .378*** | .059 | -.145* | .469*** | .124 | 1 | | | |
| 9. PHQ | .524*** | .605*** | .073 | .308*** | .065 | .034 | .092 | .032 | 1 | | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 10. SPIN | .442*** | .461*** | .038 | .275*** | .279*** | -.055 | .212** | -.023 | .388*** | 1 | |
| 11. RFQ_U | .624*** | .498*** | .050 | .266*** | .211** | -.055 | .279*** | -.056 | .459*** | .540*** | 1 |

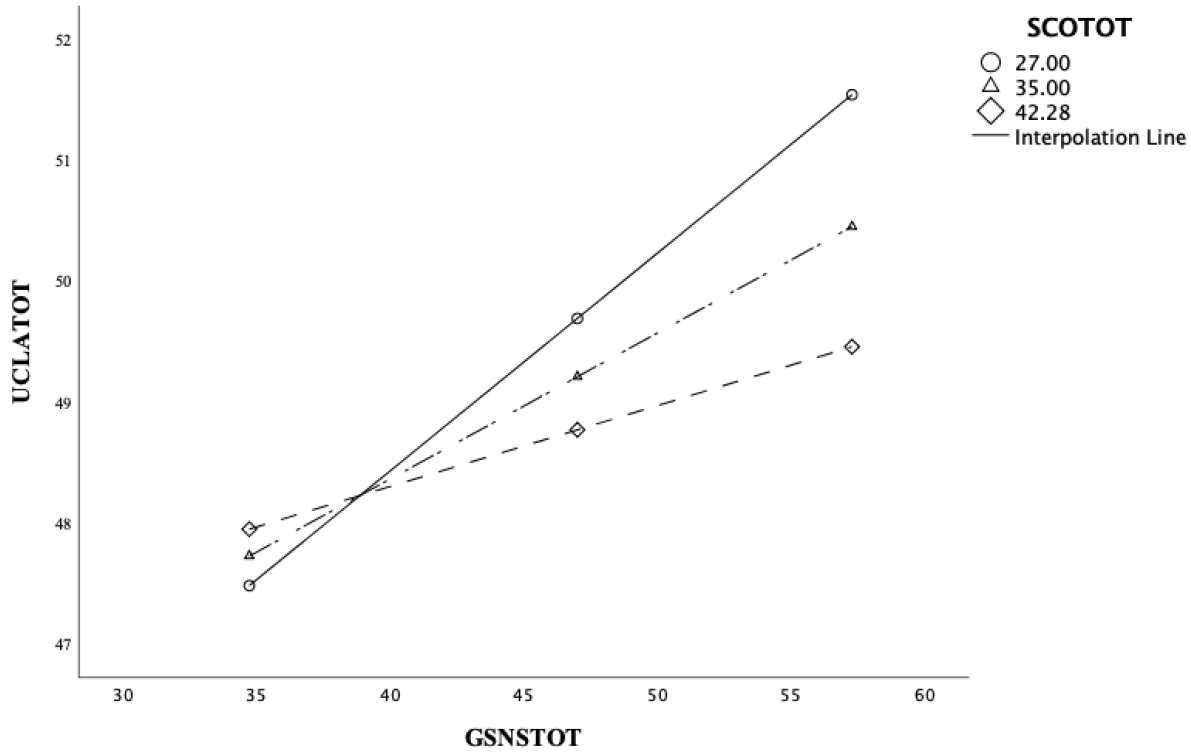
*Note.* *** means correlation significant at $p < .001$. ** means at $p < .01$. * significant at $p < .05$.

## Appendix J

*Graphical representation of the moderation analysis conducted for hypothesis 6.*

**Figure 3**

*Graphical representation of the moderating effect of SCO on the relationship between SNS use and loneliness.*




*Note.* GSNSTOT represents SNS use, UCLATOT represents loneliness scores, SCOTOT represents SCO scores.