

Effect of Loneliness on Relationships and Social Media Usage in Older Adults

Gabe Minchev

The University of Chicago

Master of Arts Program in the Social Sciences: Psychology Concentration

Faculty Advisor: Greg J. Norman, PhD

Preceptor: Hannah Hamilton, PhD

June 2024

A paper submitted in partial fulfillment of the requirements for the Master of Arts degree in the
Master of Arts Program in the Social Sciences

Abstract

Social media has become ingrained in society, providing a number of consequences both positive and negative. However, social media usage also does not occur in a vacuum. Social media use is shaped by relationships with others, including romantic ones, and can be affected by factors such as loneliness. The current study analyzed data from older adults to improve understanding of social media variation based on relationship qualities. Specifically, the study focused on participant's relationship status and satisfaction in relation to social media usage. The study also tested the role of loneliness as a moderator between those two relationship qualities and social media usage. Through one-way ANOVA and regression analyses, results revealed slight differences in social media behavior online and specifically when lonely between separated participants and both married and widowed participants. For relationship satisfaction, only a significant difference for social media usage when lonely was found. Loneliness did not appear to moderate any associations or differences on a broad level, though it did interact with widowed participants for social media usage via the phone. Implications, limitations of the current research, and directions for future research are discussed.

Keywords: Relationships, relationship satisfaction, loneliness, social media, older adults

Effect of Loneliness on Relationships and Social Media Usage in Older Adults

Social media is used by a large number of people across cultures, ages, and other demographics (Perrin, 2015). Social media allows individuals to not only stay up to date on the topics that interest them but also to maintain their social connections with friends and family. Despite these benefits, however, social media use can have negative effects on people's mental and physical health (Zheng & Lee, 2016). These negative effects can be experienced by all, but are even more concerning considering the increased vulnerability of older adults due to their media illiteracy (Kim et al., 2022). Additionally, the transition into a new phase of life and out of employment that older adults go through leaves them with feelings of loss regarding social interactions, routines, and finances (Morrison et al., 2020). These feelings of loss leave older adults perfect targets for cyber-attacks and phishing (Morrison et al., 2020; Narayanan et al., 2021). Older adults are also more vulnerable to certain health issues, weakened immune and physiological systems and therefore greater proneness to disease, increased likelihood for needing medication, greater stressors, and increased need for social support (Beers, 2000; Brivio et al., 2019; Cesari et al., 2016; Fulop & Montgomery, 2014). These risk factors can interact with the negative effects associated with social media use, particularly cognitive decline, psychological stress, and increased mental health issues (Clark et al., 2012; Chen et al., 2017; Zheng & Lee, 2016), which is why it is important to understand the social media patterns of older adults, an understudied topic in research.

One of the primary reasons why older adults turn to using social media is to keep in touch with their family and friends (Bell et al., 2013; Newman et al., 2021). Older adults tend to use social media less often than younger adults (Coyne et al., 2011), in part because they are more likely to experience barriers to social media usage, such as physical ability and fear (Wilson et

al., 2023). Some of the barriers, especially the physical, are also more prevalent when dealing with accessing social media on phones or other mobile devices, given the design of the apps and the smaller areas of the screen requiring precise touch and straining the eyes (Arfaa & Wang, 2014). Issues of screen size are normally mitigated when dealing with social media sites on larger devices, such as laptops, though these devices also have less mobility, typically requiring a home setting (Hafez et al., 2018). Therefore, while older adults use less social media than younger adults (Coyne et al., 2011), in part due to experiencing more physical barriers (Wilson et al., 2023) and having a greater social media illiteracy (Kim et al., 2022), the desire older adults have to connect can result in overcoming these barriers (Wilson et al., 2023) and engaging in differing social media patterns based on device access.

The desire to overcome and use social media (Wilson et al., 2023) can leave older adults vulnerable to exploitation and being taken advantage of due to decreased knowledge and awareness (Kim et al., 2022; Narayanan et al., 2021; Pinsker et al., 2010). This social vulnerability, while not necessarily a frequent occurrence, is a potential risk specifically for the older population and can result in negative interactions. Over time, accumulated negative interactions online can contribute to negative health effects such as chronic disease and disrupted cardiovascular and immune function (Rook, 2015), which can be harder for the older population to overcome in the long-term. Negative interactions can include cyber-attacks and phishing attempts that have been shown to target older adults specifically (Narayanan et al., 2021), in part due to their lack of media literacy and unfamiliarity (Kim et al., 2022). Evidence shows that older adults are subjected to ageism and discrimination online, even on websites such as Facebook (Levy et al., 2014). Not only is ageism present, but social media can actually contribute to negative stereotypes about the older population (Makita et al., 2021; Zhao, 2019).

These stereotypes are likely to be perpetuated, as research has shown that negative messages and comments online are more likely to be interacted with and spread (Tsugawa & Ohsaki, 2015).

Thus, while older adults choose to engage in social media to connect, the environment can lead to negative experiences and effects that are unique to older adults and understudied in comparison to research on adolescents and younger adults.

An individual's life and real-world context may also impact their social media behavior. One example of a context-specific factor that may shape social media engagement and usage is the status of one's romantic relationship. People who are in a romantic relationship are more likely to communicate with their partner through all kinds of media, including social media (Coyne et al., 2011). Social media may be used as a communication tool, like private messaging or sharing a funny video to a partner through the app or social media platform directly (Brody & Cullen, 2023). Conversely, while using social media as a communication tool for your partner may increase, the amount of time spent on social media and using social media in other ways may decrease when in a relationship and especially at the beginning of new relationships (Fejes-Vékássy et al., 2020). This can occur because of a change in priorities, such as wanting to focus on the relationship and the partner in-person and spending physical time together as opposed to virtually. In fact, getting out of a relationship and being single can increase social media usage as one copes with their breakup (Fejes-Vékássy et al., 2020). Recently becoming single can result in people changing their profile, removing their partner while also repairing or creating a new image of themselves online (Rollie & Duck, 2013). Social media can even act as a medium through which single individuals maintain some sort of contact with their former partner (LeFebvre et al., 2015) or monitor their behavior (Sheldon et al., 2019). These behaviors

all suggest that single individuals may spend more time using social media, as relationship status seems to influence how social media is used.

Satisfaction in one's relationship, not just being in one, is a great predictor of an individual's health, both physical and mental, compared to looking at relationship status alone (Adamczyk et al., 2021). Higher relationship satisfaction has also been tied to less stress, anxiety, and lower blood pressure (Holt-Lunstad et al., 2008). Relationship satisfaction has been positively correlated with decreased use of some social media platforms (Fejes-Vékássy et al., 2020) as well as a greater tendency to post about satisfying relationships on social media sites like Facebook (Emery et al., 2014) and Instagram (Fejes-Vékássy et al., 2020). Greater use of social networking sites such as Facebook was found to not only be positively correlated with lower marital satisfaction but also with more frequent thoughts of divorce (Valenzuela et al., 2014). The research therefore suggests that the associations between relationship satisfaction and social media vary based on time used, with frequency of social media usage varying based on relationship satisfaction. This association is true for the older population as well, although the strength of the association is slightly lower which suggests that social media as a form of virtual connection may not be as fulfilling for older adults (Vauclair et al., 2023). Despite this, older adults still use social media primarily to connect with friends and family (Bell et al., 2013; Newman et al., 2021; Vauclair et al., 2023; Wilson et al., 2023), even if less so than adolescents and younger adults (Vauclair et al., 2023). Beyond this, however, research on relationship satisfaction specifically looking at older adults is limited.

On a broader scale, Bouffard and colleagues (2022) discovered that excessive use of social media can negatively contribute to one's relationship satisfaction, potentially leading to greater conflict, and that an addiction to social media may be more likely when one feels less

satisfied in their relationships and uses social media more often. Excessive social media use, which can be defined as greater usage of social media than planned (Zheng & Lee, 2016), can then potentially lead to a negative, cyclical pattern that can interfere with relationships and negatively impact relationship satisfaction. The cycle and habitual pattern of this association highlights that relationship satisfaction can not only be influenced by social media, but that relationship satisfaction may also influence or predict trends in social media usage. Despite lower usage of social media when compared to younger generations, older adults are still susceptible to excessive social media use, with such negative social media usage impacting their perceived social isolation (Meshi et al., 2020). The associations between relationship satisfaction and social media use have been empirically shown to be affected by mediating factors (Demircioğlu & Göncü Köse, 2021; Satici et al., 2023), which suggests that looking for other influences may help further parse through the impact relationship satisfaction has on social media usage.

Loneliness for example, which is commonly defined as the perception of social isolation and of social needs not being met by one's relationships and their quality (Hawkley & Cacioppo, 2010), has been shown to interact with both relationship status and satisfaction, as well as impact social media behavior. Research on loneliness suggests that its prevalence among older adults is significant with as many as a quarter of the population suffering from it (Chawla et al., 2021; Surkalim et al., 2022). Loneliness can impact health long-term, having been associated with an increased risk for heart-related deaths (Olsen et al., 1991), chronic disease, (Sugisawa et al., 1994), and decreases in cognitive ability (Cacioppo & Hawkley, 2009; Gow et al., 2007). Additionally, loneliness has been found to have unique associations and interactions with relationship qualities and social media usage. Being single, as opposed to being in a relationship,

has been associated with greater loneliness (Adamczyk & Segrin, 2015) and can have a negative association with life satisfaction when not by choice (Apostolou et al., 2019). While there is some evidence that growing older reduces the correlation between being single and increased loneliness (Böger & Huxhold, 2020), other findings suggest that the negative association between singlehood and life satisfaction is greater for older adults (Hill Roy et al., 2023). Furthermore, long-term loneliness can build over time and contribute to a faster psychological decline as one ages (Hawkley & Cacioppo, 2007). Loneliness also has a negative predictive effect on relationship satisfaction over time (Mund & Johnson, 2021). Across cultures, lonelier individuals are less likely to report their partner engaging in positive behavior and are likely to experience less relationship satisfaction (Yum, 2003). Therefore, research implies that if someone is already less satisfied in their relationship, feeling lonelier may increase that dissatisfaction.

Loneliness can impact social media usage as well, with lonelier individuals being more likely to resort to social media as a potential option for missing social connection (O'Day & Heimberg, 2021). Where older adults are concerned, turning to social media for social contact and support is related to feelings of decreased loneliness (Zhang et al., 2021). Unfortunately, loneliness can also contribute to negative social media use, such as a habitual pattern of misuse (Phu & Gow, 2019) and addiction from problematic use (Rajesh & Rangaiah, 2020), both of which have been shown to interact negatively with relationships status and satisfaction. Evidence would therefore suggest that, based on the unique effect research has shown loneliness to have on both social media and relationship status and satisfaction, loneliness may play a role as a moderating variable in the association between one's relationship status, as well as one's relationship satisfaction, and their frequency of using social media.

The Current Study

Given the increased social (Pinsker et al., 2010) and physical vulnerability (Brivio et al., 2019) of older adults, it is important to understand social media patterns of older adults and the factors that may influence them, such as relationship qualities and loneliness. The current research study had two main objectives. The first was to replicate the differences among relationship statuses and levels of relationship satisfaction, separate from one another, in older adults in relation to their social media usage. I sought to replicate the finding that single individuals would be more likely to report greater use of social media than individuals who were in a relationship. I also sought to replicate that individuals who were in a relationship but experienced lower satisfaction would be more likely to report greater use of social media than individuals who experienced higher satisfaction in their relationship. The second objective was to test whether current loneliness moderated any differences among social media usage based on relationship status or relationship satisfaction. I predicted that the differences for social media use between single individuals and those who were in a relationship would be stronger for lonelier individuals such that those who were not in a relationship and lonelier would report greater social media use. Similarly, I predicted that the effect of relationship satisfaction on social media use would be stronger for lonelier individuals, with those who were less satisfied in their relationship and lonelier would report greater use of social media.

In addition to the two research objectives, some exploratory analyses were conducted to see if relationship status and satisfaction affect opinions and agreements with certain social media, Internet, and loneliness statements. Examples of these questions are whether the Internet increased feelings of loneliness if used to replace other forms of communication, and whether participants would recommend using the Internet to help with loneliness (see Supplement).

Method

The research questions were explored using an open dataset from the AARP collected in 2018 on loneliness and social connection in older adults (ages 45 and up) in the United States (<https://doi.org/10.25940/ROPER-31118687>). The survey asked about participant's health, relationships, social connectedness, and social media and Internet usage. However, the questions regarding social media usage were only asked of participants who specified that they have a device (such as a cell phone or laptop) from which they could access the Internet and thus, different subsets of the dataset (total $N = 3,223$) were looked at in different models for the appropriate dependent variable. Demographic information on the full sample can be found in Table 1.

Measures

Relationship Status and Satisfaction

Participants were asked about their marital status (*e.g., married, widowed, divorced, separated, never married, living with a partner*). Participants who were in relationships were also asked to indicate the amount of satisfaction they felt in their current relationship, measured on a 5-point Likert scale, with options from “very satisfied” to “very unsatisfied”. For the current analyses, relationship satisfaction was treated as a discrete variable rather than continuous, despite being collected on a Likert scale, due to the difficulty in knowing if a change indicated by a one-point increase meant the same across the scale. Therefore, to make the answers more comparable to each other, they were treated as discrete in this study.

Social Media Usage

Participants who said they had a device to access the Internet such as a phone or laptop were asked about their social media use. Because of research suggesting that the frequency of

social media use varies by device type (Arfaa & Wang, 2014), especially among an older population (Hafez et al., 2018), participants first answered two questions about their frequency of engaging in social media (e.g., “How frequently do you do the following activities on a mobile cell phone: Use social media [Facebook Twitter Instagram etc.]” and “How frequently do you do the following activities online? - Use social media such as Facebook, Twitter, Instagram etc.”) on a 5-point scale (i.e., 5 = *at least daily*, 4 = *at least weekly*, 3 = *at least monthly*, 2 = *less than monthly*, 1 = *never*).

Participants were also asked to indicate how often they use social media when they feel lonely (e.g., “How often do you do each of the following activities when you are feeling lonely? - Use social media”) on a 4-point scale (i.e., 1 = *never*, 4 = *always*). This last question was slightly different than the first two, in that it was part of a set of questions that was asking about engagement in specific activities when participants felt lonely, of which social media was one. This measure, therefore, looks at reports of the frequency of social media usage when participants thought about being lonely.

Loneliness

To test trait-like loneliness as a moderator, however, a measure of current loneliness was obtained in the original study through the UCLA Loneliness scale (Russell, 1996), a fairly common measure of loneliness that includes 20 item questions with 4-point Likert scale responses (i.e., 1 = *never*, 4 = *always*). The original research team used a revised version of the UCLA, Version 3 (Russell, 1996), which features the same number of questions and responses but differs in some of the specific questions. The total loneliness score for each participant was calculated by summing up their ratings, with the scale showing high internal consistency ($\alpha = .94$).

Analytic Plan

Three models were created based on the various measures of social media in the study. The first model focused on analyzing the impact of relationship status and satisfaction on social media usage via a mobile phone. The data within the model was filtered to exclude any missing responses to the question regarding the frequency of using social media on the phone. To test the effects of relationship status and satisfaction, two separate one-way ANOVA analyses were run with relationship status as a predictor in one and relationship satisfaction as a predictor in the second. Following these analyses, regression analyses were conducted also including main effects and interactions with current loneliness scores and relationship status and satisfaction for each of the three measures of social media usage.

The second and third models followed the same procedure, first running separate one-way ANOVAs with relationship status and relationship satisfaction as predictors of, respectively, social media usage online and when lonely. Following that, to test the moderation effect of current loneliness, regression analyses were conducted. The second model looked at effects on frequency of use of online social media more broadly (i.e., not limited to mobile phone use), while the third model focused on effects on the frequency of using social media particularly when lonely. Each model followed a similar cleaning procedure, with the models being created by filtering out missing values from the respective dependent measure of social media usage from the data. Additionally, all one-way ANOVA analyses were followed by Bonferroni-corrected post-hoc pairwise t-tests to pinpoint the exact differences across the different relationship statuses and degrees of relationship satisfaction. The Bonferroni-corrected post-hoc analysis provided the p-value for significance among the different groups, while the t-tests themselves summarized the means of each group for comparison.

Results

Three main waves of analyses were conducted to correspond to the various research questions. First, in order to answer whether participants' relationship status and whether their relationship satisfaction impacted their social media usage, three separate one-way ANOVAs were conducted for each of those independent variables. For relationship status, one-way ANOVAs yielded significant positive results for difference among relationship status for increased social media usage via the phone $F(5, 3043) = 2.47, p = 0.03$, online $F(5, 3161) = 2.87, p = 0.01$, and using social media when lonely $F(5, 3149) = 4.85, p < 0.001$. The results from these ANOVAs did not significantly change when age, ethnicity, and gender were added as covariates.

Further Bonferroni-corrected post-hoc pairwise independent samples t-tests revealed no significant group comparisons for phone usage (Figure 1), but did reveal significant differences among certain relationship status identities for social media usage online and when lonely. For online use of social media, post-hoc tests revealed a significant difference ($t(265) = -2.92, p\text{-value} = 0.05$) between the responses of widowed ($M = 3.05, SD = 1.80$) and separated ($M = 3.97, SD = 1.48$) participants (Figure 2). This result suggests that when compared to widowed participants, separated participants on average tended to report greater frequency of social media use online. For social media usage when lonely, post-hoc tests revealed a significant difference ($t(2528) = -3.09, p\text{-value} = 0.03$) between married ($M = 2.04, SD = 1.00$) and divorced ($M = 2.20, SD = 1.03$) participants, a significant difference ($t(2111) = -3.09, p\text{-value} = 0.04$) between married ($M = 2.04, SD = 1.00$) and separated ($M = 2.56, SD = 1.13$) participants, and a significant difference ($t(264) = -3.07, p\text{-value} = 0.02$) between widowed ($M = 1.97, SD = 1.05$) and separated ($M = 2.56, SD = 1.13$) participants (Figure 3). These results suggest that married

participants on average tended to report less use of social media when lonely than both divorced and separated participants, and that separated participants on average tended to report greater use of social media when lonely than participants who were widowed.

Regarding relationship satisfaction as the predictor variable for participants who were in a relationship, one-way ANOVA analyses did not reveal significant differences for social media usage via a phone (Figure 4) or online in general (Figure 5) but did find significance for social media usage when lonely ($F(4, 2123) = 3.49, p = 0.008$). Bonferroni post-hoc tests revealed a significant difference ($t(1392) = -3.10, p\text{-value} = 0.02$) between very satisfied ($M = 2.01, SD = 1.00$) and somewhat unsatisfied ($M = 2.33, SD = 1.03$), as well a significant difference ($t(252) = -2.83, p\text{-value} = 0.04$) between very unsatisfied ($M = 1.96, SD = 1.01$) and somewhat unsatisfied ($M = 2.33, SD = 1.03$; Figure 6). These results suggest that individuals who are somewhat unsatisfied with their relationship on average tended to report greater use of social media when lonely than participants who were on the extremes (either very satisfied or very unsatisfied).

To discern if current loneliness acted as a moderating variable, regression analyses were conducted, with one set focusing on the interaction between relationship status and current loneliness and the other set focusing on the interaction between relationship satisfaction and current loneliness. Only one significant interaction between relationship status and current loneliness was found for social media usage via a mobile phone for widowed participants ($\beta = 0.03, t(3037) = 2.77, p\text{-value} = 0.006, R^2 = 0.007$), such that increases in the current loneliness of widowed participants contributed to slightly higher reports of social media usage via a mobile phone (Figure 7). No significant interaction with current loneliness was found for satisfaction for any of the measures of social media usage. However, there was a main effect of current loneliness on predicting social media usage when feeling lonely for both models including

relationship status ($\beta = 0.007$, $t(3143) = 3.23$, $p\text{-value} = 0.001$, $R^2 = 0.006$) and relationship satisfaction ($\beta = 0.01$, $t(2118) = 3.34$, $p\text{-value} < 0.001$, $R^2 = 0.01$), suggesting in both cases that higher score on current loneliness predicted slightly higher reports of social media usage when feeling lonely. The results from these models featuring current loneliness as a moderating variable did not significantly change when age, ethnicity, and gender were added as covariates.

Discussion

The current study had two main research questions. The first was to replicate whether relationship status impacted social media usage, as well as whether relationship satisfaction impacted social media usage in an older adult population. The second was to determine whether current loneliness moderated any of the differences in social media usage between individuals reporting different relationship statuses and satisfaction levels. Using pre-existing data, the study condensed social media usage into three measures: social media usage via a mobile phone, general social media usage online, and social media usage specifically when lonely. Using one-way ANOVAs and regression analyses, relationship status and satisfaction were individually set as predictors for each of the measures of social media usage. Neither relationship status nor satisfaction appeared to have a significantly broad effect on social media usage. Analysis revealed some significant differences across the dependent measures of social media, but the effects were small based on effect size and far more isolated than previous research suggested. Most of the significant differences found across analyses were concentrated in social media usage when lonely. Additionally, current loneliness was not found to be a moderator for either relationship status or relationship satisfaction, save for one interaction with widowed participants, though current loneliness did appear to be an independent predictor for social media usage when feeling lonely.

Only one significant difference appeared in the analyses regarding relationship status and social media usage online with separated participants tending to report more frequent use of social media online, on average, than widowed participants. Although widowed adults may have barriers to engaging with social media, including difficulties navigating social media and concerns about security and participation (Hong et al., 2021), they can also experience greater benefits like social connections and comfort (Hong et al., 2021) and overcoming hardship through social engagement (Isherwood et al., 2012). One possible explanation for this finding may be that separated individuals are in a unique position, as they have experienced a loss like widowed participants (Boora & Jain, 2020; Trivedi et al., 2009) but are in a state of limbo with the relationship either leading to divorce or reconciliation (Manning & Smock, 2005). Separated individuals might therefore seek support online due to their circumstances but receive less support and less benefits of support than widowed individuals do while in the process of grieving and healing (Hong et al., 2021; Isherwood et al., 2012). Furthermore, although widowed participants are likely to experience more hardship due to loss than separated individuals (Kim et al., 2023; Longoria, 2022), the social support they can receive over social media during those hard times can increase the chances that widowed participants perceive social media as a beneficial space where they can cope. Receiving such beneficial support during their time of mourning may also decrease the overall time they spend on social media because they are not spending as much time needing to reach out to others to feel supported.

Further significant differences between participants with different relationship statuses were observed in the frequency of use of social media when feeling lonely. These comparisons again suggested that separated participants tended to report more frequent use of social media when lonely than participants who were widowed, supporting the claims that widowed

participants may receive greater benefits from communication via social media which discourage them from engaging in excessive social media use (Hong et al., 2021; Isherwood et al., 2012). An additional case for why this difference may appear in social media usage specifically when participants were asked about usage when lonely is that the study did not take into account the details of widowed participants' experience. Widowhood has different stages of grieving and dealing, and it is likely that some individuals had more time to deal with the loss of their partner (Longoria, 2022) and thus, don't prioritize social media in the same way that a recent widow might. Outside of controlling for the stages of the grieving process, the number of participants who identified as widowed or separated was notably lower than the sample sizes for the other relationship statuses, meaning that the significant effects found between them may be a product of sample size and may not be present with larger comparison groups. Still, finding significant differences between widowed and separated individuals in two out of the three measures of social media usage is evidence that a point of comparison does exist between the two, and further research can compare these two groups and find what specific aspects of their experiences may be contributing to such different results.

Additionally, married participants tended to, on average, report using social media less often when lonely than both divorced and separated participants. These differences are closer to the expected based on previous literature, which would say married individuals would be less likely to use social media due to focusing on the relationship (Abbasi, 2019b; McAndrew & Jeong, 2012) and not engaging in frequent social media usage for motivations associated with single individuals, such as coping with breakups and being newly single (Fejes-Vékássy et al., 2020), keeping in contact or monitoring an old partner (LeFebvre et al., 2015; Sheldon et al., 2019) or repairing or maintaining their self image (Rollie & Duck, 2013). Keeping in contact

with a former partner is especially pertinent to divorced and separated individuals, as they may have to communicate about shared children, assets, or other matters online more than married participants, who often have the luxury of communicating in person. However, this would not explain why there weren't meaningful differences between all participants who weren't in a relationship and married individuals. This specific finding, combined with the previous ones, suggests that there may be something unique about separated individuals and their social media behavior.

A similar trend of slight differences, specifically for reports on using social media when feeling lonely, was found with relationship satisfaction. Participants who were somewhat unsatisfied in their relationships tended to report higher levels of frequency in using social media when lonely compared to those who were very satisfied with their relationships. While this difference is supported by previous research that suggests greater satisfaction is associated with less social media usage (Bouffard et al., 2022; Fejes-Vékássy et al., 2020; Valenzuela et al., 2014), previous work would also suggest that there should also have been a significant difference between the two extremes of satisfaction as well. Not observing this difference suggests that the associations may not be as strong as previous work has found, at least for older adults. More likely, however, is that there was some part of the study design that resulted in such a unique finding, be it lack of control variables or detailed data on exact social media use, such as time used compared to reports.

Similarly, the other significant difference found was again between participants who were somewhat unsatisfied and those who were very unsatisfied, highlighting that participants who were very unsatisfied with their relationship reported less usage of social media when lonely than participants who were somewhat unsatisfied. This difference is in the opposite direction of what

was expected, as research would suggest that more social media usage would be associated with less satisfaction (Bouffard et al., 2022; Valenzuela et al., 2014). One possible explanation is that the result could be due to particular behavior or engagement with social media from participants that was not measured but can still impact relationships differently (Whiteside et al., 2018). In other words, due to the focus on only looking at relationship satisfaction, there may be other factors that are unique to the participants who reported some dissatisfaction in their relationship, be it geographical location, occupational status, or personality differences that were not controlled for within the study and could in part explain this unique finding.

One potential explanation for why no significant differences were found between relationship satisfaction and social media usage via a phone and online is because of a difference in what problematic social media usage may look like in older adults compared to younger adults. Much of the previous research suggests that problematic social media use, such as excessive use and addiction, relates negatively to relationship satisfaction (Demircioğlu & Göncü Köse, 2021; Satici et al., 2023), but that research focused on younger populations. While older adults may also suffer from similar problematic social media use (Meshi et al., 2020), perhaps the implications and consequences of that negative use look different for older adults and impact them differently. Regardless, the study questions and outcome variables for social media focused on just frequency of use and were not nuanced enough to determine problematic use or addiction. This limitation implies that research is specifically needed in studying what problematic social media usage looks like in older adults. Additionally, research can compare older adults who have an addiction to social media in comparison to those who do not to see whether addiction truly is an important factor between relationship satisfaction and social media usage.

Regression analyses revealed no significant moderating effect of current loneliness on social media usage. The notable exception was that current loneliness did seem to interact with widowed participants on the measure of reporting social media usage via a mobile phone, suggesting that widowed participants who report higher loneliness would be more likely to report greater social media usage via the phone. One potential explanation touched upon earlier is that this may be a function of grief that widowed individuals uniquely feel (Longoria, 2022), and that the greater current loneliness contributes to searching for social connection in part through social media (Hong et al., 2021; Isherwood et al., 2012; O'Day & Heimberg, 2021; Zhang et al., 2021). This finding may have been specific to social media usage via the phone because of mobility the phone allows (Hafez et al., 2018). Widowed individuals may relocate after the death of a spouse or partner due to difficulties in maintaining their current housing accommodations and may suffer from lack of social support and increased loneliness because of the change (Beal, 2006). Therefore, having the flexibility of data and the mobility of a phone can be helpful in searching for social support or maintaining connections from a previous location as relocation occurs and feelings of loneliness increase, potentially explaining this interaction. However, given that there is no robust effect of current loneliness on widowed individuals in the other measures of social media, there is reason to believe that the effect of current loneliness on widowed individuals might not be as large as predicted or explained by other factors.

Current loneliness was found to predict reports of social media usage when lonely across both models with relationship status or satisfaction as predictors. This finding implies that current loneliness independently affected social media use. While previous work supports this main effect (O'Day & Heimberg, 2021; Phu & Gow, 2019; Rajesh & Rangaiah, 2020), it did not appear in the other measures of social media, suggesting that current loneliness may not be as

effective in predicting social media usage overall for the older population. Older adults were not the target for much of the literature that predicted current loneliness contributing to social media addiction and misuse (Abbasi, 2019a; Bouffard et al., 2022; Demircioğlu & Göncü Köse, 2021; Rajesh & Rangaiah, 2020; Satici et al., 2023), which could be one explanation for why current loneliness did not have a robust effect as either a moderator or main predictor.

This research study is not without limitations, both in design and interpretation. One such example is the lack of diversity of the sample, as the overwhelming majority of participants were White. While a strength of the study is that the sample was quite large, the fact still remains that the majority of the dataset were participants who were White, married, and highly satisfied in their relationships. While factors like gender, race/ethnicity, and age didn't seem to affect the results, it is still notable that in such a large sample, minorities were still underrepresented compared to White individuals. Furthermore, given the nature of the data source, it was difficult to know the exact relationship status of participants from just one question that asked participants to choose only one option, so for the purposes of comparing the data married individuals were treated as individuals in a relationship and the other categories, outside of living with partner which had a small subsample, such as divorced, widowed, and separated were treated as being single even though they may be dating or in relationships. This is a major limitation and assumption made, and a more thorough identification and control of relationship status is required in any future research. Another limitation is the validity of the measures and answers. Participants were trusted to have read all of the questions properly, to have answered them to the best of their ability, and to have answered them truthfully. This is a concern when studying concepts like loneliness or behavior because participants, even older adults, may succumb to biases that skew their answers, whether to sound less lonely than they actually are or to indicate

that they engage in behavior they may deem unhealthy less often for the sake of keeping appearances.

Lastly, as far as design, the open dataset meant that the questions and hypotheses analyzed by the current research team were limited to what the data contained. The most appropriate example for this is the measure of social media, where a number of questions attempted to measure the concept that the current research team weaved together. Additionally, the measures for social media usage gathered frequency of use but not at actual amount of time spent on social media. For example, two participants that would have said they used social media daily can have vastly different patterns of social media usage that day; one might log on for 10 minutes per day whereas the other might spend 10 minutes per hour. These times are very different but the data available would have treated them as the same. A similar issue comes with assuming that variables such as satisfaction are interpreted and valued the same across participants; mitigation for this was addressed in part by keeping the relationship satisfaction variable discrete. Although unlikely, this limitation could be a partial explanation for the results found regarding satisfaction, and it comes from how the term was operationalized, interpreted by participants, and analyzed by the research team. Future research should examine these associations by using a more concrete measure of social media use, as well as by including open-ended questions that allow for the coding of the participants' reasoning for social media use instead of, for example, quantifying a scale of answers.

Despite these limitations, future research should not be deterred. First, with social media ever-evolving, more research should look specifically at older adults and the various individual differences between them to be able to understand and better generalize the behaviors of, and the impacts of, social media on the older population. Even better, this deep dive can be focused on

populations such as separated or widowed individuals to better understand how their experience and relationship status impact their patterns of behavior, specifically with social media, and how. Furthermore, future research can include a qualitative component that parses through the reasoning behind both the feelings of loneliness as well as social media behavior. Social media can be measured both in the amount of time spent on social media and in specific behavior, i.e., what the participants actually did when using social media. The more details and measures of social media there are, the easier and better it will be for future research teams to understand how loneliness impacts social media usage, what areas loneliness might be concentrated in, and what areas might be unaffected by loneliness.

The study showed that there were some sporadic differences between relationship status and relationship satisfaction and social media usage. These effects were admittedly small and not as robust and consistent as previous literature suggests. However, most were concentrated in reports of social media usage based on participants' perception of loneliness, which future research should delve more into. As for current loneliness, there were no significant moderation effects, despite previous literature connecting current loneliness with both relationship status and relationship satisfaction and with social media usage as well. Overall, the findings suggest that relationship status and relationship satisfaction may not play a large or crucial role in determining differences in social media usage, but future research may benefit from looking at specific aspects of relationship status and relationship satisfaction, such as in individuals who are separated, to understand the nuances and potential variables that may impact differences in social media research. Additionally, future research can continue to parse through why differences in relationship status and relationship satisfaction tend to impact social media behavior when feeling lonely, even though these differences do not interact with current loneliness directly.

References

- Abbasi, I. S. (2019a). Social media addiction in romantic relationships: Does user's age influence vulnerability to social media infidelity?. *Personality and Individual Differences*, 139, 277-280. <https://doi.org/10.1016/j.paid.2018.10.038>
- Abbasi, I. S. (2019b). Social media and committed relationships: What factors make our romantic relationship vulnerable?. *Social Science Computer Review*, 37(3), 425-434. <https://doi.org/10.1177/0894439318770609>
- Adamczyk, K., Barr, A. B., & Segrin, C. (2021). Relationship status and mental and physical health among Polish and American young adults: The role of relationship satisfaction and satisfaction with relationship status. *Applied Psychology: Health and Well-Being*, 13(3), 620-652. <https://doi.org/10.1111/aphw.12248>
- Adamczyk, K., & Segrin, C. (2015). Direct and indirect effects of young adults' relationship status on life satisfaction through loneliness and perceived social support. *Psychologica Belgica*, 55(4), 196. <https://doi.org/10.5334/pb.bn>
- Apostolou, M., Matogian, I., Koskeridou, G., Shialos, M., & Georgiadou, P. (2019). The price of singlehood: Assessing the impact of involuntary singlehood on emotions and life satisfaction. *Evolutionary Psychological Science*, 5, 416-425. <https://doi.org/10.1007/s40806-019-00199-9>
- Arfaa, J., & Wang, Y. (2014). An accessibility evaluation of social media websites for elder adults. In *Social Computing and Social Media: 6th International Conference, SCSM 2014, Held as Part of HCI International 2014, Heraklion, Crete, Greece, June 22-27, 2014. Proceedings 6* (pp. 13-24). Springer International Publishing. https://doi.org/10.1007/978-3-319-07632-4_2

- Beal, C. (2006). Loneliness in older women: a review of the literature. *Issues in Mental Health Nursing*, 27(7), 795-813. <https://doi.org/10.1080/01612840600781196>
- Beers, M. (2000). Age-related changes as a risk factor for medication-related problems. *Generations*, 24(4), 22-27. <https://www.jstor.org/stable/44877585>
- Bell, C., Fausset, C., Farmer, S., Nguyen, J., Harley, L., & Fain, W. B. (2013, May). Examining social media use among older adults. In *Proceedings of the 24th ACM Conference on Hypertext and Social Media* (pp. 158-163). <https://doi.org/10.1145/2481492.2481509>
- Böger, A., & Huxhold, O. (2020). The changing relationship between partnership status and loneliness: Effects related to aging and historical time. *The Journals of Gerontology: Series B*, 75(7), 1423-1432. <https://doi.org/10.1093/geronb/gby153>
- Bonsaksen, T., Ruffolo, M., Leung, J., Price, D., Thygesen, H., Schoultz, M., & Geirdal, A. Ø. (2021). Loneliness and its association with social media use during the COVID-19 outbreak. *Social Media+ Society*, 7(3), 20563051211033821. <https://doi.org/10.1177/20563051211033821>
- Boora, S., & Jain, A. (2020). Loneliness and social support of separated and widowed women: In relation to mental health. *Journal of Psychosocial Research*, 15(2), 675-682. <https://doi.org/10.32381/JPR.2020.15.02.28>
- Bouffard, S., Giglio, D., & Zheng, Z. (2022). Social media and romantic relationship: Excessive social media use leads to relationship conflicts, negative outcomes, and addiction via mediated pathways. *Social Science Computer Review*, 40(6), 1523-1541. <https://doi.org/10.1177/08944393211013566>
- Brivio, P., Paladini, M. S., Racagni, G., Riva, M. A., Calabrese, F., & Molteni, R. (2019). From healthy aging to frailty: in search of the underlying mechanisms. *Current Medicinal*

- Chemistry*, 26(20), 3685-3701. <https://doi.org/10.2174/0929867326666190717152739>
- Brody, N., & Cullen, S. (2023). Meme sharing in relationships: The role of humor styles and functions. *First Monday*, 28(5). <https://doi.org/10.5210/fm.v28i5.12789>
- Cacioppo, J. T., & Hawkey, L. C. (2009). Perceived social isolation and cognition. *Trends in Cognitive Sciences*, 13(10), 447-454. <https://doi.org/10.1016/j.tics.2009.06.005>
- Cesari, M., Prince, M., Thiyagarajan, J. A., De Carvalho, I. A., Bernabei, R., Chan, P., ... & Vellas, B. (2016). Frailty: An emerging public health priority. *Journal of the American Medical Directors Association*, 17(3), 188-192. <https://doi.org/10.1016/j.jamda.2015.12.016>
- Chawla, K., Kunonga, T. P., Stow, D., Barker, R., Craig, D., & Hanratty, B. (2021). Prevalence of loneliness amongst older people in high-income countries: A systematic review and meta-analysis. *Plos One*, 16(7), e0255088. <https://doi.org/10.1371/journal.pone.0255088>
- Chen, C. M., Lee, I. C., Su, Y. Y., Mullan, J., & Chiu, H. C. (2017). The longitudinal relationship between mental health disorders and chronic disease for older adults: a population-based study. *International Journal of Geriatric Psychiatry*, 32(9), 1017-1026. <https://doi.org/10.1002/gps.4561>
- Clark, L. R., Schiehser, D. M., Weissberger, G. H., Salmon, D. P., Delis, D. C., & Bondi, M. W. (2012). Specific measures of executive function predict cognitive decline in older adults. *Journal of the International Neuropsychological Society*, 18(1), 118-127. <https://doi.org/10.1017/S1355617711001524>
- Coyne, S. M., Stockdale, L., Busby, D., Iverson, B., & Grant, D. M. (2011). "I luv u!")": A descriptive study of the media use of individuals in romantic relationships. *Family Relations*, 60(2), 150-162. <https://doi.org/10.1111/j.1741-3729.2010.00639.x>

- Demircioğlu, Z. I., & Göncü Köse, A. (2021). Effects of attachment styles, dark triad, rejection sensitivity, and relationship satisfaction on social media addiction: A mediated model. *Current Psychology*, 40, 414-428. <https://doi.org/10.1007/s12144-018-9956-x>
- Emery, L. F., Muise, A., Dix, E. L., & Le, B. (2014). Can you tell that I'm in a relationship? Attachment and relationship visibility on Facebook. *Personality and Social Psychology Bulletin*, 40(11), 1466-1479. <https://doi.org/10.1177/0146167214549944>
- Fejes-Vékássy, L., Ujhelyi, A., & Faragó, L. (2020). From #RelationshipGoals to #Heartbreak – We use Instagram differently in various romantic relationship statuses. *Current Psychology*, 1-13. <https://doi.org/10.1007/s12144-020-01187-0>
- Fulop, T., & Montgomery, R. R. (2014). Immune senescence: known knowns and unknown unknowns. *Current Opinion in Immunology*, 29, vii. <https://doi.org/10.1016/j.coi.2014.06.005>
- Gow, A. J., Pattie, A., Whiteman, M. C., Whalley, L. J., & Deary, I. J. (2007). Social support and successful aging: Investigating the relationships between lifetime cognitive change and life satisfaction. *Journal of Individual Differences*, 28(3), 103-115. <https://doi.org/10.1027/1614-0001.28.3.103>
- Hafez, A., Wang, Y., & Arfaa, J. (2018). An accessibility evaluation of social media through mobile device for elderly. In *Advances in Usability and User Experience: Proceedings of the AHFE 2017 International Conference on Usability and User Experience, July 17-21, 2017, The Westin Bonaventure Hotel, Los Angeles, California, USA 8* (pp. 179-188). Springer International Publishing. https://doi.org/10.1007/978-3-319-60492-3_17

Hawkey, L. C., & Cacioppo, J. T. (2007). Aging and loneliness: Downhill quickly?. *Current Directions in Psychological Science*, *16*(4), 187-191.

<https://doi.org/10.1111/j.1467-8721.2007.00501.x>

Hawkey, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, *40*(2), 218-227.

<https://doi.org/10.1007/s12160-010-9210-8>

Hill Roy, L., Park, Y., & MacDonald, G. (2023). Age moderates the link between relationship desire and life satisfaction among singles. *Personal Relationships*, *30*(3), 893-912.

<https://doi.org/10.1111/pere.12497>

Holt-Lunstad, J., Birmingham, W., & Jones, B. Q. (2008). Is there something unique about marriage? The relative impact of marital status, relationship quality, and network social support on ambulatory blood pressure and mental health. *Annals of Behavioral Medicine*, *35*(2), 239-244. <https://doi.org/10.1007/s12160-008-9018-y>

Hong, Y., Fu, J., Kong, D., Liu, S., Zhong, Z., Tan, J., & Luo, Y. (2021). Benefits and barriers: a qualitative study on online social participation among widowed older adults in Southwest China. *BMC Geriatrics*, *21*, 1-10. <https://doi.org/10.1186/s12877-021-02381-w>

Isherwood, L. M., King, D. S., & Luszcz, M. A. (2012). A longitudinal analysis of social engagement in late-life widowhood. *The International Journal of Aging and Human Development*, *74*(3), 211-229. <https://doi.org/10.2190/AG.74.3.c>

Kim, H. S., Kim, J. S., & Lee, K. Y. (2022). The effect of digital literacy in the elderly on life satisfaction: Focusing on depression and social participation. *Gerontechnology*, *21*.

<https://doi.org/10.4017/gt.2022.21.s.712.pp1>

- Kim, N., Kim, Y., Cho, H., & Kim, K. (2023). The role of social media communication in the association between widowhood and depressive symptoms. *Innovation in Aging*, 7(Suppl 1), 662-663. <https://doi.org/10.1093/geroni/igad104.2154>
- LeFebvre, L., Blackburn, K., & Brody, N. (2015). Navigating romantic relationships on Facebook: Extending the relationship dissolution model to social networking environments. *Journal of Social and Personal Relationships*, 32(1), 78-98. <https://doi.org/10.1177/0265407514524848>
- Levy, B. R., Chung, P. H., Bedford, T., & Navrazhina, K. (2014). Facebook as a site for negative age stereotypes. *The Gerontologist*, 54(2), 172-176. <https://doi.org/10.1093/geront/gns194>
- Longoria, B. C. (2022). The widowed identity: identity transformations of the silent generation and the influence of time. *Journal of Women & Aging*, 34(6), 773-784. <https://doi.org/10.1080/08952841.2021.1948790>
- Makita, M., Mas-Bleda, A., Stuart, E., & Thelwall, M. (2021). Ageing, old age and older adults: A social media analysis of dominant topics and discourses. *Ageing & Society*, 41(2), 247-272. <https://doi.org/10.1017/S0144686X19001016>
- Manning, W. D., & Smock, P. J. (2005). Measuring and modeling cohabitation: New perspectives from qualitative data. *Journal of Marriage and Family*, 67(4), 989-1002. <https://doi.org/10.1111/j.1741-3737.2005.00189.x>
- Matook, S., Cummings, J., & Bala, H. (2015). Are you feeling lonely? The impact of relationship characteristics and online social network features on loneliness. *Journal of Management Information Systems*, 31(4), 278-310. <https://doi.org/10.1080/07421222.2014.1001282>

- McAndrew, F. T., & Jeong, H. S. (2012). Who does what on Facebook? Age, sex, and relationship status as predictors of Facebook use. *Computers in Human Behavior*, 28(6), 2359-2365. <https://doi.org/10.1016/j.chb.2012.07.007>
- Meshi, D., Cotten, S. R., & Bender, A. R. (2020). Problematic social media use and perceived social isolation in older adults: a cross-sectional study. *Gerontology*, 66(2), 160-168. <https://doi.org/10.1159/000502577>
- Morrison, B. A., Coventry, L., & Briggs, P. (2020). Technological change in the retirement transition and the implications for cybersecurity vulnerability in older adults. *Frontiers in Psychology*, 11, 514922. <https://doi.org/10.3389/fpsyg.2020.00623>
- Mund, M., & Johnson, M. D. (2021). Lonely me, lonely you: Loneliness and the longitudinal course of relationship satisfaction. *Journal of Happiness Studies*, 22(2), 575-597. <https://doi.org/10.1007/s10902-020-00241-9>
- Narayanan, V., Robertson, B. W., Hickerson, A., Srivastava, B., & Smith, B. W. (2021, December). Securing social media for seniors from information attacks: Modeling, detecting, intervening, and communicating risks. In *2021 Third IEEE International Conference on Trust, Privacy and Security in Intelligent Systems and Applications (TPS-ISA)* (pp. 297-302). IEEE. <https://doi.org/10.1109/TPSISA52974.2021.00053>
- Newman, L., Stoner, C., & Spector, A. (2021). Social networking sites and the experience of older adult users: a systematic review. *Ageing & Society*, 41(2), 377-402. <https://doi.org/10.1017/S0144686X19001144>
- O'Day, E. B., & Heimberg, R. G. (2021). Social media use, social anxiety, and loneliness: A systematic review. *Computers in Human Behavior Reports*, 3, 100070. <https://doi.org/10.1016/j.chbr.2021.100070>

- Olsen, R. B., Olsen, J., Gunner-Svensson, F., & Waldstrøm, B. (1991). Social networks and longevity. A 14 year follow-up study among elderly in Denmark. *Social Science & Medicine*, 33(10), 1189-1195. [https://doi.org/10.1016/0277-9536\(91\)90235-5](https://doi.org/10.1016/0277-9536(91)90235-5)
- Perrin, A. (2015). Social media usage. *Pew Research Center*, 125, 52-68.
<http://www.pewinternet.org/2015/10/08/2015/Social-Networking-Usage-2005-2015/>
- Phu, B., & Gow, A. J. (2019). Facebook use and its association with subjective happiness and loneliness. *Computers in Human Behavior*, 92, 151-159.
<https://doi.org/10.1016/j.chb.2018.11.020>
- Pinsker, D. M., McFarland, K., & Pachana, N. A. (2010). Exploitation in older adults: Social vulnerability and personal competence factors. *Journal of Applied Gerontology*, 29(6), 740-761. <https://doi.org/10.1177/0733464809346559>
- Rajesh, T., & Rangaiah, B. (2020). Facebook addiction and personality. *Heliyon*, 6(1).
<https://doi.org/10.1016/j.heliyon.2020.e03184>
- Rollie, S. S., & Duck, S. (2013). Divorce and dissolution of romantic relationships: Stage models and their limitations. In *Handbook of Divorce and Relationship Dissolution* (pp. 223-240). Psychology Press. <https://doi.org/10.4324/9781315820880-21>
- Rook, K. S. (2015). Social networks in later life: Weighing positive and negative effects on health and well-being. *Current Directions in Psychological Science*, 24(1), 45-51.
<https://doi.org/10.1177/0963721414551364>
- Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment*, 66(1), 20-40.
https://doi.org/10.1207/s15327752jpa6601_2

- Satici, B., Kayis, A. R., & Griffiths, M. D. (2023). Exploring the association between social media addiction and relationship satisfaction: psychological distress as a mediator. *International Journal of Mental Health and Addiction*, 21(4), 2037-2051. <https://doi.org/10.1007/s11469-021-00658-0>
- Sheldon, P., Rauschnabel, P.A., & Honeycutt, J.M. (Eds). (2019). Social Media and Relationship Drama. *The dark side of social media: Psychological, managerial, and societal perspectives* (pp. 75-88). Academic Press.
- Sugisawa, H., Liang, J., & Liu, X. (1994). Social networks, social support, and mortality among older people in Japan. *Journal of Gerontology*, 49(1), S3-S13. <https://doi.org/10.1093/geronj/49.1.S3>
- Surkalim, D. L., Luo, M., Eres, R., Gebel, K., van Buskirk, J., Bauman, A., & Ding, D. (2022). The prevalence of loneliness across 113 countries: systematic review and meta-analysis. *BMJ*, 376. <https://doi.org/10.1136/bmj-2021-067068>
- Trivedi, J. K., Sareen, H., & Dhyani, M. (2009). Psychological aspects of widowhood and divorce. *Mens Sana Monographs*, 7(1), 37. <https://doi.org/10.4103/0973-1229.40648>
- Tsugawa, S., & Ohsaki, H. (2015, November). Negative messages spread rapidly and widely on social media. In *Proceedings of the 2015 ACM Conference on Online Social Networks* (pp. 151-160). <https://doi.org/10.1145/2817946.2817962>
- Valenzuela, S., Halpern, D., & Katz, J. E. (2014). Social network sites, marriage well-being and divorce: Survey and state-level evidence from the United States. *Computers in Human Behavior*, 36, 94-101. <https://doi.org/10.1016/j.chb.2014.03.034>

- Vauclair, C. M., Rudnev, M., Hofhuis, J., & Liu, J. H. (2023). Instant messaging and relationship satisfaction across different ages and cultures. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 17(3). <https://doi.org/10.5817/CP2023-3-8>
- Whiteside, N., Aleti, T., Pallant, J., & Zeleznikow, J. (2018). Helpful or harmful? Exploring the impact of social media usage on intimate relationships. *Australasian Journal of Information Systems*, 22. <https://doi.org/10.3127/ajis.v22i0.1653>
- Wilson, G., Gates, J. R., Vijaykumar, S., & Morgan, D. J. (2023). Understanding older adults' use of social technology and the factors influencing use. *Ageing & Society*, 43(1), 222-245. <https://doi.org/10.1017/S0144686X21000490>
- Yum, Y. O. (2003). The relationships among loneliness, self/partner constructive maintenance behavior, and relational satisfaction in two cultures. *Communication Studies*, 54(4), 451-467. <https://doi.org/10.1080/10510970309363303>
- Zhang, K., Kim, K., Silverstein, N. M., Song, Q., & Burr, J. A. (2021). Social media communication and loneliness among older adults: The mediating roles of social support and social contact. *The Gerontologist*, 61(6), 888-896. <https://doi.org/10.1093/geront/gnaa197>
- Zhao, E. (2019). Does the news media foster a hostile environment for older adults: A content analysis of news articles. *Innovation in Aging*, 3(Suppl 1), S956. <https://doi.org/10.1093/geroni/igz038.3470>
- Zheng, X., & Lee, M. K. (2016). Excessive use of mobile social networking sites: Negative consequences on individuals. *Computers in Human Behavior*, 65, 65-76. <https://doi.org/10.1016/j.chb.2016.08.011>

Supplemental

This supplement focuses on the exploratory analyses that were conducted based on various opinion and agreement questions regarding social media, the Internet, and loneliness to the whole sample. These questions fit with the main two research questions of the study and analysis of these opinions was hypothesized to add extra nuance and explanation to the variance of social media behavior among older adults based on their relationship status and satisfaction.

Measures

Opinions on Social Media, Internet, and Loneliness

The robustness of the survey meant that there were also questions regarding opinions on certain behaviors or engagement with social media and the Internet, with some even being in the context of loneliness. The five statements were: (1) “Social media sites make me feel connected to friends/family”, (2) “Social media has helped me keep in touch with friends/family I otherwise would have drifted away from”, (3) “The more I use the internet as a replacement for other forms of communication the lonelier I feel”, (4) “I have fewer deep connections now that I keep in touch with people over the internet”, and (5) “I would recommend the internet to others in order to help with loneliness”. Participants rated their agreement on a 5-point Likert scale (i.e., 5 = *strongly agree*, 4 = *somewhat agree*, 3 = *neither agree nor disagree*, 2 = *somewhat disagree*, 1 = *strongly disagree*).

Analytic Plan

These exploratory analyses were conducted using one-way ANOVA analyses with the predictor of either relationship status or relationship satisfaction and the dependent variable being one of the five opinion agreement questions. This meant that across the five questions looked at, a total of 10 one-way ANOVA analyses were conducted. Similar to the analytical

process for the first two research questions, all these ANOVA analyses were followed by Bonferroni-corrected post-hoc pairwise t-tests to better compare the mean responses across different relationship statuses and degrees of relationship satisfaction.

Results

Exploratory analyses were conducted in the same manner as the core study, with several one-way ANOVA analyses with either relationship status (Table S1) or relationship satisfaction (Table S2) as predictors. After conducting Bonferroni post-hoc tests following each ANOVA, only significant differences for increased loneliness when using the internet were found for both relationship status and satisfaction, as well as significant differences for satisfaction only regarding recommending internet use for loneliness. A significant difference ($t(527) = 3.88$, $p\text{-value} = 0.001$) was found between never married ($M = 2.55$, $SD = 1.12$) and widowed ($M = 2.16$, $SD = 1.13$) participants, as well as a significant difference ($t(2371) = 4.52$, $p\text{-value} < 0.001$) between never married ($M = 2.55$, $SD = 1.12$) and married ($M = 2.24$, $SD = 1.10$) participants for feeling increased loneliness when using the internet as opposed to other forms of communication (Figure S1). These results suggest that participants who have never been married tend to agree more on average that the internet has led to increased feelings of loneliness when used instead of other forms of communication than married and widowed participants.

For the same opinion, a significant difference ($t(1431) = -2.94$, $p\text{-value} = 0.03$) was found between participants who were very satisfied with their relationship ($M = 2.19$, $SD = 1.10$) and those who were neither satisfied nor unsatisfied ($M = 2.48$, $SD = 1.10$; Figure S2). This suggests that participants who are very satisfied in their relationship tend to agree less on average that the internet has led to increased feelings of loneliness when used instead of other forms of communication than participants who reported neither satisfaction nor dissatisfaction in their

relationship. Lastly, a significant difference ($t(1448) = 2.87$, $p\text{-value} = 0.04$) was found between participants who were very satisfied with their relationship ($M = 2.92$, $SD = 1.15$) and those who were very unsatisfied with their relationship ($M = 2.63$, $SD = 1.23$) when it came to recommending the Internet for loneliness (Figure S3). This suggests that participants who were very satisfied in their relationship tended to agree more on average that they would recommend the Internet to others to help with loneliness than participants who were very unsatisfied in their relationship.

Discussion

The exploratory analyses set out to contribute to the understanding of social media patterns of older adults and their variation based on relationship status and satisfaction by seeing if major differences were present. Despite previous research suggesting higher agreement regarding social media or the Internet increasing contact with friends and family (Bell et al., 2013; Newman et al., 2021; Vauclair et al., 2023; Wilson et al., 2023), the current work found that the opinion with significant differences for both status and satisfaction was agreement on whether or not using the Internet as a form of replacement for other communication is increasing the loneliness participants felt. Participants who were never married tended to agree more on average than married and widowed participants, while participants who were very satisfied with their relationship tended to agree less with the statement than those who were impartial. An additional significant effect was found for relationship satisfaction and agreement on whether participants would recommend the Internet to others to help with loneliness, such that participants who were more satisfied tended to agree more with this statement.

The only opinion that had significant differences with relationship status as the predictor was agreement on whether or not using the Internet as a form of replacement for other

communication is increasing the loneliness participants felt, with participants who were never married agreeing more than participants who were married and widowed. This is partly in line with research that suggests single individuals tend to be lonelier (Adamczyk & Segrin, 2015), though such an effect was not present on a larger level as would have been expected. A potential explanation is that the way people engage in their relationships may also affect whether and how much social media can help their coping with loneliness or worsen the symptoms (Matook et al., 2015). If participants who were not in relationships therefore sought the Internet as a replacement tool and began to abuse or misuse it (Demircioğlu & Göncü Köse, 2021; Phu & Gow, 2019; Rajesh & Rangaiah, 2020), engaging in a potentially negative cycle of misuse (Bouffard et al., 2022; Satici et al., 2023), could report higher feelings of loneliness compared to married individuals. The differences are small and not all comparisons were significant, but this exploratory analysis suggests that an interesting effect may be present among differing relationship statuses and their engagement with the Internet when lonely, with future work benefiting from a focus on determining these differences and ensuring consistency and accuracy in defining and determining relationship status.

When it comes to relationship satisfaction, the exploratory analysis only revealed significant positive differences between relationship satisfaction and increased loneliness when using the Internet as a replacement for other forms of communication and recommending the internet to others to help with loneliness. Participants who reported neither satisfaction nor dissatisfaction in their relationship agreed more with this statement than participants who were very satisfied. This is a curious and very specific finding that is not really supported by research, nor is there much explanation for why the effect was found for someone impartial to their satisfaction and not someone who is dissatisfied. Thus, it is likely that other factors unaccounted

for contributed to this effect, as a similar challenge of not knowing the reason for this report limits the understanding of it.

What was significant and more supported by previous research is the finding regarding satisfaction and recommending the Internet to others when lonely. Participants who were more satisfied with their relationships tended to agree more with the opinion that they would recommend using the Internet to help with loneliness compared to those who were very unsatisfied. This difference can be explained by the potentially beneficial effects that individuals with higher relationship satisfaction are likely to get from social media (Fejes-Vékassy et al., 2020; Holt-Lunstad et al., 2008; Vauclair et al., 2023), including lower likelihood for misuse of media (Bouffard et al., 2022; Satici et al., 2023), which combined with their strong connection with their partner leads to greater alleviation of loneliness symptoms. However, previous research would have suggested that the significant difference found would have been larger and gone beyond the extremes. One potential explanation for the lack of robust findings could be other factors that contributed to the results but were not accounted for. Additionally, older adults have been found to potentially benefit more from engaging in social media than younger adults when it comes to loneliness (Bonsaksen et al., 2021), and while age did not affect the results, it could be that compared to young adults older adults behavior and opinions of social media are different for other factors outside loneliness. This suggest that there may be other factors or variables that have not been accounted for to make the effects and differences among these opinions clear.

The findings of the exploratory analyses suggest that overall, there is not much difference in the opinions and agreements with statements on social media, the Internet, and loneliness based on an individual's relationship status or relationship satisfaction. Other factors may have

contributed to the significant results. The lack of robust findings despite literature that suggests differences could have been present for questions regarding connection is, however, evidence that a greater, more thorough look at the opinions of older adults may be necessary to understand all of the nuances and true picture of their attitude towards social media, the Internet, and loneliness.

Figures and Tables

Table 1.

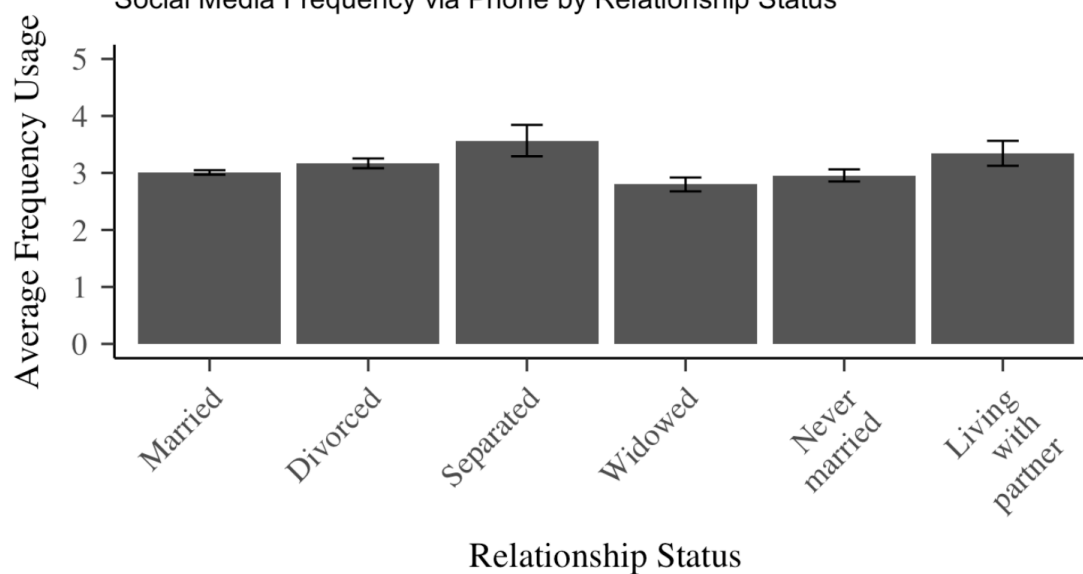
Demographic distribution of participants in the full sample

Individual Characteristics	<i>N</i>	<i>Percent</i>	<i>Mean</i>	<i>SD</i>
Age	3,223		62.5	10.2
Race/Ethnicity				
White (Non-Hispanic)	2,407	74.7		
Black (Non-Hispanic)	311	9.6		
Hispanic	326	10.1		
Other (Non-Hispanic)	99	3.1		
2+ Races (Non-Hispanic)	80	2.5		
Gender				
Male	1,611	50		
Female	1,612	50		

Note. The age range for the sample was 45 to 93 years old.

Figure 1

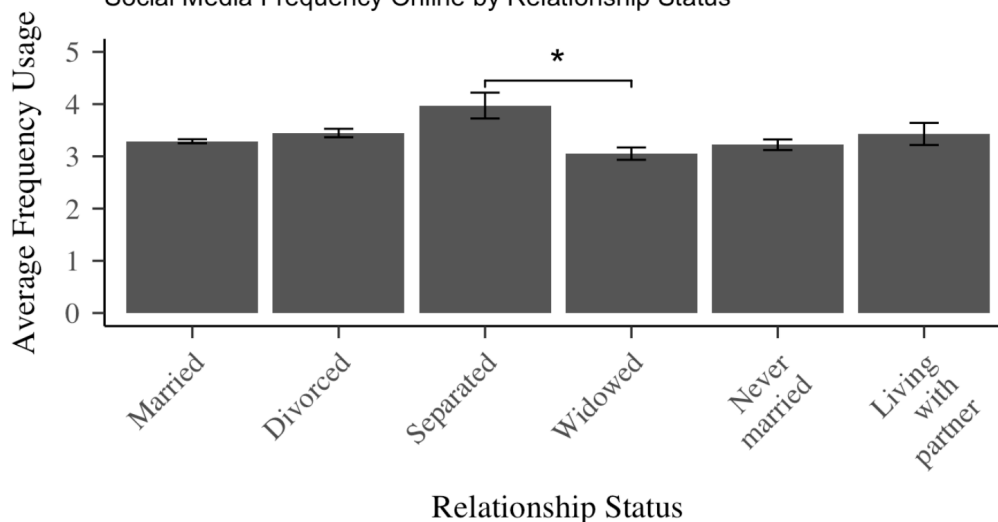
Social Media Frequency via Phone by Relationship Status



Note. The participant spread ($N = 3,049$) was as follows: married ($n = 2,031$), divorced ($n = 434$), widowed ($n = 213$), separated ($n = 37$), never married ($n = 273$), and living with partner ($n = 61$). No significant difference between the means at the 0.5 significance level

Figure 2

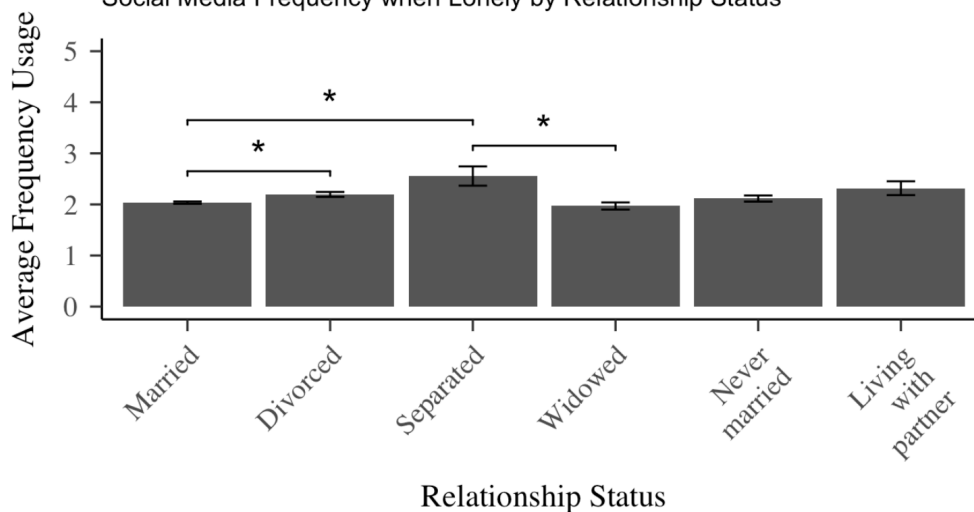
Social Media Frequency Online by Relationship Status



Note. The participant spread (N = 3,167) was as follows: married (n = 2,090), divorced (n = 450), widowed (n = 231), separated (n = 36), never married (n = 297), and living with partner (n = 63). * p-value significant at the 0.05 level

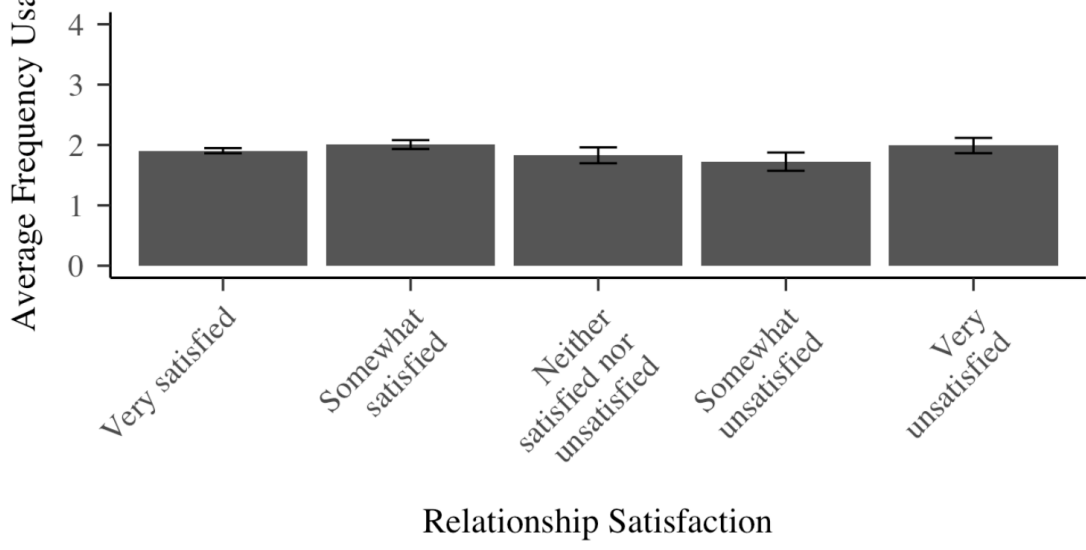
Figure 3

Social Media Frequency when Lonely by Relationship Status



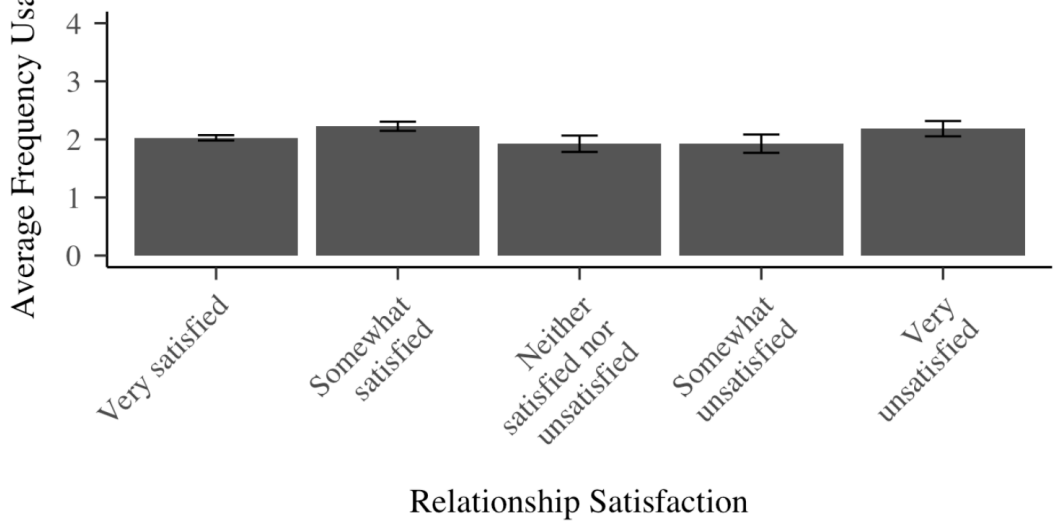
Note. The participant spread (N = 3,155) was as follows: married (n = 2,077), divorced (n = 453), widowed (n = 230), separated (n = 36), never married (n = 296), and living with partner (n = 63). * p-value significant at the 0.05 level

Figure 4
Social Media Usage via the Phone by Relationship Satisfaction



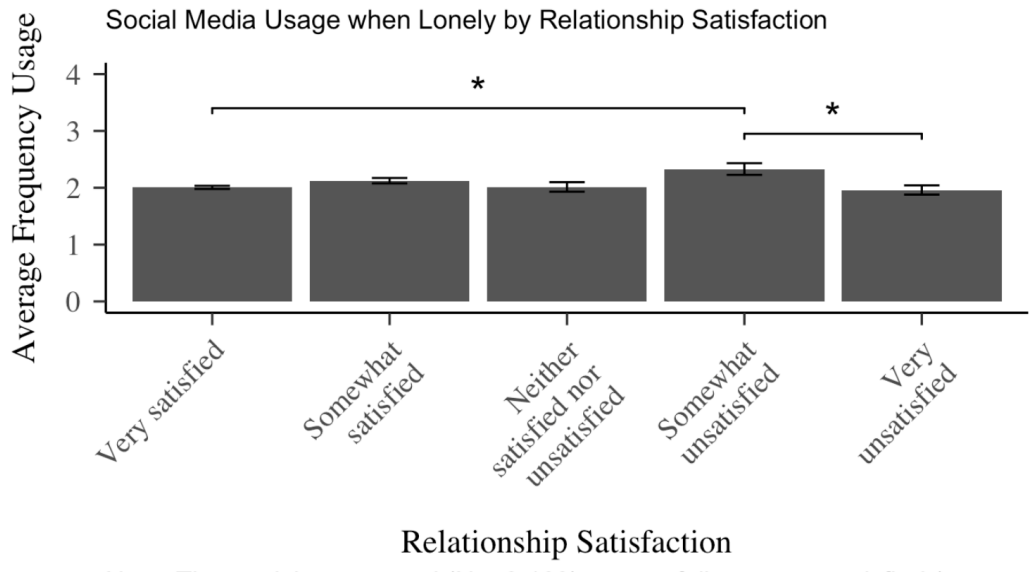
Note. The participant spread (N = 2,080) was as follows: very satisfied (n = 1,268), somewhat satisfied (n = 431), neither satisfied nor unsatisfied (n = 133), somewhat unsatisfied (n = 98), very unsatisfied (n = 150). No significant difference between the means at the 0.5 significance level

Figure 5
Social Media Usage Online by Relationship Satisfaction



Note. The participant spread (N = 2,141) was as follows: very satisfied (n = 1,309), somewhat satisfied (n = 442), neither satisfied nor unsatisfied (n = 136), somewhat unsatisfied (n = 98), very unsatisfied (n = 156). No significant difference between the means at the 0.5 significance level

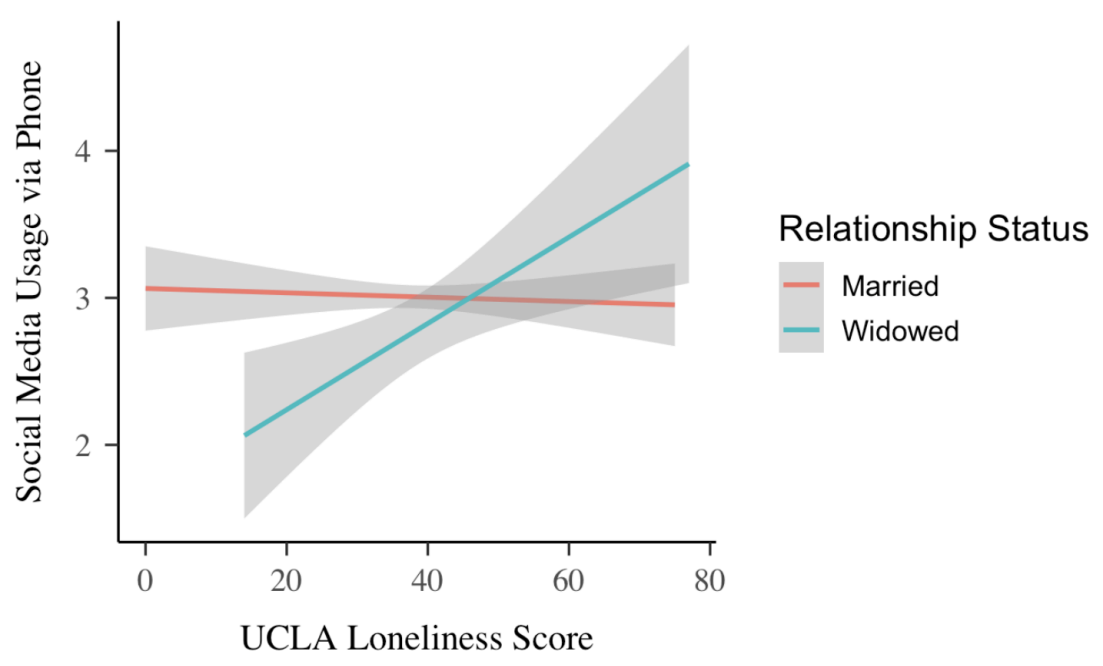
Figure 6



Note. The participant spread (N = 2,128) was as follows: very satisfied (n = 1,294), somewhat satisfied (n = 441), neither satisfied nor unsatisfied (n = 139), somewhat unsatisfied (n = 100), very unsatisfied (n = 154). * p-value significant at the 0.05 level

Figure 7

Interaction between Loneliness and Widowed Participants



Note. * p-value = 0.006

Table S1.

One-way ANOVA analyses for relationship status and various opinions surrounding social media and the Internet

Statements	Relationship Status			
	<i>df</i>	<i>F</i>	<i>p</i>	η^2
Connecting to family via social media	5	1.15	0.33	0.002
Communicating via the internet as opposed to other forms of communication	5	4.74	<0.001***	0.007
Keeping in touch with family via social media	5	2.27	0.045*	0.004
Internet leading to less deep connections	5	1.92	0.09	0.003
Recommend using internet when lonely	5	0.84	0.52	0.001

Note. The overall sample size ($N = 3,223$) was used for running these ANOVAs, but the number of participants for each response varied based on the data available. The participant spread for the connecting to family via social media was as follows: married ($n = 2,078$), divorced ($n = 450$), widowed ($n = 233$), separated ($n = 37$), never married ($n = 298$), and living with partner ($n = 62$). The participant spread for communicating via the internet as opposed to other forms of communication increasing loneliness was as follows: married ($n = 2075$), divorced ($n = 447$), widowed ($n = 231$), separated ($n = 37$), never married ($n = 298$), and living with partner ($n = 62$). The participant spread for keeping in touch with family via social media was as follows: married ($n = 1,968$), divorced ($n = 448$), widowed ($n = 231$), separated ($n = 36$), never married ($n = 297$), and living with partner ($n = 63$). The participant spread for the Internet leading to less deep connections was as follows: married ($n = 2,076$), divorced ($n = 450$), widowed ($n = 232$), separated ($n = 37$), never married ($n = 298$), and living with partner ($n = 64$). The participant spread for recommending using the Internet when lonely was as follows: married ($n = 2,074$), divorced ($n = 449$), widowed ($n = 231$), separated ($n = 37$), never married ($n = 298$), and living with partner ($n = 62$).

* p-value significant at the 0.05 level

** p-value significant at the 0.01 level

*** p-value significant at the 0.001 level

Table S2.

One-way ANOVA analyses for relationship satisfaction and various opinions surrounding social media and the Internet

Statements	Relationship Satisfaction			
	<i>df</i>	<i>F</i>	<i>p</i>	η^2
Connecting to family via social media	4	2.54	0.04	0.005
Communicating via the internet as opposed to other forms of communication	4	3.13	0.01**	0.006
Keeping in touch with family via social media	4	1.43	0.22	0.003
Internet leading to less deep connections	4	2.02	0.09	0.004
Recommend using internet when lonely	4	2.50	0.04*	0.005

Note. The overall sample size ($N = 3,223$) was used for running these ANOVAs, but the number of participants for each response varied based on the data available. The participant spread for the connecting to family via social media was as follows: very satisfied ($n = 1,299$), somewhat satisfied ($n = 442$), neither satisfied nor unsatisfied ($n = 136$), somewhat unsatisfied ($n = 98$), very unsatisfied ($n = 153$). The participant spread for communicating via the internet as opposed to other forms of communication increasing loneliness was as follows: very satisfied ($n = 1,297$), somewhat satisfied ($n = 442$), neither satisfied nor unsatisfied ($n = 136$), somewhat unsatisfied ($n = 98$), very unsatisfied ($n = 152$). The participant spread for keeping in touch with family via social media was as follows: very satisfied ($n = 1,302$), somewhat satisfied ($n = 441$), neither satisfied nor unsatisfied ($n = 136$), somewhat unsatisfied ($n = 98$), very unsatisfied ($n = 152$). The participant spread for the Internet leading to less deep connections was as follows: very satisfied ($n = 1,298$), somewhat satisfied ($n = 441$), neither satisfied nor unsatisfied ($n = 137$), somewhat unsatisfied ($n = 98$), very unsatisfied ($n = 153$). The participant spread for recommending using the Internet when lonely was as follows: very satisfied ($n = 1,298$), somewhat satisfied ($n = 439$), neither satisfied nor unsatisfied ($n = 137$), somewhat unsatisfied ($n = 98$), very unsatisfied ($n = 152$).

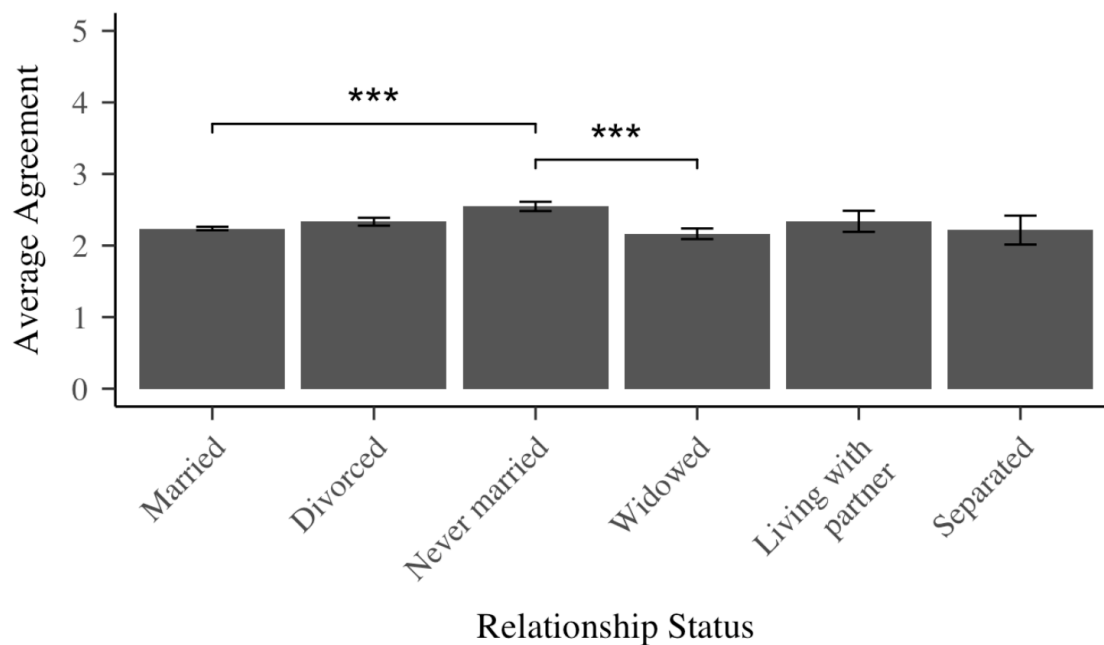
* p-value significant at the 0.05 level

** p-value significant at the 0.01 level

*** p-value significant at the 0.001 level

Figure S1

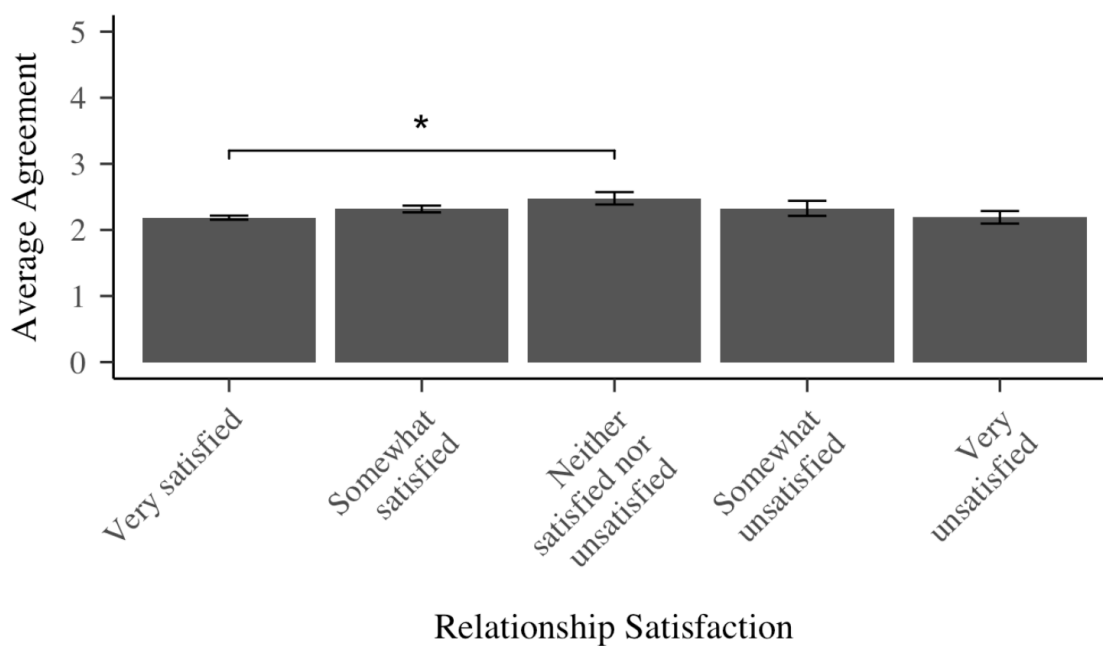
Agreement for Internet and Increased Loneliness by Relationship Status



Note. *** p-value significant at the 0.001 level

Figure S2

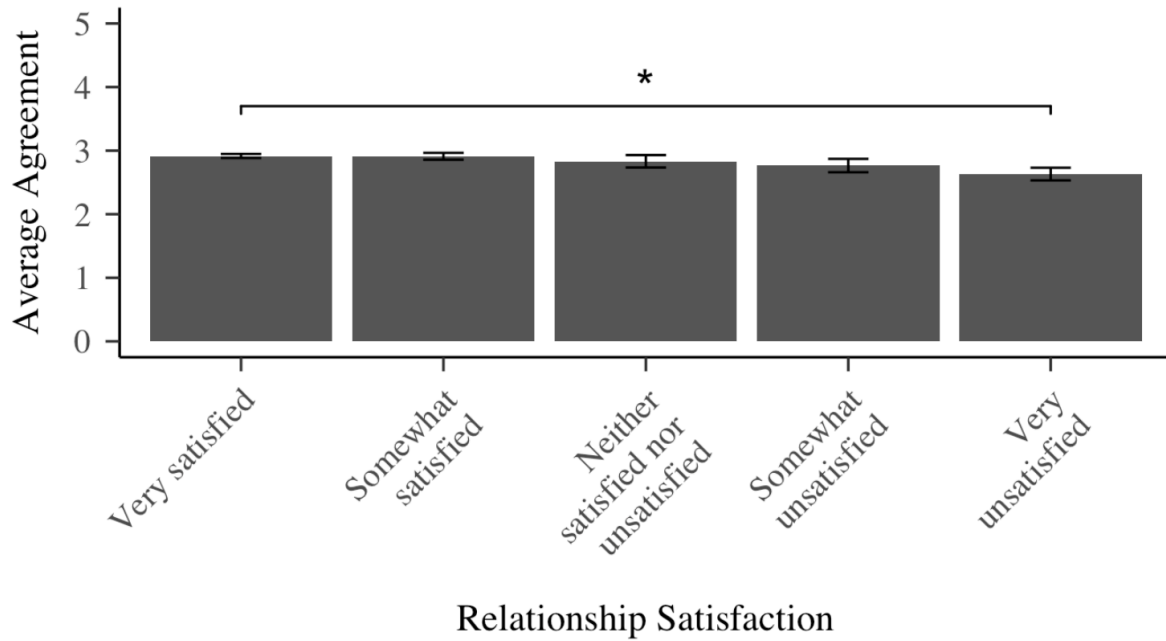
Agreement for Internet and Increased Loneliness by Relationship Satisfaction



Note. * p-value significant at the 0.05 level

Figure S3

Agreement for Recommending the Internet for Loneliness by Relationship Satisfaction



Note. * p-value significant at the 0.05 level