The Relationships Between Loneliness, Social Media Use, Appearance Comparisons, and Body Satisfaction in Young Adults

by

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Abstract

Although research has previously demonstrated social media use's effect on body satisfaction through appearance comparisons, the role of loneliness with respect to these variables remains unclear. The current study examined the relationships between loneliness, social media use, appearance comparisons, and body satisfaction in 311 young adults ages 17-29. Participants self-reported their active and passive social media use, body satisfaction, frequency of appearance comparisons, and loneliness. Associations between the main study variables were examined and a moderated mediation model whereby the relationship between social media use, appearance comparison, and body satisfaction was conditional on loneliness was implemented. Loneliness was positively correlated with appearance comparisons and negatively correlated with body satisfaction but was not associated with active ($p = .59$) or passive social media use ($p = .99$). Loneliness did not moderate the relationships between social media use, appearance comparisons, and body satisfaction. Future directions and implications are discussed.

Keywords: loneliness; social media use; appearance comparisons; body satisfaction; young adults

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Table of Contents

List of Tables

List of Figures

Chapter 1.

Introduction

The developmental period of young adulthood renders individuals vulnerable to many psychological and emotional problems. Body dissatisfaction, defined as the negative attitudes that one holds towards their own physical appearance (Heider et al., 2018), is extremely prevalent among young adults (Neighbors & Sobal, 2007). Research has found body dissatisfaction to be a significant predictor of a variety of negative outcomes, such as low self-esteem and depression. Furthermore, body dissatisfaction has been identified as one of the most consistent and robust risk factors for the development of eating disorders (Dittmar, 2009; Grabe et al., 2008; Groesz et al., 2001). Eating disorders are characterized by a persistent disturbance of eating habits and/or weight-control behaviors that result in significantly impaired physical health and psychosocial functioning (American Psychiatric Association, 2022). Although estimates vary, the lifetime prevalence of eating disorders has been reported to be 0.3-1.6%. When subthreshold disordered eating is included, rates increase dramatically, with one study indicating that by age 20, 13.1% of individuals will have experienced an eating disorder (Stice et al., 2013). In addition, eating disorders frequently co-occur with other psychiatric illnesses such as mood disorders, substance use disorders, and anxiety disorders. For example, one study found that the majority of those with eating disorders met the criteria for at least one other lifetime mental disorder (Swanson et al., 2011). Risk of suicide is also elevated among those with eating disorders, as are mortality rates more generally (APA, 2022; Fichter & Quadflieg, 2016; Herzog et al., 2000). Because body dissatisfaction is a prominent risk factor for the development and maintenance of eating pathology (Stice & Shaw, 2002), identifying the variables that influence body satisfaction is essential in preventing eating disorders and their associated concerns (Fairburn & Harrison, 2003).

1.1. Social Media and Body Satisfaction

One variable that seems to decrease body satisfaction is the media (Thompson et al., 1999). Research investigating the impact of media influences, such as movies, magazines, and television programs, on body satisfaction has consistently shown that

exposure to thin-ideal media images is associated with increased body dissatisfaction. Grabe and colleagues (2008) conducted a meta-analysis on the relationship between the media and body satisfaction and found small to moderate effect sizes for this relationship. Across correlational studies, more frequent exposure to thin-ideal media was associated with lower levels of body satisfaction. Similarly, experimental research indicated that exposure to thin-ideal models resulted in decreased body satisfaction (Grabe et al., 2008). More recently, media influences have come to include social media. Similar to traditional media, social media, through social networking sites (SNS) such as Instagram and Facebook, has also been shown to correlate with body satisfaction. For example, Meier and Gray (2014) found Facebook (FB) appearance exposure (i.e. participants' use of FB photo applications relative to total FB use) to be negatively correlated with weight satisfaction, and Mclean et al. (2015) found that social media engagement was positively correlated with body dissatisfaction.

Although there is overlap between the characteristics of traditional media with those of social media, especially with regards to thin-ideal images, social media contains some unique features which have the potential to further exacerbate body dissatisfaction. For example, Perloff (2014) provides several distinctive attributes that have important implications for the effects of social media on body image concerns. First, social media is interactive, with users being both the creators and the consumers of content. Since individuals typically present idealized version of themselves on social media, SNSs tend to portray the appearances of users in an unrealistically positive light (Bailey et al., 2020). Second, social media provides a higher level of personal agency than other media platforms. Users are not passive receivers of content, rather they seek out and engage with what they would like to see and are able to do so at any time. Third, social media operates as an outlet that centers the individual, making it more personal than traditional media. As a result, individuals may encounter many "selfies" (digitized self-portraits). Fourth, social media is an interpersonally rich modality and contains cues that offer a feeling of presence. This feeling of presence allows individuals to experience genuine emotions in a virtual environment. Finally, social media creates communities of like-minded individuals, providing access to connections with similar others. Unlike traditional media, social media is not only comprised of celebrities but also includes peers and family. The tripartite model proposed by Thompson et al. (1999) highlights the importance of parents and peers on body satisfaction. This theory proposes that the

social environment consists of the media, parents, and peers and that all three can affect body satisfaction. By encompassing peers and parents in addition to more traditional thin-ideal content, social media acts as an outlet for all three of these prominent influences.

1.2. The Mediating Role of Appearance Comparisons

The relationship between social media and body satisfaction is often understood through a sociocultural framework. Sociocultural theory posits that the thin and muscularity ideals that exists in society are reinforced and transmitted by several sociocultural pressures such as the media. These ideals are aspired to by individuals despite the fact that for many, they are impossible to achieve, resulting in body dissatisfaction (Tiggemann, 2011; Tylka, 2021). The development and maintenance of body dissatisfaction as a result of these ideals can occur through several mechanisms, one of which is appearance comparisons (Holland & Tiggemann, 2016; Saunders & Eaton, 2018). Appearance comparisons are social-cognitive processes which involve making a judgement about one's appearance in comparison with others' appearances (Mclean et al., 2013; Saunders & Eaton, 2018), and they have been shown to mediate the relationship between media exposure and body satisfaction (Tiggemann & Miller, 2010).

Put forth by Festiner (1954), Social Comparison Theory states that humans possess a drive to evaluate themselves and that the necessity for self-evaluation is based on comparisons with others. Social comparison can be upward or downward, with upward social comparisons occurring when an individual compares themselves to someone they believe to be superior (Wheeler, 1966) and downward comparisons occurring when a comparison is made with someone perceived to be inferior (Wills, 1981). With regards to body image, those who engage in upward appearance comparisons by comparing themselves with those whom they believe to be more attractive may be at an increased risk of negative body image. While downward appearance comparisons were previously thought to protect individuals against body satisfaction, results from more recent research suggests that these relationships are complicated (Saunders & Eaton, 2018). For instance, Rancourt et al. (2016) reported that while upward comparisons were associated with lower body satisfaction among women of all racial/ethnic groups, downward appearance comparisons were detrimental

for Hispanic/Latina women but were protective for Asian and White women. In addition, Lin and Solby (2016) identified an interaction effect between upward and downward appearance comparisons and body image variables and concluded that downward appearance comparisons do not buffer individuals against the detrimental effects of upward comparisons, and may in fact increase negative body image outcomes.

The mediating role of appearance comparisons in the relationship between traditional media images and body satisfaction is well established, with research finding that people's tendency to compare their own appearance to the appearance of others accounts for the relationship between media exposure and body satisfaction (Tiggemann & McGill, 2004; Tiggemann & Slater, 2004). Because individuals typically present an idealized version of themselves on SNSs, these comparisons are likely to occur through social media use as well (Bailey et al., 2020; Fardouly & Vartanian, 2015). Support for the mediating role of appearance comparisons in the relationship between social media use and body satisfaction comes from correlational and experimental research. For example, one study found that even after controlling for age and self-esteem, time spent engaging in comparisons significantly mediated the relationship between online appearance-related activity and body satisfaction (Scully et al., 2020). Likewise, another study found that relative to travel images, exposure to celebrity and peer images on Instagram increased body dissatisfaction and that this effect was mediated by state appearance comparison (Brown & Tiggemann, 2016). Moreover, this relationship has not only been demonstrated in adolescent and young adult women but in adult men, adolescent boys, and in children as well (Jarman et al. 2021; Modica, 2020; Rousseau et al., 2017; Tatangelo & Ricciardelli, 2017).

Importantly, individuals seem to be engaging in appearance comparisons more frequently on social media compared to other media platforms such as television, magazines, and billboards (Fardouly et al., 2017). One explanation for this finding is that social media consists of more relevant comparison targets. Research on the influence of peers, celebrities, and models on body satisfaction has found that peers in particular play a more influential role in shaping body image, and appearance comparisons to peers may have a stronger association with body image concerns than appearance comparisons to models or celebrities (Fardouly & Vartanian, 2015). Because peers are important comparison targets, they may be exerting a stronger influence on body image partly through social media and this influence may be much more detrimental than the

one exerted by celebrities and models through traditional media (Tiggemann & Zaccardo, 2015). Although the increased frequency of appearance comparisons on social media may be the result of the relative relevance of peers as comparison targets, this finding may also be due to the fact that social media is more widespread and easily accessible than traditional media.

1.3. Uses and Gratification Theory

Despite the abundance of research showing the negative effects that social media can have on body satisfaction, its use among young adults has continued to increase. Young adults between the ages of 18–29 remain the group with highest social media usage and 84% report using social media on a regular basis (Social Networking Fact Sheet, 2021). This increase in social media use among individuals regardless of the associated negative outcomes may be partially explained by the Uses and Gratification Theory (Katz et al., 1973). This theory views the audience as active and motivated in their media use. When applied to social media, this indicates that the media consumption habits of users of SNSs are guided by specific needs that they seek to gratify. Therefore, the observed increase in social media use in recent years may be due to some unique gratifications that users are obtaining from social media.

Research investigating the reasons behind why individuals use social media has identified several key gratifications that individuals attain such as relationship formation and maintenance, social interaction, communication, information seeking, entertainment, relaxation, and social surveillance (Joinson, 2008; Quan-Haase & Young, 2010; Whiting & Williams, 2013). Furthermore, one study found that distinct types of gratification were associated with different patterns of usage, with social connection gratification relating to increased frequency of use and content gratifications relating to increased time spent on the site (Joinson, 2008). A more recent study found motivations for social media use, such as social interaction, social capital, and appearance feedback, to be associated with increased social media engagement (Jarman et al., 2021). Therefore, although social media use is associated with many negative outcomes, it is likely that online social interaction provides opportunities for need gratification that may not be met offline (Bachner-Melman et al., 2018). In addition, the type of need being gratified may be related to the extent to which the outcome of social media use is negative. For some, social media may be acting as a tool for facilitating self-evaluation while for others, social

media use may be fulfilling a need for social connection. Although both groups may encounter similar opportunities for making appearance-related comparisons, the former group could be at greater risk for actually engaging in these comparisons (Saunders & Eaton, 2018). Thus, when conducting research on social media use and body satisfaction, it is important to simultaneously consider factors that may be motivating individuals to use social media, allowing for a more comprehensive understanding of processes. In particular, more nuanced relationships between social media use, appearance comparisons, and body satisfaction that are dependent on the reasons why individuals are using SNSs may exist (Perloff, 2014; Saunders & Eaton, 2018). Given that many individuals use social media for social connection, the role of loneliness is important to explore. A meta-analysis conducted by Song et al. (2014) reported that lonely individuals use social media to seek out social support, further highlighting the importance of examining loneliness within the context of social media use, appearance comparisons, and body satisfaction.

1.4. Loneliness

1.4.1. Loneliness and Health

Loneliness is defined as an aversive state resulting from a discrepancy between one's desired and perceived interpersonal relationships (Peplau & Perlman, 1982) and like social media use, it has been linked with negative outcomes. The effects of loneliness seem to accumulate over time resulting in the acceleration of physiological aging and an increased risk of mortality (Hawkley & Cacioppo, 2007; 2010; Holt-Lunstand et al., 2015). Moreover, the detrimental effects of loneliness persist across the lifespan, with one study reporting socially isolated children to be at greater risk of health problems as adults. Specifically, loneliness in childhood was associated with a number of cardiovascular health risks such as BMI, blood pressure, and cholesterol levels in adulthood (Caspi et al. 2006). Furthermore, the impact of loneliness extends from physical health to mental health. Richardson and colleagues (2017) found that higher levels of loneliness were linked to greater severity of mental illness and that greater baseline loneliness predicted higher levels of anxiety, depression, and poorer global mental health. With regards to eating disorders, Richardson et al. (2017) reported that greater baseline loneliness predicted heightened eating disorder risk. However, the

relationship between eating disorders and loneliness appeared to be bi-directional, as the authors also found that baseline eating attitudes predicted increased loneliness. They concluded that those who are at risk of developing an eating disorder are more likely to be lonely and this loneliness subsequently worsens eating disorder symptoms. In another study, loneliness was also found to be a mediator in the relationship between emotional dysregulation and both Bulimia Nervosa and Binge Eating Disorder (Southward et al., 2014). In addition, perceived social isolation appears to be associated with increased binge eating after controlling for dietary restraint and negative affect and was determined to be a unique predictor of binge eating (Mason et al., 2016). Research has also identified social support to be a protective factor for binge eating (Mason & Lewis, 2017). Furthermore, many characteristics associated with loneliness such as poor interpersonal attachment, negative self-esteem, and lack of trust, are prevalent in eating disorders (Levine, 2012).

Although a plethora of literature on the association between loneliness and physical and mental health exists, few studies have investigated the relationships between loneliness and body satisfaction. More broadly, Goswick and Jones (1981) reported that loneliness was related to more negative self-concepts and more self-focus, while Stephan and colleagues (1988) found loneliness to be correlated with self-esteem. More specifically, Prichard and Yalch (2008) reported that variations in loneliness significantly accounted for variations in body satisfaction for both men and women. They also found that loneliness mediated the relationship between interpersonal dependency and body satisfaction in both men and women. Recently, Barnett et al. (2020) examined body image satisfaction and loneliness among young adults and older adults and found these two variables to be correlated in both age cohorts, though the association was found to be stronger in young adults compared to older adults. While preliminary evidence suggests that loneliness and body satisfaction may be related, more research is needed to elucidate their relationship.

1.4.2. Loneliness and the Pandemic

Given that loneliness is associated with negative physical and mental health outcomes, it is not surprising that social support has been identified as a key predictor of mental and physical wellbeing and a prominent coping mechanism amongst human beings. Whether suffering from bereavement or natural disasters, social support is

critical in protecting individuals from the negative outcomes associated with these events (Saltzman et al., 2020). For example, in the aftermath of trauma, social support has been identified as one of the strongest buffers against the development of Post-Traumatic Stress Disorder (Ozer et al., 2003). However, as a result of the outbreak of the novel coronavirus disease 2019 (COVID-19), government mandated physical restrictions have made social support more difficult to acquire. Although the consequences of social isolation remain largely unknown, one anticipated effect is an increase in loneliness among vulnerable individuals. Before the outbreak of COVID-19, loneliness was relatively common, with 15 to 30% of the general population experiencing chronic loneliness (Hawkley & Cacioppo, 2010). Preliminary evidence for increases in loneliness due to pandemic-related social isolation comes from a study which found that rates of loneliness increased from January to April of 2020 (Lee et al., 2020). In contrast, another study found that individuals have shown notable resilience in terms of social connection and loneliness during the early months of the pandemic (Luchetti et al., 2020). Increased online connection facilitated by social media may be a contributing factor to the latter results. Specifically, it may be that social media use increased in response to the lack of offline social connection during the pandemic, allowing for more social support to be obtained online. Among adolescents, those who were feeling lonely as a result of COVID-19 were more inclined to use social media to cope with the lack of social contact (Cauberghe et al., 2020). However, given the current timeline, more research is needed to understand the trajectories of loneliness and social media use across the pandemic and their long-term implications.

1.4.3. Loneliness and Social Media Use

In a world that has become increasingly physically disconnected (Olds & Schwartz, 2010), SNSs are commonly used as communication tools. Although social media does allow individuals to stay connected, its effectiveness in decreasing loneliness is not straightforward. For example, Moody (2001) investigated internet use more broadly and its relation to loneliness and found that high internet use was associated with decreased social loneliness (feeling of boredom and marginality due to lack of meaningful friendships or sense of belonging to a community) but greater emotional loneliness (feeling of emptiness and restlessness due to the lack of intimate relationships). The article concluded that the impact of the internet on emotional well-

being may be more complex than previously thought and cannot be viewed as exclusively negative or positive. Similarly, Amichai-Hamburger and Artzi (2003) found that the relationship between internet use and loneliness is not direct. In fact, personality characteristics such as extroversion and neuroticism were related to loneliness and internet use. They concluded that the internet is not unhealthy for everyone, rather for certain people, if used the correct way, it has the potential to enhance wellbeing. More recently, Pittman and Reich (2016) investigated social media use and loneliness and found that the relationship among these two variables differed in relation to the type of social media. They reported that while text-based social media use appears to be unrelated to loneliness, image-based social media use was associated with decreased loneliness.

To better understand the relationship between loneliness and social media, two theories have been put forth. *The displacement hypothesis* states that loneliness is positively associated with internet use because it results in people displacing offline relationships and activities with online ones. On the other hand, *the simulation hypothesis* posits that social technologies can be useful in reducing loneliness by enhancing existing relationships and offering opportunities to form new ones (Valkenburg & Peter, 2007). Support for both hypotheses has been found with one study reporting that Facebook use for making new friends reduced peer-related loneliness over time, whereas Facebook use for social skills compensation increased peer-related loneliness over time. It was concluded that depending on adolescents' Facebook motives, either the displacement or the stimulation hypothesis can be applicable (Teppers et al., 2013). Moreover, Nowland and colleagues (2017) highlight that these two hypotheses do not need to be mutually exclusive and that technology can be used in ways that enhance or hinder offline social interactions. Likewise, Clark et al. (2018) suggest that SNSs can be beneficial when they are used to make meaningful social connections with others but can be harmful when acting as tools for social comparison or when encouraging physical isolation.

1.5. Active and Passive Social Media Use

Because the ways in which people use social media can vary, some researchers have argued that it is not necessarily the time spent on SNSs but the type of content that people engage with and their level social media engagement that matters (Yang &

Brown, 2013). Complicating matters is the fact that the number of social media platforms that individuals can partake and the content that these platforms deliver has greatly increased over the last decade, leading to larger variability in how individuals spend their time on SNSs. Whereas in previous years, there were limits to what one could engage with online, now, two individuals can spend the same amount of time on social media and have vastly different experiences. But the differences do not end there. Even within SNSs, algorithms have allowed for the construction of individualized online worlds, where individuals on the same apps are living in different content realities. While some individuals are targeted with cooking and fashion videos, others are mainly seeing sports and comedy clips. In addition, one's level of engagement can vary from scrolling through content to creating and posting content. In fact, researchers have differentiated between these online behaviors and have termed them active social media use and passive social media use. Active social media use is defined as online behavior that facilitates direct exchanges between users and includes actions such as liking and commenting. In contrast, passive social media use refers to the monitoring of others without any direct engagement (Trifiro & Gerson, 2019). When using social media passively, information is consumed without any communication with the content's owner (Verguyn et al., 2017).

The existing body of literature on active and passive social media use has found contrasting consequences for wellbeing. With respect to loneliness, previous research has determined that active engagement on Facebook is negatively related to loneliness (i.e., active usage promotes feeling connected), whereas the opposite holds for passive engagement (Matook et al., 2015; Ryan & Xenos, 2011). In addition, experimentally induced active social media use was found to reduce loneliness (Deters & Mehl, 2013). Active and passive social media use have also been differentially implicated in social comparison as well. In several cross-sectional studies, a positive relationship was found between passive usage of Facebook and envy, but no significant relationship was observed for active Facebook usage (Krasnova et al., 2015; 2013; Tandoc et al., 2015). Passive Facebook usage has been found to increase feelings of envy longitudinally as well (Verduyn et al., 2015). In terms of experimental research, studies have found that those who tend to engage in comparisons are lower in appearance satisfaction/self-perceptions after passive Facebook use (Fardouly et al., 2015; Vogel et al., 2015). In sum, whether or not SNSs increase or decrease loneliness and social/appearance comparisons depends on the individual's underlying tendencies as well as their level of

engagement. SNSs have the capacity to increase an individual's subjective well-being by allowing them to increase their social capital and feelings of connectedness through active usage of these sites. However, they can also be a significant source of distress, especially when they elicit social comparisons and envy when being used passively.

1.6. Relationships Between Loneliness, Social Media Use, Appearance Comparison, and Body Satisfaction

Although social media use is linked with many negative outcomes, its use does not appear to be exclusively maladaptive, especially when it comes to loneliness. On the one hand, research has established that appearance comparisons are one mechanism whereby social media use influences body satisfaction. On the other hand, certain types of social media use seem to alleviate loneliness and may even provide social support. Therefore, social media use may be harmful with regards to its impact on body satisfaction but helpful when it comes to alleviating loneliness. For example, Walker and colleagues (2015) speculate that when SNSs are not used as a tool to physically compare oneself to peers, social media use could decrease loneliness. Along the same lines, one study found that abstaining from social media use could result in increased loneliness (Vally & D'Souza, 2019), while another reported that Instagram use was associated with lower loneliness only for people who were less inclined to engage in social comparison (Yang, 2016). Thus, it is possible that social media use is simultaneously adaptive and maladaptive when both body satisfaction and loneliness are considered. Furthermore, differing levels of body satisfaction and loneliness may interact with each other and produce divergent outcomes. The relationships between loneliness, social media use, appearance comparisons, and body satisfaction should be further investigated in order to improve our understanding of these variables.

1.7. The Present Study

Based on an extensive body of literature, relationships exist between loneliness and social media use as well as social media use and body satisfaction. Furthermore, appearance comparisons seem to play an important role across these three variables. However, research has not yet explored the relationship between active social media use, passive social media use, loneliness, appearance comparisons, and body

satisfaction simultaneously. The current study will address this gap in the literature by examining the associations between these five variables as well as determining whether the indirect effects of active and passive social media use on body satisfaction through appearance comparisons are moderated by loneliness.

1.8. Hypotheses

1) Loneliness will be positively correlated with appearance comparisons and negatively correlated with body satisfaction.

2) Loneliness will be positively correlated with passive social media use and negatively correlated with active social media use.

3) Passive social media use will be positively correlated with appearance comparisons and negatively correlated with body satisfaction.

4) Active social media use will be positively correlated with body satisfaction and negatively correlated with appearance comparisons.

5) The frequency of appearance comparisons will mediate the effect of social media use on body satisfaction.

6) Loneliness will moderate the indirect effect of social media use on body satisfaction via appearance comparison.

Chapter 2.

Methodology

2.1. Participants

Recruitment was conducted as part of a larger study on social media use and well-being. Participants were recruited using several methods. University students were recruited using an advertisement describing the study's goal of investigating social media use and well-being. This advertisement was posted on the online Research Participation System (RPS) of Simon Fraser University, as well as distributed through flyers and notices around campus. Additional participants were recruited from the University of British Columbia Department of Psychology's Paid Participation Pool as well as online forums, emails, and posters distributed in the community. Only participants between the ages of 17 to 29 who currently own and operate a smartphone were included in the analyses, given that social media use is especially common among adults under 30 years of age (Auxier & Anderson, 2022). Body dissatisfaction and loneliness also tends to be elevated among young adults (Barnett et al., 2020). The final sample consisted of 311 participants which was consistent with the number of participants required to obtain a power of .98 with an R^2 of .39 (i.e., to detect a medium effect size with conditional process analyses using percentile-based bootstrapped confidence intervals; Preacher et al., 2007).

2.2. Procedures

The following procedures were approved by Simon Fraser University's Research Ethics Board as part of a harmonized review. Data was collected as part of a larger study investigating social media use and well-being. Participants received a link to the study survey after signing up to participate. Participants who signed up to participate on the RPS website chose a date and time for completion. Each participant was emailed instructions, a participation number, and a link to the survey. Participants completed the 60-minute survey on their own personal device within seven days of receiving the study link. If participants had not completed the survey within the first three days of the initial invitation, a reminder email was sent. If six days after the initial survey email a

participant had not yet completed the survey, a second reminder email was sent. The reminder emails informed participants of their upcoming deadline to complete the online survey.

Upon clicking the study link, participants were directed to the online survey platform (REDCap). Before beginning the questionnaires, participants were asked to provide informed consent to participate in the study. After consenting to participate, participants began the study by responding to measures assessing their demographics, loneliness, body satisfaction, appearance comparisons, and active and passive social media use, in addition to questionnaires that were part of the larger study. To control for ordering effects, the questionnaire measures were presented in a randomized order by REDCap. However, the specific items within each questionnaire were not randomized. After completing the online survey, participants received 3 RPS credits for their participation or were entered in a draw to win one out of ten $25 gift cards.

2.3. Measures

2.3.1. Demographics and Anthropometric Measurements

To obtain socio-demographic data (i.e., age, sex, gender identity, sexual orientation, and ethnic-cultural background), participants completed a questionnaire developed for this study. Participants were also asked to provide their weight and height and from this information, body mass index (BMI; weight (kg)/height (m^2)) was calculated.

2.3.2. Appearance Comparisons

The frequency of appearance comparisons that individuals engage in was assessed using the Total Frequency subscale of the Physical Appearance Comparison Scale – 3 (PACS-3; Schaefer & Thompson, 2018). Participants rated how often they engage in different types of comparisons using a 5-point Likert scale ranging from 1 *(never)* to 5 *(almost always).* Items were averaged to yield a mean score with higher scores indicating greater frequency of appearance comparisons. The PACS-3 has demonstrated excellent internal consistency (α = .94 for men, 0.91 for women) in a normative sample. In the current study sample, this measure also demonstrated

excellent internal consistency (α = 0.90). Additionally, support has been found for the convergent validity and incremental validity of the PACS-3 Frequency scores. More specifically, the PACS-3 Total Frequency subscale was found to predict unique variance in body satisfaction. Finally, the test-retest reliability for the PACS-3 subscales were good, with an interclass correlation coefficient of 0.85 for the Total Frequency subscale. (Schaefer & Thompson, 2018).

2.3.3. Body Satisfaction

Participants' perceived body satisfaction was assessed with the Body Areas Satisfaction Scale, a 9-item subscale of the Multidimensional Body-Self Relations Questionnaire (BASS; Brown et al., 1990). The BASS measures the degree of body satisfaction of specific body parts, weight, height, muscle tone, and appearance on a 5-point Likert scale ranging from 1 (*very dissatisfied*) to 5 (*very satisfied*). Items were averaged to yield a mean score, with higher scores indicating greater satisfaction with bodily features. Strong psychometric findings of the BASS have been demonstrated in both adults and adolescents, and research has confirmed the convergent, discriminant, and construct validity of the overall measure (Cash, 2000; Marco et al., 2017). The test-retest reliability (r = 0.86 for males; r = 0.74 for females) and internal consistency (α = 0.73 for females; α = 0.77 for males) of the BASS were found to be acceptable (Cash, 2015). The internal consistency of the BASS in the current study sample was good (α = 0.84).

2.3.4. Loneliness

The 20-item UCLA Loneliness Scale Version 3 (UCLA LS3; Russell, 1996) was utilized to assess subjective feelings of loneliness. Responses ranged from 1 (*never*) to 4 (*always*) and scores for each item were summed together to produce a total score. Higher scores indicated greater degrees of loneliness. Psychometric data has supported the reliability and validity of the UCLA LS3 in assessing loneliness in a variety of populations (Russel, 1996). In particular, the measure was determined to have high internal consistency (α = 0.92) in sample of college students. Similarly, in the current sample, internal consistency was calculated to be α = 0.93. Further, this measure was found to be strongly positively correlated with the NYU Loneliness scale and the Differential Loneliness Scale but negatively associated with measures of social support,

supporting its convergent validity. The discriminant validity of this measure was supported by confirmatory factor analysis which indicated that loneliness and social support represented highly intercorrelated but distinct factors that were differentially related to measures of mood and personality

2.3.5. Active and Passive Social Media Use

Active and passive social media use was assessed using a 7-item measure that was validated for research (Li, 2016). The first three items on this measure assessed passive social media use and next four items assessed active social media use. Respondents rated their active and passive social media use on a 6-point Likert scale ranging from 1 (*never*) to 6 (*several times a day*). With respect to active social media use, example items include “How often do you like, favourite, vote, or react to content on social media sites?” and “How often do you comment on, or respond to someone else’s content on social media sites?”. In terms of passive social media use, sample items include “How often do you watch videos or view pictures posted on social media sites?” and “How often do you read comments/reviews on social media sites?”. The sum of items 1-3 yielded the passive social media use score and the sum of items 4-7 yielded the active social media use score, with higher scores reflecting a higher level of passive and active social media use, respectively. The active ($\alpha = 0.90$) and passive ($\alpha = 0.81$) social media use scales demonstrated high internal consistency. In the current sample, internal consistency was found to be somewhat lower but still within an acceptable range ($\alpha = 0.69$ for active social media use; $\alpha = 0.74$ for passive social media use). The active and passive social media use measure also demonstrated convergent validity as indicated by high factor loadings (0.95 of active social media use; 0.90 for passive social media use) (Li, 2016).

2.4. Data Analytic Approach

2.4.1. Preliminary Power Analyses

To control for Type I error, the alpha level was set at .05. Then, to further reduce the risk of Type I error for multiple comparisons, the Bonferroni correction was applied ($\alpha = .05$ divided by the number of bivariate correlations that were computed; .05/10 = .005). To control for Type II error, empirical power was calculated, revealing that a minimum of

200 participants was required to obtain a power of .98 with an R^2 of .39, when aiming to detect a medium effect size with conditional process analyses using percentile-based bootstrapped confidence intervals (Preacher et al., 2007).

2.4.2. Data Inspection and Assumption Checking

Choices regarding how to account for missing data were based on the quantity and pattern of the missing data in the current study. According to Schafer (1999), a missing data rate that is low (5% or less) is considered insignificant. Therefore, mean response substitution, whereby participant's missing values were substituted with their mean response, was only completed for the UCLA Loneliness Scale since the number of participants with missing items on this measure was higher than 5% (UCLA LS3 = 5.1% missing), in contrast to the other study measures, which were all below 5% (BASS = 4.4% missing, PACS-3 = 1.9% missing, ASMU = 1.3% missing, PSMU = 1.3% missing). With respect to missing items within the UCLA LS3, mean response substitution was not used if greater than or equal to 10% of items were missing. Because the proportion of missing data across all of the other study measures was low (less than 5%), listwise deletion was considered the most appropriate method for all analyses, with the exclusion of correlational analyses, where pairwise deletion was used (Tabachnik & Fidell, 2018).

Through the inspection of box-plots and Z-scores for each of the main study variables, the data was examined for the presence of univariate outliers (Tabachnick & Fidell, 2018) and three cases were identified (i.e. according to Z-score cut offs of < -3.29 or > 3.29 as suggested by Tabachnick & Fidell, 2018). However, because their discrepancy from the mean was not due to error in responding and they did not significantly impact the study's results, they were retained in the analyses. Violations of assumptions of normality were assessed by examining skewness and kurtosis as well as conducting the Kolmogorov-Smirnov test. When using skewness and kurtosis to assess for normality, normality assumptions were satisfied for all variables (i.e. skewness < 2.0, kurtosis < 7.0; Curran et al., 1996). In contrast, the Kolmogrov-Smirnov test showed that assumptions of normality were not met for appearance comparisons, active social media use, and passive social media use. However, minor violations to the assumption of normality do not influence the validity of results from a regression analysis unless sample size is very small (Hayes, 2022). Given that the sample size for this study was adequate (n = 311), the minor deviations from normality that were observed were not

considered to influence the results. Scatterplots of the standardized regression residuals and standardized predicted values were used to assess for linearity and homoscedasticity. The regressions were determined to be fairly linear and consistency in the vertical range across the X-axis of the scatterplot indicated homoscedasticity. There was also no evidence of multicollinearity as all correlations among the variables were below .7 (Tabachnick & Fidell, 2018) and the Variance Inflation Factors (VIFs) were between 1 and 2 (i.e., VIF cut-off of 2.5 according to Johnson et al., 2018). Because the Durbin-Watson statistic was below 3, the values of the residuals were deemed to be independent (Field, 2017).

2.4.3. Primary Analyses

All analyses were calculated using SPSS version 27 (IBM, 2020). Descriptive statistics were calculated for socio-demographic and anthropometric measurements as well as the main study variables. Demographic and anthropometric variables were included as covariates only if a strong theoretical basis or empirical support for their inclusion was evident. To examine the associations between the main study variables, Pearson product moment correlations were computed.

To examine the direct and indirect effects of social media use on body satisfaction and to determine whether the relationship between social media use, appearance comparisons, and body satisfaction was dependant on loneliness, a moderated mediation model was employed (Hayes, 2021). Conditional process analyses were conducted using the PROCESS macro in SPSS (Version 4; Hayes, 2021) in order to address the following research questions: 1) Do appearance comparisons mediate the relationship between active/passive social media use and body satisfaction? And 2) Does loneliness moderate the indirect effect of active/passive social media use on body satisfaction? To test whether loneliness moderated the path from social media use to appearance comparisons (depicted as path *a* in Figure 1 and Figure 2), the Model 7 PROCESS template was used. In the first model (Figure 1), active social media use was entered as the independent variable (X), frequency of appearance comparisons was considered the mediating variable (M), body satisfaction was the dependent variable (Y), and loneliness was the moderator (W). In the second model (Figure 2), passive social media use was entered as the independent variable (X) but all other variables remained consistent. A bootstrap with N = 10,000 resamples was employed in order to minimize

sampling error. To decrease the risk of Type I error for multiple comparisons, interaction terms (paths a, b, and c') were considered significant at $p < .01$. Conditional indirect effects and moderated mediation analyses (as indicated by the index of moderated mediation) were deemed significant when the 95% percentile bootstrap confidence intervals (PB CI) did not contain zero. PROCESS provided unstandardized regression coefficients and standard errors.

Figure 1. Theoretical Model 1

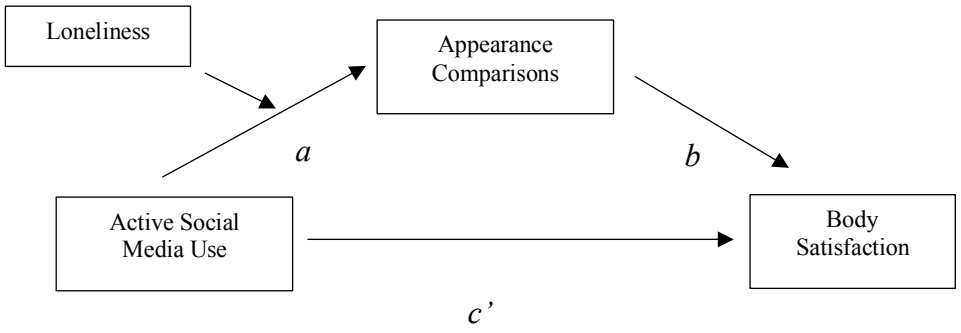
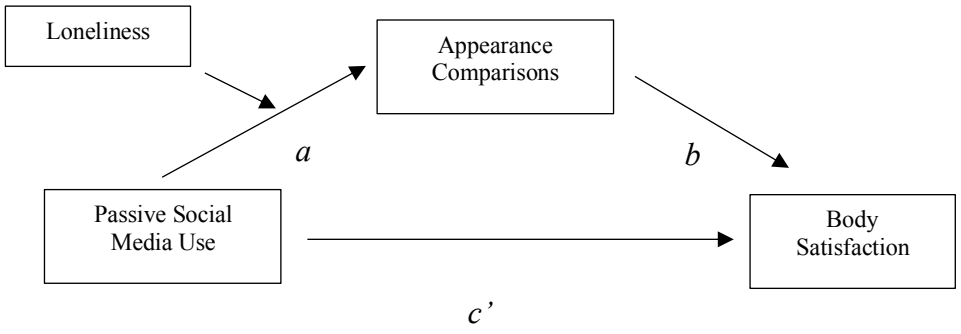


Figure 2. Theoretical Model 2



Chapter 3.

Results

3.1. Descriptive Statistics

Means and standard deviations of the main study variables are presented in Table 1. Participant demographics are discussed below. The sample consisted of 311 young adults (*n* = 122 males, *n* = 188 females, n = 1 missing, according to sex assigned at birth) between the ages of 17 and 29 (*M* = 19.99, *SD* = 2.39). In terms of current gender identity, 58.8% of the current sample self-identified as females (*n* = 183), 39.2% (*n* = 122) self-identified as males, 1.3% (*n* = 4) chose not to disclose or did not respond, and 0.6% (*n* = 2) self-identified as non-binary. Pertaining to sexual orientation, 83.9% (*n* = 261) self-identified as heterosexual, 8.7% (*n* = 27) self-identified as bisexual, 3.8% (*n* = 12) preferred not to say or did not respond, 1.9% (*n* = 6) self-identified as homosexual, and 1.6% (*n* = 5) self-identified as "other". With respect to ethnicity, 25.1% (*n* = 78) identified as Caucasian, 24.8% (*n* = 77) as East Asian, 22.8% (*n* = 71) as South Asian, 10.9% (*n* = 34) as multi-racial or "other", 10% (*n* = 31) as Southeast Asian, 4.2% (*n* = 13) as Middle Eastern, 1.3% (*n* = 4) as Latino/Hispanic, 0.6% (*n* = 2) as African, and 0.3% (*n* = 1) did not respond. The mean BMI of male (*M* = 23.50, *SD* = 3.22) and female (*M* = 21.863, *SD* = 3.68) participants were both in the normal range.

Table 1. Descriptive Statistics

	Score Range	M	SD	Minimum	Maximum	Skewness	Kurtosis
Active Social Media Use	4-24	13.63	4.37	4.00	24.00	.18	-.17
Passive Social Media Use	3-18	14.62	3.31	3.00	18.00	-.89	.33
Appearance Comparisons	1-5	2.74	.82	1.00	4.63	-.32	-.18
Body Satisfaction	1-5	3.39	.70	1.67	5.00	.08	-.25
Loneliness	20-80	45.25	10.88	20.00	73.00	-.03	-.44

3.2. Relationships Between Loneliness, Social Media Use, Appearance Comparisons, and Body Satisfaction

Correlations between the main study variables are presented in Table 2. Consistent with hypothesis 1, loneliness was found to be significantly positively correlated with appearance comparisons and significantly negatively correlated with body satisfaction. Contrary to hypothesis 2, active and passive social media use were not significantly associated with loneliness. Hypotheses 3 and 4 were also not supported as active and passive social media use were not significantly correlated with appearance comparisons or body satisfaction. Because sex assigned at birth, age, and BMI were not significantly correlated with any of the main study variables, they were not included as covariates in the moderated mediation analyses.

Table 2. Correlations Among Main Study Variables

	Active Social Media Use	Passive Social Media Use	Appearance Comparisons	Body Satisfaction	Loneliness
Active Social Media Use	1	.41**	.14	-.12	-.03
Passive Social Media Use		1	.15	-.08	.00
Appearance Comparisons			1	-.50**	.29**
Body Satisfaction				1	-.31**
Loneliness					1

** $p < 0.005$ (Bonferroni-Adjusted Alpha Level)

3.3. The Direct and Indirect Effects of Social Media Use on Body Satisfaction

The results of the moderated mediation analyses for Model 1 are shown in Table 3. The overall model was significant ($F(2, 295) = 52.05$, $p < 0.001$) and explained 26.10% of the total variance. While active social media use did not directly influence body satisfaction (coefficient = -0.01, *SE* = 0.01, 95% CI: -0.03 to 0.01), it did have an indirect effect on body satisfaction through appearance comparisons (coefficient = -0.01 *SE* = 0.00, 95% CI: -0.02 to -0.00). The conditional indirect effect of active social media use on body satisfaction through appearance comparisons was not moderated by loneliness (index of moderated mediation = -0.00, *SE* = 0.00, 95% CI: -0.00 to 0.00). In

other words, the indirect relationship between active social media use and body satisfaction via appearance comparisons was not dependent on levels of loneliness.

The results of the moderated mediation analyses for Model 2 are shown in Table 4. The overall model was significant ($F(2, 295) = 51.17$, $p < 0.001$) and explained 25.8% of the total variance. Passive social media use did not have a direct effect on body satisfaction (coefficient = -0.00, *SE* = 0.01, 95% CI: -0.02 to 0.02), rather indirectly influenced body satisfaction through appearance comparisons (coefficient = -0.02, SE = 0.01, 95% CI: -0.03 to -0.00). Conditional process analyses revealed that loneliness did not moderate the indirect effect of passive social media use on body satisfaction through appearance comparisons (index of moderated mediation = -0.00, *SE* = 0.00, 95%CI: -0.00 to 0.00). This finding indicates that the indirect effect of passive social media use and body satisfaction via appearance comparisons did not differ according to levels of loneliness.[1]

[1] The analyses for Model 1 and Model 2 were re-run while controlling passive social media use and active social media use, respectively. The results generally remained the same with regards to significance, except with respect to the indirect effect of active and passive social media use on body satisfaction through appearance comparisons no longer being significant.

Table 3. Ordinary Least Squares Regression Coefficients for Model 1

	M (Appearance Comparisons)			Y (Body Satisfaction)		
X (Predictor)	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*
Active Social Media Use	-0.04	0.05	.36	-0.01	0.01	.24
Loneliness	0.00	0.01	.94	-	-	-
Active Social Media Use X Loneliness	0.00	0.00	.12	-	-	-
Appearance Comparisons	-	-	-	-0.42	0.04	<.001
	$R^2 = 0.11$ $F(3, 294) = 12.32$, $p < .001$			$R^2 = 0.26$ $F(2, 295) = 52.05$, $p < .001$		

Table 4. Ordinary Least Squares Regression Coefficients for Model 2

	M (Appearance Comparisons)			Y (Body Satisfaction)		
X (Predictor)	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*
Passive Social Media Use	- 0.03	0.06	.63	-0.00	0.01	.80
Loneliness	0.00	0.02	.97	-	-	-
Passive Social Media Use X Loneliness	0.00	0.00	.25	-	-	-
Appearance Comparisons	-	-	-	-0.42	0.04	<.001
	$R^2 = 0.11$ $F(3, 294) = 11.87$, $p < .001$			$R^2 = 0.26$ $F(2, 295) = 51.17$, $p < .001$		

Chapter 4.

Discussion

Given the prominence of SNSs in many people's daily life, research examining the impact of social media on users' mental health is important. Additionally, because the social media landscape is constantly shifting, the literature on social media use requires continuous updating. Although the associations between loneliness and several aspects of mental health, including depression, anxiety, and suicidal ideation, have been well-documented, loneliness' relation to body satisfaction and appearance comparisons is understudied (Beutel et al., 2017; Matthews et al., 2019). Furthermore, though previous research has demonstrated the robust effect of social media use on body satisfaction through appearance comparisons, the role of loneliness in this relationship remains unexplored. This study addressed these research gaps by examining the associations between loneliness, social media use, appearance comparisons and body satisfaction as well as the moderating role of loneliness on the indirect effect of social media use on body satisfaction through appearance comparisons. While previous studies have predominantly focused on overall SNS use, this study examined both active and passive social media use in order to account for the variability in the types and levels of engagement across individuals. Given that these data were collected during the COVID-19 pandemic, this study also provided a snapshot of the social media landscape during this unique time period.

As expected, this study found that loneliness was significantly negatively associated with body satisfaction. This finding is consistent with the results of a recent cross-sectional study conducted by Barnett and colleagues (2020) which found body image satisfaction and loneliness to be associated in both young adults and older adults. While Barnett et al., (2020) also found evidence for the direct and indirect effects of body image satisfaction on loneliness, they suggest that the reverse relationship is also possible, especially since their results were correlational. More specifically, they stated that higher levels of loneliness could result in increased body dissatisfaction since previous studies have found that loneliness triggers hypervigilance and increased perceived social threats (Hawkley & Cacioppo, 2010). Future research should examine the directionality of this relationship using experimental and longitudinal designs. If

loneliness leads to body dissatisfaction, preventative interventions could be implemented in order decrease loneliness. If evidence of the opposite relationship is found, preventative interventions should target body satisfaction instead. Consistent with expectations, loneliness was also significantly positively correlated with appearance comparisons, providing additional support for the suggestion that loneliness triggers hypervigilance. This finding also further highlights the importance of future research on the relationship between loneliness and appearance-related variables.

With respect to the associations between social media use, body satisfaction, and appearance comparisons, this study found that active social media use was not significantly correlated with body satisfaction or appearance comparisons. These results are somewhat unsurprising given that several studies have found active social media use to be unrelated to well-being (Valkenburg, 2022). Furthermore, it is feasible that body satisfaction and appearance comparisons may be less impacted by active types of social media usage, such as liking and commenting, and instead are more influenced by time spent on image-based SNSs or exposure to certain types of SNS content. For instance, two people could be spending the same proportion of time actively engaging with content but one person could be spending thirty minutes a day on social media whereas another could be spending hours daily. Similarly, two individuals can “like” the same number of pictures on a SNS but one may be mainly liking photos of thin peers while another could be liking landscape photos, primarily. This highlights the importance of considering time spent on SNSs, type of SNS usage, and type of SNS content simultaneously when investigating the impact of social media use on mental health outcomes. The development of a measure of social media use that can account for all three of these variables would be greatly beneficial. Future research should also determine whether distinctive aspects of social media use are differentially related to different components of well-being.

In contrast to hypotheses, passive social media use was not significantly related to appearance comparisons. This finding is inconsistent with previous research that has found passive social media use to be associated with social comparisons and envy (Krasnova et al., 2013, 2015; Tandoc et al., 2015). Researchers have also formerly suggested that passively using social media may elicit upward social comparisons (Verduyn et al., 2017) and one study identified the mediating role of social comparisons in the relationship between passively using SNSs and the fear of missing out (Burnell et

al., 2019). However, the current study's data was collected during the COVID-19 pandemic. Thus, one possible explanation for this study's discrepant finding is that the prevalence of positive self-presentation on social media may have decreased during the pandemic, thereby changing the nature of the relationship between passive social media use and appearance comparisons (Yue et al., 2022). Passive social media use was also not associated with body satisfaction. Although this finding diverges from expectations, it is consistent with Burnell and colleagues (2019)'s insignificant finding regarding the association between passive SNS use and self-perceived physical appearance.

Contrary to expectations, this study did not find evidence for the relationship between active and passive social media and loneliness. This finding contrasts with previous research supporting the negative correlation between active social media use and loneliness (Lin et al., 2022; Yang, 2016). One possible explanation for this inconsistency is that the association between active social media use and loneliness only exists for individuals with certain personality characteristics. For example, Yang (2016) found that Instagram interaction, a form of active social media use, was related to lower loneliness only among individuals with low social comparison orientation. This highlights the value of examining the roles that personality traits and individual differences play in the relationships between social media use and mental health. Relatedly, the relationship between passive social media use and loneliness could be even more complex than previously thought. Though positive correlations between passive social media use and loneliness have been previously demonstrated (Matook et al., 2015; Ryan & Xenos, 2011), Yang (2016) found Instagram browsing, a passive social media behavior, to be associated with lower levels of loneliness. The authors suggest that Instagram browsing may not be as passive as it appears and emphasize the need for even more differentiation among different types of passive social media use.

More generally, the discrepancy between this study's findings and the results of previous research on loneliness and social media use might be a product of when this study's data was collected. Because data collection took place from November 2020 to March 2021, participant's responses on measures of social media use and loneliness may have been impacted by the pandemic. For example, British Columbia residents experienced a second lockdown which began on November 7th 2020 and ended on January 8th, 2021, during which individuals' levels of social media use and loneliness

may have been altered. Complicating matters further, participants completed questionnaires online and some participants may have been located outside of British Columbia, where the strictness of restrictions may have been different. In fact, one study hypothesized that the differing levels of depression and anxiety found among adolescents in three different countries during the pandemic could be explained by the countries' differing approaches to lockdown (Orgilés et al., 2021). Research has also shown that the social media use and loneliness levels of young adults in particular were affected by the COVID-19 pandemic, with one study reporting that in the United States, young adults were lonelier than older adults and showed a greater increase in social media use during the pandemic (Lisitsa et al., 2020). Furthermore, another study compared pandemic levels of loneliness to pre-pandemic levels using the UCLA LS3 and found that mean levels of loneliness were higher (M=43.8) during the pandemic than reported in previous research (M=38.4) (Killgore et al., 2020). Similarly, the mean UCLA LS3 for this current sample was 45.3, suggesting that the levels of loneliness of this current sample were higher than levels reported in research that was conducted before the outbreak of COVID-19.

With respect to social media use during the pandemic, social media became a primary method for coping with social isolation (Cauberghe et al., 2020) as well as a major source of information (Brailovskaia et al., 2021), especially during lockdowns. These trends are consistent with the Uses and Gratifications Theory, which views the media consumption habits of social media users as guided by specific needs that they seek to gratify (Katz et al., 1973). One possible consequence of these trends is that the distinct ways that individuals use social media may have also converged. Previously, social media as a coping method for isolation and as a tool for information seeking may have been one of a multitude of ways in which someone uses social media in their day to day life. However, during the pandemic, using social media to connect with others or acquire information may have become more predominant compared to other uses. Although no research has explicitly examined this, it is possible that because individuals were facing a shared collective experience (e.g., lockdowns, increased social isolation, increased social media use to interact with others), their social media use and perceptions of social isolations were altered.

Consistent with previous research, this study supported the indirect effects of both active and passive social media use on body satisfaction through appearance

comparisons. However, the direct effect of active and passive social media use on body satisfaction was not significant. As mentioned above, other measures of social media (e.g., time spent on SNS, type of content engaged with) may be more relevant to body satisfaction than active and passive social media use. In addition, this study found no evidence of the moderating role of loneliness on this relationship. This finding is unanticipated especially when considering Hawkely & Cacioppo (2010)'s model of loneliness. The authors posited that perceived social isolation initiates implicit hypervigilance for social threat in an individual's surroundings, which results in cognitive biases. In fact, they state that individuals high in loneliness see the world as a more threatening place, expect more negative social interactions, and remember more negative social information relative to nonlonely people. In this study, the hypervigilance for social threat that is triggered by loneliness was hypothesized to extend to hypervigilance with respect to appearances as well. Therefore, people higher in loneliness were expected to engage in more appearance comparisons as a result of this hypervigilance. However, given that this study did not find support for the moderating role of loneliness, it is possible that the hypervigilance set off by loneliness is limited to other types of social comparisons and does not apply to appearance comparisons in particular. More research is needed to identify alternative potential moderators and mediators of the relationship between social media use, appearance comparisons, and body satisfaction, as these would be important targets for body dissatisfaction prevention and intervention.

4.1. Limitations and Future Directions

The present research contributes to an existing body of literature on the relationships between social media use, appearance comparisons, and body satisfaction while also considering the role that loneliness plays across these relationships. Because individuals typically use social media to gratify specific needs, it is important to identify variables that may be influencing the relationship between social media use, appearance comparisons, and body satisfaction. Given that one of the most common needs that are gratified through the use of social media are social needs (Joinson, 2008), loneliness is an important variable to investigate. In this study, loneliness was found to correlate with appearance comparisons and body satisfaction. However, due to the correlational nature of these results, causal inference cannot be assumed. At present, it is unclear whether

loneliness results in increased appearance comparisons and decreased body satisfaction or vice versa. Additionally, a third variable could be exerting influence on all three variables. Future research should utilize experimental designs to examine the causal role of loneliness on appearance comparisons and body satisfaction and determine the directionality of these relationships. Although this study found no evidence for loneliness as a moderator among the main study variables, future research should also further examine the role that loneliness plays with respect to social media use, appearance comparisons, and body satisfaction. For instance, it is possible that loneliness motivates individuals to use SNSs, therefore rendering individuals susceptible to the negative or positive effects of social media. Qualitative analyses could be used to examine what motivates individuals to use social media and whether these motivations differ across levels of loneliness, appearance comparisons, and body satisfaction. In addition, the current research only focused on loneliness as a moderator but future research can explore other moderators (e.g., personality characteristics, online social support) in the relationship between social media use, appearance comparisons, and body satisfaction.

Another limitation of this study is its measure of social media use. Currently, there are no universal measures of active and passive social media use, with studies measuring these variables in a variety of ways. While the measure of active and passive social media use that we used was validated for research, its use is not widespread and it does not allow for direct comparisons across other similar studies. Furthermore, we asked participants to self-report their social media use. Previous studies have found that self-reported social media use can be biased and unreliable (Seabrook et al, 2016), with evidence of both under- and over-estimation (Lin et al., 2015; Naab et al., 2019). Therefore, future research should expand upon existed methods of assessing social media use. Because social media use is a complex and multifaceted variable, it is not accurately captured only by the number of minutes an individual spends on SNSs. Instead, the types of apps that individuals use and the ways in which individuals engage with them are also relevant. This study conceptualized social media use through the ways in which individuals interact with content on social media (i.e. active social media use and passive social media use). However, this measure of social media use does not account for the wide variety of activities that individuals participate in while using social media (Rodriguez et al., 2022). It would be incredibly useful if future research created a

measure of social media use that incorporated the types of apps that individuals use, the time spend on these apps, and the proportion of time they spend actively and passively engaging with content.

Because this study only included young adults, these findings are limited in generalizability. The decision to restrict analyses to young adults exclusively was deliberate since this age group is more likely to use social media, to suffer from loneliness, and experience lower body satisfaction (Pittman & Reich, 2016; Bartnett et al., 2020). Furthermore, image-based apps such as TikTok, Snapchat, and Instagram are especially common among adults under the age of 30 (Auxier & Anderson, 2022). Nevertheless, it would be important to examine the relationships between loneliness, social media use, appearance comparisons, and body satisfaction across age groups, especially among adolescents, given their growing access to social media and increasing rates of loneliness (Twenge et al., 2021; Vogels et al., 2022). Another factor further limiting generalizability is the fact that this study was conducted during Fall 2020 to Winter 2021, at the height of the COVID-19 pandemic. In particular, social media use and loneliness are two variables that were likely influenced by government-mandated social isolation, especially among young adults. While this study furthers our understanding of the relationships between social media use, appearance comparisons, body satisfaction, and loneliness, future studies need to confirm whether the results of this study remain consistent during post-pandemic life.

Another warranted consideration is the ethnic composition of our sample. Approximately one fourth of our sample identified as exclusively Caucasian, whereas the remaining three-fourths were composed of a variety of ethnicities or were multiracial. Given that previous research has identified ethnic differences as influential with respect to factors such as loneliness, appearance comparisons, and body image outcomes (Achdut & Refaeli, 2021; Lay et al., 2020; Rancourt et al., 2016; Rogers Wood & Petrie, 2010), differences in ethnicity may have had an impact on the current study's variables as well. For instance, DeBraganza and Hausenblas (2010) found that ethnicity moderated the effects of viewing thin-ideal images on body satisfaction, with African American women displaying no significant changes in body satisfaction and Caucasian women reporting significantly higher body dissatisfaction after viewing images of models compared with control images. With regards to the current study, it is possible that ethnic differences may have had an impact on the relationships examined. To date, little

research exists on the social media use of ethnic minorities (Charmaraman et al., 2018), especially in relation to loneliness, appearance comparisons, and body satisfaction. Future research would benefit from examining the relationships between these variables within a cultural context.

4.2. Conclusion

The present study examined the relationships between loneliness, active and passive social media use, appearance comparisons, and body satisfaction. The current study's findings underscore the complexity of these relationships and indicate some directions for future research. Results provided support for the associations between body satisfaction, appearance comparisons, and loneliness, suggesting the need for more experimental and longitudinal research aimed at examining the relationship between loneliness and appearance-based variables. No support was found for the associations between active or passive social media use and loneliness, appearance comparisons, and body satisfaction, highlighting the need for more nuanced measures of social media use. Given that loneliness was not found to be a moderator of the relationships between social media use, appearance comparisons, and body satisfaction, future research is needed to determine alternative potential moderators, as identifying moderators could have implications for interventions.

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Appendix A. Exploratory Analyses

An exploratory analysis was implemented in order to explore the direct and indirect effects of time spent on image-based SNSs on body satisfaction. Time spent on image-based apps was calculated from participants' iPhone activity usage data. Participants uploaded screenshots of their activity usage (e.g. the number of minutes spent on-screen over the 10 days) for their top 15 apps. From this information, the number of minutes that each participant spent on Instagram, TikTok, and Snapchat, if any, were summed and divided by the number of days that the usage spanned to yield an overall variable that represented the time that participants spent on these image-based SNSs. Instagram, TikTok, and Snapchat were included in this variable because their use is especially common among adults under the age of 30 (Auxier & Anderson, 2022). Facebook was not included in this measure because its popularity among youth has declined more recently (Vogels et al., 2022). This variable was not included in the main analyses because a significant portion of participants did not upload screenshots of their iPhone usage (46%).

Hypotheses

1) Time spent on image-based SNSs will be positively correlated with appearance comparisons and negatively correlated with body satisfaction.

2) Time spent on image-based SNSs will be negatively correlated with loneliness.

3) The frequency of appearance comparisons will mediate the effect of time spent on image-based SNSs on body satisfaction.

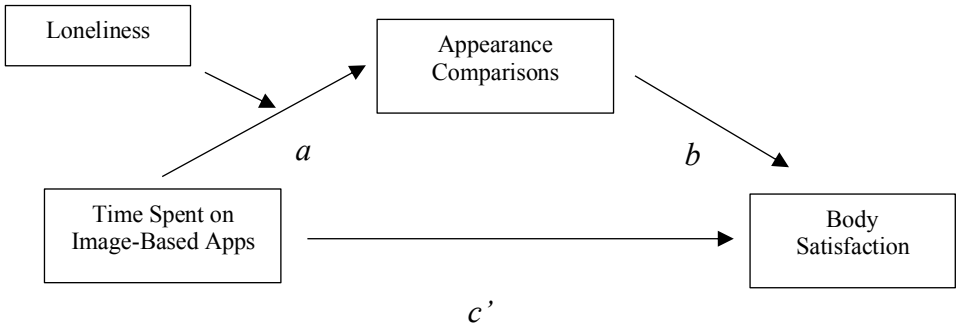
4) Loneliness will moderate the indirect effect of time spent on image-based SNSs on body satisfaction via appearance comparison.

Data Analytic Approach

The data analytic plan was similar to that of the main study. To control for Type I error, the alpha level was set at .05 and in order to further reduce the risk of Type I error for multiple comparisons, the Bonferroni correction was applied ($\alpha = .05$ divided by the

number of pairwise comparisons; .05/3 = .017). Pearson product moment correlations were used to examine the associations between time spent on image-based SNSs and the main study variables. Furthermore, a moderated mediation model was conducted using time spent on image-based SNSs as the independent variable (X), frequency of appearance comparisons as the mediating variable (M), body satisfaction as the dependent variable (Y), and loneliness as the moderator (W). Similar to the main study analyses, conditional process analyses were implemented using the PROCESS macro in SPSS (Version 4; Hayes, 2021) and Model 7 was used. A bootstrap with N = 10,000 resamples was employed in order to minimize sampling error. To decrease the risk of Type I error, interaction terms for paths a, b, and c' were considered significant at $p < .01$. Conditional indirect effects and moderated mediation analyses (as indicated by the index of moderated mediation) were deemed significant when the 95% percentile bootstrap confidence intervals (PB CI) did not contain zero. PROCESS provided unstandardized regression coefficients and standard errors.

Figure A.1. Exploratory Model 3



Results

Correlations are presented in Table A.1 and the results of the moderated mediation analysis for Model 3 are shown in Table A.2. In contrast to hypotheses, time spent on image-based apps was not correlated with appearance comparisons, body satisfaction, and loneliness. While the overall model was significant ($F (2, 157) = 32.17$, $p < 0.001$) and explained 29.1% of the total variance, time spent on image-based apps

did not directly (coefficient = -0.00, *SE* = 0.00, 95% CI: -0.00 to 0.00) or indirectly influence body satisfaction (coefficient = -0.00, *SE* = 0.00, 95% CI: -0.00 to 0.00). The conditional indirect effect of time spent on image-based SNSs on body satisfaction through appearance comparisons was not moderated by loneliness (index of moderated mediation = 0.00, *SE* = 0.00, 95% CI: -0.00 to 0.00).

Table A.1. Correlations Between Variables

	Time Spent on Image-Based SNSs	Appearance Comparisons	Body Satisfaction	Loneliness
Time Spent on Image-Based SNSs	1	.06	-.04	.04

* $p < 0.05$; ** $p < 0.01$

Table A.2. Ordinary Least Squares Regression Coefficients for Exploratory Model 3

	M (Appearance Comparisons)			Y (Body Satisfaction)		
X (Predictor)	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*
Time Spent on Image-Based SNSs	-0.00	0.00	.93	-0.00	0.00	.81
Loneliness	0.02	0.01	.03	-	-	-
Time Spent on Image-Based SNSs X Loneliness	0.00	0.00	.80	-	-	-
Appearance Comparisons	-	-	-	-0.45	0.06	<.001
	$R^2 = 0.11$ F (3, 156) = 6.52, $p < .001$			$R^2 = 0.29$ F (2, 157) = 32.17, $p < .001$		

Discussion

This exploratory analysis examined whether time spent on image-based SNSs, as opposed to level of engagement (i.e. active/passive social media use), yielded

alternative findings with respect the indirect and direct effects on body satisfaction. It also explored whether loneliness moderated the indirect relationship between time spent on image-based SNSs and body satisfaction. Contrary to expectations, time spend on image-based apps was not correlated with any of the main study variables. While the overall moderated mediation model was significant, time spent on image-based apps did not have a direct or indirect effect on body satisfaction. Loneliness was not found to moderate the indirect relationships between time spent on image-based SNSs, appearance comparisons, and body satisfaction. One possible explanation that can account for these insignificant findings is that the analyses may have been underpowered. Given that a significant portion of our participants did not upload screenshots of their iPhone usage (46%), the sample size for these analyses (n = 160) may have been insufficient. As stated above, the number of participants required to obtain a power of .98 with an R^2 of .39 is 200 (i.e., to detect a medium effect size with conditional process analyses using percentile-based bootstrapped confidence intervals; Preacher et al., 2007). Alternatively, as highlighted above, the COVID-19 pandemic may have had altered individuals' social media usage and its relationship to key variables, including loneliness, body satisfaction and appearance comparisons.

Appendix B. Consent Form

THE UNIVERSITY OF BRITISH COLUMBIA

Informed Consent by Participants in a Research Study
Title of Study: Use of Mobile Applications and Wellbeing
Version Date: January 26, 2021

Principal Investigator:
Dr. Shannon Zaitsoff, Associate Professor, Department of Psychology, Simon Fraser University, [...@sfu.ca]
Co-Investigator: Dr. Jennifer Coelho, Clinical Associate Professor, Department of Psychiatry, University of British Columbia, [...@sfu.ca]
SFU collaborator: Research Coordinator
Research Team: Haya Zaid-Alkailani [...@sfu.ca], three undergraduate students

Who is funding this study?
This study is being funded by the BC Children's Hospital Research Institute.

Study Purpose:
Thank you for participating in this research study today. The purpose of this study is to examine the relationship between social media use and wellbeing.

Voluntary Participation
Your participation in this study is completely voluntary. You have the right to refuse to participate in this study without any penalty. If you decide to participate in this study, you may choose to withdraw from the study at any time without any negative consequences to your education, employment, or other services to which you are entitled or are presently receiving.

What will you be doing?
If you choose to participate in the study, you will answer several questions on the online survey platform REDcap. You will answer questions related to your social media usage, sleep patterns, loneliness, social support, self-compassion, body satisfaction, body checking behaviours, appearance comparisons, psychological distress, eating habits and other general questions about your wellbeing. You will also answer questions regarding your experience with the COVID-19 pandemic. However, you may skip the COVID-19 questions if you wish not to answer these questions. You will also be asked to report on

your demographic information (e.g. age, sexual orientation, ethnicity). Studies involving humans now routinely collect information on race and ethnic origin as well as other characteristics of individuals because these characteristics may influence how people respond and allow us to better understand our sample. Providing this information is voluntary, and you do not have to answer any questions you do not wish to or any questions that make you feel uncomfortable. At the end of the survey, you will be asked to upload screenshots of your battery use percentage (instructions will be provided). This will allow us to better understand your weekly social media usage. If any of these questions seem sensitive or personal in nature, you may choose not to answer the question and leave it blank. This study will take you approximately 60 minutes to complete online. You will have 7 days from receipt of this email to complete the study. Participants recruited through Simon Fraser University's RPS system will receive 2 research participation credits, upon completion of the study. Participants recruited through other methods will be entered in a draw to win one out of ten $25 Starbucks gift cards. You may contact the researcher or use RPS to opt-out of the study at any time without penalty.

We are asking to collect your email address in order to create a separate database in which winners for the Starbucks gift cards will be drawn. This will be kept as a separate database in order to maintain the deidentified database. We may also use this email to communicate with you regarding the study. You need to know that emails sent to some webmail services (e.g. Gmail, Hotmail, etc.), may be stored/routed outside of Canada (for example, in the United States) and governed by foreign laws. Due to the fact that future emails will contain personal information about you, including your name and information about your health, the Freedom of Information and Protection of Privacy Act requires that we obtain your consent before we continue. All of the information which you provide to us will be kept completely confidential. Providing your email address means that you voluntarily agree and give your consent for the study team to use email to communicate with you.

Study Risks and Benefits

There are no known risks or benefits associated with participation in this study. However, there is a chance that you may experience mild distress when answering questions about your eating patterns or anxiety. You do not have to answer any questions that upset you or seem sensitive or personal in nature.

If you are experiencing emotional distress or discomfort in relation to any aspect of this study, you may wish to contact one of the following resources:

1) Crisis Lines:
    a) Vancouver Crisis Centre: 604-872-3311 or toll-free 1-866-661-3311
    b) Fraser Health Crisis Line: 604-951-8855 or toll-free 1-877-820-7444
2) Family Services of Greater Vancouver: 604-731-4951; www.fsgv.ca
3) Oak Counselling Services Society: 604-266-5611; www.oakcounsellingservices.com
4) SFU Health and Counselling: Burnaby campus: 778.782.4615, Vancouver campus: 778.782.5200, Surrey campus: 778.782.5200 https://www.sfu.ca/students/health.html
5) SFU Clinical Psychology Centre: 778-782-4720; https://www.sfu.ca/psychology/clinical-psychology-centre.html

6) UBC Psychology Clinic: 604-822-3005; http://clinic.psych.ubc.ca/

Compensation
For participants recruited through the Psychology RPS system, you will receive 2 research participation credits for agreeing to participate in the study. Participants recruited through other methods (i.e. emails, UBC Department of Psychology's Paid Participation Pool, posters, online forums, etc.) will be entered in a draw to win one out of ten $25 Starbucks gift cards. This draw is limited to participants residing in Canada and who are the age of majority in their province of residence, excluding Quebec residents' participants. Odds of winning depend on the number of participants. If you choose to withdraw from the study at any time, you will remain eligible for the prize draw.

Measures to maintain confidentiality
Your confidentiality will be respected. All documents will only be identifiable by unique code numbers. Participants will not be identified by name in any reports of the completed study. To ensure confidentiality, data will be devoid of any identifiable information (e.g. names, email addresses) and will be stored on REDCap, a cloud-based service. Survey information collected using REDCap is stored and backed up in Canada at the UBC University Data Centre; therefore, any personal information collected is under the authority of the Freedom of Information and Protection of Privacy Act (FIPPA). Databases will be stored for at least 5 years, in accordance with UBC policy on the retention of data.

If you wish to withdraw from the study prior to data being deidentified, your data will be deleted immediately, without any penalty. If you choose to withdraw from the study after personal information is anonymized and added to data materials, published or otherwise disseminated, it will no longer possible to withdraw your data.

Researchers are increasingly required by granting agencies and journals to make their data accessible in a research repository, known as open access data. Thus, your deidentified research data (which means your name, birth date, and other identifiers have been removed) may be deposited into a publicly accessible location at the time of publication. This can enhance the transparency of the research data and allows for external validation and fraud control, but also allows other to access the data for re-analysis of this study to do other kinds of analyses in the future, beyond what you are consenting to in this study. Also, this future use of your data may not be subject to oversight by a research ethics board, and thus the data may be publicly shared and used in currently unknown ways. Once the data are made publicly available, you will not be able to withdraw your data. Even though the identifying information will be removed from the data it is possible that others may be able to find out who you are. The chance of this is currently thought to be quite low.

Study Results
The main study findings may be presented at academic conferences or published in academic journal articles. Participants will not be personally identifiable in any

presentation of the findings. If you have any questions or concerns about the study you can contact the principal investigator, Dr. Shannon Zaitsoff) or the SFU collaborator, Deepika Bajaj. If you wish to obtain the results from this study, please contact Dr. Shannon Zaitsoff or Deepika Bajaj.

Who can you contact if you have complaints or concerns about the study?
If you have any concerns about your rights as a research participant and/or your experiences while participating in this study, you may contact Dr. Jeffrey Toward, Director, Office of Research Ethics [...@sfu.ca] or (...). Please use the following reference number [**insert study number**] when contacting the officer for concerns or complaints. Alternatively, you can contact the Research Participant Complaint Line in the UBC Office of Research Ethics at 604-822-8598 or if long distance e-mail RSIL@ors.ubc.ca or call toll free 1-877-822-8598.

Future studies
The researchers may wish to contact you to provide you with the opportunity to hear about how you can participate in studies in our lab in the future. Please indicate whether you would be willing to be contacted in the future:

☐ No, please do not contact me about potential future projects.

☐ Yes, I would be interested in being contacted about future projects. I understand that I will not be obligated to participate if I choose not to and can remove my contact information at any time. My preferred contact email is: _____

Consent
Taking part in this study is entirely up to you. You have the right to refuse to participate in this study. If you decide to take part, you may choose to pull out of the study at any time without giving a reason and without any negative impact on your education, employment, or other services to which you are entitled or are presently receiving.

- Agreeing to participate in this study below indicates that you have received a copy of this consent form for your own records.
- Agreeing to participate in this study indicates that you consent to participate in this study.
- You do not waive any of your legal rights by participating in this study.

☐ No, I do not wish to take part in this study.

☐ Yes, I wish to participate in this study.

Appendix C. Measures

Demographics

Please complete the survey below.

Thank you!

What is your age?	_____
When were you born? Please enter the month and year you were born. (e.g. June 1997)	_____
What sex were you assigned at birth?	◯ Male ◯ Female
What is your current gender identity?	◯ I currently identify as male ◯ I currently identify as female ◯ I currently identify as non-binary ◯ I currently identify as transgender ◯ I choose not to disclose ◯ Other
Please specify your current gender identity.	_____
What is your sexual orientation?	◯ Heterosexual ◯ Homosexual ◯ Bisexual ◯ Other ◯ Prefer not to say
What is your ethnic/cultural background?	☐ Indigenous (e.g. First Nations, Inuit, Métis) ☐ Caucasian/European ☐ Latino/Hispanic ☐ African ☐ South Asian (e.g., India, Pakistan, Sri Lanka) ☐ East Asian (e.g., China, Japan, Korea) ☐ South East Asian (e.g., Philippines, Indonesia, Thailand) ☐ Middle Eastern (e.g. Iran, Iraq, Turkey) ☐ Other
Please specify your ethnic/cultural background	_____
What is your height in feet and inches? (e.g., 5'2")	_____
How much do you weigh? (in pounds)	_____
Have you ever been diagnosed with an eating disorder (e.g., anorexia nervosa, bulimia nervosa, binge eating disorder or another eating disorder)?	◯ Yes ◯ No
Please list your diagnosis:	_____

Body Area Satisfaction Scale (BASS; Brown et al., 1990)

Use this scale to indicate how dissatisfied or satisfied you are with each of the following areas or aspects of your body	Very Dissatisfied	Mostly Dissatisfied	Neither Satisfied Nor Dissatisfied	Mostly Satisfied	Very Satisfied
119) Face (facial features, complexion)	○	○	○	○	○
120) Hair (colour, thickness, texture)	○	○	○	○	○
121) Lower torso (buttocks, hips, thighs, legs)	○	○	○	○	○
122) Mid torso (waist, stomach)	○	○	○	○	○
123) Upper torso (chest or breasts, shoulders, arms)	○	○	○	○	○
124) Muscle tone	○	○	○	○	○
125) Weight	○	○	○	○	○
126) Height	○	○	○	○	○
127) Overall appearance	○	○	○	○	○

Physical Appearance Comparison Scale-3 (PACS-3; Schaefer & Thompson, 2018)

Please complete the survey below.

Thank you!

People sometimes compare their physical appearance to the physical appearance of others. This can be a comparison of their weight or shape, muscularity, or overall appearance. Below you will find a list of different contexts in which people may engage in these types of physical appearance comparisons.

For each type of comparison, please do the following:

Step 1: First indicate how often you make these kinds of comparisons (using the scale provided, Never to Almost Always)

Step 2: If you never engage in a particular type of comparison (i.e., rated the item as "Never"), then go directly to the next set of items. However, if you rate an item as "Seldom," "Sometimes," "Often," or "Almost Always" please also rate how you felt you looked relative to the comparison target (Much Better to Much Worse), and how that comparison made you feel (Very Positive to Very Negative).

When I'm at a party or social gathering, I compare my overall appearance to the appearance of others.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative
When I'm out in public, I compare my weight/shape to the weight/shape of others.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative

When I meet a new person (same sex), I compare my weight/shape to his/her weight/shape.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative
When I watch a movie, I compare my overall appearance to the appearance of the actors/actresses.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative
When I watch television, I compare my weight/shape to the weight/shape of the actors/actresses.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative
When I see a model in a magazine, I compare my weight/shape to his/her weight/shape.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always

When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative
When I see a model in a magazine, I compare my muscularity to his/her muscularity.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative
When I watch a movie, I compare my muscularity to the muscularity of the actors/actresses.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse
When you make these comparisons, how does it usually make you feel?	◯ Very positive ◯ Positive ◯ Neutral ◯ Negative ◯ Very negative
When I'm out in public, I compare my muscularity to the muscularity of others.	◯ Never ◯ Seldom ◯ Sometimes ◯ Often ◯ Almost Always
When I make these comparisons, I typically believe that I look _____ than the person to whom I am comparing myself.	◯ Much better ◯ Better ◯ The same ◯ Worse ◯ Much Worse

UCLA Loneliness Scale Version 3 (UCLA LS3; Russel, 1996)

UCLA Version 3 Loneliness Scale

Instructions: The following statements describe how people sometimes feel. For each statement, please indicate how often you feel the way described by placing a check in the space provided. Here is an example: How often do you feel happy? If you never felt happy, you would check "never"; if you always feel happy, you would check "always."

	NEVER 1	RARELY 2	SOMETIMES 3	ALWAYS 4
*1. How often do you feel that you are "in tune" with the 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 do you feel that there are people you can talk to?				
*20. How often do you feel that there are people you can turn to?				

Scoring: Items that are asterisked should be reversed (i.e., 1 4, 2 3, 3 2, 4 1), and the scores for each item then summed together. Higher scores indicate greater degrees of loneliness. From Russell DW: UCLA Loneliness Scale (Version 3): reliability, validity, and factor structure, *J Pers Assess* 66:20-40, 1996.

Active and Passive Social Media Use (Li, 2016)

Please complete the survey below.

Thank you!

	never	less than once a week	once a week	2-6 times a week	once a day	several times a day
How often do you watch videos or view pictures posted on social media sites?	○	○	○	○	○	○
How often do you read comments/ reviews on social media sites?	○	○	○	○	○	○
How often do you read discussions on social media sites?	○	○	○	○	○	○
How often do you share others' content on social media sites (e.g., retweet, share posts or status updates)?	○	○	○	○	○	○
How often do you like, favourite, vote, or react to content on social media sites?	○	○	○	○	○	○
How often do you comment on, or respond to someone else's content on social media sites?	○	○	○	○	○	○
How often do you post your own content (e.g. tweet, status update, post pictures/videos) on social media sites?	○	○	○	○	○	○

Battery Usage Screenshots (i.e., Time Spent on Instagram, TikTok, and Snapchat)

Please upload screenshot of your battery usage. To do this, go to the "Settings" section of your smartphone and click the "Battery" option.

If you have an iPhone with an iOS between 9 and 11

o Click on "Last X Days" and the clock symbol displayed in the right-hand corner to display both onscreen and background activity listed for the app.

o Screen shot this page by holding down the power and home button. Please be sure to include Activity Usage of your top 15 applications.

o Please compare your display to the photo below to ensure the correct data is being viewed. Screenshots should be similar to pictures below.

o Upload these screenshots to the dropbox below by saving them as .jpg or .png file. (Please upload up to 3 screenshots below - the number of screenshots you upload may vary from phone to phone).

Please upload a screenshot #1 of your battery usage.

Please upload screenshot #2 of your battery usage.

Please upload screenshot #3 of your battery usage.

How many screenshots did you upload above?

_____

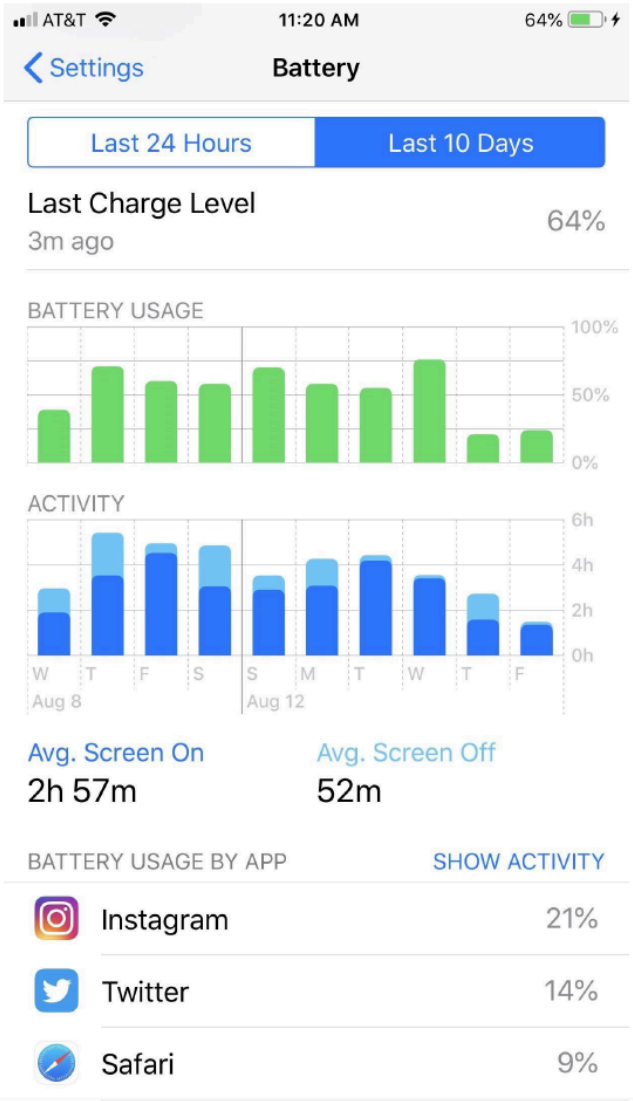
Please upload a screen shot of your battery usage. To do this go to the "Settings" application on your smartphone and click the "Battery" option.

If you have an iOS with 12 or greater

1. First, Scroll down and click on "Last 10 days".
2. Second, please screenshot both graphs labelled "Battery Usage" and "Activity" by holding down the power and home button at the same time.
3. Please compare your display to the photo below to ensure the correct data is being viewed. Screenshots should be similar to the picture below.
4. Please ensure that "Avg. Screen On" and "Avg. Screen Off" data are included in your screenshot.
5. Upload these screenshots to the dropbox below by saving them as .jpg or .png file.

Please upload screenshots of your battery use graphs here.

1. Now scroll down and screenshot the percent battery use by application, by holding down both the home and power button at the same time.
2. Please compare your display to the photo below to ensure the correct data is being viewed. Screenshots should be similar to the picture below.
3. Please be sure to include activity usage of your top 15 applications.
4. Upload these screenshots to the dropbox below by saving them as .jpg or .png file. (Please upload up to 3 screenshots of your battery percentage below - the number of screenshots you upload may vary from phone to phone).



Please upload screenshot #1 of your battery usage percentage.

Please upload screenshot #2 of your battery usage percentage.

Please upload screenshot #3 of your battery usage percentage.

How many screenshots did you upload above?

1. Now Click “Show Activity” in the upper right corner. This should display both onscreen and background activity for each app listed.

2. Please compare your display to the photo below to ensure the correct data is being viewed. Screenshots should be similar to the picture below.

3. Please be sure to include activity usage of your top 15 applications.

4. Upload these screenshots to the dropbox below by saving them as .jpg or .png file. (Please upload up to 3 screenshots - the number of screenshots you upload may vary from phone to phone).

Please upload screenshot #1 of your battery usage time here.