The relationship between social media use and loneliness amongst young adults and the roles of interpersonal communication competence and Fear of Missing Out

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Abstract

Using social media is a daily activity for most young adults. Despite the positive aspects of social media use (SMU), previous research showed that it could lead to feelings of loneliness. Little research has examined potential individual differences that might affect this relationship. This current study looks at the relationship between SMU and loneliness from a new perspective by testing the possible moderating effects of interpersonal communication competence (ICC) and the 'Fear of Missing Out' (FoMO). A cross-sectional study was conducted among 338 Dutch young adults (18-25) using an online questionnaire. In line with the first hypothesis, a positive relationship was found between SMU and loneliness. In addition, FoMO had a moderating effect on this relationship. The association between SMU and loneliness, however, was not stronger for young adults with weaker ICC levels. Additional explorative follow-up analyses showed a mediating effect of FoMO on the relationship between SMU and loneliness. In summary, the results of the current study indicate that increased use of social media does increase feelings of loneliness. This positive relationship seems to be enhanced by high levels of FoMO but not by weaker ICC amongst young adults. Moreover, FoMO was also a mediator in the relationship between SMU and loneliness. Further research is needed to better understand how FoMO interacts with SMU and loneliness.

Keywords: Loneliness, social media use, fear of missing out, interpersonal communication competence

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interpersonal communication competence and Fear of Missing Out

Emma is a 23-year-old college student, and despite having hundreds of online friends, she often feels alone. She spends hours scrolling through her social media feeds, checking likes, comments, and messages, and can lose track of time. Emma is constantly aware of what is happening online and whether, for example, her friends have already posted something on TikTok or Instagram. Because of her social media use (SMU), she spends less time with people in person, such as friends or family. This way, she does not create or maintain offline social relationships and often feels lonely. Not just for Emma, but for most young adults in the digital age, social media is a big part of their lives. 97% have an account with one or more social networking sites, and 96% are online (almost) daily (CBS, 2020). The most used social media platforms by young adults in the Netherlands are Facebook, Instagram, WhatsApp, YouTube, and Snapchat (Statista, 2022). Through social media, young adults can connect with others, participate in communities, share information, and update their status (Boyd & Ellison, 2007).

Studies highlight the positive and negative effects of SMU. For example, a positive effect is that SMU increases young adults' social capital (Woods & Scott, 2016). In addition, SMU serves as online social support (Cole et al., 2017). On the other hand, SMU also has negative effects on the well-being of young adults. For example, SMU is linked to depression (Lin et al., 2016), stress (Apaolaza et al., 2019), and social anxiety (Shaw et al., 2015). Social networking sites have also changed how people interact, and it can even harm the quality of face-to-face social interactions (Rotondi et al., 2017). Thus, despite the positive effects of SMU (e.g., social capital, social support), it negatively impacts young adults' offline social interactions and mental health.

In particular, SMU can have an influence on feelings of loneliness among young adults (Primack et al., 2017). One study found that young adults experience more loneliness than older adults (Griffin, 2010). Another study showed that people may experience loneliness because they spend less time offline (Chou & Hsiao, 2000). Relatedly, limiting the use of social media appears to reduce feelings of loneliness among young adults (Hunt et al., 2018). Moreover, in addition to regular SMU, social media addiction is

also associated with feelings of loneliness (Yao & Zhong, 2014). Social media addiction can occur when young adults overuse social media, which may lead to low life satisfaction (Hawi & Samaha, 2016; Cao et al., 2020). So, both regular SMU and social media addiction may lead to feelings of loneliness in young adults.

A reason for Emma her feelings of loneliness could be that she has a 'Fear of Missing Out' (FoMO). FoMO is a personality trait where someone feels anxious when they think someone else is having a pleasant experience without them (Przybylski et al., 2013; Hetz et al., 2015). Young adults with high levels of FoMO are exposed to a plethora of information about others' offline social interactions on social media, keeping abreast of people's lives (Hetz et al., 2015; Roberts & David, 2020). Research showed that FoMO is often associated with fatigue, stress, psychical symptoms, decreased sleep, negative mood states, less life satisfaction, and higher levels of loneliness (Przybylski et al., 2013; Blackwell et al., 2017; Milyavskaya et al., 2018; Barry & Wong, 2020). Young adults with FoMO may become lonely on social media because of social comparison (Dibb & Foster, 2021). Moreover, they might experience social exclusion and disconnection, by seeing photos and videos of other people have rewarding experiences without them (Marengo et al., 2021). Earlier research showed that individuals with high levels of FoMO, who use more social media, experience more negative emotions such as anxiety and anger than individuals with lower levels of FoMO (Riordan et al., 2021). This current research suggests that for young adults with high levels of FoMO, more SMU may lead to more feelings of loneliness.

Emma uses social media daily and considers herself a person who has weak interpersonal communication competence (ICC). ICC is the ability to socially interact with others online and offline (Bochner & Kelly, 1974; Reich, 2017). Some studies confirm that young adults with weaker ICC would rather spend their time online than offline (Jimenez & Morreale, 2015; Hollenbaugh, 2021). For shy people who believe they are less successful in offline social situations, for example, communicating through social media is more attractive (Appel & Gnambs, 2019). However, Emma thinks she is less successful in online social situations than her peers because of her weaker ICC levels. Young adults with weaker ICC may find it more challenging to interact in online environments (e.g., social media) than

others with stronger interpersonal communication skills (Reich, 2017). People with strong ICC are often considered extroverts and disclose their thoughts, opinions, or feelings online, which can lead to online emotional support (Nilsen et al., 2013; Cheng et al., 2019). Because of their high levels of ICC, young adults can maintain social bonds, which may lead to fewer feelings of loneliness (Xu et al., 2020). Therefore, this present study hypothesizes that Emma's high SMU and high feelings of loneliness may be explained by her low ICC levels.

The present study dives deeper into the relationship between SMU and loneliness, as it appears that SMU can lead to feelings of loneliness (Yao & Zhong, 2014; Primack et al., 2017; Hunt et al., 2018). Earlier research suggested that more SMU may have an effect on both FoMO and ICC levels of young adults and that this may lead to more feelings of loneliness (Fumagalli et al., 2021; Mao et al., 2023; Xie et al., 2023; Van Tonder et al., 2023). Thus, studies suggested a mediating effect of FoMO and ICC separately in the positive relationship between SMU and loneliness. However, this current research suggests that FoMO and ICC as traits make some individuals more susceptible to the effect of SMU on loneliness than others.

Moreover, as social media has become an integral part of most young adults' daily lives, it is crucial to understand if either the individual trait ICC or FoMO makes a difference in the relationship between SMU and loneliness. Understanding if these two moderators affect the positive relationship between SMU and loneliness, this present study can provide new insights into young adults' social offline and online lives and mental health in the digital age. The results of this current study may provide insights for young adults with weaker ICC or high levels of FoMO. For example, they may learn how to reduce their SMU or how to cope with SMU to reduce feelings of loneliness. In conclusion, this study aims to examine the relationship between SMU and loneliness and, to my best knowledge, to be the first to investigate whether this relationship is moderated by both ICC and FoMO independently in one design. The following research question was formulated: *To what extent is social media use (SMU) related to young adults' feelings of loneliness, and to what extent do interpersonal communication competence (ICC) and Fear of Missing Out (FoMO) moderate this relationship?*

Theoretical Framework

Social media use & loneliness

Social media are internet-based applications that people can use to create and exchange content (Kaplan & Haenlein, 2010). Through social networking sites (e.g., Instagram, Facebook), people can create their own public or private profiles, view other profiles, post user-generated content (e.g., text, photos, and videos), and connect and interact with others (e.g., liking or commenting) (Boyd & Ellison, 2007; Subrahmanyam & Smahel, 2011). Instant messaging applications (e.g., WhatsApp, Facebook Messenger) allow people to effortlessly communicate with other people over the internet (Ramirez & Broneck, 2009). So, social media (i.e., social networking sites and instant messaging applications) allow users to create content and stay in touch with other people online.

Over the years, several scientific studies have shown that social media use (SMU) has a negative impact on the mental well-being of young adults (Davila et al., 2012; Berryman et al., 2017; O'Reilly et al., 2018). For instance, research investigating the developmental patterns of SMU has indicated its association with mental health issues, including depressive symptoms (Moreno et al., 2011) and stress (Egan & Moreno, 2011). In addition, research showed that young adults with high SMU were more likely to experience symptoms of social anxiety than young adults with low SMU (Shaw et al., 2015). Moreover, empirical research revealed that SMU among young adults could lead to feelings of loneliness (Primack et al., 2017; Hunt et al., 2018; Bonsaksen et al., 2023).

Loneliness is an unpleasant and distressing experience people may have due to a deficiency in their social network (Perlman & Peplau, 1981). These deficiencies in a person's network of social relationships can be qualitative (e.g. poor communication, dissatisfaction) or quantitative (e.g. frequency of social interaction, existence of social relationships). Perlman and Peplau (1981) viewed loneliness as a subjective state, and not only as an objective experience. An objective experience, in contrast, is the feeling of social isolation, which refers only to the absence of social relationships (Peplau et al., 1979). Another study by Primack et al. (2017) divided social isolation into an objective and subjective experience. Objective social isolation is seen here as an actual lack of social relationships, and subjective

social isolation is described as feeling uninvolved in relationships. Thus, objective and subjective social isolation are seen as related, but not the same. The current research measures both objective social isolation and subjective experience as indicators of loneliness, which is in line with the definition of loneliness from Perlman and Peplau (1981).

These two objective and subjective constructs of loneliness are represented by the multidimensional theory of loneliness, developed by Weiss (1974). He distinguishes loneliness into two types; social loneliness and emotional loneliness. Social loneliness results from the absence of a network of engaging social relationships (e.g., a group of friends, colleagues, and fellow students). People may experience this type of loneliness when they move to a new social environment, for example to a new school or job. Emotional loneliness stems from the lack of an intimate relationship or a close emotional bond. This form of loneliness occurs when a person loses their best friend or experiences a divorce, for example (Russell et al., 1984). People can feel emotionally lonely, even when they have a large group of social relationships. On the other hand, people can have intimate relationships but still experience social loneliness. Here, social loneliness links to objective social isolation and emotional loneliness to subjective experience (Perlman & Peplau, 1981). In other words, the current definition of loneliness in this research is seen as how someone perceives, experiences, and evaluates his or her absence of or quality of social contacts (De Jong Gierveld, 1998).

The relationship between SMU and loneliness among young adults can be explained by the social displacement model by Kraut et al. (1998). This model hypothesized that internet use replaces face-to-face social interactions (i.e., offline communication with social contacts). As a result, young adults lack feelings of affection from interactions with friends or family in real life, which can make them feel lonely. Kraut et al. (1998) examined internet use over a period of one to two years, and results showed that increasing internet use was associated with decreased family communication and face-to-face interactions of participants with social contacts. Moreover, the findings of their study showed that increased internet use was associated with self-reported feelings of loneliness.

More studies confirmed that individuals who spend more time on online activities than offline engagements experience increased levels of loneliness (Chou & Hsiao, 2000; Deniz, 2010; Weiser, 2001). A possible reason for this could be the different nature of building and maintaining social relationships online, for example, by chatting via WhatsApp or Instagram Direct Messenger, as opposed to face-to-face interactions in real life (Long et al., 2022). Among young adults, social media platforms serve primarily as a means of staying in touch with their social contacts, but online communication can be less satisfying than in-person relationships because they lack intimacy and meaning (Subrahmanyam et al., 2008; Scott et al., 2019). A recent study even confirmed that people who rely on social media to sustain their social interactions experience feelings of loneliness (Bonsaksen et al., 2023). Moreover, a study demonstrated a positive association between SMU and loneliness, suggesting that virtual friendships formed through social networking sites are less fulfilling than face-to-face friendships (Dror & Gershon, 2012). Thus, while social media enables communication among individuals, it cannot fully replace the depth and quality of human interactions, potentially leading to increased feelings of loneliness.

In line with this reasoning, research showed that young adults can feel emotionally lonely even if they have an online circle of friends (Von Soest et al., 2020). Nowadays, there is a desire among most young adults to expand their online social network, as evidenced by their pursuit of acquiring "friends" or "followers" on social media platforms (Fardghassemi & Joffe, 2022). However, socializing on social media does not serve as a replacement for face-to-face social interactions, which does not alleviate feelings of loneliness (Yao and Zhong, 2014). So, young adults can have many people in their network on social media, but still experience emotional loneliness (Reid & Reid, 2007).

The relationship between SMU and loneliness was investigated by Hunt et al., (2018) through an experiment. In their experiment, participants were randomly assigned to either limit their SMU to 10 minutes per day or to use social media the way they would normally do for three weeks. The experimental group who limited their SMU showed less loneliness compared to the control group. The study showed that young adults with decreased SMU experienced decreased levels of loneliness compared to those with high SMU. In a related study, Primack et al. (2017) explored the association between SMU and social

isolation, with a specific focus on self-reported overall time and frequency of SMU. In their study, participants filled in an online survey that measured self-reported overall time and frequency of SMU and their level of loneliness. The results of the study showed that young adults with high SMU are more likely to be socially isolated, compared to young adults with low SMU.

In addition to regular SMU, excessive use of social media is also linked to feelings of loneliness (Costa et al., 2019; Bakry et al., 2022). When young adults overuse social media, they feel overwhelmed by the information and social activities on social media (Han & Myers, 2018; Sun & Zhang, 2021). This overuse can lead to social media addiction and differs from regular SMU, such that malignant psychological dependence on social media can occur (Cao et al., 2020). When young adults are addicted to social media, they have reduced self-regulation and cannot control their excessive SMU (Khan et al., 2021). These addictive symptoms of social media can lead to low work performance (Xanidis & Brignell, 2016), less healthy social relationships (Müller et al., 2016), sleep problems (Koc & Gulyagci, 2013), and low life satisfaction (Hawi & Samaha, 2016). So, excessive SMU is defined as social media addiction, and this can have a negative effect on young adults. Muusses et al., (2014) investigated the relationship between compulsive internet use and loneliness, and the results showed that compulsive internet use predicted loneliness over time. Thus, previous research showed that people with moderate to excessive SMU may experience loneliness. Therefore, the current study made no distinction between the amount of SMU (regular to overuse) among young adults to investigate the relationship between SMU and loneliness.

H1. There is a positive relationship between social media use (SMU) and loneliness among young adults, such that increased SMU corresponds to increased loneliness.

Fear of Missing Out & loneliness

One emerging phenomenon that can help explain the link between SMU and loneliness is the Fear of Missing Out (FoMO). FoMO is defined as "a pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski et al., 2013) (p. 1841). People with FoMO get anxious when noticing they are missing out on experiences that others are having (Hetz et al., 2015). Research on FoMO and its associations with personality has shown that FoMO is associated with neuroticism (i.e., emotional instability) (Rozgonjuk et al., 2021). Neuroticism is one of the big five personality traits and is the predisposition to experience negative affect, which includes anxiety (Mehroof & Griffiths, 2010). FoMO individuals are more prone to negative emotions such as anxiety and tend to worry quickly. They become anxious if they are not invited to a party or when, for example, they do not understand an inside joke that their friends laugh at (Pryzbylski et al., 2013).

Much of the existing literature on FoMO relates to the context of SMU. For example, research showed that individuals high in FoMO tend to stay connected or stay informed about the lives of others through SMU (Beyens et al., 2016). People who feel they are missing out on rewarding experiences may feel compelled to check their social media more often to keep up with friends' plans and activities, which could even lead to social media addiction (Elhai et al., 2016; Alinejad et al., 2022). So, FoMO seems to be positively associated with regular and problematic SMU (Baker et al., 2016; Franchina et al., 2018; Roberts & David, 2020; Zhu & Xiong, 2022).

For young adults high in FoMO, SMU may have negative consequences. If young adults with FoMO engage in social media, they may show behaviors that involve comparing their social lives to others (Vogel et al., 2015; Reer et al., 2019). On social networking sites, they get exposed to photos and videos of other rewarding activities posted by friends or influencers, and they may experience anxiety about their perceived lack of success and participation (Elhai et al., 2018; Yin et al., 2019). This social comparison on social media platforms could be a reason for individuals with FoMO to experience feelings of loneliness (Dibb & Foster, 2021). Furthermore, young adults with higher levels of FoMO are particularly conscious of their lack of offline social interactions compared to those with lower FoMO

levels (Scott & Woods, 2018). This heightened awareness of missing out can lead to feelings of exclusion or disconnection from their peers (Marengo et al., 2021). So, it may be suggested that high levels of FoMO exacerbate the positive relationship between SMU and loneliness.

To date, not much scientific literature is available regarding the role of the trait FOMO as a moderator in the relationship between SMU and loneliness. Recent scientific research does indicate that FoMO is a moderator in the relationship between SMU and negative affect in young adults (Riordan et al., 2021). This study found that FOMO enhanced the effect of SMU on negative emotions such as unhappiness, anxiety, and sadness. In another study, the results showed that FoMO strengthened the relationship between SMU and sleep, as adolescents who reported higher levels of FOMO used more social media and went to sleep later (Scott & Woods, 2018). However, some studies suggest that FoMO is a mediator in the positive relationship between SMU and loneliness (Fumagalli et al., 2021; Mao et al., 2023). These studies indicate that SMU leads to higher levels of loneliness through higher levels of FoMO. Moreover, a study showed a positive relationship between FoMO and loneliness, but with a moderating effect of SMU (Barry & Wong, 2020). However, the current study aims to show that the influence of SMU on loneliness differs for individuals with high levels of FoMO and thus indicates a moderating effect of FoMO on the positive relationship between SMU and loneliness.

H2. Fear of Missing Out (FoMO) will moderate the positive relationship between social media use (SMU) and loneliness among young adults, such that this association is stronger for young adults with higher levels of FoMO.

Interpersonal communication competence & loneliness

Another moderator that could explain the link between SMU and loneliness is interpersonal communication competence (ICC). ICC is a broad term, and there are a lot of different accepted terminologies to describe it. For example, the term "competence" in ICC can be referred to several terms: social adjustment, psychosocial competence, environmental competence, rhetorical competence, communicative competence, conversational competence, interactional competence, relational competence, and social skills (Spitzberg & Cupach, 1983). In the current study, ICC is viewed as the perception of one's ability to effectively handle social relationships in various communication settings (Rubin & Martin 1994). These communication settings can involve interaction between two individuals, as well as communication between groups (Spitzberg & Cupach, 1984). ICC can also be defined as communication or social skills used during social interactions and social or group dynamics (Riggio, 1986; Mantzouranis et al., 2019).

The offline and online contexts in which people communicate with each other differ, and people's interpersonal communication skills are therefore considered context-sensitive (Cîrtiță-Buzoianu et al., 2022). Offline ICC is considered as the behavior and communication of individuals in real life, such as during face-to-face conversations. Face-to-face communication can be more personal than online communication because of the verbal and nonverbal cues and instant feedback individuals get from their interlocutors (Mantzouranis et al., 2019). For example, a short time in which someone formulates their answer is expected in the offline interpersonal context because there is a high degree of personal attention. Moreover, offline ICC is an important factor affecting the quality of interpersonal relationships (Erozkan, 2013).

Not much research has been done in the online context of ICC, which is unexpected since people interact a lot via social media and communicate more online than offline (Lieberman & Schroeder, 2020). Online ICC is considered as the behavior and communication of individuals in the digital world, such as social media interactions. In the online context, interpersonal communication can be synchronous (e.g., live streams/chats) or asynchronous (e.g., text messaging, emailing) (Siemens, 2011). Asynchronous

online communication gives individuals more time to think about a response because it does not require the immediate attention of the recipient. Moreover, emoticons (i.e., pictorial representations of facial expressions) are used in the digital context, for example, in text messages or comments on social media (Lo, 2008). These emoticons are important for setting the tone and purpose of a message and replacing people's facial expressions in offline communications. Because of the differences in the online and offline contexts, both online and offline ICC were measured to get a complete picture of a person's ICC level.

According to Reich (2017), some characteristics of offline social competence could translate to online social interactions, and he considered offline ICC as equivalents of online ICC. For example, there is a link between cyberbullying and low social competence in offline environments, for both bullies and victims, as discovered by Vandebosch and Van Cleemput (2009). Furthermore, a study demonstrated that young adults with high face-to-face social skills (e.g., prosocial behaviors), extended these behaviors in their digital world (Wright & Li, 2011). So, these studies suggest that offline ICC could be reflected in online interactions. In the present study, the same components of ICC were measured in the online and offline contexts, and these two contexts were combined to measure an average level of ICC.

Examples of components of ICC in the online and offline context include sociability, emotion decoding, self-disclosure, and assertiveness (Mantzouranis et al., 2019). The tendency to prefer contact and interaction with other people to being alone is defined as the sociability component of ICC (Cheek & Buss, 1981). Emotion decoding refers to identifying other people's emotions such as anger or happiness (Hyniewska et al., 2019). In the offline context, people can recognize the emotions of others through body language, and in the online world, for example, through the use of emoticons (Lo, 2008). The component self-disclosure of ICC means the intentional revealing of personal intimate information such as how you feel (e.g., people showing that they are scared of something) (Tardy & Smithson, 2018). The component assertiveness means the skill of respecting yourself by expressing your feelings and desires in an interpersonal situation (Lorr & Morr, 1980). For example, someone who is assertive tends to initiate something or ask others to change their behavior. The function of these four components of ICC remains

the same in the present study regardless of the context (offline or online) in which the interpersonal communication occurs (Mantzouranis et al., 2019).

Research has shown that ICC is associated with SMU. For example, people with low ICC levels spend more time online than offline, to escape from real-life conversations (Caplan, 2005). Furthermore, research shows that young people with less communication skills, who lack close relationships and fulfillment in their offline lives, seek to fill this through SMU (Valkenberg et al., 2005). Moreover, young adults' weak ICC can influence their feelings of social anxiety (i.e., fear in social situations) (Hwang & Lee, 2015). Because young adults with low ICC are anxious to be judged by others in an offline context, they prefer communication on social media compared to face-to-face communication (Hutchins et al., 2021). However, this time spent on social media can have negative consequences for young adults with weak ICC.

Young adults with low levels of ICC may have difficulty with their self-disclosure (i.e., sharing personal information) on social media platforms. For example, they may find it difficult to share their emotions and therefore may not be encouraged by others online (Zakahi & Duran, 1985). This lack of emotional support online might lead to feeling socially disconnected and lonely (Nilsen et al., 2013; Lee et al., 2013). On the other hand, young adults with stronger self-disclosure will have the ability to receive emotional support on social media, which will increase their relational satisfaction (Huang, 2016). Moreover, research was conducted on the relationship between SMU and loneliness in which online self-disclosure was examined as a moderator (Xu et al., 2020). Results of this study showed that online self-disclosure might help maintain the closeness of social relationships, thereby reducing loneliness. In the current study, it is assumed that individuals with lower levels of ICC (i.e., self-disclosure) feel lonelier when using more social media than individuals with higher levels of ICC.

ICC's sociability and assertiveness components could also explain the positive relationship between SMU and loneliness. People with high levels of sociability and assertiveness are often considered extroverts (Soto & John, 2017). Research showed that people with extraversion and sociability can express themselves to a great extent online, and therefore grow their online social capital more than

introverted people (Kraut et al., 2002; Sheeks & Birchmeier, 2007). Extraverts with a wide range of online social connections may therefore feel less lonely than introverts when their SMU increases (Cheng et al., 2019). On the other hand, one can assume that introverts' involvement in an online community decreases when they use social media due to their lack of ICC such as sociability, which can make them feel lonely. So, it can be suggested that people with less sociability and assertiveness, who are considered introverts, feel lonelier when they use social media than people who are extroverted and are more social and assertive.

To conclude, this current study suggests that people's ICC (i.e., sociability, self-disclosure, emotion decoding, and assertiveness) are skills that are used in offline and online interactions between individuals or groups and can affect the quality of social relationships dynamics (Riggio, 1986; Mantzouranis et al., 2019). Young adults with low ICC are less able to disclose themselves on social networking sites, so they receive less emotional support from others and may feel lonely (Nilsen et al., 2013; Lee et al., 2013). On the other hand, young adults with high sociability and assertiveness, considered extroverts, can express themselves online, leading to more social contacts and fewer feelings of loneliness compared to introverts (Cheng et al., 2019). This study aims to show that more SMU may lead to more feelings of loneliness, especially for young adults with weaker ICC. Not much earlier research is done on the moderating effect of levels of ICC in the relationship between SMU and loneliness. However, research confirmed that the component self-disclosure of ICC has a moderating effect on the relationship between SMU and loneliness (Xu et al., 2020). Furthermore, previous studies within the context of ICC have frequently focused on either offline ICC or online ICC. To gain a comprehensive understanding of the ICC of young adults in an era where communication largely takes place in the digital domain, for example through social media, both offline and online ICC are examined in this present research. Figure 1 shows the full conceptual model for the current study.

H3. Interpersonal communication competence (ICC) will moderate the positive relationship between social media use (SMU) and loneliness among young adults, such that this association is stronger for young adults with weaker levels of ICC.

Figure 1

Conceptual model of the study
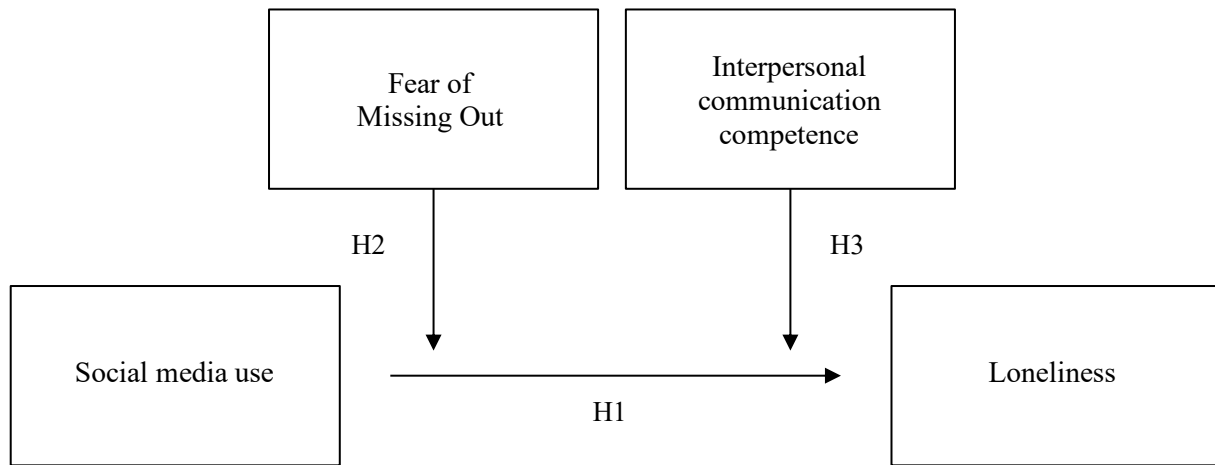
Note. The conceptual model of the independent moderation effect of 'Fear of Missing Out' and interpersonal communication competence on the relationship between social media use and loneliness.

Method

Study design

      This current research aimed to examine the relationship between loneliness, social media use (SMU), Fear of Missing Out (FoMO), and interpersonal communication competence (ICC) among young adults. To investigate this relationship, a cross-sectional design was employed. The quantitative data was collected through an online questionnaire using Qualtrics. This design was chosen because it allows data from all four variables (loneliness, SMU, ICC & FoMO) to be collected simultaneously and relationships between them to be discovered in the target population of young adults. The study focuses on young adults from the Netherlands and the questionnaire was therefore written in Dutch to avoid miscommunication due to a language barrier. The outcome variable in this research was loneliness. The predictor variable was the participant's SMU, and ICC and FoMO were two independent moderators.

Participants

      This study focused on Dutch young adults aged between 18 and 25 years. Convenience and snowball sampling via social media were used to recruit these participants. The questionnaire was shared through Facebook groups, Instagram and LinkedIn. Also, friends and family of the experimenter have been asked to share the link with other people who fit into the target group. A statistical power analysis was conducted using G*Power version 3.1.9.7 to indicate the sample size for the current study (Faul et al., 2007). The results suggested that, with a power of 80%, a sample size of 395 is suitable to obtain adequate statistical power (Appendix G). Therefore, the sample size aimed for in this study was 395. In total, 553 participants took part in the study, however, not all the participants finished the questionnaire. After removing these participants from the data, the final sample consisted of 338 participants. In earlier research in the field of SMU and loneliness with a moderating effect of self-disclosure the sample size consisted of 308 respondents (Xu et al., 2020). Therefore, the sample size of the current study is considered appropriate. Out of the 338 participants, 91.7% were female and 8.3% were male, and the mean age was 22 ($SD = .12$).

Measures

The online survey consisted of five components to execute the research.

Loneliness

In this study, the outcome variable was loneliness, which was assessed using a scale consisting of six items. The scale was developed by De Jong Gierveld and Van Tilburg (2006) and measured overall, emotional, and social loneliness. Notably, the researchers first developed an 11-item loneliness scale, but this scale sometimes made it difficult to use in large studies. They considered the shortened version (6-items) valid and appropriate, which was used in the current study. These 6-items were: *"I experience a general sense of emptiness"; "There are plenty of people I can rely on when I have problems"; "There are many people I can trust completely"; "I miss having people around me"; "There are enough people I feel close to"; "I often feel rejected".* A five-point Likert scale was utilized for the items, with response options that ranged from 1 (strong disagreement) to 5 (strong agreement). To obtain a more precise measurement of loneliness, the three positively worded items were reverse-coded, which can be found in Appendix B. A mean score was calculated based on the participants' responses, to create the loneliness scale ($M = 2.29$, $SD = 0.81$). The reliability of the scale was excellent ($\alpha = .874$).

Social media use

Firstly, a scale by Vossen and Valkenburg (2016) was used to measure the variable social media use (SMU). This scale consisted of four questions about participants' use of social networking sites (e.g., Instagram, TikTok) and instant messaging applications (e.g., WhatsApp, Facebook Messenger), and their frequency. The first question was about how many days per week the participants used social networking sites. For this item, a range from 0 (never) to 8 (7 days a week) was used. A greater numerical value indicated more frequent SMU. Secondly, the participants were asked how much time they spend on social networking sites per day, expressed in hours and minutes. This item was an open-ended question. The third question was about the use of instant messaging applications per week and the same range from the first question was used. Lastly, participants were asked how many hours and minutes they spend on instant messaging applications per day, also through an open-ended question. Following the questions,

social networking sites (M = 1558.15, SD = 43.08) and instant messaging applications (M = 701.97, SD = 31.25) were measured separately by multiplying the results in minutes by the number of days of the week. Finally, the total score for SMU in minutes per week was obtained by summing the weekly values of these two items (M = 2232.64, SD = 978.80).

Fear of Missing Out

One moderator variable of this research was 'Fear of Missing Out'. To measure this variable, a scale by Pryzbylski et al. (2013) was employed. The scale used to assess FoMO comprised 10 items, each rated on a 5-point Likert scale indicating agreement or disagreement. A mean score was calculated based on the participant's responses to the 10 items. A higher mean score indicated a greater level of FoMO experienced by the participant. One example of an item included in the FoMO scale developed by Pryzbylski et al. (2013) is: *"I get worried when I find out my friends are having fun without me".* To measure a scale for FoMO, means were calculated over the 10 items (M = 2.99, SD = 0.67). In addition, a reliability analysis was conducted on the 10-item FoMO scale (α = 0.78).

Interpersonal communication competence

Another moderating variable in the present study was interpersonal communication competence. This variable was measured by the 'Real and Electronic Communication Skills questionnaire' (RECS), developed by Mantzouranis et al. (2019) (Appendix A). In their study, the objective was to create a multidimensional measure for social communication skills that is relevant to both computer-mediated communication (CMC) and face-to-face (FtF) interactions. First, social skills dimensions relevant to face-to-face (FtF) interactions were asked through the Real Communication Skills (RCS) subscale. Second, the same social skill dimensions were applied to text-based computer-mediated communication through the Electronic Communication Skills (ECS) subscale. Both subscales consisted of four dimensions of social competence: sociability, self-disclosure, emotion decoding, and assertiveness. The scale consisted of 36 items and each subscale included 18 items. All the dimensions consisted of 5 items, except for the assertiveness subscale which consisted of 3. The 18 offline items themselves were adapted to the online context. An example of an item of the dimension sociability in FtF interactions was: *"People think I have*

a lot of friends". The dimension sociability in CMC interactions was measured by an item such as: *"I have a wide circle of online friends"*. Offline self-disclosure was measured by an item such as: *"I find it difficult to hide my emotions"*. An example item of the dimension self-disclosure in CMC interactions was: *"I easily share my emotions"*. An example item of the dimension emotion decoding in FtF and CMC interactions was: *"I am skilled in identifying the emotions of others"*. Offline and online assertiveness (RCS) was measured by an item such as: *"I do not express my opinion when it differs from others"*. The questionnaire first presented participants with statements about ICC in the offline context and then similar statements in the online context. The participants' responses were evaluated using a Likert scale with 5 points, where 1 indicated strong disagreement and 5 indicated strong agreement. A total of 3 items from the self-disclosure subscale and 1 item from the assertiveness subscale were reverse-coded so that the ICC score could be correctly calculated, which can be found in Appendix B.

To ensure that the subscales of RECS were valid and reliable, an exploratory factor analysis (EFA) and a reliability analysis were performed on the 18 items of both RCS and ECS in SPSS. The Kaiser-Meyer-Olkin (KMO) sampling adequacy value was 0.77, which suggested that the sample size of the RCS subscale was good (Field, 2018). Secondly, Barlett's Test showed significant results (χ^2 (153) = 1718.85, p = < .001), indicating that the correlations between the scale items of RCS were large enough. The EFA showed that 4 components had initial eigenvalues greater than 1. Those components explained 55.39% of the variance. So, the variance explained by these 4 components suggests that they capture a substantial portion of the underlying patterns or structures in the dataset.

For the ECS subscale, the KMO sampling adequacy value was 0.79, indicating that the sample size of the ECS subscale was excellent (Field, 2018). The Barlett's Test also showed a good outcome (χ^2 (153) = 1612.82, p = < .001), indicating acceptable correlations between the scale items. Five components had initial eigenvalues greater than 1. Those components explained 57.35% of the variance. So, these components explain an acceptable percentage of variability of the ECS subscale. It was expected to have 4 components. Therefore, a solution to improve the structure of the instrument was to exclude an item of the assertiveness dimension from the ECS subscale. The EFA showed 4 components with an eigenvalue

greater than 1, which explained 53,49% of the variance. This means that the 5-components did not consistently emerge in different analyses. Because of the little difference between the two variances of the RECS subscale, the researcher's choice was to include the item from the assertiveness dimension. However, it is important to keep this validity in mind for interpreting the findings of the study, due to potential limitations of the measurement of RECS as chosen instrument for ICC. The factor analysis for both subscales can be found in Appendix F.

Furthermore, the reliability of the general RECS scale was excellent (α = .80). The RCS subscale (offline ICC) showed good reliability (α = .73). Its dimensions showed good or questionable reliability (sociability α = .78; self-disclosure α = .74; emotion decoding α = .80; assertiveness α = .65). The ECS subscale (online ICC) also showed good reliability (α = .78), but its dimension 'assertiveness' showed bad reliability (α = .27). Despite the low outcome of the scale reliability of the assertiveness dimension, the overall reliability of ICC in the offline and online context was still considered good. Therefore, it was decided to combine the two online and offline subscales into a full ICC scale. However, it is important to interpret the results with this consideration in mind. A mean score was calculated based on the participant's responses to the 36 items (M = 3.20, SD = 0.34). The complete questionnaire can be found in Appendix C.

Procedure

Through social media, people were invited to participate in this study. In this recruitment, they were informed about the eligibility requirements (i.e., Dutch citizen and age). A shared link to Qualtrics allowed them to access the survey. The first thing participants saw in Qualtrics was an information letter that asked them to give informed consent (Appendix D). To ensure that the targeted group completed the survey, the eligibility requirements were again reiterated. Before starting the questionnaire, the participants had to confirm that they had read the informed consent and agreed to take part in the research. The survey first started with demographic questions about their age and gender. Secondly, questions about loneliness, SMU, ICC, and FoMO were asked. Finally, participants received a debriefing (Appendix E).

Results

A regression analysis with mean centered variables and the Hayes' version 4.2 PROCESS macro model 2 in IBM SPSS Statistics 27 (Hayes, 2013) were used to test all three hypotheses. This was chosen because in SPSS all assumptions could be properly tested and with the Hayes model 2 the conditional effects could be analyzed.

Before testing the hypotheses, missing data and outliers of the data were first inspected. There were some slight outliers of the data (4 for SMU, 6 for loneliness, and 11 for ICC). Therefore, in the regression analysis the Cook's Distance was checked, to identify whether there are outliers that negatively affect the regression model. The largest Cook's Distance was 0.14, indicating that no observations had undue influence on the model.

Secondly, the normality and homogeneity of the data were determined (Appendix H). The assumption of normality of the residuals has not been met. This has been tested with skewness and kurtosis statistics (z-score$_{skewness}$ = 2.92, z-score$_{kurtosis}$ = 0.15). Since the dataset is large, the analysis will be robust against this violation. According to the regression standardized predicted value on regression standardized residual plot the assumptions of homoscedasticity and linearity are met.

Correlation analysis

Pearson's Correlation test was conducted to examine the relation between the variables. The results showed that SMU and loneliness had a weak positive correlation, $r = .108$, $p = .047$. Furthermore, results showed a weak negative correlation between loneliness and ICC, $r = -.276$, $p = < .001$. Moreover, since the intercorrelations in the study revealed a non-significant positive correlation between FoMO and ICC, the decision to measure them separately in the current study design was supported. The means, standard deviations, and results of the correlation analysis can be found in Table 1.

Table 1

Correlations, means (M) and standard deviations (SD) of model variables

Scale	M	SD	1.	2.	3.	4.
1. Loneliness	2.29	0.81	-			
2. SMU	2232.64	978.80	.108*	-		
3. ICC	3.20	0.34	-.276**	.131*	-	
4. FoMO	2.99	0.67	.324**	.187**	.036	-

Note. Correlation is significant at * $p < 0.05$, ** $= p < .01$. SMU = Social Media Use, ICC = Interpersonal Communication Competence, FoMO = Fear of Missing Out

Regression analysis

To test the hypotheses a regression has been run with loneliness as dependent variable, SMU as independent variable, and ICC and FOMO as moderating variables. First, SMU, ICC and FOMO were mean centered to prevent multicollinearity issues. Next, the interaction variables were calculated by multiplying the mean centered SMU with the mean centered ICC and afterwards the mean centered SMU with the mean centered FOMO. The regression as a whole was significant, $R^2 = .22$, $F(5, 331) = 18.56$, $p < .001$.
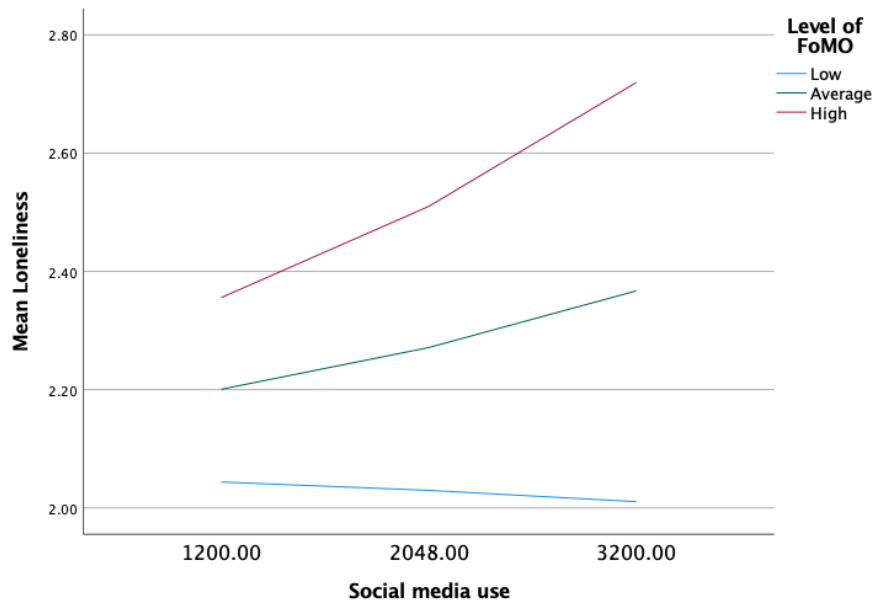
Firstly, hypothesis 1 was analyzed, which suggested a positive relationship between SMU and loneliness. Within this regression analysis the mean centered independent variable SMU was significant, $B = .00082$, $t(331) = 1.98$, $p = .048$. Therefore, the first hypothesis of the current study, which stated that SMU is related to loneliness, was confirmed. Moreover, the positive sign of this relationship implies that higher levels of SMU lead to higher levels of loneliness.

Secondly, hypothesis 2 was analyzed, which stated that FoMO has a moderating effect on the relationship between SMU and loneliness. The interaction effect between the mean centered SMU and the mean centered FOMO was significant, $B = 0.00014$, $t(331) = 2.42$, $p = .016$. So, there was proof that

FoMO moderated the positive relationship between SMU and loneliness, such that this association was stronger for young adults with higher levels of FoMO. Thus, hypothesis 2 was supported (see Figure 2).

Figure 2

Independent moderating effect of FoMO on SMU as a predictor of loneliness

Lastly, hypothesis 3 was analyzed, which suggested that ICC in the online and offline context has a moderating effect on the relationship between SMU and loneliness. The interaction effect between the mean centered SMU and the mean centered ICC was not significant, B = -0.00024, $t(331)$ = -1.82, p = .069. This result indicates that the positive relationship between SMU and loneliness was not moderated by ICC, such that the association was stronger for young adults with weaker levels of ICC. Thus, the third hypothesis of the present study was rejected (see Figure 3). All the results of the regression analysis can be found in Table 2 and all the conditional effects can be found in Table 3. Figure 4 shows the full moderation model with SMU as predictor, and the full SPSS output of the regression analysis can be found in Appendix I.

Figure 3

Independent moderating effect of ICC on SMU as a predictor of loneliness
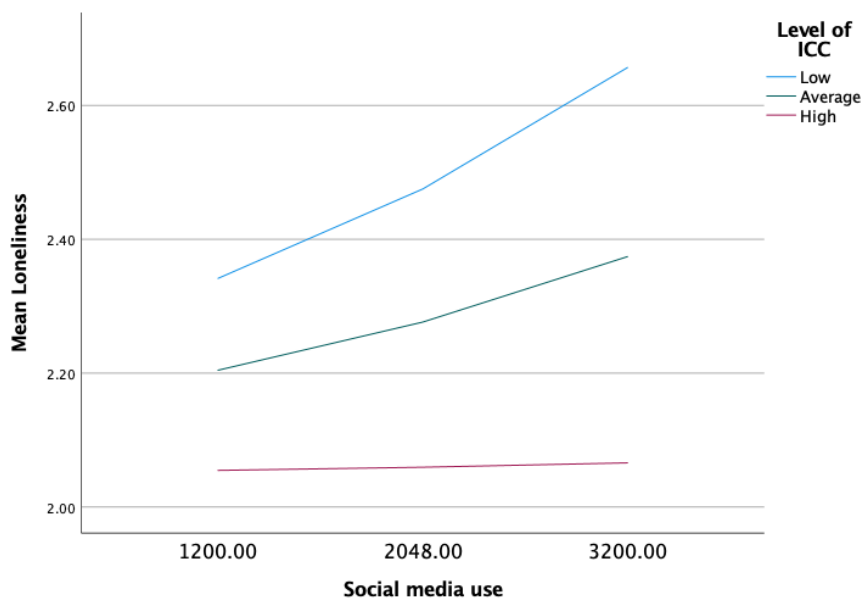
Table 2

Regression analysis output

	B	SE	β
Constant	2.29	0.04	
SMU (MC)	0.000082*	0.000042	.10*
ICC (MC)	-0.70***	.12	-.30***
FoMO (MC)	0.37***	.06	.31***
SMU*ICC	-0.00024	0.00013	-.09
SMU*FoMO	0.00014*	0.00006	.12*
Total R^2		.22***	
F		18.56	

Note: * p < .05, ** p< .01, *** p < .001

Table 3

Conditional effects for the dependent variable loneliness from SMU for different levels of the moderators.

FoMO	ICC	Effect	t	p
2.32	2.85	.0001	.91	.36
2.99	2.85	.0002	2.57	.01
3.66	2.85	.0003	3.47	.001
2.32	3.20	.0000	-.23	.82
2.99	3.20	.0001	1.98	.05
3.66	3.20	.0002	3.06	.002
2.32	3.54	-.0001	-1.38	.17
2.99	3.54	.0000	.001	.10
3.66	3.54	.0001	1.33	.19

Note. All values within the table are the average - 1SD, the average or 1 average + 1SD.

Figure 4

Independent moderating effect of FoMO and ICC on SMU as a predictor of loneliness
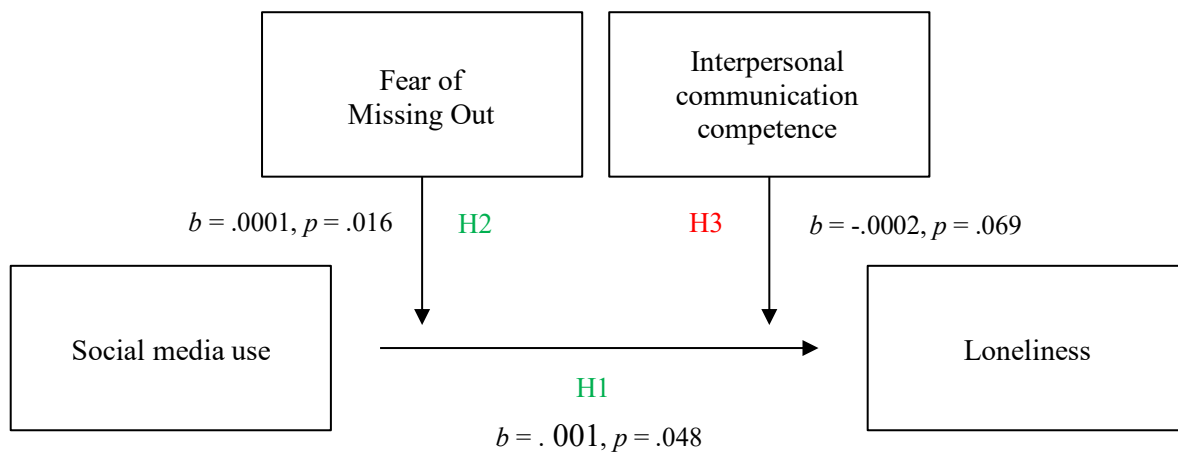
Note. b, unstandardized regression coefficient; *p*, p-value.

Additional exploratory analysis

Mediation analysis

Given previous theory indicated evidence for a mediating effect of FoMO in the relationship

between SMU and loneliness, it was chosen to run an additional mediation analysis (Fumagalli et al.,

2021; Mao et al., 2023). Moreover, the intercorrelations of the current study showed a significant positive

correlation between SMU and loneliness and a significant positive correlation between FoMO and SMU.

The mediation analysis was done using Hayes' version 4.2 PROCESS macro model 4 (Hayes, 2013).

Loneliness was inserted as the outcome variable, SMU as the predictor variable, and FoMO as the

mediator variable. The findings showed that SMU and loneliness had no direct significant relationship (*B*

= .0004, *t* =.93, *p* = .356). Furthermore, the results showed a significant indirect effect of FoMO on the

relationship between SMU and loneliness, *b* = .00004, Bootstrapped 95% CI [00002, .0001]. This means

that FoMO had a full mediating effect in the relationship between SMU and loneliness. All the results for

the mediation analysis can be found in Table 4. Figure 5 shows the exploratory mediational model.

Table 4

Mediation analysis output

	FoMO			Loneliness		
	B	*SE*	*β*	*B*	*SE*	*β*
Constant	2.70	0.09		1.05	0.24	
SMU	0.00013***	0.0004	.19	0.00004	0.12	.05
FOMO				0.38***	0.06	.32
Total R^2	.04***			.33***		
F	12.11			20.37		

Note: * p < .05, ** p< .01, *** p < .001

Figure 5

Mediating effect of FoMO on SMU as a predictor of loneliness

$\beta = .19$, $b = .0001$, $p = .0006$

Fear of Missing Out

$\beta = 0.32$, $b = .384$, $p < .001$

Social media use
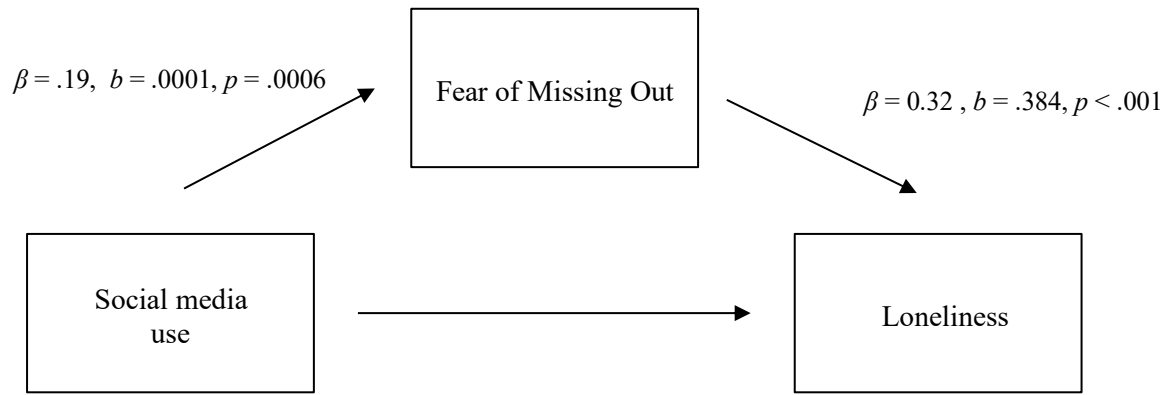
Loneliness

Direct effect, $\beta = .05$, $b = .00004$, $p = .356$

Indirect effect, $b = .00004$, 95% Bootstrapped CI [.00002, .00087]

Discussion

The objective of the present research was to investigate the relationship between social media use (SMU) and feelings of loneliness among young adults, independently moderated by interpersonal communication competence (ICC) and the Fear of Missing Out (FoMO). Firstly, the present research tested the hypothesis that increased SMU led to increased feelings of loneliness (H1). In line with expectations, the results showed a significant relationship between SMU and loneliness, supporting H1. Secondly, the results of the present study suggested support for the hypothesis that the association between SMU and loneliness is stronger for young adults with higher levels of FoMO (H2). The results showed a significant moderating effect for FoMO, so H2 was confirmed. Thirdly, the current study hypothesized that young adults who use social media and have a weaker ICC experience more loneliness than young adults with a stronger ICC (H3). However, contrary to expectations, there was no significant effect for the moderator ICC. Thus, there was no support for H3.

Main findings

As expected, the results of the current study showed a significance in the relationship between SMU and loneliness (H1), meaning that young adults with more SMU experienced more feelings of loneliness. A potential explanation for this could be that the use of social media displaces offline communication with social contacts, causing young adults to miss depth and intimacy they do not receive on social media platforms (Kraut et al., 1998; Deniz, 2010; Scott et al., 2019). Moreover, having a large social network online is not an effective alternative to face-to-face social interactions, because young adults can still feel emotionally lonely (Yao and Zhong, 2014; Von Soest et al., 2020).

In addition, the current study investigated the moderating role of FoMO in the positive relationship between SMU and loneliness (H2). The significance of the relationship between SMU and loneliness was enhanced when FOMO was added to the model. In addition, FoMO itself was also a significant predictor of young adults' loneliness and FoMO was a significant moderator in the model. So, young adults with high levels of FoMO have more feelings of loneliness when using social media than young adults with low levels of FoMO. A reason for this could be that young adults high in FoMO are

more anxious on social media due to social comparison than young adults low in FoMO (Vogel et al., 2015; Dibb & Foster, 2021). Also, via social media, individuals with FoMO are aware of the activities or connections they are missing, which can make them feel excluded or disconnected from others (Scott & Woods, 2018; Marengo et al., 2021). So, young adults with high levels of FoMO are more affected by the use of social media than young adults with low levels of FoMO.

Because earlier theory suggested the mediating role of FoMO in the relationship between SMU and loneliness (Fumagalli et al., 2021; Mao et al., 2023), this has been investigated in an exploratory mediation analysis. It was found that FoMO did have a significant mediating effect on the relationship between SMU and loneliness. This means that in the current study, FoMO was not only a moderator but also a mediator in the relationship between SMU and loneliness. One explanation for this could be that SMU may trigger feelings of FoMO, leading young adults to compare themselves to others and experience a fear of not being as socially connected (Yin et al., 2019). These feelings of FoMO, in turn, can intensify feelings of loneliness and isolation, as people may feel left out or disconnected from their online peers (Fumagalli et al., 2021). So, these results of the mediation analysis indicate a complex interplay between SMU, FoMO, and loneliness, because results also showed that FoMO had moderating effect in the relationship between SMU and loneliness.

In addition, the results of the current study do not support the hypothesis for the moderating effect of ICC in the positive relationship between SMU and loneliness, in the sense that this association would be stronger for young adults with weak ICC (H3). This contrasts with the earlier research providing evidence for the moderating role of ICC (e.g., self-disclosure, sociability) in the relationship between SMU, loneliness (Cheng et al., 2019; Xu et al., 2020). One explanation for this could be that people with weaker ICC can still feel interconnected with other people who may have less ICC through social media and join an online community, for example, and therefore feel less socially alone (Pittman & Reich, 2016). Another explanation could be that young adults with weaker ICC could build communication skills (e.g., self-disclosure) on social media platforms, and therefore do not feel lonely (Hollenbaugh et al., 2020; Olowo et al., 2020; Dibb & Foster, 2021).

Limitations & Future Research

The current study has potential limitations. Firstly, a limitation of this study is the use of a self-reported questionnaire. This means that respondents were in control of their answers, and these might potentially be biased. Thus, participants were able to affect their responses by trying to give a socially desirable answer. When socially desirable responses occur in research, participants want to present a favorable image of themselves (Johnson and Fendrich 2005). Therefore, it is possible that participants did not fill out the questionnaires seriously or honestly, and this in turn may have affected the validity of the data (Zimerman et al., 2014). Future research could focus on bias in self-reports and make use of a social desirability scale, for example (Van de De Mortel, 2008). In the future, observational research can also be done in this research, which may produce other results (Blanchard et al., 2009). For example, a case study can be done in which young adults are observed in their use of social media and how they apply their interpersonal communication skills. This observation will give an actual representation of their online ICC.

Secondly, a limitation of the study is the generalizability of the results to different genders. The study focused on Dutch young adults aged between 18 and 25 years old, and 91.7% of the sample consisted of female participants. So, the sample is predominantly female, and this means that the findings of the research may not be generalizable to other gender groups. A possible explanation for this may be that women may be lonelier than men (Beutel et al., 2017). An explanation for this could be that women are more prone to online social comparison (Valls, 2022). Future research could consider including a more diverse sample that represents a broader range of genders.

Third, a limitation of this current study may be that the data analyzed in this study are from a single point in time (i.e., cross-sectional). The present study was not an experiment, making it impossible to make assumptions about whether more SMU actually causes an increase in loneliness. Experiments allow to state with fairly high certainty that cause-and-effect relationships found correspond to reality (Hyttinen et al., 2013). In the future, an experiment or longitudinal design could be used, to capture changes over time and provide deeper insights into the relationship between SMU and loneliness. A

longitudinal or experimental research design may lead to different findings and a greater understanding of the causal dynamics between variables, which may not be evident in a cross-sectional design. For example, future studies could suggest a bidirectional relationship between loneliness and SMU, because studies also showed that loneliness predicts spending more time online (Caplan, 2007; Kim et al., 2009; Sheldon et al., 2011). Thus, other types of designs would provide more insight into the (bidirectional) relationship between SMU and loneliness over time and allow for stronger insights and causal inferences.

A fourth limitation could be the reliability of the scale real and electronic communication skills questionnaire (RECS) (Mantzouranis et al., 2019) as a chosen instrument for interpersonal communication competence (ICC). The RECS scale consisted of the subscales real communication skills (RCS) and electronic communication skills (RCS). Although the overall reliability of the real and electronic communication skills questionnaire (RECS) was found to be excellent, ($\alpha = .80$), the dimension assertiveness of the subscale ECS had low reliability ($\alpha = .27$). This may have affected the results of H3 by not giving a representative view of ICC in the online context. Future research should develop this real and electronic communication skills measurement, to better understand the outcomes. For example, by investigating the limitations of the dimension assertiveness and the differences between real and electronic communication skills further. Moreover, in the present study, offline and online ICC were combined to provide a complete picture of one's ICC level and showed no moderating effect on the relationship between SMU and loneliness. Further research could be done on the difference between offline and online ICC in the relationship between SMU and loneliness (Mantzouranis et al., 2019).

Conclusion

To my best knowledge, this present study was the first to examine the relationship between SMU and loneliness with ICC in the online and offline context and FoMO as two independent moderators among young adults. In line with expectations, results showed a general positive relationship between SMU and loneliness. Moreover, the result showed evidence for the moderating effect of FoMO. This means the association between SMU and loneliness was stronger for young adults with higher levels of FoMO than young adults with lower levels of FoMO. In addition, an exploratory mediation analysis showed a mediating effect of FoMO on the relationship between SMU and loneliness. The complex phenomenon of FoMO needs to be further investigated, for example, through a mediation moderation analysis. Future research could also explore the difference between FoMO as a personality trait between individuals and a state that can vary within an individual depending on factors such as time, circumstances or a specific event about which a person may feel FoMO. Moreover, this current study showed that ICC had no moderating effect on the relationship between SMU and loneliness. These new findings were not in line with earlier research which suggested that ICC could be a moderator in the relationship between SMU and loneliness (Cheng et al., 2019; Xu et al., 2020). The results of the current research can contribute to society, by giving more attention to the development of interventions to reduce SMU for individuals with high levels of FoMO. More research needs to be done on the relationship between SMU, FoMO, and loneliness, out of the importance of promoting resilience in young adults with FoMO to deal with SMU and its possible negative impact on their well-being. In the future, it could also be interesting to look at individuals' different SMU activities, as a study showed that interactive activities, for example commenting or sending messages via instant messaging applications, are related to lower levels of loneliness (Yang, 2016). Moreover, future research could make use of experimental or longitudinal studies to better understand (bidirectional) relationships and provide causal connections.

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Appendix

Appendix A: Real and Electronic Communication Skills questionnaire (RECS)

Real Communication Skills

Sociability

I enjoy meeting new people.

I like to invite new people/acquaintances to activities.

I like to meet up with a large group of friends.

I could introduce new things to interesting people.

People think I have a lot of friends.

Self-disclosure

I cry in front of other people.

I don't show my emotions easily.

I don't easily show that something scares me.

I find it hard to hide my emotions.

I do not easily show that I am ashamed of something.

Emotion-decoding

I can identify emotions of others.

I can feel others' sadness even when it is hidden.

I sense when someone is happy and rarely get it wrong.

I pay attention to body language of others.

I notice when someone is angry.

Assertiveness

Friends consider me an assertive person.

I express my opinion, even if it differs from a person I respect.

I do not express my opinion when it differs from others.

Electronic Communication Skills

Sociability

I have a wide online circle of friends.

I might suggest moving an online conversation from a public social media platform to a private chat room

(from Instagram to Instagram Direct Messenger, for example)

I enjoy chatting publicly with a large group of people.

I like to introduce new things to interesting people.

I like to invite new people/acquaintances to activities.

Self-disclosure

I do not readily show that I am ashamed of something.

I don't readily show that something scares me.

I share my emotions easily.

I find it difficult to hide my emotions.

I write long texts.

Emotion-decoding

I can identify emotions of others.

I pay attention to emoticons to better understand others' emotions.

I easily notice when someone is angry.

I sense when someone is happy and rarely get it wrong.

I sense others' sadness even when it is hidden.

Assertiveness

Friends consider me an assertive person.

I speak up when I disagree with someone.

I do not express my opinion when it differs from others.

Appendix B: Reverse-coded items ICC scale

In total, 7 items were reverse-coded so that the ICC and Loneliness score could be correctly calculated.

ICC

Self-disclosure subscale

I do not readily show that I am ashamed of something.

I don't readily show that something scares me.

I don't show my emotions easily.

Assertiveness

I do not express my opinion if it differs from that of others.

Loneliness

There are plenty of people I can fall back on in case of trouble.

I have plenty of people I can completely fall back on.

There are enough people with whom I feel close.

Appendix C: Questionnaire Scales in Dutch

Dutch:

Demografische vragen:

Wat is je leeftijd?

Wat is je geslacht?

Social media gebruik

De volgende vragen gaan over jouw sociale media gebruik. Beantwoord elke vraag door gebruik te maken van de onderstaande schaal (kies het nummer dat het beste overeenkomt met jouw antwoord) en maak gebruik van het formulierveld.

Sociale media is verdeeld in sociale netwerksites en instant messaging applications. Er volgen nu eerst 2 vragen over jouw gebruik van sociale netwerksites en vervolgens 2 vragen over jouw gebruik van instant messaging applicaties.

Hoeveel dagen per week gebruik je sociale netwerksites? (Bijv. TikTok, Instagram, YouTube, Snapchat etc.)

Nooit (1)	1 dag per week (2)	2 dagen per week (3)	3 dagen per week (4)	4 dagen per week (5)	5 dagen per week (6)	6 dagen per week (7)	7 dagen per week (8)

Hoeveel tijd besteed je per dag aan het gebruik van sociale netwerksites? (in uren en minuten). Vul beide formuliervelden in.

Uren: _____

Minuten: _____

Hoeveel dagen per week gebruik je instant messaging applicaties? (bijv. WhatsApp, Facebook Messenger etc.)

Nooit (1)	1 dag per week (2)	2 dagen per week (3)	3 dagen per week (4)	4 dagen per week (5)	5 dagen per week (6)	6 dagen per week (7)	7 dagen per week (8)

Hoeveel tijd besteed je per dag aan het gebruik van instant messaging applicaties? (in uren en minuten). Vul beide formuliervelden in.

Uren: _____

Minuten: _____

Offline ICC

De volgende stellingen gaan over jou en jouw gedrag en communicatie in een face-to-face setting. Beantwoord elke vraag door gebruik te maken van de onderstaande schaal (kies het nummer dat het beste overeenkomt met jouw antwoord). Antwoord open en eerlijk, er zijn geen goede of foute antwoorden.

Sociabiliteit

Ik vind het leuk om nieuwe mensen te ontmoeten.

Ik nodig graag nieuwe mensen/kennissen uit voor activiteiten.

Ik spreek graag af met een grote groep vrienden.

Ik zou nieuwe dingen kunnen voorstellen aan interessante mensen.

Mensen vinden dat ik veel vrienden heb.

Zelfonthulling

Ik huil in het bijzijn van andere mensen.

Ik toon niet snel mijn emoties.

Ik laat niet snel merken dat iets mij bang maakt.

Ik vind het moeilijk om mijn emoties te verbergen.

Ik laat niet snel merken dat ik me ergens voor schaam.

Emotie decoderen

Ik kan emoties van anderen identificeren.

Ik voel het verdriet van anderen, zelfs als het verborgen is.

Ik voel aan wanneer iemand blij is en heb het dan zelden mis.

Ik let op lichaamstaal van anderen.

Ik merk het op wanneer iemand boos is.

Assertiviteit

Vrienden beschouwen mij als een assertief persoon.

Ik geef mijn mening, ook al verschilt die van een persoon die ik respecteer.

Ik uit mijn mening niet als deze afwijkt van die van anderen.

Online ICC

Sociabiliteit

Ik heb een brede online vriendenkring.

Ik zou kunnen voorstellen om een online gesprek te verplaatsen van een openbaar social media platform

naar een privé chat room (van Instagram naar Instagram Direct Messenger bijvoorbeeld)

Ik vind het leuk om openbaar met een grote groep mensen te chatten.

Ik stel graag nieuwe dingen voor aan interessante mensen.

Ik nodig graag nieuwe mensen/kennissen uit om activiteiten te ondernemen.

Zelfonthulling

Ik laat niet snel merken dat ik me ergens voor schaam.

Ik laat niet snel merken dat iets mij bang maakt.

Ik deel gemakkelijk mijn emoties.

Ik vind het moeilijk om mijn emoties te verbergen.

Ik schrijf lange teksten.

Emotie decoderen

Ik kan emoties van anderen identificeren.

Ik let op emoticons om de emoties van anderen beter te begrijpen.

Ik merk gemakkelijk wanneer iemand boos is.

Ik voel aan wanneer iemand blij is en heb het dan zelden mis.

Ik voel het verdriet van anderen, zelfs als het verborgen is.

Assertiviteit

Vrienden beschouwen mij als een assertief persoon.

Ik zeg het wanneer ik het niet eens ben met iemand.

Ik uit mijn mening niet als deze afwijkt van die van anderen.

FoMO

Hieronder vind je stellingen over jouw dagelijkse ervaringen. Beantwoord elke vraag door gebruik te maken van de onderstaande schaal (kies het nummer dat het beste overeenkomt met jouw antwoord). Antwoord open en eerlijk, er zijn geen goede of foute antwoorden. Antwoord op basis van wat werkelijk jouw ervaringen weerspiegelt en niet op basis van wat je denkt dat jouw ervaringen zouden moeten zijn.

Ik vrees dat anderen meer verrijkende ervaringen hebben dan ik.

Ik vrees dat mijn vrienden meer verrijkende ervaringen hebben dan ik.

Ik maak me zorgen als ik merk dat mijn vrienden plezier hebben zonder mij.

Ik word angstig als ik niet weet wat mijn vrienden van plan zijn.

Het is belangrijk dat ik mijn vrienden hun grappen begrijp.

Soms vraag ik me af of ik te veel tijd besteed aan het bijhouden van wat er gaande is.

Het stoort me als ik een kans mis om met vrienden af te spreken.

Als ik een leuke tijd heb, is het belangrijk voor mij om de details online te delen (bijv. status updaten).

Als ik een geplande bijeenkomst mis, stoort me dat.

Als ik op vakantie ga, blijf ik op de hoogte van wat mijn vrienden doen.

Eenzaamheid

Hieronder vind je stellingen over jou en jouw gevoel. Beantwoord elke vraag door gebruik te maken van de onderstaande schaal (kies het nummer dat het beste overeenkomt met jouw antwoord). Antwoord open en eerlijk, er zijn geen goede of foute antwoorden.

Ik ervaar een leegte om me heen.

Er zijn genoeg mensen op wie ik in geval van narigheid kan terugvallen.

Ik heb veel mensen op wie ik volledig kan terugvallen.

Ik mis mensen om me heen.

Er zijn voldoende mensen met wie ik me nauw verbonden voel.

Vaak voel ik me in de steek gelaten.

English:

Demographic questions:

What is your age?

What is your gender?

Social media use

The following questions are about your social media usage. Answer each question using the scale below (choose the number that best matches your answer) and use the form field.

Social media is divided into social networking sites and instant messaging applications. There will now follow 2 questions about your use of social networking sites and then 2 questions about your use of instant messaging applications.

How many days a week do you use social networking sites? (E.g. TikTok, Instagram, YouTube, Snapchat)

Never (1)	1 day per week (2)	2 days per week (3)	3 days per week (4)	4 days per week (5)	5 days per week (6)	6 days per week (7)	7 days per week (8)

Hoeveel tijd besteed je per dag aan het gebruik van sociale netwerksites? (in uren en minuten). Vul beide formuliervelden in.

Hours: _____

Minutes: _____

How many days a week do you use instant messaging applications? (e.g., WhatsApp, Facebook

Messenger)

Never (1)	1 day per week (2)	2 days per week (3)	3 days per week (4)	4 days per week (5)	5 days per week (6)	6 days per week (7)	7 days per week (8)

How much time do you spend per day using instant messaging applications? (in hours and minutes).

Complete both form fields.

Hours: _____

Minutes: _____

Offline ICC

The following statements are about you and your behavior and communication in a face-to-face setting.

Answer each question using the scale below (choose the number that best matches your answer). Answer

openly and honestly; there are no right or wrong answers.

Sociability

I enjoy meeting new people.

I like to invite new people/acquaintances to activities.

I like to meet up with a large group of friends.

I could introduce new things to interesting people.

People think I have a lot of friends.

Self-disclosure

I cry in front of other people.

I don't show my emotions easily.

I don't easily show that something scares me.

I find it hard to hide my emotions.

I do not easily show that I am ashamed of something.

Decoding emotions

I am skilled in identifying the emotions of others.

I can feel others' sadness even when it is hidden.

I sense when someone is happy and rarely get it wrong.

I pay attention to body language of others.

I notice when someone is angry.

Assertiveness

Friends consider me an assertive person.

I express my opinion, even if it differs from a person I respect.

I do not express my opinion if it differs from that of others.

Online ICC

Sociability

I have a wide online circle of friends.

I might suggest moving an online conversation from a public social media platform to a private chat room

(from Instagram to Instagram Direct Messenger for example)

I enjoy chatting publicly with a large group of people.

I like to introduce new things to interesting people.

I like to invite new people/acquaintances to activities.

Self-disclosure

I do not readily show that I am ashamed of something.

I don't readily show that something scares me.

I share my emotions easily.

I find it difficult to hide my emotions.

I write long texts.

Decoding emotions

I am skilled in identifying the emotions of others

I pay attention to emoticons to better understand others' emotions.

I easily notice when someone is angry.

I sense when someone is happy and rarely get it wrong.

I sense others' sadness even when it is hidden.

Assertiveness

Friends consider me an assertive person.

I speak up when I disagree with someone.

I do not express my opinion when it differs from others.

FoMO

Below are statements about your daily experiences. Answer each question using the scale below (choose the number that best matches your answer). Answer openly and honestly; there are no right or wrong answers. Answer based on what truly reflects your experiences and not on what you think your experiences should be.

I fear that others have more enriching experiences than I do.

I fear that my friends have more enriching experiences than I do.

I get anxious when I notice that my friends are having fun without me.

I get anxious when I don't know what my friends are up to.

It is important that I understand my friends' jokes.

Sometimes I wonder if I spend too much time keeping up with what's going on.

It bothers me when I miss an opportunity to meet up with friends.

When I have a good time, it's important for me to share the details online (e.g., status updates).

If I miss a scheduled meeting, it bothers me.

When I go on vacation, I stay up to date on what my friends are doing.

Loneliness

Below are statements about you and how you feel. Answer each question using the scale below (choose the number that best matches your answer). Answer openly and honestly, there are no right or wrong answers.

I experience an emptiness around me.

There are plenty of people I can fall back on in case of hardship.

I have plenty of people I can completely fall back on.

I miss people around me.

There are enough people with whom I feel close.

Often I feel abandoned.

Appendix D: Informed Consent in Dutch and translated in English

Welkom!

Je bent uitgenodigd om deel te nemen aan een vragenlijst voor een afstudeerproject van de Master Communicatie- en Informatiewetenschappen aan Tilburg University. Voor deze vragenlijst worden Nederlandse jongvolwassenen tussen de 18 en 25 jaar gezocht. Ik wil je graag informeren over het doel van het onderzoek en wat de vragenlijst inhoudt.

Procedure en duur van de enquête: Het invullen van de vragenlijst zal ongeveer 5 tot 10 minuten duren. Deelname aan deze studie is op vrijwillige basis en je kunt stoppen met de vragenlijst wanneer je zou willen, zonder enige consequenties.

Doel van de studie: Onderzoek naar het gedrag en de communicatie van mensen offline en online (via sociale media). Ik ben geïnteresseerd in de zelf-perceptie van mensen en hoe zij hun ervaringen met sociale media ervaren. Het is belangrijk op te merken dat dit onderzoek geen enkele vorm van manipulatie met zich meebrengt en dat alle antwoorden met vertrouwelijkheid zullen worden behandeld.

Mogelijke risico's en voordelen: Deelname aan de studie zal geen risico's of negatieve gevolgen hebben. Jouw deelname draagt bij aan wetenschappelijke kennis voor de Master Communicatie- en Informatiewetenschappen.

Privacy en vertrouwelijkheid: De gegevens die in deze studie worden verzameld, zullen worden geanonimiseerd. Persoonlijke gegevens zoals jouw naam en e-mailadres worden niet opgenomen in rapporten of publicaties die uit dit onderzoek voortvloeien. De gegevens worden uitsluitend gebruikt voor wetenschappelijk onderzoek en alleen de onderzoeker heeft toegang tot de data. Je deelname is geheel

vertrouwelijk en de verzamelde gegevens worden opgeslagen in de online enquêtesoftware Qualtrics op een wachtwoord beveiligd account. De gegeven antwoorden worden bewaard tot het einde van het lopende academische jaar (eind augustus 2023).

Contactgegevens: Als je vragen hebt over het onderzoek, kun je contact opnemen met de onderzoeker, Sara van den Ende - s.k.vdnende@tilburguniversity.edu

Toestemming: Je deelname aan dit onderzoek is geheel vrijwillig. Door op de knop "Ik ga akkoord" hieronder te klikken, geef je aan dat:

- Je de informatie hierboven hebt begrepen

- Je vrijwillig instemt om de vragenlijst in te vullen

- Je minimaal 18 jaar bent

Alvast bedankt voor je deelname!

English:

Welcome!

You are invited to participate in a questionnaire for a graduation project of the Master in Communication and Information Sciences at Tilburg University. Dutch young adults between the ages of 18 and 25 are sought for this questionnaire. I would like to inform you about the purpose of the study and what the questionnaire entails.

Procedure and duration of the survey: Completing the questionnaire will take approximately 5 to 10 minutes. Participation in this study is voluntary and you can quit the questionnaire whenever you would like without any consequences.

Purpose of the study: To investigate people's behavior and communication offline and online (through social media). I am interested in people's self-perceptions and how they perceive their experiences with social media. It is important to note that this study does not involve any kind of manipulation and all responses will be treated with confidentiality.

Potential risks and benefits: Participation in the study will have no risks or negative consequences. Your participation will contribute to scientific knowledge for the Master of Communication and Information Sciences.

Privacy and confidentiality: The data collected in this study will be anonymized. Personal data such as your name and email address will not be included in any reports or publications resulting from this study. The data will be used exclusively for scientific research and only the researcher will have access to the data. Your participation is completely confidential, and the data collected will be stored in the online survey software Qualtrics on a password-protected account. The responses given will be kept until the end of the current academic year (end of August 2023).

Contact information: If you have any questions about the study, please contact the researcher, Sara van den Ende - s.k.vdnende@tilburguniversity.edu

Consent: Your participation in this study is completely voluntary. By clicking the "I agree" button below, you indicate that:

- You understood the information above

- You willingly consent to fill out the survey.

- You are at least 18 years old

Thank you in advance for your participation!

Appendix E: Debriefing in Dutch and translated in English

Dutch:

Ik wil je bedanken dat je de tijd hebt genomen om de vragenlijst in te vullen over het gebruik van sociale media en de mogelijke invloed hiervan op hiervan op eenzaamheid bij jongvolwassenen.

Je deelname wordt zeer gewaardeerd!

Het doel van deze vragenlijst was om te onderzoeken of er een relatie is tussen het gebruik van sociale media en gevoelens van eenzaamheid onder jongvolwassenen, en of deze relatie wordt beïnvloed door factoren als interpersoonlijke communicatieve vaardigheden en FoMO (fear of missing out).

Nogmaals hartelijk dank voor je waardevolle bijdrage aan dit onderzoek.

Met vriendelijke groet,

Sara van den Ende

English:

I want to thank you for taking the time to complete the questionnaire about social media use and its possible impact on loneliness in young adults.

Your participation is greatly appreciated!

The purpose of this questionnaire was to investigate whether there is a relationship between social media use and feelings of loneliness among young adults, and whether this relationship is influenced by factors such as interpersonal communication skills and FoMO (fear of missing out).

Thank you again for your valuable contribution to this study.

Kind regards,

Sara van den Ende

Appendix F: Results of exploratory factor analysis

Table F1

Results of the exploratory factor analysis of ECS subscale by Mantzouranis et al. (2019)

Items	Factor				
	1	2	3	4	5
1	.765				
2	.756				
3	.681				
4	.631				
5	.449			.	
6		-.840			
7		-.820			
8		-.819			
9		-.784			
10		-.444			
11		.910			
12			.903		
13				.663	
14				.535	
15	.392			.507	
16				.431	
17					.767
18				.719	
Eigenvalues	4.219	1.977	1.896	1.137	1.093
Variance	23.44%	10.98%	10.53%	6.32%	6.07%
Total variance	57.35%				

Table F2

Results of the exploratory factor analysis of RCS subscale by Mantzouranis et al. (2019)

Items	Factor			
	1	2	3	4
1	.764			
2	.758			
3	.735			
4	.688			
5	.665			
6		.786		
7		.781		
8		.768		
9		.757		
10		.667		
11			.806	
12			.766	
13		.712		
14			.662	
15			.499	
16				.852
17				.852
18				.565
Eigenvalues	3.717	2.593	2.264	1.396
Variance	20.65%	14.41%	12.56%	7.76%
Total variance	55.39%			

Appendix G: G-power analysis

Power analysis for double (independent) moderation

To determine the minimum sample size for the current study, a statistical power analysis was conducted using G*Power version 3.1.9.7 (Faul et al., 2007). 5 predictors (independent variable, moderation 1, moderation 2, interaction effect 1, interaction effect 2) were included to calculate the necessary sample size for a double moderation model. Results indicated the required sample size to achieve 80% power for detecting a medium effect (f^2 = .02), at a significance criterion of α = .05, was N = 395 for "Linear multiple regression: fixed model, single regression coefficient".

Appendix H: Assumption tests: Normality and Homogeneity

Figure H1

Normality Q-Q plot
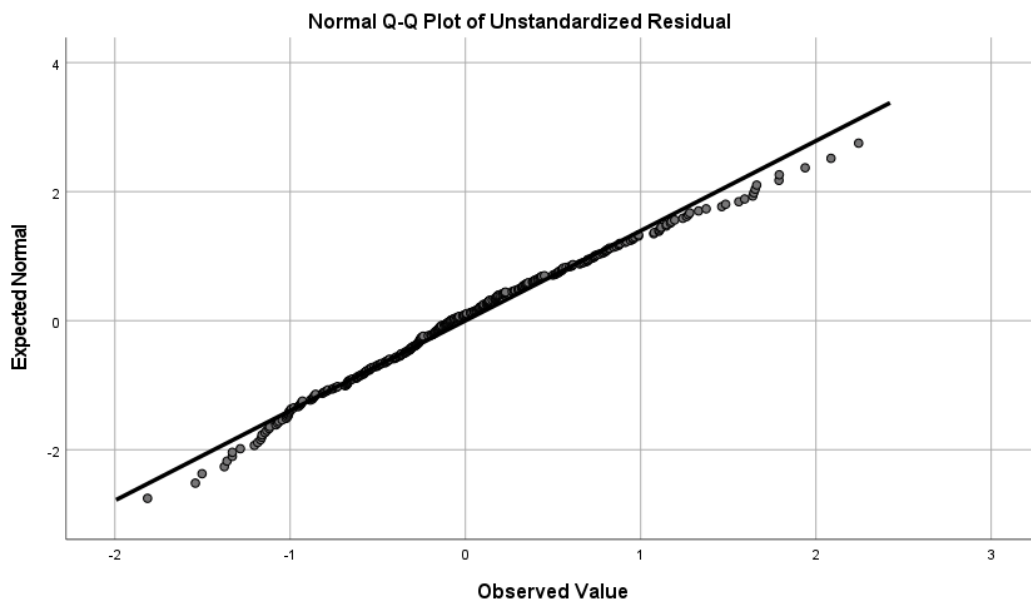
Figure H2

Homogeneity Scatterplot
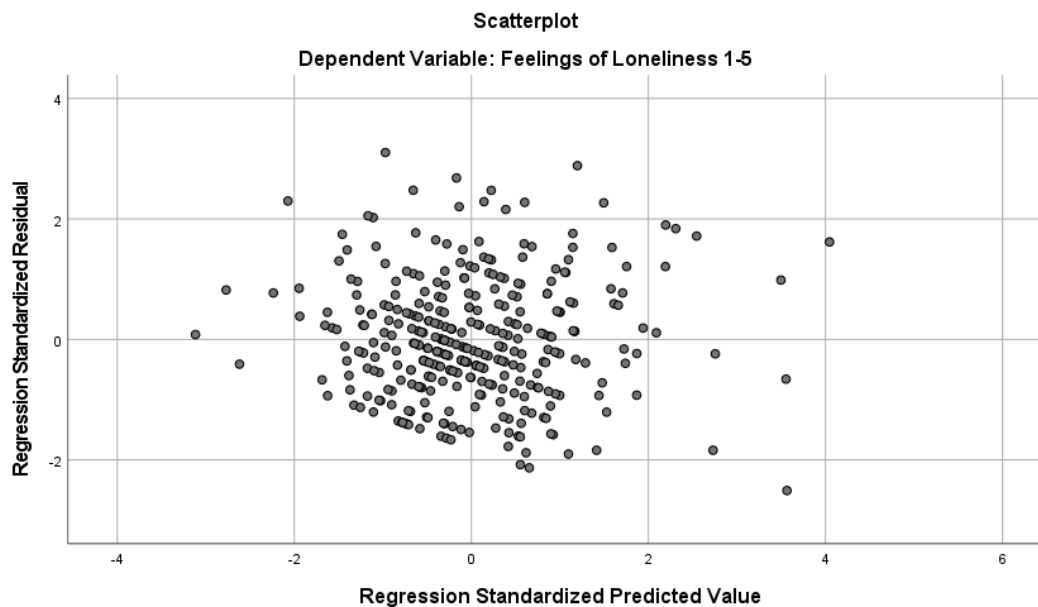
Appendix I: Regression output in SPSS

```
Run MATRIX procedure:

***************** PROCESS Procedure for SPSS Version 4.0 ****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2022). www.guilford.com/p/hayes3


*************************************************************************
Model  : 2
    Y  : Y_Loneli
    X  : X_SMU
    W  : MOD_ICCm
    Z  : MOD_FoMO

Sample
Size:  337

*************************************************************************
OUTCOME VARIABLE:
 Y_Loneli

Model Summary
          R        R-sq         MSE           F         df1         df2           p
      .4680       .2190       .5229     18.5642      5.0000    331.0000       .0000

Model
             coeff          se           t           p        LLCI        ULCI
constant    2.2844       .0405     56.4275       .0000      2.2048      2.3641
X_SMU        .0001       .0000      1.9770       .0489       .0000       .0002
MOD_ICCm    -.6946       .1156     -6.0107       .0000      -.9220      -.4673
Int_1       -.0002       .0001     -1.8232       .0692      -.0005       .0000
MOD_FoMO     .3713       .0602      6.1637       .0000       .2528       .4898
Int_2        .0001       .0001      2.4201       .0161       .0000       .0003

Product terms key:
 Int_1     :        X_SMU     x        MOD_ICCm
 Int_2     :        X_SMU     x        MOD_FoMO

Test(s) of highest order unconditional interaction(s):
      R2-chng           F          df1         df2           p
X*W       .0078      3.3241      1.0000    331.0000       .0692
X*Z       .0138      5.8571      1.0000    331.0000       .0161
BOTH      .0223      4.7290      2.0000    331.0000       .0094
----------
    Focal predict: X_SMU     (X)
          Mod var: MOD_ICCm (W)
          Mod var: MOD_FoMO (Z)

Conditional effects of the focal predictor at values of the moderator(s):

   MOD_ICCm   MOD_FoMO      Effect          se           t           p        LLCI
ULCI
     -.3450      -.6699       .0001       .0001       .9143       .3612      -.0001
 .0002
```

-.3450	.0000	.0002	.0001	2.5695	.0106	.0000
.0003						
-.3450	.6699	.0003	.0001	3.4655	.0006	.0001
.0004						
.0000	-.6699	.0000	.0001	-.2347	.8146	-.0001
.0001						
.0000	.0000	.0001	.0000	1.9770	.0489	.0000
.0002						
.0000	.6699	.0002	.0001	3.0621	.0024	.0001
.0003						
.3450	-.6699	-.0001	.0001	-1.3785	.1690	-.0002
.0000						
.3450	.0000	.0000	.0001	.0008	.9994	-.0001
.0001						
.3450	.6699	.0001	.0001	1.3281	.1850	.0000
.0002						

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.

```
DATA LIST FREE/
   X_SMU     MOD_ICCm   MOD_FoMO   Y_Loneli  .
BEGIN DATA.
  -978.8005     -.3450     -.6699     2.2080
       .0000     -.3450     -.6699     2.2753
   978.8005     -.3450     -.6699     2.3427
  -978.8005     -.3450      .0000     2.3633
       .0000     -.3450      .0000     2.5241
   978.8005     -.3450      .0000     2.6848
  -978.8005     -.3450      .6699     2.5187
       .0000     -.3450      .6699     2.7728
   978.8005     -.3450      .6699     3.0269
  -978.8005      .0000     -.6699     2.0487
       .0000      .0000     -.6699     2.0357
   978.8005      .0000     -.6699     2.0227
  -978.8005      .0000      .0000     2.2040
       .0000      .0000      .0000     2.2844
   978.8005      .0000      .0000     2.3648
  -978.8005      .0000      .6699     2.3594
       .0000      .0000      .6699     2.5331
   978.8005      .0000      .6699     2.7069
  -978.8005      .3450     -.6699     1.8894
       .0000      .3450     -.6699     1.7961
   978.8005      .3450     -.6699     1.7027
  -978.8005      .3450      .0000     2.0447
       .0000      .3450      .0000     2.0448
   978.8005      .3450      .0000     2.0448
  -978.8005      .3450      .6699     2.2001
       .0000      .3450      .6699     2.2935
   978.8005      .3450      .6699     2.3869
END DATA.
GRAPH/SCATTERPLOT=
 X_SMU     WITH     Y_Loneli BY        MOD_ICCm /PANEL   ROWVAR=  MOD_FoMO .
```

*********************** ANALYSIS NOTES AND ERRORS ***********************

Level of confidence for all confidence intervals in output:

95.0000

W values in conditional tables are the mean and +/- SD from the mean.

Z values in conditional tables are the mean and +/- SD from the mean.

NOTE: The following variables were mean centered prior to analysis:
          MOD_ICCm MOD_FoMO X_SMU

WARNING: Variables names longer than eight characters can produce incorrect
output
when some variables in the data file have the same first eight characters.
Shorter
variable names are recommended. By using this output, you are accepting all
risk
and consequences of interpreting or reporting results that may be incorrect.

------ END MATRIX -----