Lonely online: A social model of digital media addiction: A study in 21 countries

Lonely online: A social model of digital media addiction: A study in 21 countries

Agata Blachnio[a], Aneta Przepiórka[a], Oleg Gorbaniuk[b], Monika McNeill[c], Rebecca Bendayan[d,e], Menachem Ben-Ezra[f], Alan Angeluci[g], Ana Maria Abreu[h], Maria J. Blanca[d], Tihana Brkljacic[i], Nenad Čuš Babić[j], Mithat Durak[k], Julia Gorbaniuk[a], Juraj Holdoš[l], Ana Ivanova[a], Meiko Makita[m], Sadia Malik[n], Elvis Mazzoni[o], Anita Milanovic[p], Bojan Musil[j], Igor Pantic[q], Belen Rando[r], Gwendolyn Seidman[s], Emre Senol-Durak[k], Lancy D'Souza[t], Mariek M. P. Vanden Abeele[u], Mariusz Wołońciej[a], Anise M. S. Wu[v], Shu M. Yu[w], and Martina Benvenuti[o]

ABSTRACT

Digital media addiction limits face-to-face communication, which can have negative effects on the subjective wellbeing of individuals. However, the effect of digital media addiction on subjective wellbeing has not been adequately explored, and it is recommended in the literature that the role of mediating variables related to social life should be investigated. These include loneliness and satisfaction with relationships. The current study investigated whether loneliness and satisfaction with relationships explained the link between people's digital media addiction and their sense of flourish- ing. A sample of 6,434 respondents from 21 countries (Mage = 25.92 years, SD = 9.78; 65.5% women) took part in a cross-sectional survey study. The study included a comprehensive evaluation of digital media addiction using several measures. The following scales were applied: the Internet Addiction Scale, the Facebook Intrusion Questionnaire, the Phubbing Scale, the De Jong Gierveld Loneliness Scale, the Relationship Assessment Scale, and the Flourishing Scale. A two-level path analysis showed that loneliness and satisfaction with interpersonal relationships fully mediated the link between digital media addiction and flourishing on the individual level. This suggests that digital media addiction may affect flourishing only through its impact on loneliness and satisfaction with interpersonal relationships.

KEYWORDS

Digital media addiction; Flourishing; Loneliness; Satisfaction with relationships

1. Introduction

The current study aims to explore the mediating role of loneliness and satisfaction with interpersonal relationships in the interaction between digital media addiction and flourishing. The displacement hypothesis posits that when users spend an excessive amount of time using digital media, this may limit the time spent on relationships, especially face-to-face ones (Valkenburg & Peter, 2007) and face to face communication is accepted as being unfavourable to its online version (Hall & Liu, 2022). This in turn may diminish the quality of these relationships and thereby lower wellbeing among both adults (Hall & Liu, 2022; Liu et al., 2019) and children (Ruest et al., 2018). Prior studies, exploring displacement hypothesis, are ambiguous; they indicate that the hypothesis predicts a relationship between using social media and loneliness. Thus, face-to-face contacts correlate with a better assessment of social relationships and they are a finer predictor of well-being that online-contacts. Moreover, the more online contacts one has online, the fewer interactions they may cultivate in reality with friends and family (Hall et al., 2019). It is also worth emphasing that using social media as a factor that leads to weakening social interaction and diminishing well-being, remains underexplored (Hall et al., 2019). Consequently, it seems justified that questions asked since the beginning of the development of new technologies (Kraut et al., 2002) remain current and worth investigating further.

Based on a previous study and explanatory hypotheses by Kraut et al. (2002), subsequently tested in other studies (e.g., Liu et al., 2019), we created a model with digital media addiction as a latent variable predicting loneliness, satisfaction with relationships, and—through its prediction of these two—flourishing (Figure 1). Flourishing is defined as a sense of accomplishment and healthy psycho-social functioning that people experience as a source of personal fulfillment (Senol Durak & Durak, 2019). Exploratory hypotheses seemed reasonable in those studies, given that the level of connectedness with other people is a contributing factor in flourishing (Gudka et al., 2021).

Many studies indicate that the kinds of benefits or harms users derive from new technologies are greatly a result of their personal resources, e.g., anxiety level (Tokunaga & Rains, 2010), or self-control (Cudo et al., 2020). Based on Social Skill Model of problematic Internet use (Caplan, 2005; Lee-Won et al., 2015), it is assumed that people with social skills deficits would more likely use online communication and feel more comfortable and safe when using it. The online world can be a safe space for upskilling social contacts for such individuals. However, as indicated by different studies, it is crucial how one approaches it, i.e., active media use can be beneficial, while using new media in a passive way is often related with loneliness (Zhang et al., 2022). Active media use, in turn would result in experiencing benefits of social contact and one such profit would be experiencing flourishing.

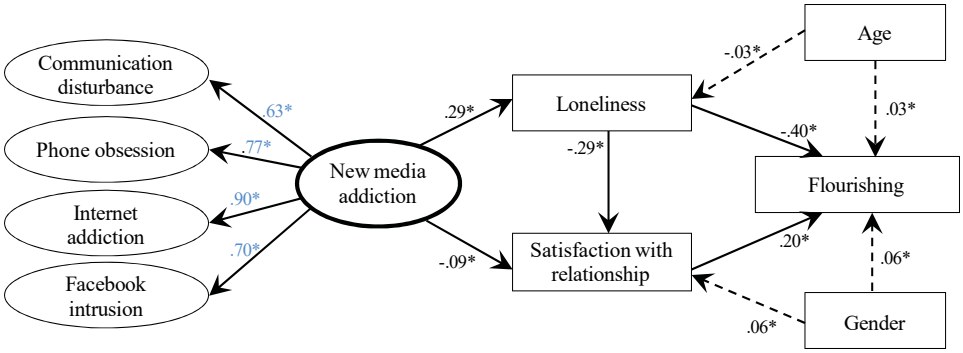

Figure 1. Model of relations between digital media addiction and flourishing. *p < .01

The proposed model is an attempt at combining "social" variables with social contacts (loneliness and satisfaction with relationships) but also, with what seems to be an outcome variable—flourishing. Besides, we strive to illustrate a universality of said relationships included in our model by exploring them from an intercultural perspective.

1.1. Digital technology

Digital technologies have been developing rapidly in recent years. Concerns have grown that the use of technologies might become addictive (Henzel & Håkansson, 2021) and impact people's mental health (Barthorpe et al., 2020; Haand & Shuwang, 2020; Wu et al., 2015). Because current understanding of Internet addiction tends to be very narrow, it is believed that investigating digital technology should be multidimensional (Meng et al., 2022; Reichert et al., 2021). Due to that, an umbrella term is explored in the present investigation: digital media addiction (DMA) as a complex construct comprising several facets, such as Internet addiction (Kuss & Pontes, 2018; Peper & Harvey, 2018), phubbing (ignoring a conversation partner by using own smartphone in their presence) (Karadağ et al., 2015), mobile addiction (Smetaniuk, 2014), and Facebook intrusion (Elphinston & Noller, 2011). These phenomena are interconnected, however each one of them refers to a different aspect of engaging with new digital media. The construct posits that behavioral addiction manifests itself in the compulsive and excessive use of electronic media such as tablets, smartphones, laptops, computers, and social media (Davey & Davey, 2014; De Sola Gutiérrez et al., 2016; Twenge, 2019). Digital media addiction additionally involves difficulties controlling digital media use (e.g., frequent checking) and shows in typical addiction symptoms such as a tolerance (i.e., increased use to achieve satisfaction) and abstinence syndrome (i.e., craving, anxiety, and irritation when the digital medium is inaccessible; De Sola Gutiérrez et al., 2016).

1.2. Digital media addiction, satisfaction with relationship, loneliness and wellbeing

Statistics show an increase in the experience of loneliness in recent years, which is linked with numerous health problems (Beutel et al., 2017; Mellor et al., 2008; National Academies of Sciences [NAS], Engineering, and Medicine, 2020). A link between digital media use and wellbeing has been found in a number of studies (Twenge, 2019; Twenge & Campbell, 2019). However, a systematic review demonstrated a negative, though rather weak, relationship between social media usage and wellbeing (Duradoni et al., 2020). There was a rather weak link between digital media use and well being among 9- to 12-year-old children when offline relationships were included as a moderator (Bruggeman et al., 2019). A study indicated that loneliness was a mediator of this link (Satici, 2019). The findings of a meta-analysis indicate that the relationship between digital media usage and wellbeing is likely to be positive or negative depending on what users actually do while operating digital media. For instance, using a smartphone for calling or texting may be positively related to wellbeing, while in the case of online gaming this relationship is likely to be negative (Liu et al., 2019), presumably because the former stimulates social interaction whereas the latter may displace or hinder it, especially when online behavior is problematic. Further, many studies indicate important differences between active and passive use of social media: the passive use of social media has been associated with loneliness (Yang, 2016), anxiety, depression (Aalbers et al., 2019), and with decrease of wellbeing (Verduyn et al., 2022). This effect is principally due to a passive use characterized by social comparison. To date, however, few studies have explored the role of lacking social interaction as an explanatory mechanism for the relationship between digital media addiction and wellbeing.

In order to better understand the determinants of psychological wellbeing in the social media world, we decided to explore flourishing, defined as a state of optimal mental health and positive emotional wellbeing—namely, the experience of positive psychological and social

functioning (Nelson et al., 2016). The term "flourishing" derives from eudemonic and hedonic approaches and is defined as optimal wellbeing or as the evaluation of one's life as optimal (Senol Durak & Durak, 2019). A longitudinal study found that limited new media use (up to 30 minutes a day) could significantly decrease loneliness (Hunt et al., 2018). Research also indicates a positive link of loneliness to social media addiction (Baltaci, 2019) and to nomophobia, which is a fear of being detached from a smartphone (Durak, 2018). We therefore hypothesized that digital media addiction would be positively correlated with loneliness (H1). Moreover, one of the essential preconditions for wellbeing is satisfaction with relationships or friendships (Myers & Sweeney, 2004). Low relationship satisfaction combined with the need to belong can lead to loneliness (Mellor et al., 2008). Using digital media can have an impact on social relations. For these reasons, we predicted that digital media addiction would be negatively related to satisfaction with social relationships (H2).

Previous findings have established a link between loneliness and mental health, showing that more lonely people are at an increased risk of depression and anxiety (Beutel et al., 2017), which leads to lower flourishing. Prior literature has shown that some aspects of digital media usage can be related to wellbeing (Zhao et al., 2018). However, the relationship between digital media usage and wellbeing is indirect, whereas loneliness interacts with digital media usage (problematic Internet use) and wellbeing directly (Kim et al., 2009). Also, satisfaction with relationships is a mediating variable between smartphone usage and wellbeing (Chan & Li, 2020). Our model predicts a full mediating role of loneliness and satisfaction with personal relationships in the link between digital media addiction and flourishing. We hypothesized that loneliness would be a mediator between digital media addiction and flourishing (H3). In other words, we predicted that an increase in digital media addiction would increase the level of loneliness, which in turn would cause flourishing to decrease. We also hypothesized (H4) that satisfaction with relationships would be a mediator between digital media addiction and flourishing. In other words, we expected that an increase in digital media addiction would decrease the level of satisfaction with relationships, and that flourishing would be reduced as a result.

2. Method

2.1. Participants and procedure

A sample of $N = 6{,}434$ respondents took part in the study. Their mean age was $M = 25.92$ years ($SD = 9.78$), and 34.3% of them were men. Data were collected in 21 countries: Belarus, Brazil, China, Croatia, Ecuador, India, Israel, Italy, Mexico, the Netherlands, Pakistan, Poland, Portugal, Serbia, Slovakia, Slovenia, Spain, Turkey, the UK, Ukraine, and the USA.

The results presented in this article are part of a larger project, and further results have already been published; however, in every article we focus on a different set of variables, which also applies to the current analysis. Data were collected by the project collaborators and co-authors of this article in each of the participating countries. The study was conducted in local languages and back-translation procedures were applied to adapt the measures from English into the local languages. A convenience sampling approach was used to reach a large group of respondents, varied in terms of socio-demographic characteristics. Participants volunteered to take part in the study and received no monetary reward. They were informed about the anonymity of their participation in the study. The study had been approved by the institutional review board. In the majority of the countries data collection links were distributed via e-mails, mobile messages, and advertised on social media platforms i.e., Facebook, LinkedIn, and WhatsApp. In China, Ecuador, and Slovakia pen-and-paper methods were used. On average, participation ratio was between 96% and 100%.

2.2. Measures

2.2.1. Measurement of new media addiction

To assess the accuracy of the established construct, consisting of four variables:

(1) Internet Addiction Scale developed by Karadağ et al. (2015). The measure consists of six items (e.g., "I feel anxious when I don't have access to the Internet"), rated on a 5-point Likert scale (1 = *completely disagree* to 5 = *completely agree*).
(2) Facebook intrusion, we used the Facebook Intrusion Questionnaire, developed by Elphinston and Noller (2011), based on behavioral addiction components and a scale measuring phone involvement. It consists of eight items (e.g., "I have been unable to reduce my Facebook use"), rated on a 7-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Phubbing was measured using the Phubbing Questionnaire (Karadağ et al., 2015), consisting of eight items (e.g., "I am always busy with my mobile phone when I'm with my friends"). The scale has two scales: (3) Communication Disturbance and (4) Phone Obsession, with four items in each (Błachnio et al., 2021).

2.2.2. Measurement of the mediators

We also used the De Jong Gierveld Loneliness Scale, measuring the sense of loneliness. The scale consists of 11 items (e.g., "I miss having really close friends"), rated on a 5-point Likert scale (1 = *completely disagree* to 5 = *completely agree*). To assess satisfaction with relationships, we used the Relationship Assessment Scale by Hendrick (1988). It consists of seven items (e.g., "In general, how satisfied are you with your relationship?") designed to measure general relationship satisfaction. Participants responded to each item using a 5-point scale (1 = *low satisfaction* to 5 = *high satisfaction*).

To assess flourishing, we used the Flourishing Scale by Diener et al. (2010). The measure is composed of eight items (e.g., "I am optimistic about my future"). Participants responded to each item on a 7-point Likert scale (1 = *strongly disagree* to 7 = strongly agree). All the measures used had good or at least satisfactory reliability in every participating country (see Table 1). The items are in the Appendix.

2.2.3. Statistical analyses

We conceptualized the data as a two-level structure, in which individual respondents were nested within countries of residence. To test the hypotheses, we used the Mplus 7.3 software package (Muthén & Muthén, 2015). In order to examine an individual-level phenomenon we were interested in pure Level 1 effects (individual effects) only, without considering Level 2 variables and their influence on Level 1 variables. Therefore, we used group-mean centering to control for differences between countries; group effects were accounted for only by the variance term. Group-mean centering

Table 1. Descriptive statistics (raw data), reliability, and within-level correlations between variables.

Variables	*M*	*SD*	α_{min}	α_{max}	α_{Me}	*ICC*	1	2	3	4	5	6
1. Communication disturbance	2.08	0.78	.70	.95	.80	.14	–					
2. Phone obsession	3.14	0.94	.71	.87	.80	.12	.55*	–				
3. Internet addiction	2.39	0.82	.66	.87	.78	.08	.54*	.69*	–			
4. Facebook intrusion	2.57	1.23	.73	.93	.84	.12	.44*	.48*	.66*	–		
5. Loneliness	2.42	0.76	.61	.91	.87	.14	.15*	.11*	.32*	.23*	–	
6. Satisfaction with relationships	5.18	1.27	.60	.91	.86	.20	−.07*	−.03	−.07*	−.06*	−.31*	–
7. Flourishing	3.67	0.94	.77	.95	.91	.18	−.10*	.01	−.16*	−.10*	−.47*	.33*

N = 6,434; *M* = mean; *SD* = standard deviation; α_{min}, α_{max}, α_{Me} = minimum, maximum, and mean Cronbach's alpha for countries; *ICC* = intraclass correlations; *p < .01.

subtracts the cluster (country) mean (and between-country variance) from each variables. Analysis of variance at the within country level captures relationships between variables that are universal to people living in most countries, while analysis of differences between country means tends to identify cultural differences. By controlling in multilevel approach, the variance due to differences between people in countries and differences between countries, we avoided i.a. ecological fallacy.

Because of the non-normal distribution, we used the MLR (robust maximum likelihood) estimator in a 2-level analysis (Muthén & Muthén, 2015). We applied further criteria to evaluate model fit, namely: (1) comparative fit index (CFI) higher than .90; (2) root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) lower than .07 (Brown, 2015; Hu & Bentler, 1998).

3. Results

Table 1 shows descriptive statistics for the whole sample (raw data), intraclass correlations, and within-level correlations between the variables. ICC values ranged from .08 to .20, which means the country was an important cluster variable to control for. Therefore, the analysis took account of the person level and controlled for country-level sources of variance. As illustrated in Table 1. Communication disturbance, mobile phone obsession, internet addiction, and Facebook intrusion are positively related to loneliness, but negatively to satisfaction with relationships. Moreover, communication disturbance, internet addiction, and Facebook intrusion are negatively related to flourishing.

We used 2-level second-order confirmatory factor analysis with MLR estimator and group-mean centering (within-country level) to check a second-order measurement model with four first-order factors: communication disturbance, mobile phone obsession, Internet addiction, and Facebook intrusion. The model had acceptable fit indices: $\chi^2(239) = 1987.79$, $p < .001$; CFI = .912, RMSEA = .034, SRMR = .045. The standardized path coefficients are shown in the Appendix.

A two-level path analysis with MLR estimator and group-mean centering showed an acceptable fit of the model (see Figure 1) to the collected data: $\chi^2(304) = 2441.52$, $p < .001$; CFI = .904, RMSEA = .034, SRMR = .046. We used age and gender (1 = female, 0 = male) as control variables (i.e., covariates) in this model. The standardized path coefficients are shown in Figure 1. All the paths considered in the hypotheses were statistically significant, which means that the hypotheses were supported.

Variables included in the model explain 8.5% of the variance for loneliness, 10.8% for satisfaction with relationships, and 25.7% for flourishing. Specifically, loneliness and new media addiction explain, respectively 7.0% and 0.6% unique variance of satisfaction with relationships. On the other hand, loneliness and satisfaction with relationships explain respectively 14.2% and 3.7% unique variance of flourishing.

The model presented in Figure 1 includes two mediators: loneliness and satisfaction with relationships. The total indirect effect was statistically significant ($\beta = -.43$, $p < .001$), and so were specific indirect effects: (a) digital media addiction → loneliness → flourishing ($\beta = -.33$, $p < .001$); (b) digital media addiction → satisfaction with relationships → flourishing ($\beta = -.05$, $p < .001$). New media addiction explains 3.4% of the variance of flourishing on its own, but after taking into account the remaining independent variables, the direct path between new media addiction and flourishing was not statistically significant ($\beta = -.018$, $p = .356$).

4. Discussion

The main aim of the study was to investigate the mediating role of loneliness and satisfaction with social relationships in the link between digital media addiction and flourishing. Our hypotheses were tested in a sample of 6,434 respondents from 21 countries. We found that loneliness and satisfaction with relationships fully mediated the link between digital media addiction and flourishing. This means that higher Digital Media Addiction (DMA), higher

loneliness, and lower social relationship satisfaction were the results of lower sense of accomplishment and sense of psycho-social functioning, which are described by flourishing. The Social Model of Digital Media Addiction shows the country average relationships between variables at the individual level. We also tested digital media addiction as a global phenomenon that manifests itself as communication disturbance and mobile phone obsession), Internet addiction, and Facebook intrusion. All those factors are strongly intercorrelated, which indicates that they share common variance. Therefore, multifaced evaluation for DMA, as reported by several studies (Meng et al., 2022; Reichert et al., 2021), has been supported.

As predicted (H1), DMA was positively associated with loneliness. Similarly, other research indicated that loneliness was associated with excessive use of the Internet or Facebook (Błachnio & Przepiorka, 2019). Studies show that lonely people have different activity patterns when using new media (Al-Saggaf & Nielsen, 2014) or share the most private information about themselves via these media which they would probably never share in a face-to-face interactions (Błachnio et al., 2016). A previous study suggests that lonely people show a different pattern of media addiction (i.e., they more often watch movies and listen to music) than those who are not lonely and who more often interact with others on social media (Błachnio & Przepiorka, 2019). As offered in the displacement hypothesis, using digital media is preferred by people to having face-to-face relationships (Hall & Liu, 2022; Valkenburg & Peter, 2007).

The present study confirmed that digital media addiction was negatively related to satisfaction with relationships (H2). This is consistent with the results of other studies, indicating that the more often people use digital media in a problematic way, be it by browsing the Internet or using social networks, the lower their satisfaction with relationships. This is also in line with the lower perceived social support reported by problematic digital media users (Park et al., 2014; Zeng et al., 2021). Perhaps people venture into the virtual world to satisfy their need for human contact, spending more and more time online, but by doing so they fail to satisfy their need to belong to a social group. According to the Social Skill Model of Problematic Internet Use, people prefer online communication to face-to-face interaction, which results in lower relationship satisfaction (Lee-Won et al., 2015).

We predicted that loneliness would be a mediator between digital media addiction and flourishing (H3), and the results confirm this prediction. More specifically, digital media addiction was associated with higher level of loneliness, which in turn was related to a lower level of flourishing. Similar results were observed in other studies examining the roles of problematic Internet use, loneliness, and wellbeing (Kim et al., 2009). This may indicate that the more one uses online contacts through the available means, the less they satisfy one's deeper need for contact with others and the lonelier one feels. Therefore, online communication might be perceived as superficial. The mediating role of loneliness was also confirmed for the link between friendship relationships and Facebook intrusion (Błachnio et al., 2018). Similarly, previous research indicated that flourishing was negatively related to problematic Facebook use (Satici & Uysal, 2015).

Lastly, we expected that satisfaction with the relationships would be a mediator between digital media addiction and flourishing (H4). Satisfaction with relationships mediates a relationship between digital media addiction and flourishing in two ways: directly and indirectly via loneliness. Indeed, it turns out that the more often people use digital media, the less satisfied they feel with their contacts, while a higher level of satisfaction with one's contacts is associated with a higher level of flourishing. Similar findings have been reported in other studies (Gudka et al., 2021). The direction of these relationships is also supported in the literature, where it is indicated that excessive use of the Internet or social networking sites translates into a lower sense of social support and a poorer evaluation of relationships (Liu & Yu, 2013; Tang et al., 2016). Thus, experiencing social support is a crucial indicator of emotional wellbeing (Rueger et al., 2010),

and having friends is an important point of reference (e.g., Bokhorst et al., 2010). Based on those findings, it can be concluded that insufficient face-to-face contacts, or the lack of them, can reduce life satisfaction.

4.1. Limitations and future study

Certain limitations of this study should also be noted. Firstly, in some countries, the reliability of the scales we used was relatively lower. However, it is essential to remember that we did not analyze the results for individual countries in this study. Secondly, our study had a correlational character, which means no causal conclusions can be drawn. Thirdly, although we tried to select countries diverse in terms of various geographical, economic, and cultural factors, only 21 countries were included in the sample. In the future, it would be useful to conduct similar studies in an even greater number of countries to allow for a broader generalization. Moreover, longitudinal studies should perhaps be conducted in the future to test current model. Last but not least, it would be worth asking participants specifically about their activity on the Internet.

5. Conclusions

To summarize, our research shows that technologies designed to facilitate online interactions actually increase loneliness, which leads to lower satisfaction in these relationships, as well as a lower sense of personal accomplishment and psycho-social functioning, as a measure of subjective wellbeing (flourishing). We can therefore talk about a digital media paradox that can be illustrated with a metaphor of quenching thirst in the desert with saltwater. The intensity of this effect can probably vary depending on the degree of preference for online and offline communication (Thayer & Ray, 2006). Unsatisfied need for an interpersonal affiliation and social contact with others translates directly into lower life satisfaction.

In conclusion, our study has confirmed the role of loneliness and relationship satisfaction in how digital media addiction affects human flourishing. “Offline” relationships can therefore be considered a foundation of wellbeing, as evidenced by findings from many countries. The current findings can serve as a basis for relevant interventions useful to therapists, psychologists, and educators, applicable to interactions between partners in romantic relationships, between children and their caregivers or teachers, and many more. The research reported in this article partly fulfills the urgent need for in-depth studies on the impact of digital media on behavior. Given the unrestricted access to the Web and the increasing amount of time spent online, it is crucial to be cautious when using the relatively new communication technologies. Together with the alarming WHO mental health statistics, our findings suggest that more research is needed to explore this topic to a greater extent. Further research could help develop effective support interventions and predict the consequences of new media use for the development of the younger generations.

Compliance with ethical standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all individual adult participants included in the study.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The study was financed by the National Science Centre, Poland, grant no. [UMO-2017/26/M/HS6/00779].

ORCID

Sadia Malik http://orcid.org/0000-0002-5110-5924

References

Aalbers, G., McNally, R. J., Heeren, A., De Wit, S., & Fried, E. I. (2019). Social media and depression symptoms: A network perspective. *Journal of Experimental Psychology: General*, *148*(8), 1454. https://doi.org/10.1037/xge0000528

Al-Saggaf, Y., & Nielsen, S. (2014). Self-disclosure on Facebook among female users and its relationship to feelings of loneliness. *Computers in Human Behavior*, *36*, 460–468. https://doi.org/10.1016/j.chb.2014.04.014

Baltaci, Ö. (2019). The predictive relationships between the social media addiction and social anxiety, loneliness, and happiness. *International Journal of Progressive Education*, *15*(4), 73–82. https://doi.org/10.29329/ijpe.2019.203.6

Barthorpe, A., Winstone, L., Mars, B., & Moran, P. (2020). Is social media screen time really associated with poor adolescent mental health? A time use diary study. *Journal of Affective Disorders*, *274*, 864–870. https://doi.org/10.1016/j.jad.2020.05.106

Beutel, M. E., Klein, E. M., Brähler, E., Reiner, I., Jünger, C., Michal, M., Wiltink, J., Wild, P. S., Münzel, T., Lackner, K. J., & Tibubos, A. N. (2017). Loneliness in the general population: Prevalence, determinants and relations to mental health. *BMC Psychiatry*, *17*(1). https://doi.org/10.1186/s12888-017-1262-x

Błachnio, A., & Przepiorka, A. (2019). Be aware! If you start using Facebook problematically you will feel lonely: Phubbing, loneliness, self-esteem, and Facebook intrusion. A cross-sectional study. *Social Science Computer Review*, *37*(2), 270–278. https://doi.org/10.1177/0894439318754490

Błachnio, A., Przepiorka, A., Bałakier, E., & Boruch, W. (2016). Who discloses the most on Facebook? *Computers in Human Behavior*, *55*(Part B), 664–667. https://doi.org/10.1016/j.chb.2015.10.007

Błachnio, A., Przepiórka, A., Gorbaniuk, O., McNeill, M., Bendayan, R., Durak, M., Senol Durak, E., Ben-Ezra, M., Benvenuti, M., Angeluci, A., Abreu, A. M., Makita, M., Blanca, M. J., Brkljacic, T., Babič, N. Č., Gorbaniuk, J., Holdoš, J., Ivanova, A., Malik, S., & Yu, S. Mazzoni, E. (2021). Country indicators moderating the relationship between phubbing and psychological distress: A study in 20 countries. *Frontiers in Psychology*, *12*, 588174. https://doi.org/10.3389/fpsyg.2021.588174

Błachnio, A., Przepiórka, A., Wolonciej, M., Mahmoud, A. B., Holdos, J., & Yafi, E. (2018). Loneliness, friendship, and Facebook intrusion: A study in Poland, Slovakia, Syria, Malaysia, and Ecuador. *Studia Psychologica*, *60*(3), 183–194. https://doi.org/10.21909/sp.2018.03.761

Bokhorst, C. L., Sumter, S. R., & Westenberg, P. M. (2010). Social support from parents, friends, classmates, and teachers in children and adolescents aged 9 to 18 years: Who is perceived as most supportive? *Social Development*, *19*(2), 417–426. https://doi.org/10.1111/j.1467-9507.2009.00540.x

Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. Guilford Publications.

Bruggeman, H., Van Hiel, A., Van Hal, G., & Van Dongen, S. (2019). Does the use of digital media affect psychological wellbeing? An empirical test among children aged 9 to 12. *Computers in Human Behavior*, *101*, 104–113. https://doi.org/10.1016/j.chb.2019.07.015

Caplan, S. E. (2005). A social skill account of problematic Internet use. *Journal of Communication*, *55*(4), 721–736. https://doi.org/10.1111/j.1460-2466.2005.tb03019.x

Chan, M., & Li, X. (2020). Smartphones and psychological wellbeing in China: Examining direct and indirect relationships through social support and relationship satisfaction. *Telematics and Informatics*, *54*, 101469. https://doi.org/10.1016/j.tele.2020.101469

Cudo, A., Torój, M., Demczuk, M., & Francuz, P. (2020). Dysfunction of self-control in Facebook addiction: Impulsivity is the key. *Psychiatric Quarterly*, *91*(1), 91–101. https://doi.org/10.1007/s11126-019-09683-8

Davey, S., & Davey, A. (2014). Assessment of smartphone addiction in Indian adolescents: A mixed method study by systematic-review and meta-analysis approach. *International Journal of Preventive Medicine*, *5*(12), 1500–1511. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4336980

De Sola Gutiérrez, J., Rodríguez De Fonseca, F., & Rubio, G. (2016). Cell-phone addiction: A review. *Frontiers in Psychiatry*, *7*, 7. https://doi.org/10.3389/fpsyt.2016.00175

Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D. W., Oishi, S., & Biswas Diener, R. (2010). New wellbeing measures: Short scales to assess flourishing and positive and negative feelings. *Social Indicators Research*, *97*(2), 143–156. https://doi.org/10.1007/s11205-009-9493-y

Duradoni, M., Innocenti, F., & Guazzini, A. (2020). Wellbeing and social media: A systematic review of Bergen addiction scales. *Future Internet*, *12*(2), 24. https://doi.org/10.3390/fi12020024

Durak, H. Y. (2018). What would you do without your smartphone? Adolescents' social media usage, locus of control, and loneliness as a predictor of nomophobia. *Addicta: The Turkish Journal on Addictions*, *5*(2), 1–15. https://doi.org/10.15805/addicta.2018.5.2.0025

Elphinston, R. A., & Noller, P. (2011). Time to face it! Facebook intrusion and the implications for romantic jealousy and relationship satisfaction. *Cyberpsychology, Behavior, and Social Networking*, *14*(11), 631–635. https://doi.org/10.1089/cyber.2010.0318

Gudka, M., Gardiner, K. L., & Lomas, T. (2021). Towards a framework for flourishing through social media: A systematic review of 118 research studies. *The Journal of Positive Psychology*, *18*(1), 86–105. https://doi.org/10.1080/17439760.2021.1991447

Haand, R., & Shuwang, Z. (2020). The relationship between social media addiction and depression: A quantitative study among university students in Khost, Afghanistan. *International Journal of Adolescence and Youth*, *25*(1), 780–786. https://doi.org/10.1080/02673843.2020.1741407

Hall, J. A., Kearney, M. W., & Xing, C. (2019). Two tests of social displacement through social media use. *Information, Communication & Society*, *22*(10), 1396–1413. https://doi.org/10.1080/1369118X.2018.1430162

Hall, J. A., & Liu, D. (2022). Social media use, social displacement, and wellbeing. *Current Opinion in Psychology*, *46*, 101339. https://doi.org/10.1016/j.copsyc.2022.101339

Hendrick, S. S. (1988). A generic measure of relationship satisfaction. *Journal of Marriage and the Family*, *50*(1), 93–98. https://doi.org/10.2307/352430

Henzel, V., & Håkansson, A. (2021). Hooked on virtual social life: Problematic social media use and associations with mental distress and addictive disorders. *PLOS ONE*, *16*(4), e0248406. https://doi.org/10.1371/journal.pone.0248406

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods*, *3*(4), 424–453. https://doi.org/10.1037/1082-989X.3.4.424

Hunt, M. G., Marx, R., Lipson, C., & Young, J. (2018). No more FOMO: Limiting social media decreases loneliness and depression. *Journal of Social and Clinical Psychology*, *37*(10), 751–768. https://doi.org/10.1521/jscp.2018.37.10.751

Karadağ, E., Tosuntaş, U. B., Erzen, E., Duru, P., Bostan, N., Şahin, B. M., Çulha, L., & Babadağ, B. (2015). Determinants of phubbing, which is the sum of many virtual addictions: A structural equation model. *Journal of Behavioral Addictions*, *4*(2), 60–74. https://doi.org/10.1556/2006.4.2015.005

Kim, J., LaRose, R., & Peng, W. (2009). Loneliness as the cause and the effect of problematic Internet use: The relationship between Internet use and psychological wellbeing. *CyberPsychology & Behavior*, *12*(4), 451–455. https://doi.org/10.1089/cpb.2008.0327

Kraut, R., Kiesler, S., Boneva, B., Cummings, J. N., Helgeson, V., & Crawford, A. M. (2002). Internet paradox revisited. *Journal of Social Issues*, *58*(1), 49–74. https://doi.org/10.1111/1540-4560.00248

Kuss, D. J., & Pontes, H. M. (2018). *Internet addiction* (Vol. 41). Hogrefe Publishing.

Lee-Won, R. J., Herzog, L., & Park, S. G. (2015). Hooked on Facebook: The role of social anxiety and need for social assurance in problematic use of Facebook. *Cyberpsychology, Behavior, and Social Networking*, *18*(10), 567–574. https://doi.org/10.1089/cyber.2015.0002

Liu, D., Baumeister, R. F., Yang, C. C., & Hu, B. (2019). Digital communication media use and psychological wellbeing: A metaanalysis. *Journal of Computer-Mediated Communication*, *24*(5), 259–273. https://doi.org/10.1093/jcmc/zmz013

Liu, C., & Yu, C. (2013). Can Facebook use induce wellbeing? *Cyberpsychology, Behavior and Social Networking*, *16*(9), 674–678. https://doi.org/10.1089/cyber.2012.0301

Mellor, D., Stokes, M., Firth, L., Hayashi, Y., & Cummins, R. (2008). Need for belonging, relationship satisfaction, loneliness, and life satisfaction. *Personality and Individual Differences*, *45*(3), 213–218. https://doi.org/10.1016/j.paid.2008.03.020

Meng, S. Q., Cheng, J. L., Li, Y. Y., Yang, X. Q., Zheng, J. W., Chang, X. W., Shi, Y., Chen, Y., Lu, L., Sun, Y., Bao, Y.-P., & Shi, J. (2022). Global prevalence of digital addiction in general population: A systematic review and meta-analysis. *Clinical Psychology Review*, *92*, 102128. https://doi.org/10.1016/j.cpr.2022.102128

Muthén, L. K., & Muthén, B. O. (2015). *Mplus user's guide seventh edition*. Muthén & Muthén.

Myers, J. E., & Sweeney, T. J. (2004). The indivisible self: An evidence-based model of wellness. *Journal of Individual Psychology*, *60*, 234–244. https://psycnet.apa.org/record/2004-21594-004

National Academies of Sciences, Engineering, and Medicine. (2020). *Social isolation and loneliness in older adults: Opportunities for the health care system*. National Academies Press.

Nelson, S. K., Layous, K., Cole, S. W., & Lyubomirsky, S. (2016). Do unto others or treat yourself? The effects of prosocial and self-focused behavior on psychological flourishing. *Emotion*, *16*(6), 850–861. https://doi.org/10.1037/emo0000178

Park, S., Kang, M., & Kim, E. (2014). Social relationship on Problematic Internet Use (PIU) among adolescents in South Korea: A moderated mediation model of self-esteem and self-control. *Computers in Human Behavior*, *38*, 349–357. https://doi.org/10.1016/j.chb.2014.06.005

Peper, E., & Harvey, R. (2018). Digital addiction: Increased loneliness, anxiety, and depression. *NeuroRegulation*, *5*(1), 3–8. https://doi.org/10.15540/nr.5.1.3

Reichert, R. A., Martins, G. D. G., Silva, A. M. B. D., Scatena, A., Barbugli, B. C., Micheli, D. D., & Andrade, A. L. M. (2021). New forms of addiction: Digital media. In *Psychology of substance abuse* (pp. 43–53). Springer International Publishing. https://doi.org/10.1007/978-3-030-62106-3_3

Rueger, S., Malecki, C., & Demaray, M. (2010). Relationship between multiple sources of perceived social support and psychological and academic adjustment in early adolescence: Comparisons across gender. *Journal of Youth and Adolescence*, *39*(1), 47–61. https://doi.org/10.1007/s10964-008-9368-6

Ruest, S., Gjelsvik, A., Rubinstein, M., & Amanullah, S. (2018). The inverse relationship between digital media exposure and childhood flourishing. *The Journal of Pediatrics*, *197*, 268–274. https://doi.org/10.1016/j.jpeds.2017.12.016

Satici, S. A. (2019). Facebook addiction and subjective wellbeing: A study of the mediating role of shyness and loneliness. *International Journal of Mental Health and Addiction*, *17*(1), 41–55. https://doi.org/10.1007/s11469-017-9862-8

Satici, S. A., & Uysal, R. (2015). Wellbeing and problematic Facebook use. *Computers in Human Behavior*, *49*, 185–190. https://doi.org/10.1016/j.chb.2015.03.005

Senol Durak, E., & Durak, M. (2019). Psychometric properties of the Turkish version of the flourishing scale and the scale of positive and negative experience. *Mental Health, Religion & Culture*, *22*(10), 1021–1032. https://doi.org/10.1080/13674676.2019.1689548

Smetaniuk, P. (2014). A preliminary investigation into the prevalence and prediction of problematic cell phone use. *Journal of Behavioral Addictions*, *3*(1), 41–53. https://doi.org/10.1556/jba.3.2014.004

Tang, J. H., Chen, M. C., Yang, C. Y., Chung, T. Y., & Lee, Y. A. (2016). Personality traits, interpersonal relationships, online social support, and Facebook addiction. *Telematics and Informatics*, *33*(1), 102–108. https://doi.org/10.1016/j.tele.2015.06.003

Thayer, S., & Ray, S. (2006). Online communication preferences across age, gender, and duration of Internet use. *Cyberpsychology & Behavior*, *9*(4), 432–440. https://doi.org/10.1089/cpb.2006.9.432

Tokunaga, R. S., & Rains, S. A. (2010). An evaluation of two characterizations of the relationships between problematic Internet use, time spent using the Internet, and psychosocial problems. *Human Communication Research*, *36*(4), 512–545. https://doi.org/10.1111/j.1468-2958.2010.01386.x

Twenge, J. M. (2019). More time on technology, less happiness? Associations between digital-media use and psychological wellbeing. *Current Directions in Psychological Science*, *28*(4), 372–379. https://doi.org/10.1177/0963721419838244

Twenge, J. M., & Campbell, W. K. (2019). Media use is linked to lower psychological wellbeing: Evidence from three datasets. *Psychiatric Quarterly*, *90*(2), 311–331. https://doi.org/10.1007/s11126-019-09630-7

Valkenburg, P. M., & Peter, J. (2007). Online communication and adolescent wellbeing: Testing the stimulation versus the displacement hypothesis. *Journal of Computer-Mediated Communication*, *12*(4), 1169–1182. https://doi.org/10.1111/j.1083-6101.2007.00368.x

Verduyn, P., Gugushvili, N., & Kross, E. (2022). Do social networking sites influence wellbeing? The extended active-passive model. *Current Directions in Psychological Science*, *31*(1), 62–68. https://doi.org/10.1177/09637214211053637

Wu, X., Tao, S., Zhang, Y., Zhang, S., Tao, F., & Tian, J. (2015). Low physical activity and high screen time can increase the risks of mental health problems and poor sleep quality among Chinese college students. *PLOS ONE*, *10*(3), e0119607. https://doi.org/10.1371/journal.pone.0119607

Yang, C. C. (2016). Instagram use, loneliness, and social comparison orientation: Interact and browse on social media, but don't compare. *Cyberpsychology, Behavior, and Social Networking*, *19*(12), 703–708. https://doi.org/10.1089/cyber.2016.0201

Zeng, G., Zhang, L., Fung, S. -F., Li, J., Liu, Y. -M., Xiong, Z. -K., Jiang, Z. -Q., Zhu, F. -F., Chen, Z. -T., Luo, S. -D., Yu, P., & Huang, Q. (2021). Problematic Internet usage and self-esteem in Chinese undergraduate students: The mediation effects of individual affect and relationship satisfaction. *International Journal of Environmental Research and Public Health*, *18*(13), 6949. https://doi.org/10.3390/ijerph18136949

Zhang, L., Li, C., Zhou, T., Li, Q., & Gu, C. (2022). Social networking site use and loneliness: A meta-analysis. *The Journal of Psychology*, *156*(7), 492–511. https://doi.org/10.1080/00223980.2022.2101420

Zhao, J., Zhang, Y., Jiang, F., Ip, P., Ho, F. K. W., Zhang, Y., & Huang, H. (2018). Excessive screen time and psychosocial wellbeing: The mediating role of body mass index, sleep duration, and parent–child interaction. *The Journal of Pediatrics*, *202*, 157–162. https://doi.org/10.1016/j.jpeds.2018.06.029

Appendix: 2-level second-order confirmatory factor analysis: Standardized factor loadings of factor/items on within-level

	Factor/Items	Est.	SE	*t*	*p*<
	First-order factor: Communication Disturbunce	BY			
CD1	My eyes start wandering on my phone when I'm together with others	.703	.025	28.525	.000
CD2	I am always busy with my mobile phone when I'm with my friends.	.823	.022	38.166	.000
CD3	People complain about me dealing with my mobile phone.	.642	.036	18.043	.000
CD4	I'm busy with my mobile phone when I'm with friends.	.783	.030	26.079	.000
PhO	**First-order factor: Facebook Phone Obsession**	BY			
PhO5	My phone is always within my reach.	.507	.017	29.516	.000
PhO6	When I wake up in the morning, I first check the messages on my phone.	.542	.021	25.854	.000
PhO7	I feel incomplete without my mobile phone.	.777	.014	57.414	.000
PhO8	My mobile phone use increases day by day.	.613	.019	32.134	.000
IA	**First-order factor: Internet addiction**	BY			
IA1	I spend time using the Internet more than I plan to.	.500	.017	29.350	.000
IA2	The people around me say that I spent too much time dealing with the Internet.	.589	.027	22.214	.000
IA3	I think that life would be boring, purposeless and monotonous without the Internet.	.606	.022	28.127	.000
IA4	I prefer to spend time on the Internet rather than go out with others.	.553	.028	19.735	.000
IA5	I can't wait to use the Internet if I don't have an access to the Internet for a long time.	.728	.014	53.669	.000
IA6	I feel anxious when I don't have an access to the Internet.	.698	.019	36.219	.000
FI	**First-order factor: Facebook Intrusion**	BY			
FI1	I often think about Facebook when I am not using it	.690	.020	35.068	.000
FI2	I often use Facebook for no particular reason	.557	.016	33.942	.000
FI3	Arguments have arisen with others because of my Facebook use	.596	.045	13.319	.000
FI4	I interrupt whatever else I am doing when I feel the need to access Facebook	.731	.024	30.720	.000
FI5	I feel connected to others when I use Facebook	.607	.026	23.749	.000
FI6	I lose track of how much I am using Facebook	.623	.043	14.396	.000
FI7	The thought of not being able to access Facebook makes me feel distressed	.779	.017	45.687	.000
FI8	I have been unable to reduce my Facebook use	.686	.022	31.452	.000
NMA	**Second-order factor: New Media Addiction**	BY			
CD	Communication Disturbunce	.631	.034	18.329	.000
PHO	Phone Obsession	.766	.031	24.600	.000
IAS	Internet addiction	.903	.022	41.566	.000
FI	Facebook Intrusion	.700	.048	14.681	.000

CD—communication disturbance, MPhO—phone obsession, MPhA—mobile phone addiction, IA—internet addiction, FI—Facebook intrusion' Est.—standardized factor loading, SE—standard error.