

NINO GUGUSHVILI

Digital communication technologies
and mental health: An interplay between
usage types and user characteristics



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and user characteristics

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by

Nino Gugushvili

Supervisors

Dr. Philippe Verduyn (Maastricht University)

Prof. Dr. Robert A.C. Ruiten (Maastricht University)

Dr. Karin Täht (University of Tartu)

Assessment Committee

Prof. Dr. Kai Jonas (chair, Maastricht University)

Prof. Dr. Jüri Allik (University of Tartu)

Prof. Dr. Steven Eggermont (KU Leuven)

Dr. Thomas Frissen (Maastricht University)

Dr. Kenn Konstabel (University of Tartu)

Prof. Dr. Christian Montag (Ulm University)

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MAASTRICHT UNIVERSITY

NINO GUGUSHVILI

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Supervisors: Dr. Philippe Verduyn (Maastricht University)

Prof. Dr. Robert A.C. Ruiter (Maastricht University)

Dr. Karin Täht (University of Tartu)

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CHAPTER 1

General introduction

“Man is a tool-using animal.
Without tools he is nothing.
Nowhere do you find him without tools.”
Thomas Carlyle, 1831

When the Covid-19 pandemic spread across the world, elderly people living in nursing homes were isolated from their loved ones. Lockdowns and social distancing measures prevented people to visit their families and increased loneliness among all layers of the population but especially among the elderly. That is why Sarah Firth started a “FaceTime for Nana” campaign on Facebook. Initially, she intended to collect \$300, just enough to buy one iPad for a particular nursing home such that residents could connect with their family members. In the end, she collected ten times more, thanks to social media. As a result, several nursing homes across Massachusetts received iPads, and in just one day, in one facility, more than 75 calls were made using this device.

While social media proved to be a blessing for Sarah Firth and nursing home residents in Massachusetts, this cannot be said for Matilda Rosewarne. Matilda was a fifteen-year-old girl living in Bathurst, Australia. She was confronted with the dark side of social media when she became a victim of cyberbullying. In high school, Matilda was targeted by bullies on Snapchat and was subject to abusive comments and spreading of fake porn on this social networking site. After a long period of cruel and relentless abuse, she eventually took her own life.

These two stories illustrate the possible impact of smartphones and social networking sites. These technologies can be used to enhance or undermine mental health. Even though in most cases the outcomes are far less dramatic than those described above, it is critical to understand when, how, and for whom using these digital communication technologies impacts mental health. This is especially important given the widespread use of these communication tools across the world.

Indeed, the rapid evolution in information and communication technologies during the past two decades has led to the massive adoption of smartphones in today’s society. Smartphones are “mobile phones capable of running general-purpose computer applications” (Oxford University Press, n.d.), and recent smartphones also provide internet access and the possibility to install a wide range of specific apps. Smartphones offer many benefits and do not only allow to call or send messages but also to make and share pictures or videos, listen to music or purchase goods (Magaudda, 2021; Rashid et al., 2020). It is therefore no surprise that smartphones are very often used. Today, more than 6.6 billion people own a smartphone, which corresponds to 84% of the world’s population (Ericsson, 2021). Moreover, people spend a lot of time on their smartphone – on average 4 hours and 48 minutes each day (Kemp, 2022).

Smartphones offer a wide range of affordances but one highly popular functionality is usage of social networking sites (SNS). SNS are the most often downloaded apps on smartphones (Statista, 2021b) and more than 85% of SNS users access these online platforms using their smartphones (Dean, 2021). SNS allow users to create a personal profile and a list of online social connections. Moreover, SNS users can post content on the SNS platform but also access or react to content posted by other users. Finally, most contemporary SNS allow to connect with other users by sending direct messages (Bayer et al., 2020). SNS such as Facebook, WeChat, Instagram, TikTok, and Snapchat are highly popular worldwide. As of 2022, more than 4.2 billion people use SNS (Datareportal, 2022) and spend on average 145 minutes on these platforms each day (Statista Research Department, 2021).

The massive adoption of smartphones and SNS has sparked substantial public concern and debate about the effects of these digital communication technologies on users' mental health (Anthony, 2020; Haidt & Twenge, 2021). In response, a large number of studies have been conducted and meta-analyses of this evidence revealed that time spent on smartphones is negatively but only weakly associated with mental health ($r \approx -.10$) (Ferguson et al., 2022; Vahedi & Saiphoo, 2018). Similarly, the relationship between time spent on SNS and mental health has also been found to be characterized by a weak negative effect ($r \approx -.10$) (Appel et al., 2020).

These observations led some authors to conclude that the effects of smartphone and SNS use are too small to have a meaningful impact on users' mental health (Appel et al., 2020; Odgers & Jensen, 2020; Orben & Przybylski, 2019). However, several authors argued that such conclusions are premature and hide deeper complexities characterizing the relationship between smartphones, SNS and mental health (Dienlin & Johannes, 2020; Johannes et al., 2021; Kushlev & Leitao, 2020; Valkenburg, 2022). Specifically, aggregate effect sizes on the impact of amount of time spent on smartphones and SNS do not take into account that (a) smartphones and SNS can be used in different ways with differential consequences for mental health (Griffioen et al., 2020; Kross et al., 2021; van Deursen et al., 2015; Verduyn et al., 2017), (b) the impact of (subtypes of) smartphone and SNS use on mental health differs across users (Johannes et al., 2021; Valkenburg & Peter, 2013), and (c) initially adaptive ways of engaging with smartphones or SNS may over time take on problematic properties or even result in an addiction-like behaviour. Below, I elaborate on each of these limitations.

Limitations of Past Research and Aims of the Dissertation

1. Research on Aggregate Effects of Overall Usage Time Does not Take Usage Types Into Account

Most studies on the impact of smartphones or SNS on mental health focused on the amount of time people use these digital communication tools. However, smartphones and SNS can be used in many different ways (Elhai, Hall, et al., 2017; Ellison et al., 2020; Kross et al., 2021; Rozgonjuk & Elhai, 2021; Trifiro & Gerson, 2019; van Deursen et al., 2015; Verduyn et al., 2022) and there is growing consensus that in order to understand the impact of smartphone and SNS usage on mental health, it is critical to consider how users engage with these technologies (Kross et al., 2021; Kushlev & Leita, 2020; Shaw et al., 2021; Trifiro & Gerson, 2019). This is reflected in several recent theoretical frameworks and empirical studies, which increasingly often take usage types into account.

According to the Hierarchical Computer-Mediated Communication taxonomy (Meier & Reinecke, 2021), a distinction needs to be made between different levels of interaction during smartphone or SNS use, ranging from not interactive at all to highly interactive. Several theories have been proposed to describe differences in interactivity and there is currently a lot of debate which categorizations are optimally suited for this purpose (Meier & Krause, 2022).

In research on smartphone use, one dominant approach is to distinguish between social and non-social usage of smartphones (van Deursen et al., 2015). Social usage covers activities such as calling, sending SMS, usage of instant messaging apps, and SNS use. Non-social use, on the other hand, refers to activities such as information seeking, browsing, and playing non-social games. Past studies show that social use of smartphones is primarily associated with positive outcomes in terms of mental health (Bae, 2019; Chan, 2015; Lapierre & Zhao, 2022; Stevic et al., 2022). However, social use has also been found to be related to problematic usage of smartphones (van Deursen et al., 2015) and information overload (Li & Chan, 2021). In contrast, non-social usage of smartphones has been found to be primarily associated with negative mental health outcomes (Chan, 2015; Elhai, Gallinari, et al., 2020; Lukoff et al., 2018; Rozgonjuk, Elhai, et al., 2019; Stevic, Schmuck, Matthes, et al., 2021) but some studies demonstrated that non-social use can be associated with positive mental health outcomes as well (Abbasi et al., 2021; Li & Chan, 2021). As such, while it is often argued that social use enhances mental health and non-social use undermines it, empirical findings are actually mixed.

In research zooming into the consequences of usage of SNS, one popular approach is to make a distinction between active and passive SNS use (Burke et al., 2010; Krasnova et al., 2015). Active use encompasses activities that directly foster communication with other users (e.g., commenting, uploading

photos or videos, writing a status update, and chatting). Passive use of SNS refers to viewing content posted by others without interacting with them e.g., browsing and scrolling). According to the active-passive model of SNS use (Verduyn et al., 2017), active use has a positive impact on mental health by increasing social capital and associated feelings of social connectedness. In contrast, passive SNS has a negative impact on mental health by eliciting upward social comparisons and associated feelings of envy or inferiority. However, while initial evidence was largely consistent with these claims, recent findings challenged the active-passive model (e.g., Valkenburg et al., 2021; Yin et al., 2019).

In sum, early studies on the impact of smartphone and SNS use mainly focused on the overall amount of time spent using these digital communication tools. While such studies are still highly prevalent and often cited (Orben et al., 2019; Twenge & Campbell, 2019), there is an increasing trend to move towards more fine-grained measures of SNS and smartphone use (social vs non-social smartphone use, active vs. passive SNS use). However, recent findings suggest that current popular distinctions between usage types are too coarse. As such, these frameworks should be extended, either by further decomposing usage types or by crossing usage types with user characteristics, which I turn to in the next section.

2. Research on Aggregate Effects of Overall Usage Time Does not Take User Characteristics Into Account

Users of digital communication technologies differ in terms of a wide range of characteristics such as age, gender, and personality. These user characteristics may play a key role in the relationship between digital communication technologies and mental health. According to the Differential Susceptibility to Media Effects Model (DSMM) (Valkenburg & Peter, 2013), the effects of social media use are not universal but strongly differ across persons. Moreover, these individual differences can be related to dispositional, social, and developmental factors.

However, past studies have mainly focused on aggregate (average) effects of usage of (different types of) digital communication technologies on mental health (Johannes et al., 2021; Vuorre et al., 2022). While research on average effects is undeniably valuable for understanding the impact of digital communication technologies in the overall population (Johannes et al., 2021), these aggregate effects do not tell us for whom usage of digital communication technologies is beneficial, detrimental, or non-significant (Bolger et al., 2019; Bryan et al., 2021; Johannes et al., 2021). There is a need to shift from focusing on aggregate effect sizes to research on individual differences and user characteristics that explain this interpersonal variability (Bryan et al., 2021; Johannes et al., 2021; Vuorre et al., 2022).

Recently, it has been convincingly demonstrated that the relationship between digital communication technologies and mental health strongly differs across participants. For example, Valkenburg and colleagues (2021) showed that the

effect of the amount of time spent on SNS on self-esteem varies across persons. Similarly, Beyens and colleagues (2020) showed that the impact of passive and active SNS use on mental health varies from person to person. Moreover, Aalbers and colleagues (2022) found that the relationship between different indicators of smartphone use (e.g., the amount of time spent, sum of received notifications, multitasking) and procrastination also varies from user to user.

While it is informative to identify individual differences, a key challenge is to explain these differences by systematically identifying user characteristics moderating the relationship between usage of digital communication technologies and mental health. With regard to smartphone use, first evidence suggests that the relationship between (subtypes) of smartphone use and mental health depends on demographic user characteristics, such as age (Stevic, Schmuck, Karsay, et al., 2021) and gender (Amez et al., 2020; Nishida et al., 2019) but this was not confirmed in other studies (Jensen et al., 2019; Sewall et al., 2022; Yang et al., 2018). Similarly, recent studies have shown that the effects of (subtypes of) SNS use on mental health are especially negative for females (Barthorpe et al., 2020; Frison & Eggermont, 2016; Orben et al., 2022) or younger adults (Vannucci et al., 2017), but, again, these findings were not supported in other studies (Coyne et al., 2020; Hardy & Castonguay, 2018; Verduyn et al., 2015a).

In sum, past studies on the consequences of usage of smartphones and SNS mainly focused on aggregate effect sizes. Such studies are still highly prevalent but attention is gradually shifting towards studies on individual differences. However, it is largely unclear which user characteristics account for this variability. To advance our understanding of user characteristics moderating the relationship between digital communication tools and mental health, it is critical to create a systematic overview of research that already has been done in this regard. Moreover, it is necessary to expand the scope by not only examining demographic user characteristics but also other stable dispositions including personality traits such as neuroticism or extraversion.

3. Research on Aggregate Effects of Overall Usage Time Does not Distinguish Non-Problematic From Problematic Usage

Two different persons may spend a lot of time using smartphones or SNS but while one person may feel in control to stop whenever that person wants to, the other person may experience withdrawal-like symptoms akin to addictions when trying to stop. The latter usage pattern has been referred to by the term *problematic* usage (Haug et al., 2015; Ryan et al., 2014). Problematic smartphone use (PSU) pertains to excessive use of smartphones manifested through behavioural addiction-like symptoms (Billieux, Maurage, et al., 2015). Similarly, problematic SNS use is defined as excessive use of SNS characterized by symptoms akin to addictions (Andreassen, 2015). Some authors prefer the terms “smartphone addiction” and “SNS addiction” (for a discussion, see Montag et al., 2021) but

Panova and Carbonell (2018) argue that, unlike other (behavioural) addictions, excessive use of smartphones or SNS often implies non-clinical or milder forms of functional impairment. Moreover, as the terms smartphone addiction and SNS addiction are not (yet) officially recognized as formal psychiatric disorders, we will follow the suggestion by Panova and Carbonell (2018) and use the terms “problematic smartphone use” and “problematic SNS use” throughout the dissertation.

Recent evidence revealed that problematic usage of smartphones and SNS increased over time (Olson et al., 2022) and created major economic and societal burden (Rumpf et al., 2022) including drops in mental health across the population (for overviews, see Elhai, Dvorak, et al., 2017; Hussain & Griffiths, 2018). Due to the deleterious consequences of problematic smartphone and SNS use, it is of key importance to examine which users are especially likely to engage in problematic usage patterns.

According to the Interaction of Person-Affect-Cognition-Execution model (I-PACE) (Brand et al., 2016, 2019), the development and maintenance of problematic usage of technologies, including smartphones and SNS, is a multifaceted and complex process. One key set of predisposing factors pertains to core user characteristics, which may directly or indirectly impact problematic usage. For example, prior research suggests that younger users (Mitchell & Hussain, 2018; Monacis et al., 2017; van Deursen et al., 2015; Vujić & Szabo, 2022) and females (Stănculescu & Griffiths, 2022; Su et al., 2020; Vujić & Szabo, 2022) are more prone to overusing SNS and smartphones.

However, demographic characteristics only covers a subset of relevant user characteristics. According to the I-PACE model, certain personality traits may also be drivers of problematic usage of digital communication technologies (Wegmann & Brand, 2019). Among the big five personality traits, especially neuroticism was found to be a critical predictor of problematic use of SNS (for meta-analytic evidence, see Huang, 2019, 2022) and smartphones (for meta-analytic evidence, see Carvalho et al., 2018; Marengo, Sindermann, et al., 2020). Similarly, fear of missing out has been found to be another key user characteristic predicting problematic usage patterns (for an overview, see Elhai et al., 2021). However, it is not clear why people high in neuroticism and FoMO are especially vulnerable to engage in problematic smartphone or SNS use.

In sum, research on the impact of smartphones and SNS on mental health has predominantly focused on the amount of time people spend on these technologies. However, this approach does not take into account usage types and user characteristics, and does not distinguish problematic from non-problematic use. The aim of this dissertation is to increase our understanding of the impact of smartphone and SNS use on mental health while considering these limitations. Since the start of this doctoral research project, exciting novel approaches have been proposed (e.g., Kross et al., 2021; Valkenburg, 2022; Vuorre et al., 2022) and I have built on these recent advancements to demonstrate how the impact of digital communication technologies on mental health depends on an interaction between usage

types and user characteristics. Specifically, this dissertation will answer the following questions:

- 1) How does usage of SNS and smartphones influence mental health?
- 2) Which user characteristics have been investigated as moderators of the relationship between (different types of) SNS use and mental health in prior research?
- 3) How do major personality traits (e.g., neuroticism) moderate the relationship between (different types of) smartphones use, SNS use and mental health?
- 4) How do demographic (e.g., age) and personality traits (e.g., neuroticism) moderate the relationship between non-problematic SNS use and problematic SNS use, and what are the associated consequences for mental health?
- 5) Why is neuroticism a vulnerability factor in the context of problematic SNS use? Do fear of missing out and self-control mediate the relationship between neuroticism and problematic SNS use?
- 6) Why is FoMO a vulnerability factor in the context of problematic smartphone use? Do dimensions of problematic smartphone use mediate the relationship between fear of missing out and mental health?

Dissertation Outline

The dissertation consists of the introduction, six core chapters, four of which are already accepted or published, and the general discussion. In **Chapter 2**, we address the 1st and 2nd limitation. Specifically, we propose the extended active-passive model of SNS use as an extension of the original active-passive model formulated in 2017 (Verduyn et al., 2017). Compared to the original model, the extended active-passive model provides a more nuanced understanding of the relationship between SNS use and mental health. In particular, in response to the 1st limitation we decompose active SNS use in four subtypes by crossing two fundamental interaction dimensions: reciprocity and communion. Moreover, we decompose passive SNS use in four subtypes by crossing two fundamental content dimensions: self-relevance and achievement. Finally, in response to the 2nd limitation, we propose to cross usage types and user characteristics in the prediction of mental health outcomes as the effect of SNS usage types are not uniform across users.

In **Chapter 3**, we address the 1st and 2nd limitations by conducting a systematic review on user characteristics moderating the relationship between (subtypes) of SNS use and mental health. Specifically, to address the 1st limitation, we decompose SNS use into overall, active, and passive usage types. To address the 2nd limitation, we review for each of these usage types which user characteristics moderate their relationship with mental health. Moreover, when describing our

results, we make a distinction between robust and non-robust moderating user characteristics.

In **Chapter 4**, we address the 1st and 2nd limitation in a diary study on user characteristics moderating the relationship between (usage types of) digital communication technologies and mental health. Specifically, to address the 1st limitation, we decompose smartphone usage into time spent on smartphones, social usage of smartphones, and non-social usage of smartphones. Similarly, we decompose Instagram use into time spent on Instagram, active use of Instagram and passive use of Instagram. To address the 2nd limitation, we test the moderating roles of two key personality traits in these relationships: neuroticism and extraversion.

In **Chapter 5**, we address the 2nd and 3rd limitation in a cross-sectional study on the relationship between non-problematic SNS use, problematic SNS use and mental health. Specifically, in response to the 2nd limitation, we test whether the relationship between Facebook use and mental health depends on the age of users and their degree of neuroticism and extraversion. In response to the 3rd limitation, we examine problematic Facebook use as a mediator between non-problematic Facebook use and mental health, and investigate whether age, neuroticism and extraversion impacts the probability of non-problematic Facebook use turning into problematic Facebook use.

In **Chapter 6**, we address the third limitation in a cross-sectional study on the relationship between neuroticism and problematic SNS use. Specifically, we examine whether the relationship between neuroticism and problematic usage of SNS is parallelly mediated by two possible mechanisms: fear of missing out and self-control. This allows to explore the unique and joint role of these mechanisms in the vulnerability of neurotic users to develop problematic usage of SNS.

In **Chapter 7**, we address the third limitation in a cross-sectional study where we zoom into the role of fear of missing out in the context of problematic smartphone use. Specifically, we examine which dimensions of problematic smartphone use (tolerance, positive anticipation, cyberspace-oriented relationships, withdrawal, and physical symptoms) are most relevant to explain why fear of missing out predicts reduced emotional well-being.

Finally, **Chapter 8**, summarizes the key findings of this dissertation and discusses the theoretical and practical implications. Moreover, it highlights strengths and limitations of the conducted studies, provides recommendations for future research and closes the dissertation with an overall conclusion.

General Contributions

The present dissertation makes several general contributions to the field. First, this dissertation goes beyond the “good” versus “bad” dichotomy of technological determinism according to which usage of digital communication technologies is either good or bad for mental health (Livingstone et al., 2018; Orben, 2020). The

results of this dissertation unequivocally show that there is no simple answer to the question how smartphones and SNS impact mental health as this impact depends on a wide range of factors.

Second, the dissertation demonstrates the value of decomposing overall measures of smartphone and SNS use into subtypes. Chapter 2, Chapter 3, and Chapter 4 demonstrate that the impact of smartphones and SNS on mental health depends on how smartphones and SNS are used. This may explain why prior research that did not take these key nuances into account resulted in mixed findings.

Third, the findings from this dissertation underscore the importance of user characteristics in understanding the effects of smartphone and SNS use on mental health. The results from Chapter 3 and Chapter 4 demonstrate that only by crossing user characteristics with usage patterns the impact of digital communication technologies on mental health can be understood. This also implies that inconsistencies in past research may be partially attributed to the neglect of relevant user-level moderators.

Fourth, the present dissertation extends our understanding of precursors of problematic usage of smartphones and SNS. We did not only show for which users non-problematic usage is especially likely to turn into problematic usage (Chapter 5), but also explored due to which lower-level mechanisms these users are especially vulnerable (Chapter 6 and Chapter 7).

Together, the present dissertation offers a nuanced understanding of the relationship between digital communication technologies and mental health.

CHAPTER 2

Do social networking sites influence well-being? The extended active-passive model

This chapter is based on: Verduyn, P., Gugushvili, N., & Kross, E. (2022).
Do social networking sites influence well-being?
The extended active-passive model.
Current Directions in Psychological Science, 31(1), 62–68.

CHAPTER 3

A systematic review of user characteristics moderating the relationship between overall, active, and passive use of social networking sites and mental health

This chapter is based on: Gugushvili, N., Rozgonjuk, D., Täht, K., Ruitter, R. A. C., Kross, E., & Verduyn, P. (In preparation).
A systematic review of user characteristics moderating the relationship between overall, active, and passive use of social networking sites and mental health.

CHAPTER 4

The moderating role of extraversion and neuroticism in the relationship between digital communication technologies and mental health: A diary study

This chapter is based on: Gugushvili, N., Täht, K., Rüter, R. A. C., & Verduyn, P. (In preparation). The moderating role of extraversion and neuroticism in the relationship between digital communication technologies and mental health: A diary study.

CHAPTER 5

Facebook use intensity and depressive symptoms: A moderated mediation model of problematic Facebook use, age, neuroticism, and extraversion

This chapter is based on: Gugushvili, N., Täht, K., Rüter, R. A. C., & Verduyn, P. (2022). Facebook use intensity and depressive symptoms: A moderated mediation model of problematic Facebook use, age, neuroticism, and extraversion. *BMC psychology*, 10(1), 279.

CHAPTER 6

The association between neuroticism and problematic social networking sites use: The role of fear of missing out and self-control

This chapter is based on: Gugushvili, N., Täht, K., Schruuff-Lim, E. M., Ruiters, R. A.C., & Verduyn, P. (2022). The association between neuroticism and problematic social networking sites use: the role of fear of missing out and self-control. *Psychological Reports, 0*(0).
<https://doi.org/10.1177/00332941221142003>

CHAPTER 7

Two dimensions of problematic smartphone use mediate the relationship between fear of missing out and emotional well-being

Based on: Gugushvili, N., Täht, K., Rozgonjuk, D., Raudlam, M., Ruitter, R.A.C., & Verduyn, P. (2020). Two dimensions of problematic smartphone use mediate the relationship between fear of missing out and emotional well-being. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, 14(2). <https://doi.org/10.5817/CP2020-2-3>

CHAPTER 8

General discussion

Smartphones and SNS are popular and powerful tools. When used appropriately, these digital communication technologies can bring people together, create supportive communities and enhance mental health. However, when used inappropriately, these technologies can contribute to cyberbullying, create social divides, and undermine mental health.

The ever-increasing usage of smartphones and SNS has sparked substantial interest in the general public about the effects of these technologies on mental health, and also fueled a lot of debate among scholars examining this topic (Twenge et al., 2020; Valkenburg, 2022; Vuorre et al., 2021). A large volume of empirical studies has been conducted to examine the impact of time spent on smartphones and SNS on mental health. Undoubtedly, these studies advanced our understanding of the effects of digital communication technologies on mental health (Kross et al., 2021). However, these studies often resulted in mixed findings (for an overview, see Appel et al., 2020; Kross et al., 2021; Meier, 2022; Orben, 2020; Valkenburg et al., 2021). As argued in Chapter 1, this is mainly due to a predominant focus on aggregate effects of overall usage time which does not (1) make a distinction between usage types, (2) take user characteristics into account, and (3) distinguish between non-problematic and problematic engagement with SNS or smartphones.

It is of key importance to address these limitations of aggregate effects of overall usage time as doing so has broad scientific and societal implications. The initial arrival of (communication) technologies (e.g., printing press, radio, television) has often been accompanied by concerns that these technologies negatively impact mental health and society more broadly (BBC Future, 2016; Drotner, 1999). Smartphones and SNS are no exception (Orben, 2020). These worries are often based on a causationist, direct-effects standpoint according to which usage of technologies impacts all users similarly. This approach is often reflected in techno-deterministic headlines in mainstream media (e.g., Campbell, 2017; Haidt, 2022; Macmillan, 2017; O’Connell, 2018; Twenge, 2017), claiming that smartphones and SNS are solely responsible for myriad adverse outcomes. However, such headlines are often misleading or are based on a misinterpretation of research (e.g., Marshall, 2022)¹, and may contribute to fear or panic in society.

Techno-deterministic discourses inside and outside academia have overlooked the complexity of technology usage and tended to diminish the agency of users by portraying them as powerless victims of technology (Kline, 2001). This is troublesome because such a discourse, combined with societal panic is rarely informative or valuable for policymaking (Orben, 2019). Therefore, it is critical to examine the impact of digital communication technologies on mental health in

¹ The headline claims that smartphone screen exposure may lead to earlier onset of puberty. However, it is based on a study in which rats were exposed to pure blue light.

a more nuanced manner and clarify when, how and for whom usage of smartphones and SNS relates to mental health.

In line with this reasoning, this dissertation set out to answer six questions to provide a nuanced perspective on how usage patterns and user characteristics interact and impact mental health. The questions were: (1) How does usage of SNS and smartphones influence mental health? (2) Which user characteristics have been investigated as moderators of the relationship between (different types of) SNS use and mental health in prior research? (3) How do major personality traits (e.g., neuroticism) moderate the relationship between (different types of) smartphones use, SNS use and mental health? (4) How do demographic (e.g., age) and personality traits (e.g., neuroticism) moderate the relationship between non-problematic SNS use and problematic SNS use, and what are the associated consequences for mental health? (5) Why is neuroticism a vulnerability factor in the context of problematic SNS use? Do fear of missing out and self-control mediate the relationship between neuroticism and problematic SNS? (6) Why is FoMO a vulnerability factor in the context of problematic smartphone use? Do dimensions of problematic smartphone use mediate the relationship between fear of missing out and mental health?

The remainder of this chapter is organized as follows: First, we will discuss the main findings of the six chapters that constitute the core of this dissertation. Second, we will describe the theoretical and practical implications of the findings. Third, we will highlight limitations of the conducted studies and provide concrete recommendations for future research to further advance our knowledge about the relationship between usage of digital communication technologies and mental health.

Main Findings

In response to the first research question, we critically reviewed previous studies on the consequences of active and passive SNS use and formulated the extended active-passive model of SNS use in chapter 2. We explained that while the original active-passive model of SNS use has advanced our understanding of the impact of SNS on mental health, it needed further refinement. We proposed three specific extensions. First, we proposed to decompose passive SNS usage: the effects of passive SNS usage depend on content features such as self-relevance and achievement. Second, we proposed to decompose active SNS usage: the effects of active SNS usage depend on interaction features such as reciprocity and communion. Third, we proposed that it is essential to consider how usage types interact with users characteristics. The consequences of (subtypes of) active and passive SNS use differ across users depending on a range of vulnerability or protective user features. The extended active-passive model of SNS use provides a nuanced understanding by arguing that the consequences of active SNS use are not always beneficial and those of passive SNS use are not always detrimental.

In response to the second research question, and consistent with the third extension of the extended active-passive model, we reviewed in chapter 3 prior evidence on user characteristics that possibly moderate the relationship between (different types of) SNS use and mental health. For this purpose, we conducted a systematic review. We used a fine-grained approach by distinguishing between SNS usage types (overall, active, and passive) and mental health indicators (positive and negative indicators). In total, we identified 26 relevant journal articles, 15 unique moderators, and 76 tests of moderation. Most moderators (73%) were examined in a single journal article only, highlighting the need for a more systematic approach in this domain. Moreover, among the remaining 27% of moderators that were examined at least twice, social comparison orientation was the only moderator for which results were consistent. For those high on social comparison orientation, passive SNS usage was consistently found to be associated with decreases in mental health while this is not the case for users who score low on this trait.

In response to the third research question, and building on the findings of the third chapter, in Chapter 4 we conducted a *seven-day diary study* to investigate the moderating role of neuroticism and extraversion in the relationship between smartphones and Instagram use and mental health. We again opted for a fine-grained approach by distinguishing between smartphone usage types (overall, social, non-social), Instagram usage types (overall, active, passive) and mental health indicators (positive and negative indicators). We found that non-social use of smartphones and passive use of Instagram is predictive of negative affect. This finding suggests that when usage of digital technologies is not aimed at fostering meaningful social connections, it can have negative consequences for mental health. Moreover, we found that neuroticism is a significant moderator of the relationship between time spent on smartphones and negative affect, as well as between passive use of Instagram and negative affect. These (negative) relationships were detrimental for people high in neuroticism. As such, neuroticism may act as a vulnerability factor in these relationships. Some evidence suggested that this may also be the case for extravert SNS users. Extraversion was found to moderate the relationship between the amount of time spent on smartphones and positive affect in the sense that for extraverted users, spending time on smartphones was related to decreases in positive affect.

In response to the fourth research question, in Chapter 5 we describe the findings of a cross-sectional study on how non-problematic SNS use may turn into problematic use and negatively impact mental health. We tested this mediation pathway and examined whether age, neuroticism, and extraversion act as moderators of this indirect relationship. We found that problematic usage of Facebook fully mediated the relationship between Facebook use intensity and depressive symptoms. Moreover, we also found that this indirect relationship was especially strong for young users and neurotic users. However, this relationship was not moderated by extraversion. This suggests that young users and neurotic users are more vulnerable to end up using SNS in a problematic manner.

In response to the fifth research question, in chapter 6 we zoomed into on the role of neuroticism and examined why neuroticism is a vulnerability factor in the context of problematic SNS use. We tested this in a cross-sectional study and using structural equation modelling, we examined the parallel mediating roles of FoMO and self-control in the relationship between neuroticism and problematic SNS use. We found that neuroticism was predictive of both FoMO and self-control. However, only FoMO was predictive of increases in problematic SNS use. Tests of indirect effects revealed that FoMO was a robust mediator while self-control did not mediate the relationship between neuroticism and problematic SNS use.

In response to the sixth research question, in chapter 7 we zoomed into on the role of FoMO as a vulnerability factor in the context of problematic smartphone use. We conducted a cross-sectional study and using structural equation modelling, we tested the parallel mediating roles of five dimensions of problematic smartphone use in the relationship between FoMO and emotional well-being. We found that among the five dimensions of problematic smartphone use, cyberspace-oriented relationships and physical symptoms were the only significant mediators of this relationship. This study adds to our understanding of the consequences of FoMO and the value of decomposing problematic smartphone use in subdimensions.

Implications

This dissertation has many theoretical and practical implications. We will first discuss the theoretical implications by discussing how the present findings advance our understanding of the relationships between digital communication technologies and mental health. Next, we will turn to practical implications by describing how the present findings may ultimately contribute to happier societies.

Theoretical Implications

The Importance of Usage Types. A large number of studies have combined smartphone and SNS usage into the overall monolithic measure of “screen time” (Meier & Reinecke, 2021), or examined the overall amount of time spent on smartphones or SNS (Kross et al., 2021). However, such approaches are increasingly often being criticized. First, lumping together higher-level units of analysis (e.g., smartphones) with lower-level units (e.g. SNS) may confound effects of technologies (Meier & Reinecke, 2021). Second, overall measures of smartphone and SNS usage time do not tell us how people actually use these technologies (van Deursen et al., 2015; Verduyn et al., 2017). Throughout chapters 2, 3, and 4, we demonstrated the value of making a distinction between usage types by showing that the relationship between digital communication

technologies and mental health is complex and depends on how users engage with these technologies. As such, our findings underscore the value of decomposing smartphone and SNS usage, and measuring usage of these technologies in a fine-grained manner.

The Importance of User Characteristics. The second main contribution of this dissertation is a demonstration of the importance to take the interplay between usage types and user characteristics into account. Throughout Chapters 2, 3, 4, and 5, we have proposed and empirically tested a range of user characteristics as moderators of the relationship between (different types of) smartphone and SNS use and mental health. In doing so, we moved away from the direct-effects paradigm (Bryan et al., 2021; Johannes et al., 2021) and attempted to identify user characteristics that act as robust moderators. In Chapters 2 and 3, we provided an overview of what already has been done and what research is still needed. In Chapter 4 and 5, we made a contribution at an empirical level by studying the role of demographic characteristics and personality traits. We demonstrated that both types of user characteristics are important to take into account in research on the relationship between digital communication technologies and mental health.

The Importance of Separating Non-Problematic from Problematic Usage. The third main contribution of the present dissertation is an analysis of problematic usage of SNS and smartphones by taking into account a dynamic interplay between non-problematic usage, user characteristics, and lower-level mechanisms. Specifically, Chapter 5 revealed that SNS use can turn into problematic patterns, especially for younger and neurotic users. Building on this finding, in chapter 6, we explored in-depth why neuroticism would be a vulnerability factor for problematic SNS use and identified FoMO as a robust mechanism linking neuroticism with problematic usage patterns. Finally, in Chapter 7, we zoomed in further and explored why FoMO would be a risk factor in the context of problematic usage of these technologies. In doing so, we identified two specific dimensions of problematic usage of smartphones which linked high levels of FoMO with decreased emotional well-being: cyberspace-oriented relationships and physical symptoms. Taken together, our findings provide a nuanced overview of precursors and underlying mechanisms of problematic SNS and smartphone use and underscore the value of integrating mediating and moderating mechanisms.

Practical implications

The findings of the present dissertation are relevant for a wide range of stakeholders.

Policymakers

The present findings are relevant for policymakers who wish to protect users of digital communication technologies from negative consequences. Our findings do not support a techno-deterministic and dystopian causationist point of view (Orben, 2019) according to which usage of smartphones and SNS universally cause harm to all users. As such, policy aimed at preventing access to digital communication tools likely constitutes a suboptimal approach. In the present dissertation, we illustrated that the outcomes of digital communication technologies depend on an interaction between user and usage characteristics. Policymakers could (1) target vulnerable groups via information campaigns to raise awareness regarding the potential adverse effects of SNS and smartphone use, (2) encourage transparent and rigorous research using nuanced approaches on the consequences of digital communication technologies, and (3) create policies aimed at SNS developers to stimulate them sharing anonymized large-scale behavioural data of users with independent researchers such that the nature of interactions between usage and user characteristics can be optimally studied.

Counsellors

Our findings suggest that specific sub-populations (e.g., users with high neuroticism) are at a higher risk of developing problematic usage patterns and diminished mental health. Two implications follow from these findings. First, it may be difficult to amend stable personality traits such as neuroticism but it may be possible to impact mechanisms underlying the negative effects of neuroticism such as FoMO. Indeed, FoMO can be successfully targeted by intervention strategies such as the FoMO-R method which includes awareness and resilience-building activities (Alutaybi et al., 2020). Second, counsellors should also focus on the self-regulatory processes (i.e., the goals that problematic users try to achieve when using SNS and smartphones) (Ozimek & Förster, 2021) and offer healthier alternatives. For example, when neurotic clients use these technologies to cope with loneliness in order to feel better, counsellors could design specific interventions to address such regulatory attempts.

SNS users

The findings of the present dissertation suggest that the average SNS user should not be overly concerned about the impact of the time spent on smartphones and SNS if this usage does not trigger damaging psychological mechanisms or becomes addictive. Rather than focusing on time spent on digital communication tools, SNS users may profit from examining how they use these tools. Most users will likely benefit when using SNS to engage in warm, targeted interactions as

these interaction types are most likely to elicit feelings of connectedness and enhance mental health. Moreover, most users will likely profit when avoiding frequent exposure to self-relevant success stories posted by others on SNS, and stay mindful of the content they are exposed to. For instance, they should be aware that people mainly engage in positive self-presentation on SNS and primarily share positive aspects of their lives (e.g., picture-perfect photos of themselves), which does not necessarily match reality.

Platform developers

The findings of the present dissertation clearly illustrate the damage associated with problematic usage and the need to protect vulnerable groups of users. However, to understand the full scale of the issue and efficiently tackle it, transparency from SNS platform developers and access to anonymized data are essential. Therefore, we strongly encourage developers to actively cooperate with independent researchers to identify key features of their platforms, usage patterns, and risk groups among their users. We are fully aware that this may not always be in the immediate economics interest of profit-oriented companies, as they directly benefit from users' spending large amounts of time on their platforms. However, we believe it is the responsibility of social media companies to protect users by taking action and ensuring that their tools are designed to be optimally helpful.

Limitations and Future Studies

The present dissertation contributed to our understanding of the impact of digital communication technologies on mental health. However, a number of limitations should be mentioned that could be addressed in future studies. First, in most empirical studies we exclusively relied on self-report measures for assessing technology usage. However, self-report measures do not correlate strongly with non-obtrusive log data of smartphones and SNS (Boyle et al., 2022; Ernala et al., 2020; P. H. Lee et al., 2021; Marengo et al., 2021; Parry et al., 2021; Rozgonjuk, Pruunsild, et al., 2020). As such, future research should consider including objective measures as a more ecologically valid option for capturing (problematic) use of smartphones and SNS when replicating our findings (Dissing et al., 2021; Ryding & Kuss, 2020b).

Second, in Chapters 4–7 we relied on a convenience sampling technique to recruit participants due to which samples consisted predominantly of female white users with higher education degrees. Moreover, the mean age across our empirical studies ranged from 26 to 30 years. Future research is necessary to replicate our findings using more diverse participant samples to examine the generalizability of our findings.

Third, in Chapters 5–7 we made use of cross-sectional research designs. Recent studies suggest that the relationship between digital communication technologies and mental health may be reciprocal (Frison & Eggermont, 2017; Jun, 2016; Orben, 2020; Rousseau et al., 2017; Stanković et al., 2021). Therefore, experimental studies are needed to clarify the temporal direction of the relationships described in chapters 5–7.

Fourth, this dissertation focused on SNS usage either without specifying the platforms (Chapter 3) or on specific platforms such as Instagram and Facebook (Chapter 4, Chapter 5). However, we did not investigate other popular SNS platforms such as TikTok and WeChat (for overviews, see Montag et al., 2018, 2021). Future research needs to examine the cross-platform validity of our findings. Existing evidence indicates that users engage differently with various platforms (Rozgonjuk et al., 2021a) and different SNSs may impact users' mental health differently (Pittman & Reich, 2016; Rozgonjuk, Sindermann, et al., 2020).

Fifth, while the empirical chapters presented in this dissertation advance our understanding of problematic usage of SNS and smartphones, the observation of partial mediation in Chapter 6 and Chapter 7 suggests that there may be additional mechanisms which underlie the relationships between user characteristics, problematic usage, and mental health. Such factors may include negative reinforcement mechanisms (e.g., fear of social isolation) and positive reinforcement mechanisms, (e.g., experience of gratification) (Wegmann & Brand, 2019). Future research is needed to identify potential additional robust mediators of these relationships.

Sixth, in the present dissertation, we mainly focused on personality traits characterized by social deficiencies, as antecedents of problematic usage of smartphones and SNS (e.g., Chapter 6, Chapter 7). However, *the Reward-driven Hypothesis* (Wegmann & Brand, 2019) argues that socially competent individuals may also be at risk of developing problematic usage patterns through positive reinforcing mechanisms. Future research needs to thoroughly identify and test such predisposing characteristics, as well as underlying mechanisms.

Seventh, Montag and colleagues (2019; 2021; 2020) highlight the data business model's importance in understanding why users become hooked to SNS. Simply put, this business model relies on collecting and selling personal data to marketing companies. This, in turn, compels SNS engineers to introduce specific features, such as likes and personalized and frictionless newsfeeds, which lead to problematic usage of SNS. In Chapter 5, we have demonstrated that intense usage of Facebook indeed is predictive of problematic Facebook use. However, we did not investigate specific features of SNS that may be responsible for this relationship. As such, future studies are necessary to identify such features and cross them with personality traits to gain better understanding of the antecedents of problematic usage patterns.

Finally, in Chapter 3, we conducted a systematic review. However, due to the limited number of studies, we were unable to conduct a meta-analysis. As a result, we relied on a procedure known as “vote counting” to distinguish between robust

and non-robust effects. However, such a procedure has its drawbacks, as it does not consider factors such as differences in sample size (Suri, 1998), data dependencies, and multiple testing practices, which may lead to accumulation of type I error (Bender et al., 2008; Cheung, 2019). We suggest that once the necessary amount of evidence is accumulated, this systematic review should be followed by a meta-analysis.

Conclusion

The present dissertation addressed three key limitations of research that focused on the relationship between usage time of digital communication technologies and mental health. First, we showed that different usage types of SNS and smartphones are differentially related to mental health. Second, we demonstrated that these relationships differ systematically across users and identified vulnerability factors in these relationships. Third, we clarified the complex direct and indirect relationships between these vulnerability factors, problematic usage of digital communication technologies, and mental health outcomes. Overall, this dissertation demonstrates that the impact of digital communication technologies on mental health is complex and depends on an interaction between usage types and user characteristics.

APPENDIX

Summary

In the 21st century, smartphones and social networking sites (SNS) have become essential tools for billions of people for a wide range of purposes including connecting and collaborating with others, accessing information, shopping online, or passing time. Due to the popularity and prevalence of smartphones and SNS, much work has been done in the past two decades to understand how these digital communication technologies impact mental health.

Past research predominantly focused on the amount of time people spend using smartphones and SNS. This yielded mixed findings and meta-analyses revealed that, on average, the effect of smartphone and SNS usage on mental health is negative but small. However, focusing on overall usage time does not take into account (1) usage types, (2) user characteristics, and (3) the distinction between non-problematic and problematic usage of digital communication technologies, and how the interplay between these three aspects impacts mental health.

In this dissertation, we addressed these three key limitations and answered six major research questions: (1) How does usage of SNS and smartphones influence mental health? (2) Which user characteristics have been investigated as moderators of the relationship between (different types of) SNS use and mental health in prior research? (3) How do major personality traits (e.g., neuroticism) moderate the relationship between (different types of) smartphones use, SNS use and mental health? (4) How do demographic (e.g., age) and personality traits (e.g., neuroticism) moderate the relationship between non-problematic SNS use and problematic SNS use, and what are the associated consequences for mental health? (5) Why is neuroticism a vulnerability factor in the context of problematic SNS use? Do fear of missing out and self-control mediate the relationship between neuroticism and problematic SNS? (6) Why is FoMO a vulnerability factor in the context of problematic smartphone use? Do dimensions of problematic smartphone use mediate the relationship between fear of missing out and mental health?

Chapter 1 provides a comprehensive overview of past research, identifies three key limitations, and explains how the present dissertation will address these limitations.

Chapter 2 critically reviews past research on the impact of active and passive use of SNS on mental health and formulates the extended active-passive model of SNS use. In this model, we decompose active SNS use in four subtypes by crossing two fundamental interaction dimensions: reciprocity and communion. Moreover, we decompose passive SNS use in four subtypes by crossing two fundamental content dimensions: self-relevance and achievement. Finally, we propose to cross usage types and user characteristics in the prediction of mental health as the effect of different types of SNS use differs across users.

Building on Chapter 2, **Chapter 3** systematically reviews existing evidence on user characteristics that have been tested as moderators of the relationship between (types of) SNS use and mental health. We demonstrate that out of 15 unique moderators distributed across 26 manuscripts, the majority of moderators (73%) were studied in a single journal article only. We also demonstrate that findings were largely mixed for those moderators that were studied at least in two journal articles. The only exception was social comparison orientation which has been found to robustly moderate the relationship between passive SNS use and mental health. For users scoring high on social comparison orientation, passive SNS usage was associated with diminished mental health. On the other hand, the relationship between passive use of SNS and mental health was not significant for those who scored low on this trait.

Chapter 4 presents findings from a seven-day diary study that we conducted to empirically test the moderating role of neuroticism and extraversion in the relationship between digital communication technologies and mental health. Specifically, we used a fine-grained approach and distinguished between different types of smartphone use (overall time spent, social use, non-social use), Instagram use (overall time spent, active use, passive use) and indicators of mental health (positive affect, negative affect). We found that non-social use of smartphones and passive use of Instagram predicts negative affect. We also found that neuroticism moderates the relationship between time spent on smartphones and negative affect and between passive Instagram use and negative affect, such that these effects are detrimental for those who score high on this trait but are non-significant for those with a low score. Finally, we also found that extraversion is a risk factor in the relationship between time spent on smartphones and positive affect. Those who scored high on extraversion experienced declines in positive affect. However, this was not the case for those users who scored low on extraversion.

Chapter 5 presents findings from a cross-sectional study where we examined whether the relationship between Facebook use intensity and depressive symptoms is mediated by problematic Facebook use and moderated by age, neuroticism, and extraversion. We found that problematic Facebook use fully mediated the relationship between Facebook use intensity and depressive symptoms. Furthermore, our findings demonstrated that this indirect relationship was stronger for young users and users scoring high on neuroticism.

Chapter 6 explores further why neuroticism is a vulnerability factor in the context of problematic use of SNS. For this purpose, we conducted a cross-sectional study and tested whether the relationship between neuroticism and problematic SNS use was parallelly mediated by fear of missing out and self-control. We found that only fear of missing out was a robust mediator of this relationship.

Chapter 7 builds on the findings of Chapter 6. In a cross-sectional study, we examined whether the relationship between fear of missing out and emotional well-being was parallelly mediated by five dimensions of problematic smart-

phone use (tolerance, positive anticipation, cyberspace-oriented relationships, withdrawal, and physical symptoms). Our findings demonstrated that only two dimensions: cyberspace-oriented relationships and physical symptoms, were robust mediators of this relationship.

Chapter 8 presents an overview of the main findings of the dissertation. It also discusses the theoretical and practical implications of these findings, acknowledges the limitations, and provides recommendations for future research. For instance, the empirical studies presented in the dissertation are correlational and therefore future studies should replicate these findings in experimental studies to clarify the causal nature of the relationship between usage of digital communication technologies and mental health.

Samenvatting

In de 21e eeuw zijn smartphones en sociale netwerksites (SNS) essentiële hulpmiddelen geworden voor miljarden mensen voor een breed scala aan doeleinden, waaronder connecteren en samenwerken met anderen, toegang krijgen tot informatie, online shoppen of tijdverdrijf. Vanwege de populariteit en prevalentie van smartphones en SNS is er de afgelopen twee decennia veel onderzoek gedaan om te begrijpen hoe deze digitale communicatietechnologieën de mentale gezondheid beïnvloeden.

Eerder onderzoek richtte zich voornamelijk op de hoeveelheid tijd die mensen besteden aan het gebruik van smartphones en SNS. Dit leidde tot tegenstrijdige bevindingen en uit meta-analyses bleek dat het effect van smartphone- en SNS-gebruik op mentale gezondheid gemiddeld genomen negatief maar klein is. Echter, wanneer men focust op de totale gebruikstijd wordt geen rekening gehouden met (1) gebruikstypes, (2) gebruikerskenmerken, en (3) het onderscheid tussen niet-problematisch en problematisch gebruik van digitale communicatietechnologieën, en hoe de wisselwerking tussen deze drie aspecten invloed heeft op de mentale gezondheid.

In dit proefschrift hebben we deze drie belangrijke beperkingen aangepakt en zes belangrijke onderzoeksvragen beantwoord: (1) Hoe beïnvloedt het gebruik van SNS en smartphones de mentale gezondheid? (2) Welke gebruikerskenmerken zijn in eerdere studies onderzocht als moderatoren van de relatie tussen (verschillende soorten) SNS-gebruik en mentale gezondheid? (3) Hoe modereren belangrijke persoonlijkheidskenmerken (bv. neuroticisme) de relatie tussen (verschillende soorten) smartphonegebruik, SNS-gebruik en mentale gezondheid? (4) Hoe modereren demografische (bv. leeftijd) en persoonlijkheidskenmerken (bv. neuroticisme) de relatie tussen niet-problematisch SNS-gebruik en problematisch SNS-gebruik, en wat zijn de bijbehorende gevolgen voor de mentale gezondheid? (5) Waarom is neuroticisme een kwetsbaarheidsfactor in de context van problematisch SNS-gebruik? Mediëren FoMO en zelfcontrole de relatie tussen neuroticisme en problematisch SNS gebruik? (6) Waarom is FoMO een kwetsbaarheidsfactor in de context van problematisch smartphonegebruik? Mediëren dimensies van problematisch smartphonegebruik de relatie tussen FoMO en mentale gezondheid?

Hoofdstuk 1 geeft een uitgebreid overzicht van eerder onderzoek, identificeert drie belangrijke beperkingen en legt uit hoe dit proefschrift deze beperkingen zal aanpakken.

Hoofdstuk 2 geeft een kritisch overzicht van eerder onderzoek naar de impact van actief en passief gebruik van SNS op mentale gezondheid en formuleert het uitgebreide actief-passief model van SNS-gebruik. In dit model splitsen we actief SNS-gebruik op in vier subtypen door twee fundamentele interactiedimensies te kruisen: wederkerigheid en “communion”. Bovendien ontleden we passief SNS-

gebruik in vier subtypen door twee fundamentele inhoudsdimensies te kruisen: zelfrelevantie en prestatie. Ten slotte stellen we voor om gebruikstypes en gebruikerskenmerken te kruisen bij het voorspellen van mentale gezondheid, aangezien het effect van verschillende soorten SNS-gebruik verschilt tussen gebruikers.

Voortbouwend op Hoofdstuk 2, geeft **Hoofdstuk 3** een systematisch overzicht van gebruikerskenmerken die in eerder onderzoek zijn getest als moderatoren van de relatie tussen (soorten) SNS-gebruik en mentale gezondheid. We laten zien dat van de 15 unieke moderatoren verdeeld over 26 manuscripten, de meerderheid van de moderatoren (73%) slechts in één tijdschriftartikel werd bestudeerd. We tonen ook aan dat de bevindingen grotendeels tegenstrijdig waren voor die moderatoren die in ten minste twee tijdschriftartikelen werden bestudeerd. De enige uitzondering was de neiging tot sociale vergelijking aangezien deze neiging consistent de relatie tussen passief SNS-gebruik en mentale gezondheid modereert. Voor gebruikers die een sterke neiging hebben om zich met anderen te vergelijken, werd gevonden dat passief SNS-gebruik geassocieerd is met verminderde mentale gezondheid. Echter, de relatie tussen passief gebruik van SNS en mentale gezondheid was niet significant voor diegenen die laag scoorden op deze eigenschap.

Hoofdstuk 4 presenteert de bevindingen van een zevendaags dagboekonderzoek dat we hebben uitgevoerd om de modererende rol van neuroticisme en extraversie in de relatie tussen digitale communicatietechnologieën en mentale gezondheid empirisch te testen. Concreet gebruikten we een fijnmazige benadering en maakten we onderscheid tussen verschillende soorten smartphonegebruik (totale tijdsbesteding, sociaal gebruik, niet-sociaal gebruik), Instagramgebruik (totale tijdsbesteding, actief gebruik, passief gebruik) en indicatoren van mentale gezondheid (positief affect, negatief affect). We vonden dat niet-sociaal gebruik van smartphones en passief gebruik van Instagram negatief affect voorspellen. We vonden ook dat neuroticisme een modererende rol speelt in de relatie tussen tijdsbesteding op smartphones en negatief affect en tussen passief Instagramgebruik en negatief affect, in de zin dat deze effecten nadelig zijn voor diegenen die hoog scoren op deze eigenschap, maar niet-significant zijn voor mensen met een lage score. Ten slotte vonden we ook dat extraversie een risicofactor is in de relatie tussen tijd doorgebracht op smartphones en positief affect. Diegenen die hoog scoorden op extraversie, ervoeren een afname in positief affect. Dit was echter niet het geval voor de gebruikers die laag scoorden op extraversie.

Hoofdstuk 5 presenteert de bevindingen van een cross-sectionele studie waarin we onderzochten of de relatie tussen de intensiteit van Facebook-gebruik en depressieve symptomen wordt gemedieerd door problematisch Facebookgebruik en gemodereerd door leeftijd, neuroticisme en extraversie. We vonden dat problematisch Facebookgebruik de relatie tussen de intensiteit van Facebookgebruik en depressieve symptomen volledig medieerde. Bovendien toonden

onze bevindingen aan dat deze indirecte relatie sterker was voor jonge gebruikers en gebruikers die hoog scoorden op neuroticisme.

Hoofdstuk 6 onderzoekt verder waarom neuroticisme een kwetsbaarheidsfactor is in de context van problematisch gebruik van SNS. Hiervoor hebben we een cross-sectionele studie uitgevoerd en getest of de relatie tussen neuroticisme en problematisch SNS-gebruik parallel werd gemedieerd door FoMO en zelfcontrole. We vonden dat alleen FoMO een robuuste mediator was in deze relatie.

Hoofdstuk 7 bouwt voort op de bevindingen van Hoofdstuk 6. In een cross-sectionele studie onderzochten we of de relatie tussen FoMO en emotioneel welzijn parallel werd gemedieerd door vijf dimensies van problematisch smartphonegebruik (tolerantie, positieve anticipatie, cyberspace-georiënteerde relaties, afkickverschijnselen en lichamelijke symptomen). Onze bevindingen toonden aan dat slechts twee dimensies: cyberspace-georiënteerde relaties en lichamelijke symptomen, robuuste mediators waren van deze relatie.

Hoofdstuk 8 geeft een overzicht van de belangrijkste bevindingen van het proefschrift. Het bespreekt ook de theoretische en praktische implicaties van deze bevindingen, erkent de beperkingen en doet aanbevelingen voor toekomstig onderzoek. Bijvoorbeeld, de empirische studies die in het proefschrift worden beschreven zijn correlatief en daarom zouden toekomstige experimentele studies deze bevindingen moeten repliceren om de aard van de causaliteit tussen het gebruik van digitale communicatietechnologieën en mentale gezondheid te verduidelijken.

Kokkuvõte

Erinevad digitaalsed kommunikatsioonitehnoloogiad nagu nutitelefonid ja sotsiaalmeediaplatvormid (SMP) on 21. sajandil muutunud miljardite inimeste jaoks olulisteks tööriistadeks. Neid kasutatakse erinevatel eesmärkidel, muuhulgas teiste inimestega ühenduse loomiseks, koostööks, teabele ligipääsuks, veebis ostlemiseks ja aja veetmiseks. Nutitelefonide ja SMP-e populaarsuse ja laia leviku tõttu on teadlased viimase kahe aastakümne jooksul uurinud, kuidas need digitaalsed kommunikatsioonitehnoloogiad mõjutavad inimeste vaimset tervist. Need uuringud on keskendunud peamiselt üldisele ajale, mille inimesed veedavad nutitelefone ja SMP-e kasutades ning on andnud erinevaid tulemusi. Uuringuid kokkuvõtvate metanalüüside tulemused on näidanud, et on nutitelefonide ja SMP-e kasutamise kasutamise keskmine mõju vaimsele tervisele on negatiivne, aga samas väike. Üldisele kasutusajale keskendumine ei võta aga arvesse (1) erinevaid kasutustüüpe, (2) kasutajate omadusi ega (3) digikommunikatsioonitehnoloogiate mitteprobleemse ja probleemse kasutuse eristamist. Samuti ei ole siiani olnud teada kuidas eelnevalt mainitud kolm faktorit koos toimivad inimeste vaimse tervise kujunemisele digitehnoloogiate rikkas keskkonnas.

Käesolevas väitekirjas seega keskendusin neile kolmele faktorile ning vastasin kuuetele peamisele uurimisküsimusele: (1) Kuidas mõjutab SMP-e ja nutitelefonide kasutamine vaimset tervist? (2) Milliseid kasutajate karakteristikuid on varasemates uuringutes SMP-e kasutamise ja vaimse tervise vaheliste seoste moderaatoritena vaadeldud? (3) Kuidas mõjutavad peamised isiksuseomadused (nt neurootilisus) nutitelefonide kasutamise ja vaimse tervise ning SMP-e kasutamise ja vaimse tervise vahelist seost? (4) Kuidas demograafilised näitajad (nt vanus) ja isiksuseomadused (nt neurootilisus) modereerivad seost mitteprobleemse SMP-e kasutamise ja probleemse SMP-e kasutamise vahel ning millised on sellega seotud tagajärjed vaimsele tervisele? (5) Miks on neurootilisus probleemse SMP-e kasutamise kontekstis riskitegur? Kas eemalejäämise hirm (ingl. keeles *Fear of Missing Out* (FoMO)) ja enesekontroll vahendavad seost neurootilisuse ja probleemse SMP-e vahel? (6) Miks on FoMO probleemse nutitelefoni kasutamise kontekstis riskifaktor? Kas probleemse nutitelefoni kasutamise eri dimensioonid vahendavad seost FoMO ja vaimse tervise vahel? Väitekirja jaguneb kaheksaks peatükiks.

1. peatükk annab põhjaliku ülevaate varasematest uuringutest, toob välja nende kolm põhilist puudust ja selgitab, kuidas käesolev doktoritöö neid puudusi käsitleb.

2. peatükis vaadeldakse kriitiliselt varasemaid uuringuid SMP-e erinevate (aktiivse ja passiivse) kasutamistüüpide mõju kohta vaimsele tervisele. Lisaks sõnastatakse SMP-e kasutamise mudel, mille nimetasime laiendatud aktiivne-passiivne mudel. Selles mudelis vaadeldakse aktiivset SMP-e kasutamist neljas

modulatsioonis põhinedes kahel näitajal: vastastikkus ja ühendus. Need neli modulatsiooni moodustuvad siis kahe näitaja madalatest ja kõrgetest tasemetest. Sarnaselt vaatasime passiivset SMP-e kasutamist neljaks jaotatuna, põhinedes kahel põhilisel näitajal: enesekohasus ja saavutused. Kokkuvõtvalt tegime ettepaneku vaimse tervise prognoosimisel vaadata koos nii kasutustüüpe kui ka kasutaja omadusi, kuna eri isemoomuga SMP-de kasutamise mõju on erinevate kasutajate lõikes erinev.

3. peatükis antakse süstemaatiline ülevaade (2. peatükile tuginedes) SMP-e kasutajate karakteristikutest, mida on varasemates uuringutes testitud SMP-e kasutamise (tüüpe) ja vaimse tervise vahelise seose moderaatoritena. Tuuakse välja 15 erinevat moderaatorit 26-st käsikirjast, kusjuures enamik moderaatoritest (73%) olid vaatluse all ainult ühes ajakirjaartiklis. Paraku olid tulemused nende moderaatorite kohta, mida uuriti vähemalt kahes teadusartiklis, üsnagi erinevad. Ainsana näitas sotsiaalse võrdluse orientatsioon püsivaid tulemusi. Nimelt on leitud, et indiviididel, kellel on tugevam orienteeritus sotsiaalsele võrdlusele, on SMP-de aktiivne kasutamine seotud kehvema vaimse tervisega. Teisest küljest ei olnud seos SMP-e passiivse kasutamise ja vaimse tervise vahel statistiliselt oluline nende jaoks, kelle sotsiaalse võrdluse näitaja oli madalam.

4. peatükk põhineb seitse päeva kestnud päevikuuuringu tulemustel. Selle uuringu eesmärk oli empiiriliselt testida kahe isiksuse omaduse, neurootilisuse ja ekstravertsuse, modereerivat rolli digikommunikatsioonitehnoloogiate ja vaimse tervise seose puhul. Digi-kommunikatsioonitehnoloogiate puhul eristasime erinevaid nutitelefoni kasutamise tüüpe (üldine kulutatud aeg, sotsiaalne kasutus, mittesotsiaalne kasutus), Instagrami kasutamise eri võimalusi (üldine kulutatud aeg, aktiivne kasutamine, passiivne kasutamine) ning vaimse tervise puhul eristasime negatiivset ja positiivset afekti. Leidsime, et nutitelefoni mittesotsiaalne kasutamine ja Instagrami passiivne kasutamine ennustab pigem negatiivset afektiivsust. Samuti leidsime, et neurootilisus modereerib seost nutitelefoni veedetud aja ja kasutaja negatiivse emotsionaalsuse vahel, samuti seost passiivse Instagrami kasutamise ja negatiivse emotsionaalsuse vahel. Täpsemalt neurootilisemate kasutajate puhul näeme negatiivseid mõjusid, aga neid kelle neurootilisuse näitajad on madalad, ei ole neid mõjusid. Lõpuks leidsime ka, et ekstravertsus on nutitelefoni veedetud aja ja positiivse emotsionaalsuse vahelise seose riskitegur. Need, kel on ekstravertsuse skaalal kõrge tulemus, kogesid vähem positiivseid emotsioone. Kuid see ei kehtinud nende kasutajate puhul, kes said ekstravertsuse näitajal madala tulemuse.

5. peatükis esitatakse läbilõikeuuringu tulemused. Uuringus on vaatluse all Facebooki kasutamise intensiivsuse ja depressiivsete sümptomite vaheline seos ning uurimisküsimuseks on, kas probleemne Facebooki kasutamine vahendab nimetatud seost ning kas rolli omavad kasutaja vanus ja isiksuseomadused (neurootilisus ja ekstravertsus). Tulemused näitasid, et probleemne Facebooki kasutamine vahendas täielikult Facebooki kasutamise intensiivsuse ja depressiivsete sümptomite vahelist seost. Lisaks näitasid tulemused, et see vahendatud seos oli tugevam nooremate ja kõrgema neurootilisusega kasutajate puhul.

6. peatükis uurisime lähemalt, miks neurootilisus on SMP-e probleemse kasutamise kontekstis riskitegur. Selleks viisime läbi läbilõikeuuringu ja testisime, kas neurootilisuse ja probleemse SMP-e kasutamise vahelist seost vahendavad FoMO ja enesekontroll. Leidsime, et ainult FoMO oli selle suhte tugev vahendaja.

7. peatükk tugineb omakorda 6. peatüki järeldustele. Läbilõikeuuringu abil uurimisi, kas FoMO ja emotsionaalse heaolu vahelist seost vahendavad samaaegselt viis probleemse nutitelefonikasutuse dimensiooni (suurenenud kasutus, positiivne ootus, küberruumile orienteeritud suhted, võõrutusnähud ja füüsilised sümptomid). Tulemused näitasid, et ainult kaks dimensiooni (küberruumile orienteeritud suhted ja füüsilised sümptomid) eeltoetletud viiest nutitelefonikasutamise alamdimensioonist vahendasid seost FoMO ja emotsionaalse heaolu vahel.

8. peatükis antakse ülevaade kogu väitekirja peamistest leidudest. Samuti arutatakse leidude teoreetiliste ja praktiliste järelduste ja piirangute üle. Samuti antakse soovitusi tulevaste uuringute jaoks. Näiteks doktoritöös esitatud empiirilised uuringud on korrelatiivsed ja seetõttu on vajalik tulemusi tulevastes eksperimentaalsetes uuringutes korrata, et selgitada digitaalsete kommunikatsioonitehnoloogiate kasutamise ja vaimse tervise vahelise seose põhjuslikku olemust.

Impact paragraph

The rise of smartphones and social networking sites (SNS) has been accompanied by concerns inside and outside academia that these digital communication technologies negatively influence mental health. The present dissertation enhances our understanding of this pressing matter. Here, I will discuss three ways the findings from the present dissertation may contribute to this debate in the academic and public domain.

A first key message is that what we do on smartphones and SNS may be more important than the amount of time we invest in them. Researchers can benefit from this insight by decomposing aggregate usage metrics of digital technologies into meaningful subcategories such as (subtypes of) active versus passive use or social vs. non-social use. Smartphone owners and SNS users can profit from this insight by engaging in those usage types that benefit most users such as warm reciprocal interactions while avoiding exposure to self-relevant achievement-focused content of others. Counsellors should also be aware of the differential effects of different usage types and use this knowledge when designing interventions for clients who experience negative mental health consequences due to their usage of digital communication tools. Rather than exclusively preventing (or strongly limiting) clients to use smartphones or SNS, a valuable alternative may be to nudge clients towards healthier usage styles. Finally, policymakers could launch information campaigns to make the general public aware of which usage types are most beneficial for most people. However, such endeavors are complicated due to the role of individual differences, which we discuss next.

A second key message is that user characteristics matter in the context of SNS and smartphone use. This implies that scholars should pay more attention to moderators such as age, gender, and personality traits to systematically explain for whom usage of smartphones and SNS is beneficial versus detrimental. Moreover, smartphone owners and SNS users can benefit from this insight by being aware of their own vulnerability factors. For example, when SNS users realize they have neurotic tendencies or tend to compare themselves with others, they should exercise extra caution when using smartphones and SNS. This insight is also important for counsellors as assessing their clients' proneness to engage in social comparisons and neurotic thoughts may help them to evaluate their clients' risk of suffering adverse outcomes when using smartphones and SNS. Finally, policymakers can use these insights to make the public aware of which user populations are at increased risks when using digital communication tools.

The third key message is that it is critical to make a distinction between non-problematic and problematic usage of digital communication technologies. Researchers may benefit from this insight by assessing both engagement types and identifying mechanisms that turn regular usage into problematic usage. Smartphone owners and SNS users may benefit from this insight by critically

reflecting on the degree to which they have control over these communication tools rather than exclusively focusing on the amount of time spent on these devices. Counsellors could examine whether their clients have user characteristics that make them especially vulnerable for problematic usage styles and can implement interventions targeting amendable, lower-level mechanisms (e.g., fear of missing out) to reduce addiction-like symptoms in their clients. Finally, policymakers can make use of this insight to raise awareness about specific risks associated with problematic usage of digital communication technologies. Somewhat ironically, smartphones and SNS can be used as practical tools for such information dissemination and educational campaigns.

Finally, each of the three key messages obviously also has consequences for smartphone and SNS developers but this is a complex matter. Whereas certain recommendations do not necessary clash with profit maximization (e.g., nudging warm reciprocal interactions) others may do (e.g., avoiding problematic engagement and associated usage time). However, we believe that smartphone and SNS developers should take their responsibility by, at least, providing independent researchers access to anonymized usage data such that the complex interaction between user characteristics and usage types can be even better understood.

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Curriculum Vitae

Nino Gugushvili was born in Georgia on January 25, 1989. She received her Bachelor of Arts in Psychology from Ivane Javakhishvili Tbilisi State University in 2012. Afterwards, Nino obtained her Master of Science degree in Counseling Psychology at Ivane Javakhishvili Tbilisi State University in 2014. From 2014 to 2018, Nino worked as a researcher at the Center for Social Sciences in Tbilisi, Georgia. Furthermore, from 2015 to 2016, she worked as a researcher at the Ministry of Defense of Georgia. In 2018, Nino started her PhD project: “Digital communication technologies and mental health: An interplay between usage types and user characteristics”, at Maastricht University and the University of Tartu. As of December 2022, Nino is a post-doctoral researcher in the Work and Social Psychology department at Maastricht University.

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