Anja Stevic*, Desirée Schmuck, Anna Koemets, Melanie Hirsch, Kathrin Karsay, Marina F. Thomas and Jörg Matthes

Privacy concerns can stress you out: Investigating the reciprocal relationship between mobile social media privacy concerns and perceived stress

https://doi.org/10.1515/commun-2020-0037

Abstract: Mobile social media have become a widespread means to participate in everyday social and professional life. These platforms encourage the disclosure and exchange of personal information, which comes with privacy risks. While past scholarship has listed various predictors and consequences of online privacy concerns, there has been to date no empirical investigation of a conceivable relationship with perceived stress. Using a longitudinal panel study, we examined the reciprocal relationship between mobile social media privacy concerns and perceived stress. Results supported the hypothesis that mobile social media privacy concerns at T1 are associated with higher perceived stress at T2. However, we found no evidence for the reverse association, that is, perceived stress at T1 was not related to mobile social media privacy concerns at T2. The findings are discussed based on two models—the “Antecedents privacy concerns outcomes” model and the “Privacy calculus” model.

Funding: This work was supported by the Sparkling Science Programme of the Austrian Federal Ministry of Education, Science, and Research under Grant SPA 06/109.

*Corresponding author: Anja Stevic, Department of Communication, University of Vienna, Austria, E-Mail: anja.stevic@univie.ac.at.
Desirée Schmuck, Leuven School for Mass Communication Research, KU Leuven, Belgium, E-Mail: desiree.schmuck@kuleuven.be.
Anna Koemets, Department of Communication Sciences, University of Osnabrück, Germany, E-Mail: akoemets@uni-osnabrueck.de.
Melanie Hirsch, Department of Communication, University of Vienna, Austria, E-Mail: melanie.hirsch@univie.ac.at.
Kathrin Karsay, Leuven School for Mass Communication Research, KU Leuven, Belgium, E-Mail: kathrin.karsay@kuleuven.be.
Marina F. Thomas, Department of Communication, University of Vienna, Austria, E-Mail: marina.thomas@univie.ac.at.
Jörg Matthes, Department of Communication, University of Vienna, Austria, E-Mail: joerg.matthes@univie.ac.at.

© 2021 Anja Stevic et al., published by De Gruyter. This work is licensed under the Creative Commons Attribution 4.0 International License.
Keywords: mobile social media, privacy concerns, perceived stress, panel study, reciprocal relationship

1 Introduction

Disclosing personal information on social networking sites (SNSs) has become a routine feature of our private and professional lives, so that nowadays huge amounts of personal information are shared and stored online. Revealing personal information can lead to privacy issues. In fact, 67% of the respondents to the Eurobarometer survey (2015) expressed concerns about losing control over online information. They feared that their online activities might be tracked via their mobile phones. In a survey conducted among 1000 Germans in 2018, 75% indicated that they felt rather unsafe or completely unsafe regarding their personal data online (Koptyug, 2019). This calls for an examination of specific privacy concerns, and we have chosen to look at German mobile internet users, who account for 69% of Germany’s population (German Association for the Digital Economy, 2018).

Privacy concerns

Privacy concerns are defined as perceived loss of control and lack of protection of personal information (e.g., Dienlin, 2014). Concerns about undue use of personal information mostly pertain to data and identity theft, financial fraud, and data gathering for advertising, cyber-bullying, or sexual harassment purposes (e.g., Dienlin and Trepte, 2015; Mesch, 2009; Milne, Rohm, and Bahl, 2009). Specifically, privacy concerns refer to a lack of knowledge of the way another person or company may use one’s personal information (Joinson and Paine, 2007).

In such a context, privacy concerns are meaningful stressors (Dhir and Midha, 2014; Nimrod, 2017; Suh and Lee, 2017) with negative effects such as frustration (Mamonov and Koufaris, 2014). As explained by Lim and Choi (2017), privacy issues are stressful because of the relentless self-exposure that fuels social media channels. Owing to the latter’s omnipresence and power, we need to know more about the relationship between privacy concerns and stress/lowered well-being, as the research gap remains wide.

First, no existing research takes a thorough look at privacy concerns as a predictor of stress, nor at stress as a predictor of privacy concerns. The relationship could be of a reciprocal nature and tighten over time. This could explain the stress
that is increasingly associated with SNSs (Hou et al., 2017). None of the studies we are aware of has investigated such a relationship. Instead, literature on factors associated with privacy concerns often divides them into predictors and consequences, limiting the discussion on potential circularity. Additionally, the impact of privacy concerns is often discussed in terms of privacy protection behaviors rather than well-being (e.g., Weinberger, Bouhnik, and Zhitomirsky-Geffet, 2017; Youn and Hall, 2008). Yet, investigating the privacy concerns/stress reciprocal relationship is necessary because stress is an important predictor of an individual’s overall well-being (Cassel, 2017; Kendler, Karkowski, and Prescott, 1999).

Second, most of the studies investigating both privacy concerns and stress are cross-sectional (e.g., Nimrod, 2017). While the results suggest that privacy concerns and stress are linked, it is not possible to determine the direction of the relationship in correlational studies. Thus, longitudinal panel designs are warranted.

Drawing from the “Antecedents privacy concerns outcomes” (APCO) model, we extend the current body of literature by investigating the reciprocal relationship between privacy concerns and perceived stress through a two-wave panel study.

**Privacy and mobile social media**

Information privacy is defined as “the claim of the individual to determine for themselves when, how, and to what extent information about them is communicated to others” (Westin, 1970, p. 7). Privacy concerns can thus be viewed as the feeling of not being in control of the flow of one’s personal information, resulting in worry. Furthermore, people often do not have sufficient knowledge and control over who uses their online personal information and to which purpose (Joinson and Paine, 2007). This is especially relevant because data shared on SNSs are embedded in highly complex contexts, and privacy depends not only on an individual’s decisions but also on those of third parties on the SNS network (e.g., Marwick and boyd, 2011).

We focus on privacy concerns related to ‘mobile’ social media (mobile social media privacy concerns, or MSMPCs) because social media companies or service providers often collect sensitive data from mobile devices. Smartphones allow for real-time and location-based applications (e.g., Keith, Thompson, Hale, Lowry, and Greer, 2013) that capture large amounts of personal information. Due to the increased mobility of devices, there is a constant opportunity to share and store personal information (e.g., Wei, 2013). The widespread use of location-based applications may result in such concerns about the dissemination of personal
information that a person may choose to leave SNSs (e.g., Humphreys, 2013). Thus, it is necessary to understand how users perceive privacy concerns when using SNSs on a mobile device.

Previous research on privacy concerns has mostly been grounded in the “Antecedents privacy concerns outcome model” (APCO; Smith, Dinev, and Xu, 2011), a framework that summarizes the processes which lead to and result from privacy concerns. This macro framework was based on a meta-review of empirical studies on information privacy concerns. It includes concepts that pertain to users’ privacy concerns and their related behaviors and classifies the variables used in previous studies as predictors or outcomes of privacy concerns (Benamati, Ozdemir, and Smith, 2017; Heravi, Mubarak, and Choo, 2018). The authors note that “only limited attention has been paid to factors that serve as antecedents to privacy” (Smith et al., 2011, p. 1005) and argue that “outcomes should be interpreted as actual changes of state or behavior”, not just intentions (p. 1007). This is the first study to posit a reciprocal effect between perceived stress and mobile-specific privacy concerns. In other words, we look at perceived stress both as an antecedent and as an outcome of privacy concerns.

The most commonly investigated antecedents are personality traits, demographic variables, and previous privacy experiences. Research applying this framework has yielded insights into the predictors of privacy concerns. Groups with relatively high privacy concerns are women (Cho, Rivera-Sanchez, and Lim, 2009; Gosh and Singh, 2018; Youn and Hall, 2008), comparably educated (Cecere, Le Guel, and Soulié, 2015; Hwang, Han, Kuo, and Liu, 2012) and less trusting individuals (Bergström, 2015) as well as people from individualistic cultures (Cho et al., 2009). Relatively low privacy concerns are reported by heavy SNS users (Dinev et al., 2006), which might be explained by higher perceived rewards (Bellman, Johnson, Kobrin, and Lohse, 2004; Debatin, Lovejoy, Horn, and Hughes, 2009; Gosh and Singh, 2018) as well as higher privacy self-efficacy (Dinev and Hart, 2004; Xu, Teo, Tan, and Agarwal, 2012), which predicts fewer privacy concerns.

As outcomes, researchers frequently examined users’ privacy protection behaviors or intentions to disclose information (e.g., Sun, Fang, and Hwang, 2019). However, a systematic attention concluded that users often do not behave according to their views on privacy (Barth and de Jong, 2017). Findings generated from the APCO framework suggest that privacy concerns alone cannot account for privacy protection behaviors (Heravi et al., 2018; Norberg, Horne, and Horne, 2007). When users experience only moderate privacy concerns or when their privacy self-efficacy is low, their privacy attitudes often clash with their behaviors (Weinberger et al., 2017). Barnes (2006) has named this mismatch the “privacy paradox”. This paradox is especially hard to resolve when an all-or-nothing
policy is in place, that is, either the user agrees to all privacy invasions or they cannot use the application (Shklovski, Mainwaring, Skúladóttir, and Borgthorsson, 2014).

Due to the logic of mobile-oriented SNS regarding participation and the disclosure of private information, the “Privacy calculus model” (PCM) has also been found to be a suitable basis to investigate the interplay between risks, benefits, and self-disclosure on SNSs (Dienlin and Metzger, 2016; Dinev and Hart, 2004; Krasnova, Veltri, and Günther, 2012; Wang, Duong, and Chen, 2016). The PCM suggests that before disclosing personal information online, people weigh the perceived risks and benefits (Dinev and Hart, 2004; Keith, Babb, Furner, and Abdullat, 2010). Previous research suggests that the evaluation of risks and benefits of sharing personal information can be more complicated in an SNS context as compared to offline situations (Krämer and Schäwel, 2020). One possible explanation might be that SNS users find it difficult to engage in rational decision-making processes when having to weigh the positive and negative effects of online self-disclosure (Krämer and Schäwel, 2020). These risk-benefit evaluations may therefore lead to different outcomes. On the one hand, it was found that privacy concerns positively predicted withdrawal from SNSs (Dienlin and Metzger, 2016). On the other hand, it was shown that the perceived benefits of an SNS application tend to tip the balance in favor of revealing personal information despite the perceived risks (Wang et al., 2016). People seem quite willing to sacrifice their privacy in order to be able to use a certain SNS application. In other words, their privacy concerns, if any, do not automatically trigger privacy protection behaviors. Owing to technological and social barriers/deterrents and the increasing mobility of SNSs, users might find it difficult to refrain from self-disclosure (Hargittai and Marwick, 2016). They may be unable to correctly weigh the risks and benefits of using a specific mobile application, harming their privacy as a result. In the long term, such behavior has the potential to increase levels of stress and could even result in so-called privacy fatigue phenomena (Choi, Park, and Jung, 2018).

Finally, and this is important for our study’s purposes, existing research suggests there is a close relationship between privacy concerns and other psychological states such as protective behaviors and perceived dissatisfaction or insecurity (e.g., Benamati et al., 2017; Bulgurcu, Cavusoglu, and Benbasat, 2010). Until now, however, perceived stress both as an antecedent and as an outcome of privacy concerns had never been investigated.
Stress as a predictor of privacy concerns

Perceived stress refers to an individual’s subjective stress level (Cohen, Kamarck, and Mermelstein, 1983). In this study we focus on perceived stress as a state of mind, which is reflected in our stress frequency measurements over one month. Considering perceived stress as a predictor of privacy concerns may explain why some individuals are more likely to harbor privacy concerns than others (Stieger, Burger, Bohn, and Voracek, 2013). Specifically, stressful experiences might heighten privacy concerns. As suggested by previous research, with the ongoing expansion of the mobile internet, users are disclosing more and more personal information—often unwittingly (Zhou and Li, 2014).

In this context, researchers have observed a phenomenon called “social media burnout” (Han, 2018), which has been found to result from the stress associated with new information technologies (e.g., Lim and Choi, 2017). This stressful state has been shown to lead to an intention to exert more privacy protection behavior and to discontinue SNS use (Dhir and Midha, 2014; Stieger et al., 2013). Perceived stress can decrease the “illusion of control” over an unmanageable outcome, which can be explained by decreased reward responsiveness in a state of stress (Bogdan, Pringle, Goetz, and Pizzagalli, 2012). Thus, in a state of stress, lower perceived rewards from SNS use may shatter the illusion of control over one’s online privacy (Bogdan et al., 2012). In other words, perceived control over privacy on SNSs may be lower in a state of stress than in a state of relaxation, which results in heightened privacy concerns.

In line with these theoretical assumptions, previous research has shown that a person’s self-perception of their vulnerability predicts their level of privacy concern (Dinev and Hart, 2004; Mohamed and Ahmad, 2012). Moreover, computer anxiety has been shown to increase SNS-related privacy concerns (Osatuyi, 2015). Additionally, loneliness—which correlates with stress symptoms (Deberard and Kleinknecht, 1995)—predicted privacy concerns in the context of a mobile dating application (Lutz and Ranzini, 2017). These findings suggest that stress may increase concerns over personal information dissemination on social media. Therefore, we hypothesized:

H1: Perceived stress will increase privacy concerns pertaining to social media use on a mobile device over time.
Privacy concerns as a predictor of perceived stress

Drawing from the APCO model, our aim was to investigate whether stress is not only an antecedent but also an outcome of MSMPCs. The relationship between privacy concerns and stress in real-life situations is well-established. Early research has shown that the gap between individuals’ attitudes and behaviors related to privacy concerns may cause stress (Webb, 1978). Giving value to privacy but not engaging in corresponding privacy protection behavior (i.e., privacy paradox, Weinberger et al., 2017), can result in a state of cognitive dissonance. Cognitive dissonance is an emotionally stressful state as it interferes with our need for cognitive consistency (Ding and Liu, 2019; Festinger, 1957). Being latently concerned about one’s privacy while sacrificing it in order to be able to use SNSs can therefore cause cognitive dissonance—and therefore stress over the long term.

Moreover, the concept of control is a crucial component of the stress experience (e.g., Folkman, 1984; Schönfeld, Brailovskaia, Bieda, Zhang, and Margraf, 2016). Sharing personal information, pictures, and opinions with a broad online community entails a very real loss of control over such data—a loss of control over one’s own circumstances which has been described as learned helplessness (Seligman and Maier, 1967). This perceived powerlessness over the outcome of one’s actions is applicable to mobile social media privacy regulations. Both the perceived uncontrollability of online data and the peer pressure that can make one refrain from staying away from privacy-invading SNSs are presumed to be meaningful stressors.

There is empirical evidence that privacy concerns and the associated diminished trust and control predict an increase in stress. Existing research suggests that privacy concerns closely relate to psychological states such as perceived dissatisfaction or insecurity (e.g., Benamati et al., 2017; Bulgurcu et al., 2010). However, to date, hardly anybody has looked at perceived stress as a factor of privacy concerns. Previous studies showed a strong positive association between fear of disclosure and stress (Cruddas, Gilbert, and McEwan, 2012). Researchers have shown a positive relationship between privacy concerns and social media fatigue (Bright, Bardi, and Landreth, 2015), which in turn increases anxiety and depression (Dhir, Yossatorn, Kaur, and Chen, 2018). Based on these theoretical assumptions and the related empirical evidence, it is conceivable that MSMPCs increase stress. Therefore, we hypothesized that:

H2: Privacy concerns over social media use on mobile devices will increase perceived stress over time.
2 Methodology

Sample and procedure

As part of a larger project on the impact of mobile SNS use on psychological well-being (Matthes, Karsay, Schmuck, and Stevic, 2020; Schmuck, Karsay, Matthes, and Stevic, 2019), we tested our hypotheses using a two-wave panel survey. We employed a quota sampling method based on age, gender, and educational level in Germany. Additional selection criteria were the possession of a smartphone and prior use of at least one SNS on this device. The study was conducted in cooperation with a GfK research institute. A total of 833 participants (54.1% women, $M_{\text{age}} = 45.44$, $SD_{\text{age}} = 14.83$) took part in the first panel wave (T1) in March/April 2018. The second wave (T2) was conducted four months later and included 461 participants (53% women, $M_{\text{age}} = 48.65$, $SD_{\text{age}} = 13.02$).

The attrition rate was 45%. Participants who dropped out at T2 were significantly younger ($F(1,831) = 42.64$, $p < .001$) and evidenced higher levels of stress ($F(1,824) = 16.76$, $p < .001$) than those who remained members of the panel. This must be kept in mind when interpreting the results. No differences were found with regard to gender ($F(1,831) < 0.01$, $p = .934$), occupation ($F(1,831) < 0.01$, $p = .967$), education ($F(1,831) = 2.28$, $p = .131$), and privacy concerns ($F(1,831) = 0.01$, $p = .906$).

Measurements

**Mobile social media privacy concerns.** See all items in online Appendix A. We selected the items based on the privacy concerns subscale by Hsu and Lin (2016) as well as Mani and Chouk (2017) and adapted them to our mobile social media use topic (e.g., “The use of social media platforms on the mobile phone carries a considerable data protection risk”, $M = 3.69$; $SD = 0.96$; $\alpha = 0.89$ at T1, $M = 3.55$; $SD = 1.04$; $\alpha = 0.90$ at T2).

**Perceived stress.** We used four items to measure perceived stress ($M = 2.57$; $SD = 1.14$; $\alpha = 0.88$ at T1; $M = 2.38$; $SD = 1.14$; $\alpha = 0.89$ at T2). We initially included seven items from the “Brief inventory of perceived stress” (BIPS) scale by Lehman, Burns, Gagen, and Mohr (2012). However, we based our theoretical model on the two dimensions and adapted two items from the conflict and imposition and lack of control subscales, respectively (e.g., “In the last month how often did you feel like you had to do things, even though you did not want to do them”). We selected these four items due to their highest CFA factor loadings in the BIPS scale study,
which was relevant for good model fit of confirmatory factor analysis. First, a principal component analysis indicated a one-dimensional scale for the four items at T1 (eigenvalue = 2.94; accounting for 73.42% of the variance; factor loadings of all four items above .81) and at T2 (eigenvalue = 3.04; accounting for 76.02% of the variance; factor loadings of all four items above .85). Second, a CFA with latent variables for perceived stress at T1 and T2 resulted in a good model fit: $\chi^2/df = 5.17$, CFI = .98, TLI = .96, RMSEA = .07, 90% CI [.06; .09].

Control variables. We controlled for various smartphone activities, specifically for communicative (i.e., active) and non-communicative (i.e., passive) uses, after adapting items by Chan (2015). For communicative use, we asked participants to indicate on a 6-point scale (1 = never, 6 = several times a day) how often they communicate with others using social media (e.g., WhatsApp, Facebook, Snapchat); talk with family and friends using their smartphone; read or send e-mails; and post or send photos or videos on social media ($M = 3.58$, $SD = 0.99$). For non-communicative (i.e., passive) use, we asked participants, based on the same scale, to indicate how often they used their smartphones to: read online news, search for information (e.g., on Wikipedia, Google, and blogs), view profiles of friends and family on social media platforms (e.g., Facebook), listen to radio/podcasts/music, watch television, movies or video clips (e.g., YouTube, Netflix), play games, and take photos or videos ($M = 3.04$, $SD = 1.14$).

Socio-demographic variables. We assessed age, gender, educational level (34.3% possess a high school degree), and occupation (38.1% employed full-time) as control variables.

Data analysis

We used the lavaan (Rosseel, 2012) package in R for conducting Structural Equation Modeling (SEM) with the “Full Information Maximum Likelihood” (FIML) procedure. We controlled for participants’ communicative and non-communicative smartphone use, gender, age, education, and occupation as well as autoregressive effects (e.g., stress at T1 predicting stress at T2).

3 Results

Table 1 shows the zero-order correlations between the main variables. Figure 1 displays the hypothesized model and the results.
Measurement invariance

To ensure that identical constructs with the same structure were measured over time (Schoot, Lugtig, and Hox, 2012), we tested longitudinal measurement invariance by constraining all factor loadings of the same constructs across two times of measurement for metric invariance (Vandenberg and Lance, 2000). Furthermore, we constrained all intercepts of the same constructs across two times of measurement for scalar invariance (Vandenberg and Lance, 2000). The procedure yielded a good fit for the constrained model: CFI = .998; TLI = .998; \( \chi^2/df = 76.66; p < .001; \) RMSEA = .01, 90\% CI [.00; .02]. No significant difference was found between MSMPC at T1 and T2 (\( p = .56 \)) and between perceived stress at T1 and T2 (\( p = .24 \)), which confirms metric and scalar invariance for MSMPC and perceived stress. Therefore, for both constructs full metric invariance could be established.

Structural equation model

Table 2 displays the results. Figure 1 shows the longitudinal and reciprocal associations between MSMPC and perceived stress. The hypothesized model suggested a good model fit, CFI = .96; TLI = .95; \( \chi^2/df = 2.92; p < .001; \) RMSEA = .05, 90\% CI [.04; .05].

Regarding our first hypothesis, findings showed that stress at T1 did not significantly predict MSMPC at T2, \( b = .04, SE = .03, \beta = .06, p = .230 \). Thus, H1 was not supported.

In our second hypothesis, we assumed that MSMPC would increase perceived stress over time. Supporting H2, our findings revealed that MSMPC at T1 significantly predicted stress at T2, \( b = .12, SE = .05, \beta = .10, p = .026 \).

In terms of covariates, we found that more highly educated people reported more MSMPC at T2, \( b = .14, SE = .07, \beta = .09, p = .028 \). In addition, our findings revealed that women perceived significantly more stress than men at T2, \( b = -.18, SE = .08, \beta = -.09, p = .027 \). Moreover, communicative smartphone use had no significant effect on MSMPC, \( b = .02, SE = .04, \beta = .02, p = .658 \) or on perceived stress over time, \( b = -.05, SE = .06, \beta = -.04, p = .417 \). Non-communicative smartphone use had no significant effect on MSMPC, \( b = .01, SE = .04, \beta = .02, p = .772 \), but the relationship with perceived stress was close-to-significant, \( b = .11, SE = .06, \beta = .12, p = .052 \).
Concerns about mobile privacy deprivation seem to be rising in an overly connected age. Large amounts of personal information can be shared via smartphones anytime and anywhere. Linking privacy concerns with stress is a relevant indicator of how concerns about social media information permeate offline psychological states. Our aim was to investigate the reciprocal relationship between MSMPC and perceived stress by means of a longitudinal two-wave study. For the first time ever, the reciprocal relationship between MSMPC and perceived stress was evaluated based on the APCO framework. Although we could not confirm the existence of an actual, reciprocal relationship, our findings suggest there is a longitudinal link between the two.

First, our results revealed that perceived stress does not positively predict MSMPC. This non-significant finding could mean that stress is not a predictor and does not increase MSMPC over time. This is at odds with the finding that loneliness—which correlates with stress symptoms (Deberard and Kleinknecht, 1995)—predicts SNS privacy concerns (Lutz and Ranzini, 2017). Following Bogdan et al. (2012), we had hypothesized that stress would decrease one’s perception of control over mobile social media, resulting in heightened privacy concerns, but found no support for this assumption.

Several explanations for this null finding are possible. First, the T2 sample consisted of people with significantly lower stress levels than the T1 sample. Low stress levels may not lead to MSMPC, while the expected effect of stress on MSMPC may be present in people with relatively high stress levels. Second, there might be an indirect effect via a variable we did not attempt to capture, such as the type of stress people experience. Previous research has shown that SNS-related stress increases emotional exhaustion and depression because individuals experience information overload (e.g., Lim and Choi, 2017; Matthes et al., 2020). SNS-related stress refers to the experiences and activities conducted online and not necessarily to stressful situations in real-life. Because people might already be worried about many other aspects of their lives, they may simply downplay the relevance of this online aspect.

Second, our findings show that MSMPCs positively predict perceived stress over time. This result is in line with previous findings showing that feelings of insufficient privacy are directly associated with psychological stress (Webb, 1978). For instance, Osatuyi (2015, p. 330) suggests that “ambiguity in the privacy policies has been noted as a source of stress and frustration for social media users”. Indeed, this perceived uncertainty about individual rights and management of privacy settings might be one of the main reasons why MSMPCs result in stress. This can further be explained based on the previous findings that online
vigilance, that is, “users’ permanent cognitive orientation towards online content and communication”, increases perceived stress levels on a daily basis (Reinecke et al., 2018, p. 1). In other words, being overly attentive and preoccupied with social media as well as monitoring social media activities results in stress.

MSMPCs positively predict perceived stress over time even when controlling for communicative and non-communicative uses of smartphones. There are several reasons for this from a mobile social media perspective. Social media platforms require the sharing of personal information when users join the platform, so that a great deal of personal data is stored on such platforms, to be used as they see fit by social media companies and sundry third parties. Personal information is not controlled or owned individually: People can post information or photographs that belong to other users. Therefore, privacy management is interpersonal, and respective agreements should be made (De Wolf, 2020). Moreover, social media platforms often use location-based services that are built into the platform’s application and harvest huge amounts of personal information. In that way users’ locations are being tracked because a great deal of private information is provided by the mobile device (Zhou and Li, 2014). These technological possibilities can heighten privacy concerns. Our result suggests that such a loss of control over their private data leads people down the path of pessimism and helplessness.

Not knowing what will happen to personal data one shares online implies a degree of vulnerability in and of itself. Previous research has shown that perceived vulnerability increases privacy concerns (Dinev and Hart, 2004; Mohamed and Ahmad, 2012). The finding that privacy attitudes lead to stress over time also suggests that when people do not behave in line with their privacy attitudes (privacy paradox), they experience stressful cognitive dissonance (Ding and Liu, 2019; Festinger, 1957).

While previous studies have shown that privacy concerns positively predict protection behavior on SNSs (Mohamed and Ahmad, 2012), our findings regarding mobile SNSs point in a different direction. Instead of actively engaging in the protection of personal information, individuals seem to feel imposition and lack of control over such information—they experience higher stress levels due to MSMPC. Perceived stress might lead to either data protection behavior or, on the contrary, to termination of mobile SNS use (Zhou and Li, 2014). Mobile SNS users experiencing privacy concerns may think that they do not have the time to learn how to protect their privacy online. The resulting feeling of helplessness may increase perceived stress levels.

Furthermore, it is important to note that perceived stress as a state, as measured over time in this study, can be an indicator of general well-being. Against this background, our findings are particularly interesting because they extend
the well-established APCO model by showing the broader consequences of privacy concerns on individuals’ psychological states.

In terms of covariates, it was not surprising that level of education positively predicted privacy concerns. Previous research has established a positive association between the two variables (e.g., Cecere et al., 2015; Hwang et al., 2012). Likewise, we were not surprised to find gender to be a significant predictor of stress. There are several potential explanations of why gender influences MSMPC. As shown in previous research, women are more concerned about the effects of online information gathering on their personal privacy (Sheehan, 1999) and they have significantly higher concerns about data privacy than men (Benamati et al., 2017). This correlation could be attributed to different, gender-specific socialization processes in terms of emotional self-disclosure (e.g., Stokes, Fuehrer, and Childs, 1980). Youn and Hall (2008) found that girls have a heightened perception of online privacy risks as compared to boys. Therefore, the gender effect could be present owing to socialization toward stressful experiences. Girls often perceive more stress (Östberg, Almquist, Folkesson, Låftman, Modin, & Lindfors, 2015), which could suggest their higher awareness and sense of responsibility. This finding contributes to the current body of research in so far as other studies have focused on women’s heightened privacy concerns rather than on stress per se (Cho et al., 2009; Gosh and Singh, 2018). However, we did not take a detailed look at the gender aspect, and our data do not allow us to make further inferences. Future research should drill down much deeper into this aspect. Nevertheless, we can conclude that it is necessary to control for education and gender when investigating privacy concerns and stress.

Regarding smartphone use, we did not find any direct effects of communicative and non-communicative uses on MSMPC and perceived stress over time. This was expected because direct linear effects are not sufficient to describe the complex relationship between MSMPC and perceived stress. Further moderators and mediators (such as previously experienced privacy violations or risky behaviors) are needed to explain these associations.

5 Limitations and suggestions for future research

A number of methodological limitations should be noted. Most importantly, the present panel study employed only two waves of data collection, which is enough to detect a linear relationship. Yet, in order to investigate a potential downward spiral effect, as proposed by Wadhwa and Salkever (2018), more measurements
would be necessary. With three or more waves, one could test for such a reinforc-
ing loop between MSMPC and perceived stress.

Frequent measurements would additionally account for the dynamic nature of stress. We measured stress using retrospective self-reports (e.g., “In the last month how often did you feel like ...”). Such stress reports could be distorted by memory bias (Scharkow, 2019; Segerstrom and O’Connor, 2012). As a more valid measurement, Trull and Ebner-Priemer (2013) introduced ambulatory assessment. This assessment method makes for frequent near real-time measurements and has proven useful in the study of stress (Rodrigues, Paiva, Dias, and Cunha, 2018; see Naab, Karnowski, and Schlütz, 2019). In future studies, participants could report their immediate stress levels on their smartphones every time they experienced MSMPC (mobile experience sampling)—a robust measurement of stress as a state of mind.

On a conceptual level, this study is based on two variables across two-time points. Additional variables would further strengthen the results and the contribution of this study. For example, including several dimensions of perceived stress and variables related to it such as anxiety as a trait might be relevant. Assessing personality traits could further explain different susceptibility to perceived stress due to MSMPC. We did not distinguish between different dimensions of privacy concerns, for instance, social and institutional, as suggested by previous research (e.g., Lutz and Ranzini, 2017). Because SNS use implies a social dimension in terms of sharing personal information with other people, including this dimension in future research would be useful.

Future research could further investigate potential underlying mechanisms between MSMPC and perceived stress. For instance, perceived control, need for control, trust in SNS, SNS-related stress, or rewards gained from SNSs could further explain the processes. Yet, since privacy settings are logically a subject of concern, when they are adapted accordingly, they might even reduce perceived stress (Dhir and Midha, 2014). This implies that privacy concerns might translate into positive outcomes, with changes in privacy protection. In terms of positive outcomes, studies could also test whether privacy concerns (and resulting stress) are reduced when social media applications with high data encryption standards are used.

### 6 Conclusion and implications

Our results also have important implications regarding the “Privacy calculus model” (PCM; Culnan, 1993; Culnan and Armstrong, 1999; Dienlin and Metzger; Dinev and Hart, 2004; Krasnova, Spiekermann, Koroleva, and Hildebrand, 2010).
This model infers that when the estimated benefits of SNS use are higher than the perceived risks, people are more likely to disclose personal information (e.g., Dienlin and Metzger, 2016). Our findings reveal that MSMPCs result in higher levels of perceived stress owing to increased privacy risk, which may decrease the intention to disclose personal information in the long term.

There are also several practical implications regarding the SNS context and the mobility of devices. Collectors of personal information (both individuals and companies) on mobile devices such as smartphones are a pervasive threat to people’s privacy, causing stress. At the very least, these processes should be more transparent to users. Policymakers and SNS users should acknowledge the fact that privacy concerns are a source of stress and tackle them accordingly—the latter by adjusting privacy settings or even disengaging from social media, and the former by imposing stricter privacy policies. In that sense, privacy concerns and associated (di)stress may advance privacy policy and implementation. Social media executives must understand that if they do not handle personal information confidentially, they run the risk of annoying their users, who may become less active or even stop using their service entirely.

Ensuring transparency about the use and dissemination of personal information is a prerequisite for assuaging people’s privacy concerns. Factors such as communication of fair procedures while collecting personal data may also help decrease privacy concerns and associated stress. In other words, transparency and fair use can only increase people’s confidence when sharing personal information (Culnan and Armstrong, 1999). In the future, their privacy concerns could become even more important, as more and more information is shared online. Therefore, more stringent data protection policies are necessary to ensure SNS users feel more comfortable over the long term.

References

Barnes, S. B. (2006). A privacy paradox: Social networking in the United States. *First Monday*, 11(9). https://doi.org/10.5210/fm.v11i9.1394

Barth, S., & de Jong, M. D. (2017). The privacy paradox – Investigating discrepancies between expressed privacy concerns and actual online behavior – A systematic literature review. *Telematics and Informatics*, 34, 1038–1058. https://doi.org/10.1016/j.tele.2017.04.013

Bellman, S., Johnson, E. J., Kobrin, S. J., & Lohse, G. L. (2004). International differences in information privacy concerns: A global survey of consumers. *The Information Society*, 20, 313–324. https://doi.org/10.1080/01972240490507956

Benamati, J. H., Ozdemir, Z. D., & Smith, H. J. (2017). An empirical test of an Antecedents – Privacy Concerns – Outcomes model. *Journal of Information Science*, 43, 583–600. https://doi.org/10.1177/0165551516653590
Bergström, A. (2015). Online privacy concerns: A broad approach to understanding the concerns of different groups for different uses. *Computers in Human Behavior, 53*, 419–426. https://doi.org/10.1016/j.chb.2015.07.025

Bogdan, R., Pringle, P., Goetz, E., & Pizzagalli, D. A. (2012). Perceived stress, anhedonia and illusion of control: Evidence for two mediational models. *Cognitive Therapy and Research, 36*, 827–832. https://doi.org/10.1007/s10608-011-9413-8

Bright, L. F., Bardi, S., & Landreth, S. (2015). Too much Facebook? An exploratory examination of social media fatigue. *Computers in Human Behavior, 44*, 148–155. https://doi.org/10.1016/j.chb.2014.11.048

Bulgurcu, B., Cavusoglu, H., & Benbasat, I. (2010). *Understanding emergence and outcomes of information privacy concerns: A case of Facebook*. International Conference on Information Systems (ICIS), Saint Louis.

Cassel, J. (2017). Physical illness in response to stress. *Social Stress, 169–209*. https://doi.org/10.4324/9781315129808-10

Cecere, G., Le Guel, F., & Soulié, N. (2015). Perceived internet privacy concerns on social networks in Europe. *Technological Forecasting & Social Change, 96*, 277–287. https://doi.org/10.1016/j.techfore.2015.01.021

Chan, M. (2015). Mobile phones and the good life: Examining the relationships among mobile use, social capital and subjective well-being. *New Media & Society, 17*, 96–113. https://doi.org/10.1177/1461444813516836

Cho, H., Rivera-Sanchez, M., & Lim, S. S. (2009). A multinational study on online privacy: Global concerns and local responses. *New Media & Society, 11*, 395–416. https://doi.org/10.1177/1461444808101618

Choi, H., Park, J., & Jung, Y. (2018). The role of privacy fatigue in online privacy behavior. *Computers in Human Behavior, 81*, 42–51. https://doi.org/10.1016/j.chb.2017.12.001

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*, 385–396. https://doi.org/10.2307/2136404

Cruddas, S., Gilbert, P., & McEwan, K. (2012). The relationship between self-concealment and disclosure, early experiences, attachment and social comparison. *International Journal of Cognitive Therapy, 5*, 28–37. https://doi.org/10.1521/ijct.2012.5.1.28

Culnan, M. J. (1993). “How did they get my name?”: An exploratory investigation of consumer attitudes toward secondary information use. *MIS Quarterly, 17*, 341–363. https://doi.org/10.2307/249775

Culnan, M. J., & Armstrong, P. K. (1999). Information privacy concerns, procedural fairness, and impersonal trust: An empirical investigation. *Organization Science, 10*, 115. https://doi.org/10.1287/orsc.10.1.104

Debatin, B., Lovejoy, J. P., Horn, A., & Hughes, B. N. (2009). Facebook and online privacy: Attitudes, behaviors, and unintended consequences. *Journal of Computer-Mediated Communication, 15*, 83–108. https://doi.org/10.1111/j.1083-6101.2009.01494.x

Debeerand, M. S., & Kleinkecndrecht, R. A. (1995). Loneliness, duration of loneliness, and reported stress symptomatology. *Psychological Reports, 76*, 1363–1369. https://doi.org/10.2466/pr0.1995.76.3c.1363

De Wolf, R. (2020). Contextualizing how teens manage personal and interpersonal privacy on social media. *New Media & Society, 22*, 1058–1075. https://doi.org/10.1177/1461444819876570

Dhir, M., & Midha, V. (2014). Overload, privacy settings, and discontinuation: A preliminary study of Facebook users. *Special Interest Group on Human-Computer Interaction*
Hou, X., Wang, H., Guo, C., Gaskin, J., Rost, D. H., & Wang, J. (2017). Psychological resilience can help combat the effect of stress on problematic social networking site usage. *Personality and Individual Differences, 109*, 61–66. https://doi.org/10.1016/j.paid.2016.12.048

Hsu, C., & Lin, J. C. (2016). Exploring factors affecting the adoption of internet of things services. *Journal of Computer Information Systems, 58*, 1–9. https://doi.org/10.1080/08874417.2016.1186524

Humphreys, L. (2013). Mobile social media: Future challenges and opportunities. *Mobile Media & Communication, 1*, 20–25. https://doi.org/10.1177/205157912459499

Hwang, H., Han, H., Kuo, K., & Liu, C. (2012). The differing privacy concerns regarding exchanging electronic medical records of internet users in Taiwan. *Journal of Medical Systems, 36*, 3783–3793. https://doi.org/10.1007/s10916-012-9851-1

Joinson, A. N., & Paine, C. B. (2007). Self-disclosure, privacy, and the internet. In A. Joinson, K. McKenna, T. Postmes, U.-D. Reips (Eds.), *The Oxford handbook of internet psychology* (pp. 237–252). Oxford: University Press.

Keith, M. J., Babb, J. S., Furner, C. P., & Abdullat, A. (2010). Privacy assurance and network effects in the adoption of location-based services: An iPhone experiment. *International Conference on Information Systems ICIS 2010 Proceedings.*

Keith, M., Thompson, S. C., Hale, J., Lowry, P. B., & Greer, C. (2013). Information disclosure on mobile devices: Re-examining privacy calculus with actual user behavior. *International Journal of Human-Computer Studies, 71*, 1163–1173. https://doi.org/10.1016/j.ijhcs.2013.08.016

Kendler, K. S., Karkowski, L. M., & Prescott, C. A. (1999). Causal relationship between stressful life events and the onset of major depression. *American Journal of Psychiatry, 156*, 837–841. https://doi.org/10.1176/ajp.156.6.837

Koptyug, E. (2019). *Perception of online data security in Germany 2014–2019*. Retrieved September 23, 2021 from: https://www.statista.com/statistics/448431/perception-of-online-data-security-in-germany/

Krämer, N. C., & Schäwel, J. (2020). Mastering the challenge of balancing self-disclosure and privacy in social media. *Current Opinion in Psychology, 31*, 67–71. https://doi.org/10.1016/j.copsyc.2019.08.003

Krasnova, H., Spiekermann, S., Koroleva, K., & Hildebrand, T. (2010). Online social networks: Why we disclose. *Journal of Information Technology, 25*, 109–125. https://doi.org/10.1057/jit.2010.6

Krasnova, H., Veltri, N. F., & Günther, O. (2012). Self-disclosure and privacy calculus on social networking sites: The role of culture. *Business & Information Systems Engineering, 4*, 127–135. https://doi.org/10.1007/s12599-012-0216-6

Lehman, K. A., Burns, M. N., Gagen, E. C., & Mohr, D. C. (2012). Development of the brief inventory of perceived stress. *Journal of Clinical Psychology, 68*, 631–644. https://doi.org/10.1002/jclp.21843

Lim, M. S., & Choi, S. B. (2017). Stress caused by social media network applications and user responses. *Multimedia Tools and Applications, 76*, 17685–17698. https://doi.org/10.1007/s11042-015-2891-z

Lutz, C., & Ranzini, G. (2017). Where dating meets data: Investigating social and institutional privacy concerns on tinder. *Social Media + Society, 3*, 1–12. https://doi.org/10.1177/2056305117697735

Mamonov, S., & Koufaris, M. (2014). The impact of perceived privacy breach on smartphone user attitudes and intention to terminate the relationship with the mobile carrier.
Communications of the Association for Information Systems, 34. https://doi.org/10.17705/1cais.03460

Mani, Z., & Chouk, I. (2017). Drivers of consumers’ resistance to smart products. Journal of Marketing Management, 33, 76–97. https://doi.org/10.1080/0267257X.2016.1245212

Marwick, A. E., & boyd, d. (2011). I tweet honestly, I tweet passionately: Twitter users, context collapse, and the imagined audience. New Media & Society, 13, 114–133. https://doi.org/10.1177/1461444810365313

Matthes, J., Karsay, K., Schmuck, D., & Stevic, A. (2020). “Too much to handle”: impact of mobile social networking sites on information overload, depressive symptoms, and well-being. Computers in Human Behavior, 105, 106217. https://doi.org/10.1016/j.chb.2019.106217

Mesch, G. S. (2009). Parental mediation, online activities, and cyberbullying. CyberPsychology & Behavior, 12, 387–393. https://doi.org/10.1089/cpb.2009.0068

Milne, G. R., Rohm, A., & Bahl, S. (2009). If it’s legal, is it acceptable? Consumer reactions to online covert marketing. Journal of Advertising, 38, 102–122. https://doi.org/10.2753/JOA0091-3367380408

Mohamed, N., & Ahmad, I. H. (2012). Information privacy concerns, antecedents and privacy measure use in social networking sites: Evidence from Malaysia. Computers in Human Behavior, 28, 2366–2375. https://doi.org/10.1016/j.chb.2012.07.008

Naab, T. K., Karnowski, V., & Schlütz, D. (2019). Reporting mobile social media use: How survey and experience sampling measures differ. Communication Methods & Measures, 13(2), 126–147, https://doi.org/10.1080/19312458.2018.1555799

Nimrod, G. (2017). Technostress: Measuring a new threat to well-being in later life. Aging & Mental Health, 22, 1080–1087, https://doi.org/10.1080/13607863.2017.1334037

Norberg, P. A., Horne, D. R., & Horne, D. A. (2007). The privacy paradox: Personal information disclosure intentions versus behaviors. The Journal of Consumer Affairs, 41, 100–126. https://doi.org/10.1111/j.1745-6606.2006.00070.x

Osatuyi, B. (2015). Is lurking an anxiety-masking strategy on social media sites? The effects of lurking and computer anxiety on explaining information privacy concern on social media platforms. Computers in Human Behavior, 49, 324–332. https://doi.org/10.1016/j.chb.2015.02.062

Östberg, V., Almqquist, Y. B., Folkesson, L., Låftman, S. B., Modin, B., & Lindfors, P. (2015). The complexity of stress in mid-adolescent girls and boys. Child Indicators Research, 8(2), 403–423. https://doi.org/10.1007/s12187-014-9245-7

Reinecke, L., Klimmt, C., Meier, A., Reich, S., Knop-Huelss, K., Rieger, D., & Vorderer, P. (2018). Permanently online and permanently connected: Development and validation of the online vigilance scale. PloS ONE, 13, 1–31. https://doi.org/10.1371/journal.pone.0205384

Rodrigues, S., Paiva, J. S., Dias, D., & Cunha, J. P. S. (2018). Stress among on-duty firefighters: An ambulatory assessment study. PeerJ, 6, e5967. https://doi.org/10.7717/peerj.5967

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. Journal of Statistical Software, 48, 1–36. https://doi.org/10.18637/jss.v048.i02

Scharkow, M. (2019). The reliability and temporal stability of self-reported media exposure: A meta-analysis. Communication Methods and Measures, 13, 198–211. https://doi.org/10.1080/19312458.2019.1594742

Schmuck, D., Karsay, K., Matthes, J., & Stevic, A. (2019). “Looking Up and Feeling Down”. The influence of mobile social networking site use on upward social comparison, self-esteem,
and well-being of adult smartphone users. *Telematics and Informatics*, 42, 101240. https://doi.org/10.1016/j.tele.2019.101240

Schönfeld, P., Brailovskaia, J., Bieda, A., Zhang, X. C., & Margraf, J. (2016). The effects of daily stress on positive and negative mental health: Mediation through self-efficacy. *International Journal of Clinical and Health Psychology*, 16, 1–10. https://doi.org/10.1016/j.ijchp.2015.08.005

Schoot, R. V. D., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement invariance. *European Journal of Developmental Psychology*, 9, 486–492. https://doi.org/10.1080/17405629.2012.686740

Segerstrom, S. C., & O’Connor, D. B. (2012). Stress, health and illness: Four challenges for the future. *Psychology & Health*, 27, 128–140. https://doi.org/10.1080/08870446.2012.659516

Seligman, M. E., & Maier, S. F. (1967). Failure to escape traumatic shock. *Journal of Experimental Psychology*, 74, 1–9. https://doi.org/10.1037/h0024514

Sheehan, K. B. (1999). An investigation of gender differences in on-line privacy concerns and resultant behaviors. *Journal of Interactive Marketing*, 13, 24–38. https://doi.org/10.1002/(sici)1520–6653

Shklovski, I., Mainwaring, S. D., Skúladóttir, H. H., & Borg thorsson, H. (2014). Leakiness and creepiness in app space. *Proceedings of the 32nd Annual ACM Conference on Human Factors in Computing Systems – CHI 14*. https://doi.org/10.1145/2556288.2557421

Smith, H. J., Dinev, T., & Xu, H. (2011). Information privacy research: An interdisciplinary review. *MIS Quarterly*, 35, 989–1015. https://doi.org/10.2307/41409970

Stieger, S., Burger, C., Bohn, M., & Voracek, M. (2013). Who commits virtual identity suicide? Differences in privacy concerns, internet addiction, and personality between Facebook users and quitters. *Cyberpsychology, Behavior, and Social Networking*, 16, 629–634. https://doi.org/10.1089/cyber.2012.0323

Stokes, J., Fuehrer, A., & Childs, L. (1980). Gender differences in self-disclosure to various target persons. *Journal of Counseling Psychology*, 27, 192–198. https://doi.org/10.1037/0022-0167.27.2.192

Suh, A., & Lee, J. (2017). Understanding teleworkers’ technostress and its influence on job satisfaction. *Internet Research*, 27, 140–159. https://doi.org/10.1108/IntR-06-2015-0181

Sun, Y., Fang, S., & Hwang, Y. (2019). Investigating privacy and information disclosure behavior in social electronic commerce. *Sustainability*, 11, 1–27. https://doi.org/10.3390/su1112331

Trull, T. J., & Ebner-Priemer, U. (2013). Ambulatory assessment. *Annual Review of Clinical Psychology*, 9, 151–176. https://doi.org/10.1146/annurev-clinpsy-050212-185510

Vandenberg, R. J., & Lance, C. E. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods*, 3, 4–70. https://doi.org/10.1177/10944281031002

Wadhwa, V., & Salkever, A. (2018). *Your Happiness Was Hacked: Why Tech Is Winning the Battle to Control Your Brain--And How to Fight Back*. Berrett-Koehler Publishers.

Wang, T., Duong, T. D., & Chen, C. C. (2016). Intention to disclose personal information via mobile applications: A privacy calculus perspective. *International Journal of Information Management*, 36, 531–542. https://doi.org/10.1016/j.ijinfomgt.2016.03.003

Webb, S. D. (1978). Privacy and psychosomatic stress: An empirical analysis. *Social Behavior and Personality: An international journal*, 6, 227–234. https://doi.org/10.2224/ sbp.1978.6.2.227
Privacy concerns can stress you out

Wei, R. (2013). Mobile media: Coming of age with a big splash. *Mobile Media & Communication*, 1, 50–56. https://doi.org/10.1177/2050157912459494

Weinberger, M., Bouhnik, D., & Zhitomirsky-Geffet, M. (2017). Factors affecting students’ privacy paradox and privacy protection behavior. *Open Information Science*, 1, 3–20. https://doi.org/10.1515/opis-2017-0002

Westin, A. F. (1970). *Privacy and freedom*. London, UK: Bodley Head.

Xu, H., Teo, H.-H., Tan, B. C. Y., & Agarwal, R. (2012). Effects of individual self-protection, industry self-regulation, and government regulation on privacy concerns: A study of location-based services. *Information Systems Research*, 23, 1342–1363. https://doi.org/10.1287/isre.1120.0416

Youn, S., & Hall, K. (2008). Gender and online privacy among teens: Risk perception, privacy concerns, and protection behaviors. *CyberPsychology & Behavior*, 11, 763–765. https://doi.org/10.1089/cpb.2007.0240

Zhou, T., & Li, H. (2014). Understanding mobile SNS continuance usage in China from the perspectives of social influence and privacy concern. *Computers in Human Behavior*, 37, 283–285. https://doi.org/10.1016/j.chb.2014.05.008

## Tables

### Table 1: Correlations.

|        | 1 | 2   | 3     | 4     | 5     | 6     | 7     | 8     | 9     | 10    |
|--------|---|-----|-------|-------|-------|-------|-------|-------|-------|-------|
| Age (T1)| 1 |     |       |       |       |       |       |       |       |       |
| Gender (T1) | .17*** | 1 |     |       |       |       |       |       |       |       |
| Education (T1) | -.20*** | -.01 | 1 |     |       |       |       |       |       |       |
| Occupation (T1) | .31*** | -.02 | -.11*** | 1 |     |       |       |       |       |       |
| Communicative use (T1) | -.25*** | .01 | .10’ | -.14*** | 1 |     |       |       |       |       |
| Non-communicative use (T1) | -.47*** | -.03 | .13*** | -.17*** | .72*** | 1 |     |       |       |       |
| Perceived stress (T1) | -.32*** | -.10’ | .04 | -.05 | .19*** | .29*** | 1 |     |       |       |
| Perceived stress (T2) | -.21*** | -.13’’ | .01 | .05 | .13’’ | .20*** | .62*** | 1 |     |       |
| Mobile social media privacy concerns (T1) | .10’’ | .01 | .05 | .02 | -.01 | -.05 | .10’ | .14*** | 1 |       |
| Mobile social media privacy concerns (T2) | -.02 | -.02 | .13’’ | .00 | .04 | .03 | .11’’ | .15*** | .60’’ | 1       |

Note: \( N_{T1} = 833, N_{T2} = 461 \), T1 = Time 1, T2 = Time 2; ’\( p < 0.05 \); ”\( p < 0.01 \); ***\( p < 0.001 \).
Table 2: Results of the structural equation model.

| Predictor                        | Mobile social media privacy concerns (T2) | Perceived stress (T2) |
|----------------------------------|------------------------------------------|-----------------------|
|                                  | $b$ | $SE$ | $\beta$ | $b$ | $SE$ | $\beta$ |
| Age (T1)                         | -0.00 | 0.00 | -0.05 | -0.01 | 0.00 | -0.08 |
| Gender (T1)                      | -0.00 | 0.06 | -0.00 | -0.18* | 0.08 | -0.09 |
| Education (T1)                   | 0.14* | 0.07 | 0.09 | -0.04 | 0.09 | -0.02 |
| Occupation (T1)                  | 0.02 | 0.02 | 0.04 | 0.03 | 0.02 | 0.06 |
| Communicative use (T1)           | 0.02 | 0.04 | 0.02 | -0.05 | 0.06 | -0.04 |
| Non-communicative use (T1)       | 0.01 | 0.04 | 0.02 | 0.11 | 0.06 | 0.12 |
| Perceived stress (T1)            | 0.04 | 0.03 | 0.05 | 0.65*** | 0.05 | 0.65 |
| Mobile social media privacy concerns (T1) | 0.62*** | 0.05 | 0.64 | 0.12* | 0.05 | 0.09 |
| $R^2$                            | 0.43 |       |       | 0.46 |

Note: $N_{T1} = 833$, $N_{T2} = 461$, $T1 =$ Time 1, $T2 =$ Time 2; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

Figure 1: The final model examining the longitudinal, auto-regressive, and reciprocal associations between Mobile Social Media Privacy Concerns and Perceived Stress suggests a good model fit, CFI = .96; TLI = .95; $\chi^2$/df = 2.920; $p < .001$; RMSEA = .05, 90 % CI [.04; .05]. Ovals present latent variables. The control variables are omitted due to clarity of presentation. We controlled for age, gender, education, occupation, communicative and non-communicative uses of smartphones.

Note. $N_{T1} = 833$, $N_{T2} = 461$, $T1 =$ Time 1, $T2 =$ Time 2; *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Online Appendix A

Mobile social media privacy concerns. Respondents were asked to indicate their agreement with three items on a 5-point Likert scale (1 = do not agree at all, 5 = agree completely): “The use of social media platforms on the mobile phone carries a considerable data protection risk”; “I worry about my privacy when I use social media platforms on the phone”; “I am concerned that data from social media platforms on my phone have been collected without my consent” (M = 3.69; SD = 0.96; α = 0.89 at T1; M = 3.55; SD = 1.04; α = 0.90 at T2).

Perceived stress. We asked participants to indicate the frequency of specific stress symptoms on a 6-point Likert-scale (1 = never, 6 = several times a day): “In the last month how often did you feel like you had to do things, even though you did not want to do them”; “Did you feel criticized or judged”; “Did you feel as if there were so much trouble that you could not overcome it”; “Did you have too many worries?” (M = 2.57; SD = 1.14; α = 0.88 at T1; M = 2.38; SD = 1.14; α = 0.89 at T2).