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First Aid in the Pocket: The Psychosocial Benefits of Smartphones in Self-threatening Situations


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Highlights

- Smartphones as physical devices and symbols represent social bonds and affiliation
- Beyond mere use, they can help users deal with feeling ostracized
- With smartphones in the pocket, users felt less socially threatened than without
- Social app cues reduced feeling ostracized better than information app cues
- Social app cues reduced feeling ostracized not better than providing no cues at all

Abstract

When people feel socially threatened and excluded, they could use their mobile phones to reconnect with others and feel better. We assumed that such positive results can occur even if mobile phones are not actively used. Rather, it may suffice if users believe that carrying a mobile phone ensures social connection. This mindset may help users recover a sense of belonging during self-threatening situations. In two experiments, we asked whether the smartphone as a physical device or its symbolic representation can aid in everyday self-threatening situations. In Study 1 ($N = 74$), participants with their smartphones in their pockets experienced less threatened belongingness than those who were deprived of their smartphones. In Study 2 ($N = 419$), participants who encountered a smartphone symbol with social apps after feeling socially excluded recovered better than those who encountered a symbol with informational apps, but showed no difference in recovery compared to those who encountered no symbol at all. Findings support the idea that smartphones can ‘physically’ buffer against social threats and partially serve as subtle reminders of social bonds.

Keywords: smartphone, social media, self-threat, ostracism, belongingness, need restoration, coping

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1. Introduction

The smartphone has become the Swiss Army knife of the online generation. Many applications are now integrated into this mobile multimedia device, transforming it into “the most complete manifestation of a metamedium” (Humphreys et al., 2018, p. 2794). Importantly, smartphones “are as much social objects as technological ones” (Brown, 2002, p. 3) and enable us to stay in perpetual contact (Katz & Aakhus, 2002)—permanently online, permanently connected (POPC; Vorderer et al., 2016). The ubiquity of smartphones has many cognitive and affective implications (Katz, 2006; Ross & Campbell, 2021) and can be detrimental to users’ well-being (e.g., Elhai et al., 2017; LaRose et al., 2014; Reinecke et al., 2017; Rotondi et al., 2017). For instance, people experience social pressures to be permanently available (e.g., Halfmann & Rieger, 2019; Ling, 2012; Lutz et al., 2020; Thomée et al., 2011), feel obliged to respond immediately to messages (e.g., Mai et al., 2015), procrastinate (e.g., Meier, 2022; Schnauber-Stockmann et al., 2018), fear missing out on something (e.g., Elhai et al., 2016) or feel ignored and excluded by others (e.g., Büttner & Rudert, 2021; Hales et al., 2018; Lutz, 2022). However, mobile phones may also benefit users’ feeling of safety and connectedness by allowing emergency phone calls, anytime and anywhere (Kang & Jung, 2014; Katz, 2006; Ling, 2004).

Fulfilling this need to belong and social connection is fundamental for human well-being (e.g., Baumeister & Leary, 1995) whereas feeling socially disconnected, ignored, or excluded has robust negative consequences (Williams, 2009).¹ Analogously, social media and

¹ An anonymous reviewer pointed to the world of smartphone use in wildlife and outdoor recreation (e.g., thru-hiking). Several studies showed that in such a setting, although for some individuals it is most important that smartphones provide safety and navigation, for others, smartphones can cognitively distract them from enjoying nature, solitude, or uncertainty (Amerson et al., 2020; Lepp et al., 2021; Rogers & Leung, 2021) and, thus, in such situations, security and connectedness may not represent the primary goals or even a barrier to the wellness at stake. We are fully aware of the Janus-faced features of mobile media and their multivalenced effects but a comprehensive overview would extend the scope of this paper (for a recent review, see Ross & Campbell, 2021).

instant messengers are the predominantly used applications on mobile devices (Murmuras, 2021). Thus, although phone calls and SMS may still present a direct gateway to facilitate social support and foster our well-being (e.g., Liu et al., 2019), social media and instant messaging apps are increasingly taking over these tasks (e.g., Chan, 2018; Cho, 2015; Lapierre & Zhao, 2022; Taylor & Bazarova, 2021). With the continuing rise of young “smartphone-only” Internet users (Perrin, 2021), a direct gateway to social well-being may become even more prevalent in the future, making supportive social networks permanently available (Taylor & Bazarova, 2021).

In contrast to these direct effects of mobile media use, some early ideas about the symbolic meaning of smartphones for users’ safety and security go beyond their active use (e.g., Gergen, 2003; Katz, 2006). Or as Lepp et al. (2021, p. 2) recently put it,

Safety . . . refers to smartphone users’ sense of physical safety in potentially dangerous social and physical environments, but it also refers to smartphone users’ psychological safety in knowing that information, resources, and connection are readily accessible at nearly all times and in all locations.

According to Katz (2006), such indirect social consequences of mobile communication—or third-order effects—“are subtle, and their causal linkages to the technological change are contestable (and sometimes even the existence of the phenomena is disputed)” (Katz, 2006, p. 12). Research from the cognate field of social media provides initial support for the power of such indirect effects. For instance, even simple symbolic reminders of social bonds can restore threatened belongingness (e.g., Knausenberger et al., 2015). Accordingly, these studies go beyond the mere use of smartphones and resonate well with the ideas of Katz (2006), who suggested that “mobiles can serve a highly symbolic albeit non-communicative role in emotional connectedness” (p. 27) and that “there is much more to the mobile phone than consumption. It is the portable power and connectivity that it gives to users, enormously magnifying their social reach and power to alter distant physical

circumstances” (p. 10). Thus, the symbolic meaning of smartphones as coping tools (Wolfers & Schneider, 2021) and permanently open windows to our social world may now be deeply rooted in our POPC mindsets (Klimmt et al., 2018). Put simply, people might not need to actively use their smartphones to restore threatened belongingness; activating the symbolic meaning of a smartphone might be sufficient.

To date, however, little research has examined whether smartphone devices and their symbolic representation can help individuals cope with thwarted belongingness. Thus, the present studies are among the first that investigate whether and how smartphones as physical devices and their symbolic representation can fortify a thwarted need to belong, serving as a (temporary) psychosocial ‘first aid in the pocket’ to buffer against or cope with self-threatening situations in everyday life.

2. Smartphones as Buffers Against and Tools to Cope with Threatened Belongingness

Threats are “is–ought discrepancies with an aversive character” (Greve & Strobl, 2004, p. 194). Besides physical threats like illness, or autonomy threats like loss of control, one of the most detrimental threats to the self is a social threat: Ostracism—“excluding and ignoring by individuals or groups” (Williams, 2009, p. 276)—robustly thwarts four fundamental human needs (i.e., belonging, self-esteem, control, and meaningful existence; Williams, 2009). Here, the urge to belong and feel connected to others (e.g., Baumeister & Leary, 1995; Williams, 2009) is crucial because it is not only most threatened by ostracism, but it is also a major driver of smartphone and social media use (e.g., Hoffner & Lee, 2015; Iannone et al., 2018; Vorderer et al., 2016; Vorderer & Schneider, 2017). Moreover, smartphones may provide a constant connection to others (“connected presence,” Licoppe, 2004), thereby establishing a feeling of belonging and social connectedness (e.g., Ling, 2004; Quinn & Oldmeadow, 2013; Taylor & Bazarova, 2021; Walsh et al., 2009; Wei & Lo, 2006). Notably, a threatened need to belong may effectively be restored via means other than

interpersonal face-to-face interactions (e.g., Gabriel et al., 2016; Gardner et al., 2005) and computer-mediated interactions via social media and mobile devices in particular (e.g., Vorderer & Schneider, 2017). To conceptualize how this coping process may unfold via (symbolic) smartphones, we distinguish between direct and indirect strategies as formulated in Gardner et al. (2005)'s extended model of belonging regulation.

2.1 Direct Strategies

After sensing an unsatisfactory state of belonging, individuals pay higher attention to their social environment and check for social cues. If interpersonal face-to-face interactions are possible, individuals can use strategies to directly reconnect with others to reestablish an inclusionary status (Gardner et al., 2005). In a POPC environment, interpersonal online communication may also serve as an appropriate and efficient way to restore belongingness, for instance, via directly communicating with others online (e.g., Gross, 2009; große Deters & Mehl, 2013; Notley, 2009; Wei & Lo, 2006). For instance, a recent meta-analysis found that SNS use was positively related to perceived social support (Domahidi, 2018). Moreover, prosocial online feedback helps manage challenging life events (Rodríguez-Hidalgo et al., 2020). Such findings may hold for smartphone use because the most commonly used smartphone apps are social media apps and instant messengers (Murmuras, 2021). Although these rather direct strategies of media use could be efficient remedies when face-to-face interactions are not possible, indirect gateways to pursue belongingness without interpersonal interactions could be successful avenues as well.

2.2 Indirect Strategies

Gardner et al. (2005) suggested two sets of indirect strategies to restore and buffer belongingness—*social snacking* and *social shielding*. Social snacking refers to the “[r]eaffirmation of bonds through tangible or intangible social representations” (Gardner et al., 2005, p. 230). Concerning smartphones, many virtual or physical reminders of social bonds are possible. For instance, a family portrait as a screen picture could serve as a

reminder of loved ones or the mobile device itself could be a reminder of being permanently connected (Gardner et al., 2005, pp. 232–236).

Social shielding refers to “[p]rotecting sense of belonging through use of illusions or surrogates” (Gardner et al., 2005, p. 230). According to Gabriel et al. (2016), social surrogates can be categorized as (a) being immersed into narrative social worlds (e.g., Mar & Oatley, 2008), (b) parasocial relationships with media figures (for an overview, see Hartmann, 2017), or (c) reminders of existing social bonds (e.g., Knausenberger et al., 2015; Knausenberger & Echterhoff, 2018; Knowles et al., 2015, Study 3). All social surrogates are symbolic and help fulfill social needs without genuine human interaction (Gabriel et al., 2016). Yet, Gabriel et al. (2016) conclude that these symbolic bonds do not substitute for in-person bonds. Rather, they complement each other and may function as unique social agents.

Summarized, research on social surrogates suggests that indirect gateways can be quite short, simple, and even virtual (Gabriel et al., 2016; Gardner et al., 2005). Several lab experiments (Knausenberger et al., 2015; Knausenberger & Echterhoff, 2018) support this. After being ostracized, participants completed rating items on a computer while either a Facebook or a control MS Word icon was displayed in the screen’s corner. Those who were exposed to the Facebook icon showed less interest in social contact and greater recovery of belongingness, thereby indicating that the Facebook symbol functions as a subtle virtual reminder of social contact that suffices to aid thwarted belongingness. Further research also showed strong associations between mental concepts of social networking sites (SNS) and relatedness (Chiou et al., 2015; Lee & Chiou, 2013) or positive reactions to social media cues in general (van Koningsbruggen et al., 2017).

Although none of the discussed literature investigated the role of mobile devices in coping with the negative effects of ostracism on belonging, we hypothesize that the smartphone device may serve as a social surrogate as well, mainly because its use is dominated by social apps (Murmuras, 2021) and closely connected to the POPC mindset

(Klimmt et al., 2018). The underlying mechanisms might be similar to those concerning social media (e.g., van Koningsbruggen et al., 2017): The reinforcing social use of a smartphone could strengthen the association between the mental concepts of *smartphone* and *social connectedness*. Thus, the activation of the mental concept “smartphone” might trigger the concept of “connectedness.” However, it remains unclear if such an activation suffices to restore thwarted belongingness.

What mitigates the negative consequences of an exclusionary status? The stress-buffering hypothesis (e.g., Che et al., 2018; Cohen, 2004) claims that available social support “[e]liminates or reduces effects of stressful experiences by promoting less threatening interpretations of adverse events and effective coping strategies” (Cohen, 2004, p. 677). In line with this, connected availability between romantic partners—“the perception of continuous and constant communication access to an attachment figure and the expectation they can provide security, regardless of location, time of day, or current activity” (Taylor & Bazarova, 2021, p. 190)—was related to positive affect and well-being. Similar findings seem to apply to the symbolic value of social networking sites (Chiou et al., 2015; Lee & Chiou, 2013) and smartphones (Hunter et al., 2018; Panova & Lleras, 2016; Sestir, 2020). For instance, Hunter et al. (2018) showed that the mere presence of a smartphone reduced the feeling of being excluded and led to a short-term decline in stress-related responses of the sympathetic nervous system. Similarly, after writing an essay about a previous social exclusion episode, participants with their smartphones present felt less ignored and excluded than those without their smartphones (Sestir, 2020), indicating a buffering function of the present smartphone. Thus, a present smartphone seems to shield from belongingness threats. Moreover, activating the mental concept of a socially supportive online network after an episode of ostracism could also function as a social snack and reaffirm social bonds (Knausenberger et al., 2015; Knausenberger & Echterhoff, 2018). Although this has only been investigated with Facebook’s logo yet, recent research suggests that there might be a shortcut

to social connectedness by mentally activating the more general concept of smartphones (Kardos et al., 2018).

Taken together, these findings support the notion that symbolic bonds without (mediated) interpersonal interaction can have socially beneficial effects, undergirded by mental representations (i.e., relational schemas, Baldwin, 1992) of social interactions whose activation can mitigate stress (Smith et al., 2004). This reasoning suggests that smartphones as physical devices or their symbolic representation help buffer against and cope with thwarted belongingness, which hints at important extensions of current literature. First, social resources (perceived social capital and perceived social support, e.g., Domahidi, 2018) are mentally represented (Baldwin, 1992). As the mental representations of supportive networks and smartphones may be deeply connected, activating the symbolic representation of a smartphone may facilitate the buffering and coping functions of social resources. Second, the smartphone device as a metamedium (Humphreys et al., 2018) offers myriad social apps, not only Facebook. Consequently, the smartphone's symbolic representation may activate many more social concepts in contrast to a specific app symbol (e.g., Facebook). However, research has not yet investigated whether encountering symbolic representations of smartphones is sufficient to restore threatened belongingness, and how the presence (versus absence) of a physical smartphone modulates this process. Thus, we address the following two research problems: 1) Can the physical presence of a smartphone work as a social shield and buffer against thwarted belongingness? 2) Can the symbolic representation of a smartphone work as a social snack and help cope with thwarted belongingness?

3. Study 1

Our first study investigated if the availability of a smartphone in an ostracism episode helps an individual to fortify thwarted needs. Specifically, we probed the interplay between the presence of a smartphone device as a 'physical' buffer against ostracism and the picture of a smartphone symbol (e.g., see Figure 1) as a virtual reminder of social connectedness as a

copied aid. Based on our rationale outlined above, derived from the indirect strategies of the extended model of belonging regulation—social shielding and snacking—(Gardner et al., 2005) and previous supportive research (e.g., Hunter et al., 2018; Knausenberger et al., 2015; Sestir, 2020), we predicted

H1. Individuals, who are deprived of their smartphones before experiencing ostracism, cope less successfully in restoring their thwarted belongingness satisfaction than individuals with smartphones in their pockets.

H2. Ostracized individuals, who encounter a smartphone symbol, recover from threatened belongingness better than those who were not exposed to a smartphone symbol.

H3. Ostracized individuals with smartphones in their pocket would benefit most if they were exposed to a smartphone symbol because they are reminded of their digital coping aid, whereas individuals without their smartphones are reminded of their missing device and thus would experience the least belongingness need restoration.

3.1 Methods

To test our assumptions, we conducted an experiment in the laboratory with a 2 (Smartphone available vs. unavailable) \times 1 (Ostracism) \times 2 (Smartphone picture during waiting period vs. control picture) between-subjects design. Data and material are available at OSF, https://osf.io/7ytvh/?view_only=602699ebd2ad4981a183d866faf3165c.

3.1.1 Manipulations

3.1.1.1 Smartphones as Physical Buffers. Following the notion of social shielding (Gardner et al., 2005), we assumed that smartphones can function as physical buffers to shield against belongingness threats. We manipulated the smartphone availability of the participants during the study by randomly assigning them to one of two conditions: Either they had to put their smartphone into a box for the time being in the laboratory or they carried their phone with them during the study.

3.1.1.2 Ostracism. To elicit the self-threatening state of feeling ostracized and excluded, all participants played the exclusion condition of Cyberball (Williams & Jarvis, 2006). Cyberball is an online ball-tossing game, in which a participant supposedly interacts with two other players, whose behaviors are in fact based on programmed algorithms. In the exclusion condition, after receiving the virtual ball once from each of these players, the participant does not receive it again for about three minutes. This elicits strong feelings of exclusion, social pain, and threatens fundamental needs such as belonging (Williams, 2009). In the inclusion condition, all players receive an equal number of ball throws. Cyberball is an established experimental paradigm and, in more than 200 published experiments, has been shown to strongly induce ostracism and thwart fundamental human needs. For instance, in a meta-analysis of 120 Cyberball studies, Hartgerink et al. (2015) found a large effect of the exclusion compared to the inclusion condition ($d = |1.36|$). As we were interested in reducing the state of feeling ostracized, we only used the exclusion condition.

3.1.1.3 Smartphones as Subtle Reminders. In line with the social surrogacy hypothesis (Gardner et al., 2005), being reminded of the social network that is accessible via one's smartphone anytime and anywhere could function as a social snack, and thus, as a way of coping with threatened belongingness. Inspired by previous manipulations that used the subtle display of the Facebook symbol (e.g., Knausenberger et al., 2015), after being ostracized, participants encountered one of two randomly displayed waiting screens for five minutes. In the smartphone picture condition, besides the waiting instruction, the screen contained a small smartphone symbol displaying a smartphone in lock screen mode (see Figure 1); this symbol was absent in the control condition.



Figure 1. A small symbol of a smartphone in lock screen mode (symbol on the right) was used as a subtle reminder in the smartphone picture condition in Study 1. Small versions of smartphone symbols displaying either social apps or informational apps (symbols on the left and in the middle, respectively) were used as subtle reminders in Study 2.

3.1.2 Participants and Procedure²

To estimate an optimal sample size given a statistical power $1-\beta = .80$, a significance level $\alpha = .05$, and an effect size $f = 0.30$ drawing on Knausenberger et al. (2015), we conducted an a priori power analysis using G*Power 3.1 (Faul et al., 2007). Results indicated that a sample size of at least 23 participants for each of the four groups was sufficient (i.e., 92 in total). We recruited university students on campus and via SNS to take part in a study about computer games and mood (cover story). After entering an antechamber to the lab, participants ($N = 101$; 60% female; $M_{\text{age}} = 22.59$, $SD_{\text{age}} = 4.27$, range = 18–58) read and signed an informed consent form. Before entering the lab, they had to either put their smartphones into a box or carry their phone with them for the remaining part of the study. In the lab, participants sat before a gaming laptop and completed measures of online gaming (as distractors), baseline measures (e.g., affective state), and control measures in an online

² In both studies, established ethical standards were met, including voluntary participation, informed consent, anonymity and data protection, and debriefing.

questionnaire. Then, they played a three-minute episode of Cyberball (exclusion version only). Directly afterward, their affective states and manipulation check items were assessed. Participants were told that due to data submission of the online game they had just played they have to wait a few minutes before they can go on with the questionnaire. During this five-minute waiting period, participants encountered a screen displaying waiting instructions and either a small smartphone symbol or no symbol. Using a hidden video camera, participants' behaviors were recorded to check for actual smartphone use. With the end of the waiting period, the "Continue"-button became visible again. On the last pages of the questionnaire, participants' threatened needs and affective states were assessed, followed by a thought-listing task about the waiting period. Finally, manipulation checks concerning the waiting period, further control variables (e.g., smartphone feature use), suspicion checks, and socio-demographics were assessed. Participants left the laboratory and were thanked and debriefed. They also received their compensation of 10€ and were asked to sign an agreement form about the use of the video recording. Only one person did not allow us to use the video recording; thus, the corresponding video material was deleted immediately.

3.1.3 Measures³

3.1.3.1 Belongingness Threat. Twelve items were adapted from the need-threat scales (van Beest & Williams, 2006), which is an established instrument in ostracism research

³ To be consistent with the cover story about computer games and mood, additional baseline measures included items dealing with the use of computer games. Moreover, selected items of the Positive Negative Affect Schedule (Watson et al., 1988) were additionally presented after the Cyberball game. They were not included in further analyses but helped cover an adjective about the exclusionary state (i.e., "excluded") serving as a first indicator for threatened belongingness (van Beest & Williams, 2006). To control for trait-like coping strategies, the Brief COPE (Carver, 1997) was also included during the baseline period. However, as we neither found support for factorial validity nor for reliability of the theoretically assumed subscales (Carver, 1997), they were not further analyzed. Also, the Online Vigilance Scale (Reinecke et al., 2018)—we included to measure the subjective tendency of being POPC for other purposes—was not analyzed. At the end, we explicitly asked the participants what they did during the waiting period. They could choose among four options (i.e., "I was thinking," "I was waiting for the study to continue," "I was looking at my smartphone," and "I was looking out of the window"). If they answered they had been looking at their smartphones, for exploratory purposes, a detailed battery of items was presented to assess in which activity they had been engaged and how long (Vorderer et al., 2016). Also, for exploratory purposes, we included a short thought-listing task concerning the waiting period. As our video camera was only targeted to detect the participants' obvious behaviors (e.g., pulling out phones or walking around in the room), the thought listing aimed at detecting cognitions like thinking about others. For the material, see OSF.

(Williams, 2009),⁴ and used to measure thwarted needs after the waiting period. To ensure that participants' current state was captured (instead of their experience during the Cyberball game), items were reworded. Particularly, the present instead of the past tense was used (e.g., "I feel like an outsider" instead of "I felt like an outsider"). As our focus was on belongingness, we chose the respective three items (i.e., "I feel like an outsider," "I feel rejected," and "I feel disconnected"). McDonald's omega was .75. Response options ranged from 1 (*not at all*) to 7 (*strongly agree*).

3.1.3.2 Control Variable. To control whether participants took their smartphones out of their pocket (e.g., to use them directly as a coping tool) or carried out behaviors that may have helped them distract themselves from the exclusionary state, we videotaped their activities during the waiting period via a hidden video camera.

3.1.3.3 Manipulation Checks. To ensure that participants were not directly affected by smartphone deprivation (t1), we assessed their affective states via self-assessment manikins (SAM; Bradley & Lang, 1994). SAM were also provided directly after the participants finished playing Cyberball (t2) and after the waiting period (t3). Five-point response options ranged from 1 to 5, with increasing values indicating increasing happiness, calmness, and dominance. Further, we asked if the participants were familiar with the Cyberball game and whether they have experienced technical problems during the game.

3.1.3.4 Suspicion Check. Finally, we asked the participants what they thought was the goal of the study.

3.2 Results

3.2.1 Checks and Controls

⁴ For more details of the measurement of threatened fundamental needs, see Williams (2009). As we measured the threatened needs after the waiting period, we only used the shorter version of the need-threat scale (i.e., three instead of five items), thereby omitting those items that refer to the game experience (see also <https://www.empirisoft.com/cyberball.aspx>). In their meta-analysis, Hartgerink et al. (2015) showed that different types of need scales led to similar effect sizes.

3.2.1.1 Knowledge about Cyberball and Suspicion Check. About one-third of the participants had to be removed from the sample due to their prior knowledge of the Cyberball game, technical problems, or other suspicious behaviors, leading to a final sample size of $N_{\text{final}} = 74$ (for a CONSORT flow chart of participant selection, see Supplementary Online Material, Figure A1). Some of those participants also assumed that the study dealt with exclusion. However, none of the remaining participants was suspicious about the Cyberball game, the availability of the mobile phone manipulation, or the symbol during the waiting period. Furthermore, two participants discovered the hidden camera in the room. One of them was already excluded because he knew the Cyberball game; the other person was not excluded because thought listing and suspicion check comments indicated that although the observation was discovered, she was wrong in her assumptions about the goal of the study.

3.2.1.2 Manipulation Checks. In line with previous findings (e.g., Williams, 2009), the baseline mood measures (i.e., SAM at t1) were used as proxies to assess if participants were affected in their affective states due to the availability of the smartphone and the Cyberball ostracism condition. Concerning smartphone availability, no differences were found between the two conditions, for valence: Welch's $t(63.01) = 0.66, p = .513$ (two-sided); arousal: Welch's $t(71.81) = 1.68, p = .098$ (two-sided); dominance: Welch's $t(72) = -0.89, p = .375$ (two-sided). Thus, the non-availability of the smartphone did not significantly worsen the participants' affective state. In addition, inducing ostracism via Cyberball was successful: Repeated measures ANOVAs with SAM before (t1) and after playing Cyberball (t2) showed the expected, statistically significant and strong effects, for valence: $F_{\text{Time}}(1.96, 141.19) = 16.99, p < .001, \eta_G^2 = .078$;⁵ arousal: $F_{\text{Time}}(1.87, 134.40) = 7.92, p = .001, \eta_G^2 = .031$; dominance: $F_{\text{Time}}(2, 144) = 21.59, p < .001, \eta_G^2 = .093$. Neither the smartphone availability condition nor the Smartphone Available \times Time interaction showed significant effects.

⁵ Generalized eta squared η_G^2 is reported for comparability across different designs Olejnik and Algina (2003). The time variable represents the two measurement occasions of the dependent variables at t1 and t2.

3.2.2 Main Results

After playing Cyberball, individuals without their smartphones felt more excluded ($M = 3.80$, $SD = 1.09$) than individuals with smartphones ($M = 2.56$, $SD = 1.42$), Welch's $t(61.39) = 4.16$, $p < .001$, $d = .99$. Moreover, after the waiting period, results of an ANOVA with phone condition and symbol condition as factors indicated that these individuals still felt more thwarted in their belongingness ($M = 3.11$, $SD = 1.10$) than those with smartphones ($M = 2.53$, $SD = 1.2$), $F_{\text{Phone}}(1,70) = 4.58$, $p = .036$ (.018 one-sided), $\eta_G^2 = .061$. These findings corroborate the idea of a buffer, that is, smartphones seem to work as a 'physical' aid in the pocket when encountering social exclusion and thus support H1.

Concerning the effects of the smartphone symbol, we found neither a significant main effect, $F_{\text{Symbol}}(1,70) = 0.03$, $p = .959$ (.480 one-sided), $\eta_G^2 < .001$, nor an interaction, $F_{\text{Phone} \times \text{Symbol}}(1,70) = 0.03$, $p = .864$ (.432 one-sided), $\eta_G^2 < .001$ (for descriptive statistics, see Table 1). Thus, H2 and H3 were not supported. To delve deeper into possible reasons, we investigated the video recordings and checked whether participants in the phone availability condition ($n = 33$) used their phones during the waiting period differently, depending on the display of the symbol. Although 67% of the participants, who did not encounter the symbol, used their phone ($n = 10$ of 15) compared to only 44% of those who were exposed to the symbol ($n = 8$ of 18), these differences were not significant, $\chi^2(1) = 1.63$, $OR = 0.41$, Fisher's exact test $p = 0.296$ (two-sided). To investigate the direct effect of mobile phone use on threatened belongingness, we ran an additional ANOVA. Neither did we find significant main effects, $F_{\text{Symbol}}(1,29) < 0.01$, $p = .950$ (.475 one-sided), $\eta_G^2 < .001$, $F_{\text{Phone Use}}(1,29) = 0.75$, $p = .393$ (.197 one-sided), $\eta_G^2 = .025$, nor an interaction, $F_{\text{Phone Use} \times \text{Symbol}}(1,29) = 0.01$, $p = .935$ (.468 one-sided), $\eta_G^2 < .001$.

Symbol displayed	
No	Yes

Phone available	<i>n</i>	<i>M</i>	<i>SD</i>		<i>n</i>	<i>M</i>	<i>SD</i>
No	19	3.14	1.19		21	3.08	1.03
Yes	15	2.51	1.30		19	2.54	1.16

Table 1. Means and standard deviations of threatened belongingness across conditions (Study 1, $N = 74$)

3.3 Brief Discussion

In Study 1, we found that participants, who were deprived of their smartphones, experienced ostracism more strongly compared to participants with their smartphones in their pockets, thereby supporting H1. Smartphones may thus be regarded as a ‘physical’ aid in the pocket to buffer detrimental effects when encountering social exclusion, which is in line with previous research (e.g., Hunter et al., 2018; Sestir, 2020). However, the smartphone symbol displayed after the ostracism episode neither affected recovery nor enhanced the effect of a physically present device, thereby not supporting H2 and H3, which contrasts with previous related social surrogacy research (e.g., Knausenberger & Echterhoff, 2018; Knausenberger et al., 2015). Besides the loss of power due to necessary exclusions of participants, another possible limitation of our study was the fact that we showed a neutral smartphone symbol, whereas other research used specific social media symbols (e.g., the Facebook symbol, Knausenberger et al., 2015). Perhaps, the neutral smartphone symbol did not effectively trigger mental associations, or the lock screen signaled disconnection. In Study 2, we tested whether this could be the reason for the lacking impact of the symbol and whether we would find an effect if we increase the salience of social (communication) apps on smartphones by integrating respective app icons into the smartphone symbol. Further results and limitations of Study 1 are discussed together with those of Study 2 in the General Discussion.

4. Study 2

Previous research on the social surrogacy hypothesis (Gabriel et al., 2016; Gardner et al., 2005) referred to social media (e.g., Knausenberger et al., 2015; Knausenberger &

Echterhoff, 2018; Knowles et al., 2015). Thus, our second study differentiated between the display of a smartphone symbol that incorporated only social (media) apps and a smartphone symbol that incorporated only informational apps. In doing so, we wanted to explore Study 1's unexpected finding that—in contrast to Study 1's H2—the smartphone symbol did not affect belongingness restoration. More specifically, we examined whether those kinds of apps depicted on a smartphone symbol will make a difference. Thus, we hypothesized that

H1. Ostracized individuals, who encounter a smartphone symbol displaying social apps, recover from threatened belongingness better than those who were not exposed to such a smartphone symbol.

4.1 Pilot Test

To create appropriate material for our main study, 16 participants (69% female, $M_{\text{age}} = 25.75$, $SD_{\text{age}} = 4.88$) rated three versions of a smartphone symbol in a within-subjects online experiment. The symbols contained either social apps (e.g., Facebook, WhatsApp, Twitter, Snapchat, Instagram, etc.), informational apps (e.g., newspaper icons, weather, rail traffic, etc.), or—like in Study 1—displayed a neutral lock screen without apps (see Figure 1). Six items assessed the meaning of the smartphone symbols concerning socio-emotional needs (e.g., friendship, relatedness, etc., adapted from Knausenberger et al., 2015) on a seven-point Likert-type scale (McDonald's omegas were .83, .75, and .81 for social apps, informational apps, and neutral condition, respectively). We expected that these items receive higher ratings in the social-apps condition than in the informational-apps condition. Furthermore, we included one item measuring information seeking, which should receive higher ratings in the informational-apps condition. Additionally, we included distractor items (concerning, e.g., utility, entertainment) to conceal that we were mainly interested in socio-emotional issues. We ran within-subjects ANOVAs using the *R* package *afex* (Singmann et al., 2021) applying the Huynh–Feldt sphericity correction as recommended by Haverkamp and Beauducel (2017). As expected, symbols differed with regard to (a) the socio-emotional needs score, $F(1.53$,

22.98) = 18.69, $p < .001$, $\eta^2 = .37$, with the social app symbol yielding the highest ratings ($M_{\text{Soc}} = 4.08$, $SD_{\text{Soc}} = 1.04$; $M_{\text{Inf}} = 2.39$, $SD_{\text{Inf}} = 0.87$; $M_{\text{Neut}} = 2.76$, $SD_{\text{Neut}} = 1.03$), and (b) information seeking, $F(1.60, 23.99) = 7.40$, $p = .005$, $\eta^2 = .26$, with the informational app symbol receiving the highest ratings ($M_{\text{Soc}} = 3.94$, $SD_{\text{Soc}} = 1.69$; $M_{\text{Inf}} = 6.06$, $SD_{\text{Inf}} = 0.85$; $M_{\text{Neut}} = 4.31$, $SD_{\text{Neut}} = 2.06$). For details, see additional material on OSF.

Summarized, the results supported the idea that smartphone symbols can have different meanings (i.e., social or informational), mainly depending on the content of the apps that are displayed on the screen. Thus, the social-apps symbol appears most appropriate to make mental concepts of connectedness salient, which in turn could work as a subtle reminder of existing social bonds when belongingness is threatened.

4.2 Main Study

Study 2 was conducted as an online experiment using a 2 (Social threat: Exclusion vs. Inclusion) \times 3 (“Smartphone with apps” symbol: Social apps vs. Information apps vs. No symbol) design. Data and material are available at OSF,

https://osf.io/7yvh/?view_only=602699ebd2ad4981a183d866faf3165c.

4.2.1 Participants and Procedure²

As results of Study 1 and Knausenberger et al. (2015) differed concerning the effect sizes of the presented symbol, we opted to collect as much data as possible within a one-month limit (thus, no a priori power analysis was conducted). A convenience sample was recruited via mailing lists of German universities and various Facebook groups. Participants were offered a chance to win two €25 shopping vouchers for Amazon™ as an incentive to take part in the study. After clicking the *Next* button on the welcome page, they were provided with control measures (i.e., need to belong and trait self-esteem). Then, they were randomly assigned to retrospectively report on either an episode in which they felt excluded or to report on one in which they felt included by others. Directly afterward, participants filled in manipulation check items and were randomly assigned to one of three groups, reflecting the

“Smartphone with apps” symbol condition. On the next four pages, they were asked to solve eight mathematical problems. During this session, on each top of the four pages, either a small smartphone symbol with social apps, one with informational apps, or no symbol at all was depicted. After finishing the math tasks, need threats were assessed along with suspicion checks and socio-demographics. Finally, participants were thanked and debriefed. In total, 463 participants who were older than 18 years and owned a smartphone fully completed the online questionnaire (84% female; $M_{\text{age}} = 29.91$, $SD_{\text{age}} = 10.36$, range = 18–72).

4.2.2 Manipulations

4.2.2.1 Ostracism. As many participants in Study 1 were familiar with the Cyberball paradigm, we decided to use a different manipulation instead. Similar to previous successful manipulations via narrative self-reports (e.g., Sestir, 2020), the exclusionary state was manipulated by asking the participants for self-reported retrospective descriptions about either an episode of personal exclusion or inclusion.

4.2.2.2 Smartphones as Subtle Reminders. In contrast to Study 1 but in line with our assumptions outlined in the Pretest section, we replaced the neutral lock-screen symbol with two alternatives: a “smartphone with apps” symbol that displayed either social apps or information apps (see Figure 1). The control condition contained no smartphone symbol at all. Furthermore, similar to previous administrations of subtle reminders (e.g., Knausenberger et al., 2015), the symbols were displayed while participants were answering items in a filler task which was consistent with our cover story (i.e., saying that the study deals with personal experiences and logical reasoning). More precisely, participants should solve eight mathematical problems displayed on four web pages and select the correct answer from four response options. We thought the filler task to be less suspicious than the waiting period we used in Study 1.

4.2.3 Measures⁶

4.2.3.1 Belongingness Threat. Like in Study 1, the need-threat scales were used to measure thwarted needs directly after the ostracism manipulation (t1) as well as directly after the symbol manipulation (t2). Again, as we were mainly interested in belongingness, we focused on the threatened belongingness in our analyses (i.e., the three items “I feel like an outsider,” “I feel rejected,” and “I feel disconnected”). Response options ranged from 1 (*not at all*) to 7 (*strongly agree*). Reliability estimates for t1 and t2 showed a McDonald’s omega of .77 and .84, respectively.

4.2.3.2 Control Variables.

4.2.3.2.1 Need to Belong (NTB). As our focus was on the state of threatened belongingness, we included a trait measure to control for the general, stable, and cross-situationally consistent NTB (Baumeister & Leary, 1995)—the German version of the Need to Belong scale (Leary et al., 2013), which includes 10 items (e.g., “I need to feel that there are people I can turn to in times of need”) with response options ranging from 1 (*not at all*) to 5 (*strongly agree*). McDonald’s omega was .82.

4.2.3.2.2 Trait Self-esteem (TSE). Following previous researchers, who found that trait self-esteem is strongly connected to experiencing an exclusionary state (e.g., Schneider et al., 2017), we assessed TSE with the revised German version of Rosenberg’s (1965) self-esteem scale (von Collani & Herzberg, 2003). It includes 10 items (e.g., “I am able to do things as well as most other people.”) with response options ranging from 1 (*not at all*) to 7 (*strongly agree*). McDonald’s omega was .93.

4.2.4 Measures Treatment Internalization and Suspicion Check

We consensually coded whether participants completed writing about episodes of inclusion or exclusion according to the instructions and whether they were suspicious of the

⁶ Additionally, the Online Vigilance Scale by Reinecke et al. (2018)—we used to measure the subjective tendency of being POPC for other purposes—was not analyzed.

study's goal (for details, see OSF). We removed those cases in which both variables were coded as "surely delete," resulting in a final N of 419 (for a CONSORT flow chart of participant selection, see Supplementary Online Material, Figure A2).

4.3 Results

4.3.1 Manipulation Checks

To check whether the exclusion manipulation worked, we compared the participants' threatened belongingness after the writing task. After writing about a past exclusion experience, individuals felt more threatened in their belonging ($M = 2.94$) than those who wrote about a past inclusion experience ($M = 2.53$), Welch's $t(389.5) = 3.06$, $p = .001$ (one-sided), $d = 0.30$. Taken together, although the effect size was much smaller than in Study 1 and the experimental paradigm was different, these findings indicate a successful manipulation of threatened belongingness.

4.3.2 Main Results

A 2×3 repeated-measures ANCOVA (controlling for need to belong and trait self-esteem) yielded a main effect of ostracism on threatened belongingness, $F_{\text{Ostracism}}(1, 410) = 14.88$, $p < .001$, $\eta_G^2 = .030$, a main effect of time, $F_{\text{Time}}(1, 410) = 21.38$, $p < .001$, $\eta_G^2 = .008$, but no main effect of the symbol condition, $F_{\text{Symbol}}(1, 410) = 1.01$, $p = .365$ (.183 one-sided), $\eta_G^2 = .004$. Notably, the strongest predictor was the covariate trait self-esteem, $F_{\text{TSE}}(1, 410) = 304.07$, $p < .001$, $\eta_G^2 = .386$. Need to belong was not a significant covariate, $F_{\text{NTB}}(1, 410) = 0.445$, $p = .505$ (.253 one-sided), $\eta_G^2 = .001$. Although the interaction between ostracism and symbol was slightly above the alpha-level of .05, $F_{\text{Ostracism} \times \text{Symbol}}(2, 410) = 2.93$, $p = .054$, $\eta_G^2 = .012$, the two-way interaction between time and symbol, $F_{\text{Time} \times \text{Symbol}}(2, 410) = 5.21$, $p = .006$, $\eta_G^2 = .004$, as well as the three-way interaction were significant, $F_{\text{Ostracism} \times \text{Time} \times \text{Symbol}}(2, 410) = 4.59$, $p = .011$, $\eta_G^2 = .003$. Planned contrasts showed small effects: As expected, ostracized individuals showed lowest threatened belongingness after encountering the smartphone symbol with social apps ($M = 2.63$, $SD = 1.55$) compared to both informational

apps ($M = 2.94$, $SD = 1.36$) or no symbol ($M = 2.74$, $SD = 1.48$), $t(410) = -2.08$, $p = .019$ (one-sided), $d = 0.21$, or to informational apps alone, $t(410) = -3.44$, $p < .001$, $d = 0.34$. However, exploratory post hoc comparison showed that threatened belongingness did not significantly differ between the social-apps and the no-symbol conditions, $t(410) = 0.26$, $p = .397$ (one-sided), $d = 0.03$. An inspection of the interaction plots showed that threatened belongingness of ostracized individuals declined in all conditions at t2, except for the “Smartphone with information apps” condition (Figures 2 and 3).

Analyses without covariates showed the same pattern, although effect sizes were slightly smaller (for details, see OSF).

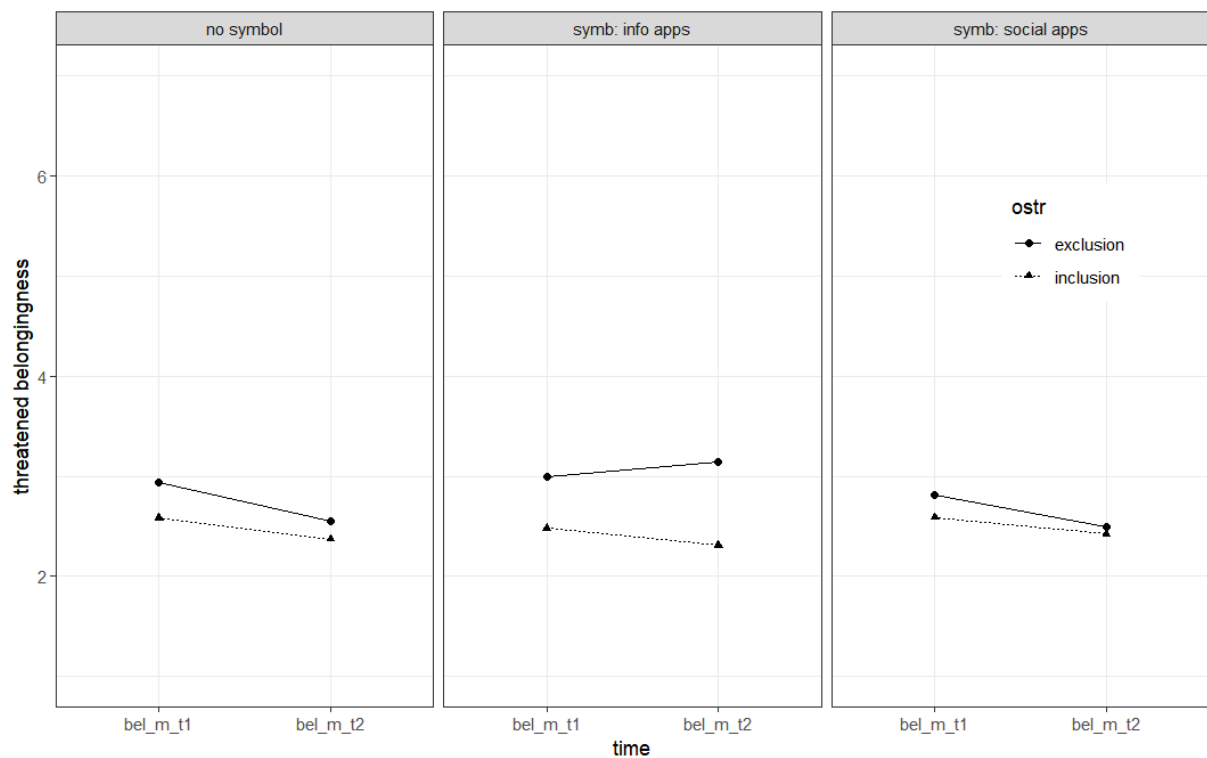


Figure 2. Interaction plot of two-factorial ANCOVA (controlling need to belong and trait self-esteem) of threatened belongingness at t1 and t2 by ostracism condition (Study 2).

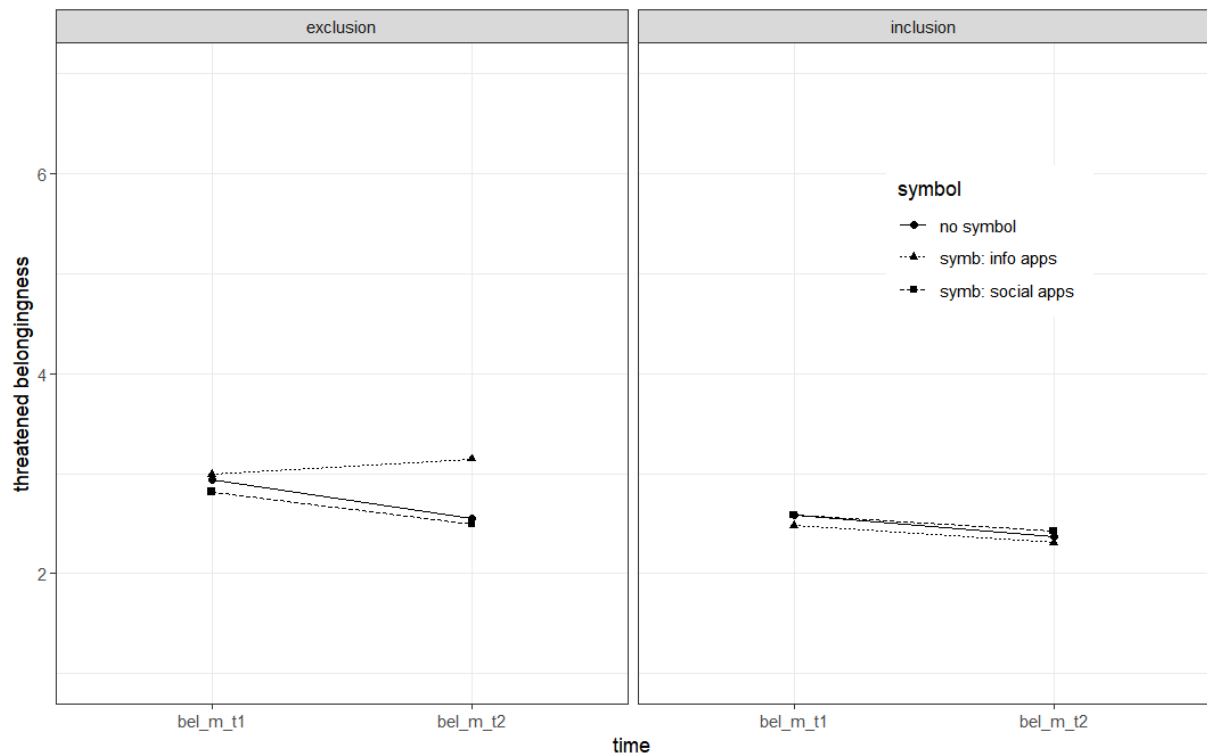


Figure 3. Interaction plot of two-factorial ANCOVA (controlling need to belong and trait self-esteem) of threatened belongingness at t1 and t2 by symbol condition (Study 2).

4.4 Brief Discussion

Study 2 supported the notion that benefitting from smartphone symbols after feeling ostracized depends on what the smartphone displays. In line with H1, those participants who encountered a symbol of a smartphone with social apps after re-experiencing an episode of ostracism were more effective in restoring their threatened belongingness than those who did not encounter such a symbol. Notably, when ostracized participants encountered a smartphone symbol displaying informational apps, threatened belongingness remained constant. In other words, when participants were ostracized, the smartphone symbol only worked as a coping tool when it was associated with social media apps. However, exploratory post hoc comparisons showed that the social-apps condition was not significantly more effective than the condition without any smartphone symbol.

5. General Discussion

Smartphones are nowadays our constant companions. Their permanent use, particularly related to social media, has many cognitive and affective implications and is often regarded as detrimental to human functioning—for instance, by increasing social pressure to be available, cognitive distraction, as well as stress and anxiety (Ross & Campbell, 2021). Concomitantly, however, using smartphones can make people feel sheltered and secure, stay in touch with their social network, and help them cope with stress, thereby contributing directly to the satisfaction of fundamental needs (Ross & Campbell, 2021). Beyond the mere use of social apps, the smartphone as a physical device has become a symbol of safety and connectedness. This may stem from the mental association of supportive ties and social resources with smartphones (e.g., Kardos et al., 2018; Katz, 2006), whose co-activation may facilitate the restoration of threatened belongingness. Following the notions of social shielding and social snacking (Gardner et al., 2005), in two experiments, we investigated whether and how smartphones as physical devices or their symbolic representations help buffer against and cope with thwarted belongingness, respectively. In Study 1, the availability of the smartphone device buffered against the negative effects of ostracism. This supports the assumption that a smartphone can indeed function as a physical first aid in the pocket and is consistent with previous research (Hunter et al., 2018; Panova & Lleras, 2016).

In Study 2, during coping after ostracism, the symbol of a smartphone with social media apps enhanced belongingness restoration compared to a smartphone symbol with informational apps. This supports the assumption that smartphone symbols can work as subtle reminders of social bonds only if they depict social media apps and thus can activate respective mental associations of social connectedness. This was also corroborated by the findings of the pilot test of Study 2 and is in line with previous research (e.g., Knausenberger et al., 2015). Moreover, these results help explain why the smartphone symbol depicting a neutral lock screen without social media apps did not exert any influence on belongingness restoration in Study 1. As a prerequisite, it seems that the mental representation of a

smartphone needs to be associated with its social use to elicit a sense of belonging or help restore threatened belongingness. In Study 2, however, the smartphone symbol with social apps did not significantly reduce threatened belongingness compared to the control condition. This raises concerns about its effectiveness as a social surrogate. The fact that the smartphone symbol with informational apps performed worse than the one with social media apps cannot be interpreted as evidence that social media apps facilitated belongingness restoration. Rather, it seems that the typical fade-out of ostracism effects during the distracting task accounted for this—just like in the control condition (e.g., Williams, 2009). But this natural recovery process should apply to the informational-apps condition as well. One reason why informational cues hindered the recovery process could be that smartphone users expect a prototypical smartphone to include social apps on the home screen and that such an expectation was violated in the informational-apps condition. Thus, future research should examine various stimuli during the recovery process to gain more insights into the effects of control conditions.

One limitation of our studies is that we did not investigate how strongly engaged participants were with their smartphones (e.g., Carolus et al., 2019; Clayton et al., 2015). In future studies, examining such relationships between users and their smartphones more deeply may explain how chronic accessible mental concepts of smartphones can impact the effectiveness of social cues. Individuals whose mental concepts are permanently salient might respond differently to the presence or absence of their smartphone or its symbolic representation. Among many socio-demographic factors, how smartphones and social media are adopted differs mostly across age groups, with younger people being more devoted to their mobile devices (Auxier & Anderson, 2021; Perrin, 2021). As our samples largely relied on young people, the generalizability of our findings is limited. Such a threat to external validity has also been an issue in previous, related lab experiments (e.g., Hunter et al., 2018; Knausenberger & Echterhoff, 2018; Sestir, 2020). However, as social bonds are crucial for the

health of older people who may use social media and smartphones differently to cope with threatened belongingness (Chen & Schulz, 2016; Hage et al., 2020), this needs to be addressed in future research.

Furthermore, although our studies focused on ostracism—a social threat—it is also possible that smartphone devices and their symbolic representation foster recovery from other threatening or stressful states (e.g., Rieger et al., 2017). When experiencing other kinds of threats like uncertainty or existential threats (e.g., receiving news about terrorist attacks or natural disasters), smartphones could be used as a coping tool (Wolfers & Schneider, 2021) and help restore thwarted needs. However, in these cases, the thwarted need structure could be more complex (e.g., including the needs for control and meaningful existence). Hence, it would be worthwhile to examine if these needs can be restored via (symbolic) smartphone devices as well. At the same time, it is important to keep in mind that the same mobile devices may not only represent what fortifies thwarted needs but also what ails them, for instance, by eliciting social pressure to be available (e.g., Halfmann & Rieger, 2019), getting ostracized (e.g., Lutz, 2022), or provoking stress and anxiety (e.g., Elhai et al., 2016; Elhai et al., 2017). Thus, future research should pay closer attention to the subjective meaning users attribute to their smartphone devices, thereby taking positive, negative, and ambivalent symbolic representations into account.

Finally, the recently proposed hierarchical computer-mediated communication (CMC) taxonomy (Meier & Reinecke, 2021) distinguishes between six levels: device, type of application, branded application, feature, interaction, and message. Such a differentiation helps disentangle seemingly contradictory findings in CMC and mental health research. Following this taxonomy, our first study is situated at the device level, whereas our second study rather fits the type of application or branded applications level. This holds for previous research. For instance, many studies focused on the branded application level (Chiou et al., 2015; Knausenberger et al., 2015; Knausenberger & Echterhoff, 2018; van Koningsbruggen et

al., 2017), whereas others zoomed in on the more fine-grained message level (Knowles et al., 2015) or the most general device level (Hunter et al., 2018; Panova & Lleras; Sestir, 2020). Taken together, future studies should investigate whether different operationalizations on different levels lead to similar conclusions. Although we assume that social snacking and social shielding may occur at any level, it is an empirical question yet to be tested.

Previous research on mobile CMC mainly focused on the direct effects of active usage on belongingness and well-being. We contend that our paper is a significant contribution to the rarely examined third-order effects of smartphones on belongingness, which may be especially important when people decide to abstain from using their smartphones (e.g., in a “digital detox” treatment, such positive indirect effects may disappear and lead to repercussions, e.g., Vally & D'Souza, 2019). Notably, third-order effects have been repeatedly reported in cognate fields (e.g., SNS; Knausenberger et al., 2015). Moreover, previous research found that present smartphone devices reduced social pain (Hunter et al., 2018). However, neither were these approaches derived from the extended model of belonging regulation, proposing the two indirect strategies of social snacking and social shielding (Gardner et al., 2005) nor were they tested with symbols of smartphones. Thus, in sum, we think that our approach applies, for the first time, these theoretically derived indirect strategies to the ideas of the third-order effects a smartphone device or its symbolic representation can have on threatened belongingness.

That said, we have to keep in mind that extant research predominantly focused on the short-term effects of social snacking and shielding. Thus, although scholars emphasized that symbolic bonds do not replace but complement in-person bonds (e.g., Gabriel et al., 2016), we still know little about how exclusively satisfying belongingness needs via social surrogates affects coping strategies and well-being in the long run. Whereas some researchers are skeptical about the enduring effectiveness of such strategies and suspect maladaptive implications for well-being (e.g., Panova & Lleras, 2016), others highlight that scholars

should avoid the fallacy of uniform efficacy and pay more attention to coping flexibility (Wolfers & Schneider, 2021), levels of analysis (Meier & Reinecke, 2021), or levels of comparison (Lutz et al., 2022). Indeed, a recent systematic review on need restoration and emotion regulation through using media showed great heterogeneity in coping effectiveness, which depended on methodological decisions (e.g., choice of comparison and control groups) and even varied within coping tools (e.g., the same coping tool was effective in one study but not in another) (Lutz et al., 2022). Future research on smartphones as physical devices and their symbolic representations should consider these insights into coping tools and put more effort into examining the heterogeneity of their short- and long-term effects.

To conclude, our studies are among the first that experimentally investigated whether and how smartphones as physical devices and their symbolic representation can temporarily remedy threatened belongingness. However, our findings are mixed. On the one hand, concerning smartphone symbols as subtle reminders, Study 2 showed that during coping after ostracism, a smartphone symbol with social media apps was more effective in belongingness restoration than a smartphone symbol with informational apps but only as effective as no smartphone symbol at all. On the other hand, in Study 1, we found that a smartphone can serve as a physical buffer. We think that the present studies resonate with theoretical assumptions and initially support the notion of smartphones as first aid in the pocket. Nevertheless, we want to emphasize that—similar to the fact that first aid kits only provide fast and preliminary support—we do not interpret the reported findings in such a way that smartphones may, metaphorically speaking, substitute profound medical and psychological care. Symbolic bonds (Gabriel et al., 2016) may provide temporal ease but do not allow inferring long-term benefits.

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Supplementary Online Material

Appendix A

Figure A1. CONSORT flow chart of participant selection (Study 1, $N_{\text{final}} = 74$).

Figure A2. CONSORT flow chart of participant selection (Study 2, $N_{\text{final}} = 419$).

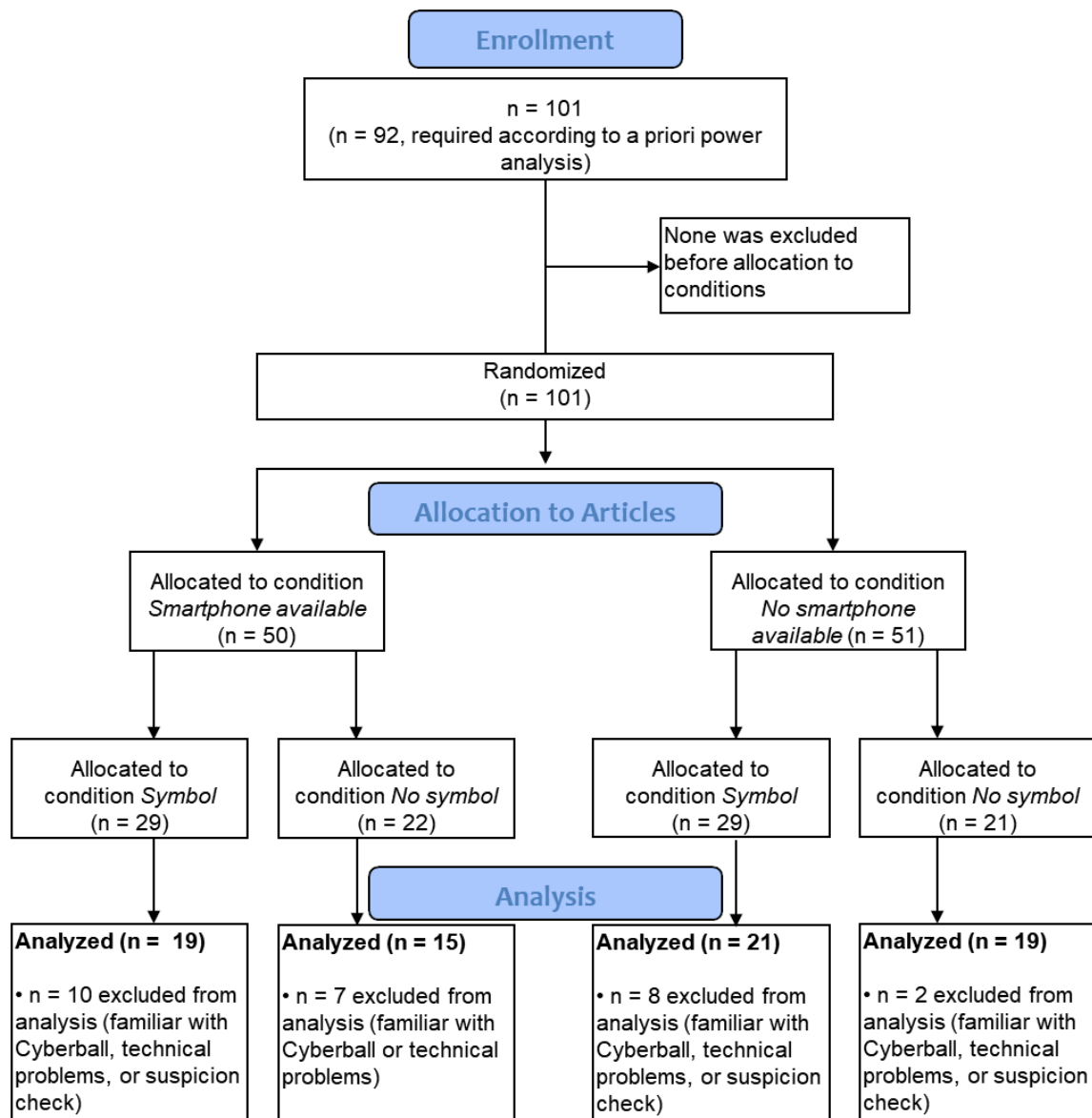


Figure A1. CONSORT flow chart of participant selection (Study 1, $N_{\text{final}} = 74$).

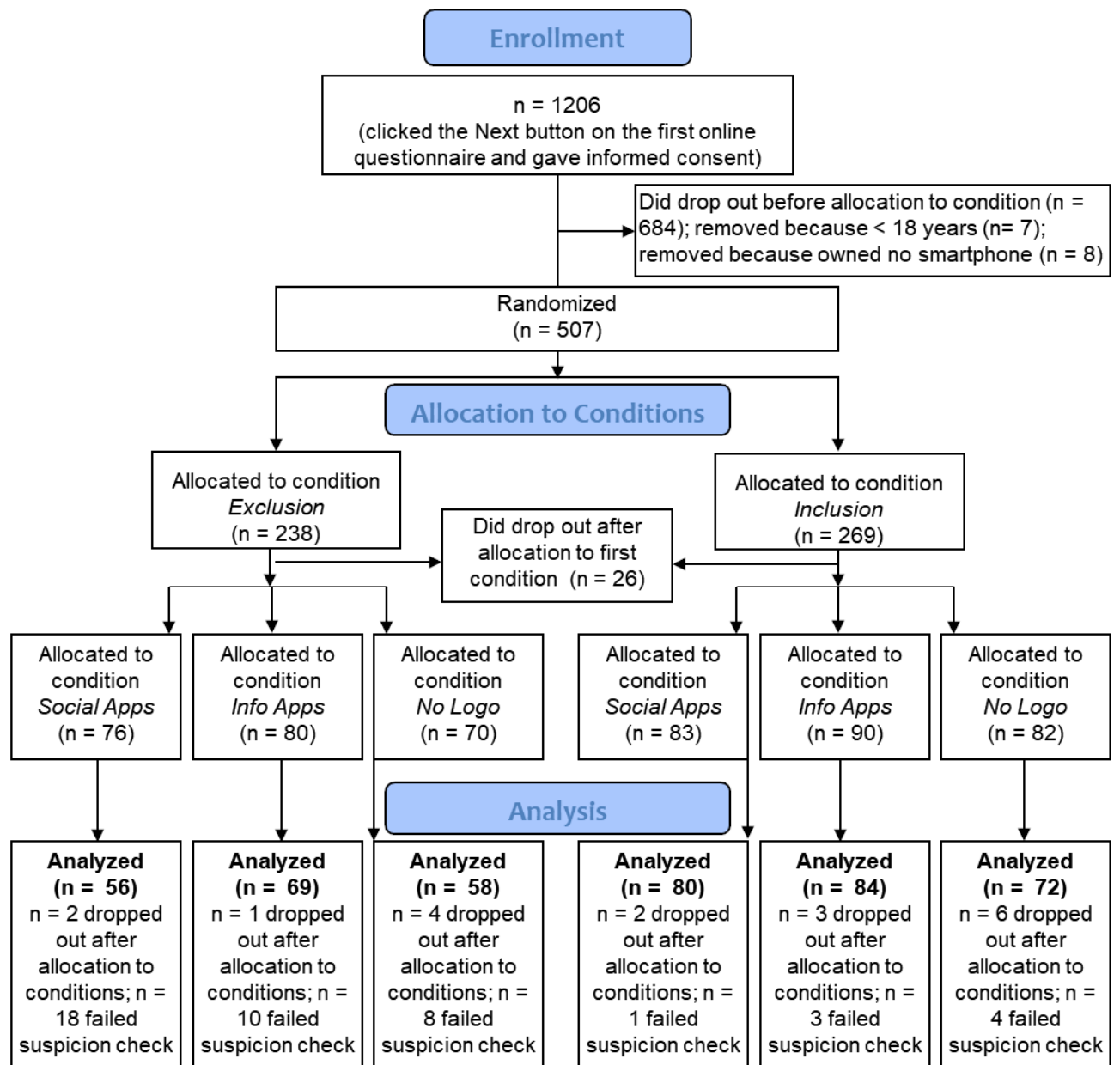


Figure A2. CONSORT flow chart of participant selection (Study 2, $N_{\text{final}} = 419$).