Computers in Human Behavior 91 (2019) 12–16

Contents lists available at ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Full length article

Smartphones reduce smiles between strangers

Kostadin Kushlev[a,*], John F. Hunter[b], Jason Proulx[c], Sarah D. Pressman[b], Elizabeth Dunn[c]

[a] Georgetown University, Department of Psychology, 37th and O Streets, N.W., Washington DC 20057, USA
[b] University of California, Irvine, Department of Psychology & Social Behavior, 4322 Social and Behavioral Sciences Gateway, Irvine, CA, USA
[c] University of British Columbia, Department of Psychology, 2136 West Mall, Vancouver, BC V6T 1Z4, Canada

ARTICLE INFO

Keywords:
Smartphones
Smiling
Nonverbal behavior
Social interactions
Mobile phones
Preregistered replication

ABSTRACT

New developments in technology—from the printing press to television—have long facilitated our capacity for "absent presence," enabling us to escape the limits of our immediate environment. Does being constantly connected to other people and activities through our smartphones diminish the need to engage with others in the immediate social world, reducing the likelihood of approach behavior such as smiling? In a preregistered experiment, strangers waited together with or without their smartphones; their smiling was later coded by trained assistants. Compared to participants without smartphones, participants with smartphones exhibited significantly fewer smiles of any kind and fewer genuine (Duchenne) smiles. These findings are based on objective behavioral coding rather than self-report and provide clear evidence that being constantly connected to the digital world may undermine important approach behavior.

In 1965, Intel engineer Gordon Moore predicted that the speed and power of microchips would grow exponentially, and his prophecy has largely come true over the five intervening decades. If cars had experienced a similar level of exponential growth since the 1960s, your car would now travel at 300,000 miles per hour and would cost just four cents (Friedman, 2016). Because of this rapid growth of microchips, many of us are now constantly accompanied by tiny, powerful computers, which keep us connected to the Internet wherever we are—a trend which is expected to intensify as today's smartphones and smartwatches are supplemented by other wearable technologies (Anderson & Rainie, 2014). How does being constantly connected to other people, places, and things affect engagement in the "real" (non-digital) world around us?

Although research on this topic is in its infancy, scholars have theorized that by providing access to broader social networks and other resources, mobile devices like smartphones may make people less engaged with their immediate social environment (e.g., Alter, 2017; Misra, Cheng, Genevie, & Yuan, 2014; Przybylski & Weinstein, 2013, 2017; Turkle, 2011, 2015). This points to the possibility that phones may interfere with the formation of new relationships or the simple pleasant exchanges that build social capital. It is important to test whether this theorizing is correct, especially given the growing epidemic of social isolation and loneliness in the US (Wilson & Moulton, 2010) and the concomitant health problems that go with these experiences (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Luo, Hawkley, Waite, & Cacioppo, 2012; Yang et al., 2016).

To our knowledge, however, no study has experimentally tested whether the presence of phones actually interferes with the kinds of approach behaviors that are critical in building social capital. Indeed, recent research suggests that phones can be helpful in some social situations. Specifically, in unpleasant social situations, the ability to retreat into the digital world may confer psychological and physiological benefits (Hunter, Hooker, Rohleder, & Pressman, 2018; Panova & Lleras, 2016), perhaps by serving as a kind of "security blanket" against aversive interactions, or even simply as a distraction (Dwyer, Kushlev, & Dunn, in press; Kushlev, Proulx, & Dunn, 2016; Smith, 2015; Strayer, Drews, & Crouch, 2006; Ward, Duke, Gneezy, & Bos, 2017). For example, Hunter et al. (2018) found that the negative psychological and physical stress responses that arise from social rejection were ameliorated for those with access to their smartphones. This study points to a surprising possibility: That by providing a source of comfort and reassurance, smartphones might make people *more* likely to exhibit approach-oriented behavior during social interactions (Hypothesis 1). This possibility is particularly relevant during interactions with strangers, in which people tend to fear that their approach-oriented behaviors could be rebuffed (Epley & Schroeder, 2014). Alternatively, by offering a familiar, comfortable, and distracting alternative to engaging in potentially awkward interactions with strangers, smartphones might draw people away from casual social interactions, diminishing the inclination to exhibit approach behaviors (Hypothesis 2).

* Corresponding author.
E-mail address: kostadin.kushlev@georgetown.edu (K. Kushlev).

https://doi.org/10.1016/j.chb.2018.09.023
Received 12 June 2018; Received in revised form 12 September 2018; Accepted 17 September 2018
Available online 21 September 2018
0747-5632/

To examine these competing possibilities, we focused on what is arguably the most fundamental approach-oriented social behavior: smiling. From the first months of life, infants recognize and respond to smiles (e.g., Bornstein & Arterberry, 2003; Kuchuk, Vibbert, & Bornstein, 1986), and smiles are a central determinant of the bond that forms between infants and caregivers (Fraiberg, 1977; Spitz & Wolf, 1946). Theorists have proposed that smiling evolved specifically as a social behavior that communicates a lack of threat to others (Shariff & Tracy, 2011), making it central for approaching novel social partners. Empirically, smiling has long been recognized as a behavior that encourages approach specifically from strangers (Connolly & Smith, 1972; Walsh & Hewitt, 1985), confers impressions of trust (Schmidt, Levenstein, & Ambadar, 2012), and is associated with perceptions of attractiveness (McGinley, McGinley, & Nicholas, 1978; Reis et al., 1990).

In the present research, we tested whether having access to smartphones affects people's inclination to smile during casual interactions with strangers. Given the competing hypotheses generated by the existing theoretical and empirical literature, our goal was to establish whether phones have a positive or negative effect on smiling, laying the groundwork for future work delineating the possible mediators and moderators of this basic effect. To begin this undertaking, we coded videos from a study conducted previously in our lab, in which pairs of strangers were randomly assigned to wait together for 10 min with or without access to their phones ($N = 76$; $M_{age} = 20.23$, $SD = 1.93$; 75% females). Though this initial study was underpowered to examine our hypotheses, we found some exploratory evidence that people tended to smile less frequently when they had access to their phones (data available at: https://tinyurl.com/Pilot-Smartphones-Smiling). This study also showed that smiling behavior only occurred when participants reported interacting with each other during the waiting period; in the absence of such interactions, we observed no smiling at all (*M*s = 0, *SD*s = 0). Thus, we conducted a larger pre-registered study, in which we specifically examined smiling behavior in pairs of strangers who reported interacting with each other. As in our pilot study, participants were assigned to wait for 10 min with a stranger, either with or without access to their phones.

1. Preregistered hypotheses and exclusion criteria

Before coding the videos, we pre-registered our hypotheses and exclusion criteria on the Open Science Framework (OSF): https://tinyurl.com/Pre-Reg-Smartphones-Smiling. We predicted that participants would display fewer Duchenne smiles and fewer total smiles when they had access to their phones than when they did not. We also pre-determined the criteria for inclusion, and did not code the videos of participants who failed to meet these criteria (in the process of coding, we discovered several additional participants who did not meet our criteria and excluded them; see Supplementary Online Materials–SOM for details). Specifically, because we were interested in casual social interactions between strangers, we excluded participants who reported being friends. Second, because our pilot data showed that smiling only occurred when participants interacted, we excluded dyads who reported not interacting at all. Finally, participants whose smiling behavior could not be coded due to missing videos or visual obstructions in the video footage were excluded by necessity; in some dyads, we obtained usable footage for one of the two participants, leaving us with an odd number of participants (N = 169).

2. Method

2.1. Participants

As described above, we obtained usable video footage from 169 participants across 90 dyads ($M_{age} = 20.27$, $SD = 2.68$; 72.2% female; 53.3% Asian; 23.7% Caucasian). Our participants were undergraduate students recruited through the subject pool at the University of British Columbia and agreed to participate in this study by signing a consent form approved by the behavioral research review board of the university. This sample included 62% same-gender dyads (48 female/female dyads and 8 male/male dyads) and 38% mixed gender dyads (34 female/male dyads), with approximately equal numbers assigned to each condition (49 dyads for the *phoneless* and 41 dyads for the *phone* conditions; see Procedure for details). Based on our pilot data, we anticipated a fairly large effect size of $d = 0.73$ (with an intraclass correlation, $ICC = 0.50$), and thus we expected to have over 80% power to detect similar effects in the present study.

2.2. Procedure

Two unacquainted participants were scheduled for each study session, and each pair was randomly assigned to the *phone* or *phoneless* condition. In the *phoneless* condition, both participants were asked to put all of their belongings in a locked cabinet when they arrived for the study. In the *phone* condition, they were also asked to place their belongings in the cabinet, but they were allowed to keep their phones. Next, the research assistant (RA) brought them into a lab room to sign consent forms. She explained that she was running behind schedule and would be ready to run them through the study in about 10 min, promising that they would still finish the study on time. She then left the participants alone in the room for approximately 10 min. Their behavior during this waiting period was videotaped by two cameras positioned to obtained clear, direct shots of the participants' faces.

After the waiting period, the RA returned and administered questionnaires, which included self-report measures designed to test other research questions. Of relevance to the present investigation, this questionnaire asked participants to report their current affect, using items drawn from Schimmack and Grob's (2000) affect valence scale, providing a validity check on our behavioral coding of smiling. Participants also reported how much they had talked to the other participant during the waiting period (0 = *none of the time* to 4 = *the whole time*), which we used to determine whether an interaction had occurred.[1] After completing the questionnaires, participants were fully debriefed. We have disclosed all measures, manipulations, and exclusions in the study, with the complete questionnaires and protocols available on OSF at https://tinyurl.com/Materials-Smartphones-Smiling.

2.3. Coding procedure

Two trained coders watched the videos of the waiting period and independently assessed smiling using previously validated muscle activity indicators (Ekman & Friesen, 1982). Coders distinguished between Duchenne and non-Duchenne smiles (Friesen & Ekman, 1983). Duchenne smiles display true enjoyment and positive affect (Frank, Ekman, & Friesen, 1993), whereas non-Duchenne smiles are often reported to be “fake” or “social”. The duration of each smile was also recorded in addition to the number and type of smiles, enabling us to calculate total smiling time. Interrater reliability for the three indices of smiling was high, *ICC*s[1,2] > 0.76. Supporting the validity of the coding, higher positive affect was associated with a greater number of Duchenne smiles, $r = 0.24$, $p = .003$, and total smiles (sum of Duchenne and non-Duchenne smiles), $r = 0.22$, $p = .007$ (these effect sizes were calculated after accounting for nonindependence between participants in dyads). See Supplementary Online Materials for detailed description of the coding procedure.

[1] Fifty-eight dyads reported interacting 4–*all of the time*, 19 dyads reported talking 3–*most of the time,* 8 dyads reported talking 2–*some of the time,* and 5 dyads reported talking 1–*a bit of the time*. In cases of a mismatch between participants, we took the higher rating to classify the dyads into these four groups.

2.4. Analytic strategy

Because participants completed the study in dyads, their smiling behavior might be nonindependent. To account for nonindependence, we used multilevel linear modeling (MLM) with participants at Level 1 clustered within dyads at Level 2. This approach enabled us to estimate the effects of condition (a Level 2 variable) on smiling (a Level 1 variable). We used maximum likelihood estimation (ML) on SPSS21. Significance was estimated using the Wald method—equivalent to the *t*-tests in single-level analyses. The intercept-only models (fixed and random intercepts + error) indicated the presence of substantial non-independence; for example, the intraclass correlation for the number of Duchene smiles was $ICC = 0.26$. We thus proceeded to estimate the full MLM models, adding the fixed effect of condition to the fixed and random intercepts, and error. Since condition was a Level 2 variable, random effects of condition were redundant and therefore not modeled. The fixed effects can be interpreted as the mean difference in smiling between conditions, akin to unstandardized regression coefficients. For the fixed effects, we also provide standardized effect sizes calculated from the Wald *t*-test and the degrees of freedom (Kashdan & Steger, 2006). See OSF for all data used in the analyses: https://tinyurl.com/Data-Smartphones-Smiling.

3. Results

3.1. Pre-registered analyses

Consistent with our pre-registered hypotheses, we found medium-to-large effects of condition on both measures of smiling. Compared to people in the *phoneless* condition, people in the *phone* condition exhibited significantly fewer Duchenne smiles, $b = -6.61$, $SE = 2.36$, 95%CI [-11.29; −1.93], $p = .006$, and fewer total smiles (i.e., sum of Duchenne and non-Duchenne smiles), $b = -10.93$, $SE = 4.11$, 95%CI [-19.09; −2.77], $p = .009$ (see Table 1 for means, standard deviations, and effect sizes; see Table S1 for all model parameters). In addition to these preregistered measures, we coded how much time participants spent smiling, providing a more practically interpretable effect size. Specifically, while participants in the phoneless condition on average spent about 2 min and 30 s smiling during the 10-min period, those in the phone condition spent about 30% less time smiling—a little more than 1.5 min during the 10-min period, $b = -44.27$, $SE = 17.83$, 95%CI [-79.67; −8.86], $p = .015$ (for details, see Table 1 here and Table S1 in SOM).

The videos in the phone condition ($M = 584.73$ s) were slightly shorter than the videos in the phoneless condition ($M = 605.16$ s), suggesting that these differences in smiling cannot be attributed to video duration; indeed, all effects remained significant after adjusting for video length: $ps < .034$. Following our pre-registered analysis plan, we repeated our main analyses excluding participants who experienced procedural errors, such as getting the debriefing form too early ($n = 9$; see SOM for further details); excluding these participants did not substantively change any of the observed effects of condition on smiling, $ps < .014$.

Table 1
Effects of phone manipulation on smiling during social interactions.

	Phone M (SD)	Phoneless M (SD)	Cohen's d
# Smiles	26.70 (19.63)	37.80 (24.70)	−0.56
# Duchenne Smiles	13.85 (11.80)	20.60 (15.52)	−0.59
Time Smiling (sec)	103.63 (86.90)	149.09 (108.29)	−0.52

Note. Effect sizes were estimated based on the Wald *t*-test of the fixed effect and corresponding degrees of freedom; means and standard deviations are exact descriptive statistics (rather than model-derived). See Table S1 in SOM for analyses details.

3.2. Exploratory analyses

In our main analyses, we focused on the effects of phones on the quality of initiated social interactions as indicated by the presence of smiling, and we only coded videos for dyads who reported interacting with each other. But did phones also impact whether or not social interactions were initiated in the first place? We conducted an exploratory analysis to examine whether condition also affected the likelihood that participants initiated an interaction at all. Consistent with our broader argument that phones reduce approach behavior between strangers, fully 32 people reported never interacting with their partner during the waiting period in the phone condition compared to just 6 people in the phoneless condition. To formally test whether people in the phone (vs. phoneless) condition were less likely to ever interact with each other (a binary outcome), we included these 19 additional dyads (excluded from our pre-registered smiling analyses for reporting no interaction during the waiting period; see SOM for details). Using this expanded sample (n = 207 participants), we employed generalized linear mixed modeling with model-based estimates and Satterthwaite degrees of freedom (GLMM; GenLinMixed command in SPSS 21), specifying a binomial probability distribution and employing the *logit* function, $f(x) = \ln(x/(1-x))$. This logistic multilevel modeling indicated that people were indeed substantially less likely to initiate an interaction with each other when phones were present versus absent, $b = -2.13$, $SE = .71$, $p = .003$, $e^b = 0.12$, 95%CI of e^b [0.03; 0.49]. These exploratory analyses provide broader evidence that phones may reduce motivation to initiate social interactions.

4. Discussion

The present research provides the first experimental evidence that smartphones reduce smiling when people have the opportunity to engage in casual social interactions. Specifically, while sitting together in a waiting room, pairs of peers who had their smartphones were less likely to smile—and to smile genuinely—compared to those whose smartphones had been taken away. In fact, people who had their phones displayed genuine (Duchenne) smiles approximately 30% less often, while also spending about 30% less time smiling overall. Because these findings are based on objective behavioral coding rather than self-report, they provide the clearest evidence to date that the ubiquitous and pervasive access to the digital world enabled by smartphones may be undermining approach-oriented social behavior in the immediate, nondigital environment. Thus, while our ability to disconnect from the nondigital world through our smartphones can be useful in aversive social situations (Hunter et al., 2018), the present findings suggest that this same affordance may be detrimental in the context of more benign social situations.

Although we focused on smiling, our exploratory analyses provide additional converging evidence for the effect of phones on approach behavior. Fully 32 people in the phone condition reported never interacting with the other person in the waiting room, compared to just 6 people in the phoneless condition. Notably, this should have worked against our ability to detect differences in smiling between conditions: Because more people in the phone condition effectively “dropped out” of our smiling analyses by not interacting at all with their partner, we presumably lost more individuals from the less sociable tail of the distribution. Thus, the remaining participants in the phone condition should have been more inclined to exhibit friendly behavior. The fact that we still see reduced smiling in the phone condition suggests that phones can have multiple, independent effects on behavior between strangers, underscoring the need for further research exploring the effects of phones on approach-oriented social behavior.

4.1. Future directions: mechanisms

Our goal in the present research was to determine whether smartphones reduce or increase smiling when people have the opportunity to engage in casual face-to-face interactions. To provide the strongest test of these competing hypotheses, we used an experimental design in a controlled lab environment, while relying on observer-coded—rather than self-reported—behavior. It was beyond our goals (and preregistered hypotheses) to explore the underlying mechanisms behind any effect of smartphones on smiling. Indeed, rigorous exploration of mechanisms requires a series of studies that manipulate not only the independent variable, but also the proposed mediator (Spencer, Zanna, & Fong, 2005). In lieu of trying to provide limited correlational evidence for mechanisms, we draw on existing empirical research to discuss plausible mechanisms and provide fruitful directions for future research.

One possible mechanism underlying the observed effects of phones on smiling is that phones may reduce the motivation to engage in approach behavior. From this motivational perspective, phone use may draw people away from casual social interactions by offering them a familiar, comfortable alternative (c.f., Hunter et al., 2018) to engaging in potentially awkward interactions with strangers (c.f., Epley & Schroeder, 2014). Alternatively, from a cognitive perspective, phones may tax available cognitive resources, which could potentially undermine the ability to initiate and sustain a social interaction with a novel social partner. Indeed, recent research has shown that even the mere presence of one's phone in the same room can reduce working memory capacity (Ward et al., 2017). In addition to these basic motivational and cognitive processes, phones may also alter people's construal of social situations. From this social cognition perspective, phones may reduce smiling by making their users less likely to perceive the presence of a stranger as an opportunity for social interaction. In this way, phones could spur a recursive process of negative social signaling: when you see me using my phone, you assume I am not interested in interacting with you, leading you to behave in less friendly manner, which I, in turn, interpret as your lack of interest in talking to me. Notably, these three possible mechanisms could operate in tandem, and documenting each of them represents fertile ground for future research.

4.2. Implications

Because smiling is a fundamental building block of human social behavior, our findings are relevant to understanding the effects of technology in a diverse array of domains. In the healthcare domain, smiling can facilitate communication and connection between a patient and a nurse (Lotzkar & Bottorff, 2001), and smiling is associated with shorter cardiovascular recovery in response to negative emotional events (Fredrickson & Levenson, 1998; Kraft & Pressman, 2012). In the workplace, longitudinal research shows that employees who express more positive emotion, including smiling, tend to receive better evaluations over time, as well as higher pay (Staw, Sutton, & Pelled, 1994). Turning to the classroom, past research suggests that phone use may distract students from attending to course material (e.g., Wood et al., 2012); our findings point to the possibility that phones may also make students less inclined to engage with their classmates—which has surprisingly potent effects on how much they enjoy coming to class (Sandstrom & Rawn, 2015). Finally, beyond its role in casual social interactions, reduced smiling due to phone use may also play a role in the domain of close relationships, such as in phubbing—snubbing others through phone use (Karadag et al., 2015; Roberts & David, 2016).

More broadly, by treating smiling as a basic behavioral mechanism that is affected by phones, it should be possible to make a broad range of novel predictions about the consequences of phone use in a diverse array of social environments.

4.3. Limitations

A key limitation of the present research is that we only examined university students in the lab; future research should extend this work to other populations and contexts. Another limitation of our studies is that we manipulated access to smartphones at the dyadic level; it would be interesting to explore the effects of smartphones when only one person has access to their phones. Would the negative effects be reduced because only one partner can disappear into the digital world—or, would the effects be even larger because the phoneless partner would feel a greater sense of being ignored? Finally, it is worth noting that we did not include conditions in which participants had access to other forms of media or devices (e.g., laptops, TV, magazines, books). Thus, our study only enables conclusions about the presence versus absence of smartphones, and not about the effects of smartphones relative to other media devices. We note, however, that this choice of design was intentional because of the ubiquity of smartphones throughout people's social lives; although reading a book or checking email on a laptop would presumably produce similar detrimental effects on smiling, it is important to understand the effects of smartphones specifically because of their ability to pervade social interactions. Indeed, nine out of ten smartphone owners in the U.S. report using their phones during their most recent social activity (Rainie & Zickuhr, 2015)—a number likely unmatched by any other existing media technology.

5. Conclusion

Each new advance in technology—from the printing press to television—has helped to facilitate our capacity for “absent presence,” by enabling us to mentally retreat from our immediate environment (Gergen, 2002). More broadly, the tools developed by humans have exercised a profound impact on the development of our species over the millennia (*c.f.,* culture-gene coevolution; Chudek & Henrich, 2011; Moya & Henrich, 2016). And just as the telegraph, the automobile, or the television transformed human mobility and communication in the 20th century (e.g., Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Putnam, 1995; Slade, 2012), mobile computing seems to be transforming how, where, and when people communicate, work, and play in the 21st century. Our findings point to the need for systematic psychological research on how human behavior is being changed by humans' modern technological environment.

Acknowledgements

This work has been funded by the Social Sciences and Humanities Research Council of Canada, grant 435-2015-0204, awarded to Elizabeth Dunn.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chb.2018.09.023.

References

Alter, A. (2017). *Irresistible: The rise of addictive technology and the business of keeping us hooked.* New York, NY: Penguin Press.
Anderson, J., & Rainie, L. (2014, March 11). *Digital life in 2025*. Retrieved from: http://www.pewinternet.org/2014/03/11/digital-life-in-2025/.
Bornstein, M. H., & Arterberry, M. E. (2003). Recognition, discrimination and categorization of smiling by 5-month-old infants. *Developmental Science, 6*(5), 585–599. https://doi.org/10.1111/1467-7687.00314.
Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics, 113*(4), 708–713. https://doi.org/10.1542/peds.113.4.708.
Chudek, M., & Henrich, J. (2011). Culture–gene coevolution, norm-psychology and the emergence of human prosociality. *Trends in Cognitive Sciences, 15*(5), 218–226. https://doi.org/10.1016/j.tics.2011.03.003.
Connolly, K., & Smith, P. K. (1972). Reactions of pre-school-children to a strange observer. *Ethological Studies of Child Behaviour,* 157–172.
Dwyer, R., Kushlev, K., & Dunn, E. (2018). Smartphone use undermines enjoyment of

face-to-face social interactions. *Journal of Experimental Social Psychology, 78*, 233–239. https://doi.org/10.1016/j.jesp.2017.10.007.
Ekman, P., & Friesen, W. V. (1982). Felt, false, and miserable smiles. *Journal of Nonverbal Behavior, 6*(4), 238–252. https://doi.org/10.1007/BF00987191.
Epley, N., & Schroeder, J. (2014). Mistakenly seeking solitude. *Journal of Experimental Psychology. General, 143*(5), 1980–1999. https://doi.org/10.1037/a0037323.
Fraiberg, S. (1977). *Every child's birthright: In defense of mothering.* New York, NY: Basic Books.
Frank, M. G., Ekman, P., & Friesen, W. V. (1993). Behavioral markers and recognizability of the smile of enjoyment. *Journal of Personality and Social Psychology, 64*(1), 83–93. https://doi.org/10.1037//0022-3514.64.1.83.
Fredrickson, B. L., & Levenson, R. W. (1998). Positive emotions speed recovery from the cardiovascular sequelae of negative emotions. *Cognition & Emotion, 12*(2), 191–220. https://doi.org/10.1080/026999398379718.
Friedman, T. L. (2016). *Thank you for being late: An optimist's guide to thriving in the age of accelerations.* New York, NY: Farrar, Straus and Giroux.
Friesen, W. V., & Ekman, P. (1983). Unpublished manuscript*EMFACS-7: Emotional facial action coding system, Vol. 2*, University of California at San Francisco1 (36).
Gergen, K. J. (2002). The challenge of absent presence. In J. E. Katz, & M. Aakhus (Eds.). *Perpetual contact: Mobile communication, private talk, public performance* (pp. 227–241). New York, NY: Cambridge University Press.
Holt-Lunstad, J., Smith, T. B., Baker, M., Harris, T., & Stephenson, D. (2015). Loneliness and social isolation as risk factors for mortality: A meta-analytic review. *Perspectives on Psychological Science, 10*(2), 227–237. https://doi.org/10.1177/1745691614568352.
Hunter, J. F., Hooker, E. D., Rohleder, N., & Pressman, S. D. (2018). The use of smartphones as a digital security blanket: The influence of phone use and availability on psychological and physiological responses to social exclusion. *Psychosomatic Medicine, 80*(4), 345–352.
Karadağ, E., Tosuntaş, Ş. B., Erzen, E., Duru, P., Bostan, N., Şahin, B. M., et al. (2015). Determinants of phubbing, which is the sum of many virtual addictions: A structural equation model. *Journal of Behavioral Addictions, 4*(2), 60–74. http://doi.org/10.1556/2006.4.2015.005.
Kashdan, T. B., & Steger, M. (2006). Expanding the topography of social anxiety: An experience sampling assessment of positive emotions and events, and emotion suppression. *Psychological Science, 17*, 120–128.
Kraft, T. L., & Pressman, S. D. (2012). Grin and bear it: The influence of manipulated facial expression on the stress response. *Psychological Science, 23*(11), 1372–1378. https://doi.org/10.1177/0956797612445312.
Kuchuk, A., Vibbert, M., & Bornstein, M. H. (1986). The perception of smiling and its experiential correlates in three-month-old infants. *Child Development, 57*(4), 1054–1061. https://doi.org/10.1111/j.1467-8624.1986.tb00266.x.
Kushlev, K., Proulx, J., & Dunn, E. W. (2016, May). Silence your phones: Smartphone notifications increase inattention and hyperactivity symptoms. *Proceedings of the 2016 CHI conference on human factors in computing systems* (pp. 1011–1020). ACM.
Lotzkar, M., & Bottorff, J. L. (2001). An observational study of the development of a nurse-patient relationship. *Clinical Nursing Research, 10*(3), 275–294. https://doi.org/10.1177/10547730122158932.
Luo, Y., Hawkley, L. C., Waite, L. J., & Cacioppo, J. T. (2012). Loneliness, health, and mortality in old age: A national longitudinal study. *Social Science & Medicine, 74*(6), 907–914. https://doi.org/10.1016/j.socscimed.2011.11.028.
McGinley, H., McGinley, P., & Nicholas, K. (1978). Smiling, body position, and interpersonal attraction. *Bulletin of the Psychonomic Society, 12*(1), 21–24. https://doi.org/10.3758/BF03329613.
Misra, S., Cheng, L., Genevie, J., & Yuan, M. (2014). The iPhone effect: The quality of in-person social interactions in the presence of mobile devices. *Environment and Behavior, 48*(2), 275–298. https://doi.org/10.1177/0013916514539755.
Moya, C., & Henrich, J. (2016). Culture–gene coevolutionary psychology: Cultural learning, language, and ethnic psychology. *Current Opinion in Psychology, 8*, 112–118. https://doi.org/10.1016/j.copsyc.2015.10.001.
Panova, T., & Lleras, A. (2016). Avoidance or boredom: Negative mental health outcomes associated with use of information and communication technologies depend on users' motivations. *Computers in Human Behavior, 58*, 249–258. https://doi.org/10.1016/j.chb.2015.12.062.
Przybylski, A. K., & Weinstein, N. (2013). Can you connect with me now? How the presence of mobile communication technology influences face-to-face conversation quality. *Journal of Social and Personal Relationships, 30*(3), 237–246. https://doi.org/10.1177/0265407512453827.
Przybylski, A. K., & Weinstein, N. (2017). A large-scale test of the goldilocks hypothesis: Quantifying the relations between digital-screen use and the mental well-being of adolescents. *Psychological Science, 28*(2), 204–215. https://doi.org/10.1177/0956797616678438.
Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy, 6*, 65–78. https://doi.org/10.1353/jod.1995.0002.
Rainie, L., & Zickuhr, K. (2015, August 26). *Americans' views on mobile etiquette.* Retrieved from: http://www.pewinternet.org/2015/08/26/americans-views-on-mobile-etiquette/.
Reis, H. T., Wilson, I. M., Monestere, C., Bernstein, S., Clark, K., Seidl, E., & Radoane, K. (1990). What is smiling is beautiful and good. *European Journal of Social Psychology, 20*(3), 259–267. https://doi.org/10.1002/ejsp.2420200307.
Roberts, J. A., & David, M. E. (2016). My life has become a major distraction from my cell phone: Partner phubbing and relationship satisfaction among romantic partners. *Computers in Human Behavior, 54*, 134–141. http://doi.org/10.1016/j.chb.2015.07.058.
Sandstrom, G. M., & Rawn, C. D. (2015). Embrace chattering students: They may be building community and interest in your class. *Teaching of Psychology, 42*(3), 227–233. https://doi.org/10.1177/0098628315587620.
Schimmack, U., & Grob, A. (2000). Dimensional models of core affect: A quantitative comparison by means of structural equation modeling. *European Journal of Personality, 14*(4), 325–345. https://doi.org/10.1002/1099-0984(200007/08)14:4 < 325::AID-PER380 > 3.3.CO;2-9.
Schmidt, K., Levenstein, R., & Ambadar, Z. (2012). Intensity of smiling and attractiveness as facial signals of trustworthiness in women. *Perceptual & Motor Skills, 114*(3), 964–978. https://doi.org/10.2466/07.09.21.PMS.114.3.964-978.
Shariff, A. F., & Tracy, J. L. (2011). What are emotion expressions for? *Current Directions in Psychological Science, 20*(6), 395–399. https://doi.org/10.1177/0963721411424739.
Slade, G. (2012). *Big disconnect: The story of technology and loneliness.* Amherst, NY: Prometheus Books.
Smith, A. (2015, April 1). *U.S. smartphone use in 2015.* Retrieved from: http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/.
Spencer, S. J., Zanna, M. P., & Fong, G. T. (2005). Establishing a causal chain: Why experiments are often more effective than mediational analyses in examining psychological processes. *Journal of Personality and Social Psychology, 89*(6), 845–851. https://doi.org/10.1037/0022-3514.89.6.845.
Spitz, R. A., & Wolf, K. M. (1946). Anaclitic depression; an inquiry into the genesis of psychiatric conditions in early childhood, II. *Psychoanalytic Study of the Child,* 2313–2342.
Staw, B. M., Sutton, R. I., & Pelled, L. H. (1994). Employee positive emotion and favorable outcomes at the workplace. *Organization Science, 5*(1), 51–71. https://doi.org/10.1287/orsc.5.1.51.
Strayer, D. L., Drews, F. A., & Crouch, D. J. (2006). A comparison of the cell phone driver and the drunk driver. *Human Factors, 48*(2), 381–391. https://doi.org/10.1518/001872006777724471.
Turkle, S. (2011). *Alone together: Why we expect more from technology and less from each other.* New York, NY: Basic Books.
Turkle, S. (2015). *Reclaiming conversation: The power of talk in a digital age.* New York, NY: Penguin Press.
Walsh, D. G., & Hewitt, J. (1985). Giving men the come-on: Effect of eye contact and smiling in a bar environment. *Perceptual & Motor Skills, 61*(3), 873–874. https://doi.org/10.2466/pms.1985.61.3.873.
Ward, A. F., Duke, K., Gneezy, A., & Bos, M. W. (2017). Brain drain: The mere presence of one's own smartphone reduces available cognitive capacity. *Journal of the Association for Consumer Research, 2*(2), 140–154. http://doi.org/10.1086/691462.
Wilson, C., & Moulton, B. (2010). *Loneliness among older adults: A national survey of adults 45+.* Washington, DC: AARP Inc.
Wood, E., Zivcakova, L., Gentile, P., Archer, K., De Pasquale, D., & Nosko, A. (2012). Examining the impact of off-task multi-tasking with technology on real-time classroom learning. *Computers & Education, 58*(1), 365–374. http://doi.org/10.1016/j.compedu.2011.08.029.
Yang, Y. C., Boen, C., Gerken, K., Li, T., Schorpp, K., & Harris, K. M. (2016). Social relationships and physiological determinants of longevity across the human life span. *Proceedings of the National Academy of Sciences, 113*(3), 578–583. https://doi.org/10.1073/pnas.1511085112.

Kostadin Kushlev is an assistant professor at Georgetown University. His research focuses on the antecedents and consequences of subjective well-being, health, and social life in the digital age. John Hunter is a PhD candidate at the University of California, Irvine. Jason Proulx received his Bachelor's degree (Honors) from the University of British Columbia. His research focuses on the impact of technology on psychological well-being. Sarah D. Pressman is an Associate Professor of Psychology & Social Behavior at the University of California, Irvine. Her research focuses on the interplay between positive emotions, stress, and health. Elizabeth W. Dunn is a professor of psychology at the University of British Columbia. Her research focuses on optimizing the use of time, money, and technology to promote human well-being.