Digital Communication Media Use and Psychological Well-Being: A Meta-Analysis

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The puzzle of whether digital media are improving or harming psychological well-being has been plaguing researchers and the public for decades. Derived from media richness theory, this study proposed that phone calls and texting improve well-being, while use of social network sites (SNSs), instant messaging (IM), and online gaming may displace other social contacts and, thereby, impair well-being. To test this hypothesis, a meta-analysis of 132 studies was conducted. The results showed that phone calls and texting were positively correlated with well-being, whereas online gaming was negatively associated with well-being. Furthermore, the relationship between digital media use and well-being was also contingent upon the way the technology was used. A series of meta-analyses of different types of SNS use and well-being was used to elucidate this point: interaction, self-presentation, and entertainment on SNSs were associated with better well-being, whereas consuming SNSs' content was associated with poorer well-being.

Keywords: Media Richness, Well-Being, Digital Media, Meta-Analysis

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Since the 1990s, a burst of new communication technologies has inspired several waves of life changes among people throughout the world who have access to them. Each time a fresh digital medium has emerged, media scholars have debated whether these new technologies are potentially harmful or helpful to people's psychological well-being. From mobile phones to Facebook, from instant messaging to Twitter, numerous studies have been published to assess whether the association of digital media use and psychological well-being is positive or negative. However, it appears that not only are there important differences in how different digital media affect psychological well-being, but even the effects within the same media channels are not consistent (Deters & Mehl, 2012). Current literature focusing on the relationships of different online media and well-being is still rare. To seek order among the welter of

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conflicting findings, the current study conducted a comprehensive meta-analysis [illegible]mpare the links [illegible] the most widely used digital media to various indices of mental health and well-being. [illegible]in the sa[illegible] methodological and theoretical framework, we also aimed to test differe[illegible] moderators (e[illegible]e) and distinguish the effects of different media use activities on well-bein[illegible]

Well-being has been extensively associated with social bonds and [illegible]ntacts (Cl[illegible] Saucier, & Hafner, 2010), and one general theme is that lacking social connection is a [illegible]jor risk f[illegible]tor for un[illegible]ppiness. Baumeister and Leary (1995) proposed that two sorts of experience[illegible] ne[illegible]ed to sati[illegible] the need to belong. First, people need frequent and non-negative socia[illegible]interacti[illegible] Second, [illegible]y need the ongoing framework of mutual concern. Either without the [illegible]her (e.g., long[illegible] relationships lacking interaction or commercial sex that lacks ongoing m[illegible]al concern) is less tha[illegible] satisfying. The distinction between these two criteria is useful in untangli[illegible]flicting findings about social media use. In the extreme, online interactions may facilitate ra[illegible] social i[illegible]tions with many people, but without any ongoing mutual concern.

Communication technologies help people contact others, and so one hy[illegible]othesis was that social media activity would generally raise happiness. Alte[illegible]y, however, it was plausible that at least some kinds of activity with communication and social [illegible]edia would repla[illegible]e regular human interaction and could, thereby, decrease happiness. We derived [illegible]mpeting hypothes[illegible] based on the displacement and stimulation hypotheses (Kraut et al., 1998; Val[illegible]nburg & Peter, 200[illegible]), to guide our analyses of the empirical links between digital media usage and [illegible]l-being.

Definitions

Psychological well-being and mental [illegible]alth are t[illegible] related constructs that are often used interchangeably. An overarching definitio[illegible]pplica[illegible]e to both constructs would be a state of wellness in which an individual feels good, based on ha[illegible]s[illegible]ositive relationships with others, a sense of purpose in life, self-acceptance, personal growth, auto[illegible]y, and environmental mastery (Ryff & Keyes, 1995). These states allow people to r[illegible]r potential, [illegible]nage stress, be productive, and make contributions to the larger community (R[illegible], 1989; R[illegible]f & Keyes, 19[illegible]). Examples of relevant outcomes include anxiety, depression, loneliness, st[illegible]s, self-este[illegible]n, [illegible]isfaction. We use the term psychological well-being for the broad range of o[illegible]comes, wh[illegible] reserving the term mental health for the subset of outcomes that invoke psychopathology, [illegible]ast [illegible] subclinical level (e.g., everyday depression). Our broad, inclusive focus on well-being[illegible]d us to t[illegible]omposite measure of multiple indicators of psychological well-being and mental health[illegible]cluding satisfa[illegible]with life, depression, anxiety, stress, loneliness, and self-esteem.

The present [illegible]eta-analysis considere[illegible] evidence about multiple forms of communications media, which deserve[illegible]finitions. We assume all readers are familiar with telephones, and "phone call" is here used to[illegible]fer to sp[illegible]g directly via such a device with another person who is physically distant. Texting refers to using a dev[illegible]ually a mobile phone, to send written messages (typically quite brief ones) to[illegible]pecific, single other pe[illegible]son, again normally across a physical distance. Social network sites (SNSs)[illegible]e online platforms by which people can communicate with large numbers of other people, such[illegible]by postin[illegible]nformation about themselves. They can also communicate with specific individuals, su[illegible]s by resp[illegible]ding dire[illegible]y to someone else's post. At present, the most widely used SNS is Facebook. I[illegible]t mess[illegible]ng (IM) u[illegible]s various devices and software to communicate directly with an individual, often[illegible]e who is a[illegible] online and tuned in, so that messages can be exchanged back and forth, akin to a written [illegible]versat[illegible]n. Typically, the messages and exchanges with IM are longer than with texting. [illegible]ne gaming[illegible] specifically refers to playing online, multiplayer, social games with friends or stra[illegible]ers.

Three hypotheses: Stimulation, displacement, and media richness

Early in the digital revolution, Kraut et al. (1998) proposed two opposing, explanatory hyp es abou how electronically mediated social interactions could affect well-being. Th isplacement hy proposed that online communication would reduce digital media use psycholo ical well-be g, because it would replace spending time with strong ties or close relations partner hereby reducing the quality of these friendships. (Put another way, it favors frequen ocial int ctions, bu o the detriment of ongoing relationships marked by mutual concern.) In contr he mulation h othesis stated that digital media use would increase well-being via its sitive e n time ent with important friends and the improved quality of these friendships hus, the two hy s predicted opposite effects. Hundreds of studies were done to check th irection of the correl ion between media use and psychological well-being (Huang, 2010; Valke Peter, 2007a). The findings were not consistent, however. A possible source of inconsistenc that mo these studies limited their investigation to one specific media channel, such as SNSs or IM, whereas di t channels may have different effects on well-being.

A third hypothesis addresses the inconsistency b ing that the effects of media differ based on their communicative power. Media richness th ry proposes tha media channels vary in their capacity to provide detailed and timely information Daft & Lengel, 198 Richer media can carry more personal information and better facilitate interpers al communication d relationship development (Sheer, 2011). Thus, richer media can make users c unicate more e iently and better understand unclear messages. When interacting with someone wit m they h strong ties, people often choose richer media, affording more social cues and synchronicity, p ecause these improve emotion and affection expression (Baym, Zhang, & Lin, 2004; Goodman-Deane, Mieczakowski, Johnson, Goldhaber, & Clarkson, 2016; e.g., phone calls). In ntrast, that are less capable of fulfilling these goals (e.g., e-mail) are used for weak ties (g, Brow , & Braun, 2014). Liu and Yang (2016) studied five communication channels, and found tha on alls and texting were used among closer friends, whereas IM, SNSs, and online gaming were us less close relationships (Yang, Brown, & Braun, 2014). The difference between IM xting was articular interest, because those two channels are quite similar in their communi ive me od and rich s. The authors proposed that whether a channel has ubiquitous and direct ac s may be e underlying feature determining whether it is an "intimate" channel or not. The pho based ch calls and texting) afford immediate responses, regardless of whether I et acc or Wi-Fi is available. Such immediacy may be particularly important and valued in clos nships. Privacy is also important for relationship development. Texting and phone c s are rather p te, while IM and SNSs have public or semipublic characters. This can explain w the rich features o r SNSs are not frequently utilized by users. For example, although IM mav de a video call function, not all users take advantage of it.

Niches, partners, and well-b

Thus far w have argued three poin s. First, evidence about the link between well-being and digital commun ion has been inconsistent (Goodman-Deane et al., 2016). Second, close social relationships are an i portant s ce of well-being (Valkenburg & Peter, 2007b). Third, different media are used for comm icating w n different pes of people (or, more precisely, within different kinds of relationships) and turn, wi affect relat nships and well-being (Liu & Yang, 2016; Yang, Brown, & Braun, 2014). Putting gether, w easoned that different digital communications media may have different relations to we ing, b ed on their effects on close relationships (Yang, Brown, & Braun, 2014).

en commun g within intimate relationships, people usually select an interactive and targeted i dium affording relatively rich social-context cues and synchronicity, both of which have been

found to improve emotion expression (e.g., phone calls). Other media that are le[ss] able of fulfillin[g] these aims, like e-mail, are more frequently used for communication with less close t[ies] (Jang, Bro[wn], & Braun, 2014).

Because cell phone calls and texting are mainly used for more intimate relationships, time spent using these two digital media channels likely intensifies the interactions between close associates. Therefore, we expected phone calls and texting to strengthen these already strong ties, consistent with the stimulation hypothesis. It follows that the effects of these media on psychological well-being are likely to be mostly positive (except for cases when negative aspects of relationships, such as unproductive conflict, occur).

In contrast, new media like Facebook are mainly used to maintain a wider network of weaker ties (although some strong ties may be present within a person's online social network; Liu, Ainsworth, & Baumeister, 2016). Time spent on Twitter, Facebook, and online gaming is predominantly used to maintain a large, diverse network of weak ties (Ellison, Steinfield, & Lampe, 2011; Liu & Baumeister, 2016; Liu & Yang, 2016). Interacting within this large network of shallow relationships may replace spending time with close relationship partners, consistent with the displacement hypothesis. The net effect on well-being of interacting with weak ties would therefore be negative, as confirmed by Chan (2014). To be sure, some digital communications may have no impact on well-being. Minimalist communications on SNSs (such as a single click to indicate a "Like" reaction to something posted by another person) hardly seem likely to intensify or replace connections to close relationship partners. However, displacement is still possible, insofar as people spend a great amount of time on these media instead of engaging in high-quality, offline interactions. The displacing effect may be especially true if the weak ties only exist online, so that an individual's online activities have no connection with their important, offline relationships.

Hence, all digital communications media are not equal in terms of their effects on well-being. Internet-based media use may displace interactions with close relationship partners, thereby reducing well-being. In contrast, Internet-independent media are used primarily for contact with close relationship partners, and may increase well-being. Some prior evidence fits this conclusion. In particular, the broad correlation between total Internet use and psychological well-being is negative (Çikrıkci, 2016; Huang, 2010). This is the view that Internet-dependent media use contributes to displacement: that is, fosters low-quality interactions important people to the extent that the person reduces high-quality interactions with close relationship partners. Internet use tends to be a relatively passive consumption activity, such as when people surf the web, read news or blogs, and watch movies. These seem in and of themselves to be irrelevant to well-being, but insofar as they displace other activities involving quality interactions with close relationship partners, the ultimate effect on well-being would be negative.

Our first two hypotheses were thus as follows.

H1: Telephone conversations and texting are positively linked to well-being, because they are primarily used for contact with close relationship partners.

H2: IM, SNS activity, and online gaming are negatively related to well-being, because they mainly feature interactions with strangers and acquaintances, which displace interactions with close relationship partners.

Our data make a different prediction based on findings by Dienlin et al. (2017). They found that communication on SNSs led to more face-to-face communication 6 months later. However, obviously, not all face-to-face interactions are with close relationship partners. Therefore, our hypotheses are not inconsistent with Dienlin et al.'s findings.

Different social network site activities

Thus far, we have discussed hypotheses based on treating each medium as a single ki f activity. However, SNSs in particular are increasingly multifunctional, so people can e age in different a it on them. These activities may have quite different implications for well-b g, as re t evidence has indicated (Burke & Kraut, 2016; Verduyn et al., 2015). Again, our reasoni is based the assumption that the kind of social connection involved in the activity will account its effec well-bei Four types of activities have been discussed in the SNS literature: interactions (m cating, ta g, and commenting on SNSs with other people); self-presentation (prese g photo pdatin one's own status); entertainment (leisure use of SNSs to pass time or entert oneself); and co nsumption (browsing the SNSs' content). The selection of these categories w based upon the most frequently used functions of SNSs, so as to include all available data into our a ys We formulated hypotheses about the first and last of these only.

Interactions seemed the best bet for a positive effect on well-being. Inso people use SNSs to interact with other people, they should experience gains in social connection. Such interactions may help satisfy the need to belong (Baumeister & Leary, 1995 d facilitate social support (Kim, Sherman, & Taylor, 2008). Regarding social support, anecdotal e ence has sugges d that people have increasingly begun to use SNS interactions to provide suppor o friends who ma e experiencing problems or distress, and such support may improve well-bein Even just the regu exchange of comments and replies may communicate that one is invested in th elationship and res about the other's welfare. Consistent with these theoretical predictions, interacti line acti es are typically associated with better psychosocial outcomes, such as lower loneliness (Verduyn et al., 2015) and higher social capital (Ellison, Vitak, Gray, & Lampe, 2014; Gr Vitak, Easton, & Ellison, 2013).

However, the benefits of SNS interac ns could ied by the nature of the relationship. As we have suggested, interactions with clos elation p partners should improve well-being, whereas interactions with distant acquaintances or st ge may be irrelevant or even detrimental to well-being. Unfortunately, our analyses were limite the information available in the literature, and many published studies have si unted inte ions without differentiating the qualities of the relationships involved. Our p diction as, therefor or a general but weak effect, with more SNS interactions being linked t ore well eing. Presumably, a much stronger effect could be found if one were able to focus s ifically o eractions with close and important relationship partners. Still, prior work has prov some vidence of the positive benefits of SNS interactions, including lower loneliness (Yang & Brow 3) and higher social capital (Ellison, Vitak, Gray, & Lampe, 2014; Gray et al., 2013).

In contrast, SN content consumptio browsing) seemingly has less to offer and may even be detrimental to y g. This activity consists chiefly of reading about other people's lives and thoughts, with interac Putting considerable time into such browsing would, at the least, be likely to produce the displace problem: namely, the time spent browsing would replace quality interaction ith significant others, thereby indirectly reducing well-being. More direct negative effects are also p sible. SNS self-presentations tend to be highly positive (Liu & Brown, 2014), presumably because eople ge ally seek to present themselves favorably (Baumeister, 1982; Goffman, 1959; Schle er, 1980) d social edia offer an ideal platform for such favorable presentations, because one more c trol over h w one depicts oneself online than in a live interaction. Meanwhile, self-assessm n rely hea y on social comparisons (Festinger, 1954). People who browse SNS postings may, therefor ily be to feel inadequate and dissatisfied, as they compare their own lives with the d images o people's lives that they read about. Exposure to these positive and idealized image n trigger envy (Krasnova, Widjaja, Buxmann, Wenninger, & Benbasat, 2015; Tandoc et al.,

2015), which is associated with depression and lower affective well-being (Tando l., 2015; Verduy et al., 2015). Previous studies have shown that browsing is often related to poorer wel g (Verdu et al., 2015; but see Deters & Mehl, 2012).

The relationships between well-being and the other two activities (s presentation and ente ain-ment) are less clear. Some studies have shown that self-presentation o SNSs is a ciated with poorer well-being (Yang & Brown, 2013), whereas other studies have foun ther a p ive (Dete & Mehl, 2012) or null relationship (see Kraut & Burke, 2015). Additionally, oth dia have sugge d that the implications of SNS self-presentation are further complicated b oth inte onal and trapersonal processes (Yang & Brown, 2016). Regarding entertainment, w e earlier resea d that online entertainment activities were related to poorer social well-bei such as lower friendsh p quality (Blais, Craig, Pepler, & Connolly, 2008), more recent studies have s g that online entertainment (such as gaming) facilitates relationship development and mainten ce (Hero Kambouri, & Winters, 2014; Lenhart, Smith, Anderson, Duggan, & Perrin, 2015). Hence, we had no s expectations regarding how self-presentation and online entertainment would affect well-being.

Method

Literature search

Two methods were applied to identify relevant s s. First, artic were searched in the following databases: Communication and Mass Media Compl Education Resources Information Center (ERIC), Google Scholar, ProQuest Dissertations & Theses, PsycINFO, and PsycArticles. The following keywords were used: ment l-being, anxiety, depression, loneliness, stress, self-esteem, life satisfaction, positive or ne tive affec nteraction, selfies, photo posting, status update, SNSs gaming, information seek SNS browsing, passive SNS use, Facebook, Myspace, Twitter, Instagram, Social Network Sites, soc dia, phone call, smart phone, mobile phone, texting, SMS, instant messaging, IM, MSN, ICQ, QQ, ming, online gaming, and MMORPGs. Second, we searched in-press or online st les. We u the logical operator "OR" between two similar keywords (e.g., SNSs OR F ebook), d then used AND" between a keyword related to digital media and one related to well-b g (e.g., ph epression). Duplicate records yielded from different databases were remove manually. e search included articles published up to 10 January 2017. Due to page limitations, both the ils included studies and analysis figures can be found in the additional material for the ma script, he on the Open Science Framework (https://osf.io/2y6r3/).

Criteria for i n

A compreh ive sear f the literature yielded 8,542 potential studies. We examined the titles and abstracts of all the refe s and excluded irrelevant ones. After initial screening, 201 studies were ide fied for further screening. The following criteria were used for further checking: (a) the studies cluded quantitative statistics (i.e., correlation coefficient, regression coefficient, etc.); (b) global meas es of digi media use (i.e., intensity, online time, or login frequency) or specific measures of me use acti es were i luded; (c) studies examining the addictive use of media were deleted; and (udies u g duplicat amples to calculate the effects were excluded. If two studies used the same data s were cons ered as having repeated samples. In this circumstance of duplicate data being used by mo an o publication, the study that contained more information was used. In the end, tudies met t riteria for inclusion (please consult the material on the Open Science Framework for ther information about the inclusion procedure).

Coding

Studies that met the inclusion criteria were coded for sample characteristics (co ntry, prop n female average age, and sample size). After coding a sample of studies, a coding manu that specified th li categories and detailed codes was developed. Following the coding manu all inform tion contai d in the 124 studies were coded. The inter-coder reliability—Krippendorf's ha—was isfying, ranging from 0.75 to 1.00 for all variables (Hayes and Krippendorf, 2007). All di epancies tween cod were discussed and the coders reached agreement.

Following guidelines from previous work (Deters & Mehl, 201 Verduyn 2015) e divided SNS activities into four categories. Replying, commenting, and li g were coded a teractions; SNS status updating or photo posting were coded as SNS self-p entation; SNS gaming nd entertainment were coded as SNS entertainment; and SNS browsing, re and monitoring were coded as SNS content consumption.

The 93 studies contained data from 23 countries or regions: Australia, ium, Canada, China, Hong Kong, India, Ireland, Japan, Malaysia, Netherlands, Pakistan, Philippine, oland, the Republic of Korea, Serbia, South Africa, Sri Lanka, Sweden, Tai ailand, Turkey, the United Kingdom, and the United States. Per Suh, Diener, Oishi, and Triand (1998), studies nducted in China, Hong Kong, Japan, Korea, Taiwan, and Thailand were coded as stern culture, and e rest were coded as Western culture.

Multiple effects in a single study

If an article included several independent effect sizes, we coded the effects separately. Simultaneously including more than one effect size yielde sample can cause an inflation of significance tests (Cooper, Hedges, & Valentine, 2019). To id includ ent effect sizes within a single meta-analysis, we used the following procedures: (we co ucted separate meta-analyses for different types of digital media (e.g., if a study reported effect or both phone calls and texting, derived from the same sample, they were used for different meta-a ses of phone calls and texting; see Table 2); and (b) if one article included several d effects for ingle type of digital media, we aggregated them into one (Hunter & Schmidt, 04; e.g. ose et al. [20] reported the effects between self-esteem, life satisfaction, loneliness, and NS use us ple, so these dependent effects were aggregated into a single effect). We u the *agg* tion from the *MAc* package in R to aggregate the dependent effect sizes. The function u rm s from Hunter and Schmidt (2004, pp. 435–8).

Data analysis

We used the atte d correlation (uncorrected correlation) for analyses. Because of the high heterogeneity (Lip & n, 2001), the random effects model was used for all analyses. To assess heterogeneity ross studies, sed the I^2 statistic, which describes the extent of true heterogeneity across studies as a percentage o l variation (Higgins and Thompson, 2002). The Q statistic is also used testing the existence of heterogeneity. However, we did not use Q test, because the Q statistic overpow ed (Aguinis, Sturman, & Pierce, 2008). All of the analyses were conducted with Comp ensive M -Analysis version 3 (Borenstein, Hedges, Higgins, & Rothstein, 2014).

Publica s analysi

We applied th llowin methods: (a) checked the asymmetry of the contour-enhanced funnel plot Sutton, Jon rams, & Rushton, 2008); (b) conducted the *p-uniform* analysis (Van Assen, van Ae & Wicherts, 2015), which assumes that the distribution of the p value is uniform, conditional

on the true effect size; and (c) conducted a *p-curve* analysis (Simonsohn, Nelso Simmons, 2014 2014b). The term *p*-hacking refers to conducting multiple analyses in order to get a ficant re ($p < .05$), which can inflate effect sizes in the published literature, as well as ssibly produci us, false-positive conclusions. A *p*-curve plots the distribution of significa values ($p < .05$), whi can be used to evaluate whether the true effect is evidential or not. Som researche believe it can help estimate extent of the so-called file drawer problem; that is, the qua y of unp ished stu s on the same topic with nonsignificant results. It should be noted that both th ary nd *p*-unifo analyses only used *p*-values lower than .05.

Results

Description of the sample

The data set finally yielded 9 effect sizes of phone calls and well-being, co ng 3,257 participants; 9 effect sizes of texting and well-being, encompassing participants; 8 effect sizes of IM usage and well-being, containing 3,981 participants; 94 effe zes of SNS usage and well-being, encompassing 34,475 participants; and 7 effect sizes of online ga ng and well-bei ncompassing 3,329 participants.

The average ages of participants in the incl ed studies were be een 12.66 and 58.22, but more than 70% of the sample had average ages betwee 5 and 25. The perc tage of female participatns was between 0% and 100%, but for 70% of the sampl e proportion o emale participants was between 45% and 70%. The sample sizes ranged from 35 to 1,9 ticipan he most frequently used scales for well-being were the University of California Los Angeles (UCLA) Loneliness Scale, Satisfaction with Life Scale, Center for Epidemiological Stu Depression scale, Self-Rating Anxiety Scale, and Rosenberg Self-Esteem Scale.

Effect sizes of global digital media use an ychological well-being

To examine the relationship b en global d l media usage and well-being, the valences of the effect sizes of anxiety, depre on, lo iness, and s s were reversed. The reversed statistics represent the correlations between obal digi media use and better well-being states. The reversed effect sizes were then aggrega with the self-esteem and life satisfaction to create a score of overall psychological being. Brooke and Kraut (2016) used a confirmatory factor analysis to justify combining these scales int index of psychological well-being. Their results revealed a common factor underlying t se scales, a owed that a one-factor solution was an acceptable fit to the data.

With the ran m-effects model, nd that the association between phone calls and well-being (r) was 10 ($P <$), with a 95% confidence interval (CI) ranging from .06 to.15, and that heterogeneity was low ($I^2 =$ .90). ing also had a positive effect ($r = .10$, 95% CI .02–.17; $P < .001$) and moderately high hetero neity ($I^2 =$). Online gaming ($r = -.12$, 95% CI −.12 to .01; $P = .07$; $I^2 = 91.82$) and SNS use ($r = -.05$, 95% CI −.0 .02; $P < .001$; $I^2 = 89.54$) had negative correlations with well-being. The use IM had a non-significant correlation with well-being ($r = .06$, 95% CI −.06 to .16; $P = .33$; $I^2 = 9$ 3; Table 1). Overall, all these correlations between global digital media use and psychological well ing were eak effects.

Effec f types o cial network site use and psychological well-being

To examin relat ship between well-being and various SNS usages, the valences of the effect of anxiety, d sion, loneliness, and stress were reversed. These reversed statistics represent the cor tions between SNS use and better well-being states. The reversed effect sizes were then aggregated

Table 1 Meta-Analysis of Digital Media Use and Psychological Well-Being

	k	*r*	Lower CI	Higher CI	*p*		I^2	
Call	9	.10***	.06	.15	.00	14.01	42.90	.00
Text	9	.10*	.02	.17	.02	28.24***	71.67	.01
IM	8	.06	−.06	.16	.33	37**	90.8	.02
SNSs	94	−.06**	−.09	−.03	.00	88 *	89	.02
Gaming	7	−.12^{+}	−.24	.01		73.37**	2	.03

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$; $^{+}p = .07$. *r* represe effect size between overall psychological well-being (where the six indicators were col sed) a ch SNS use variables. The valences of the effect sizes of anxiety, depression, lonelin s, and stress reversed. The reversed statistics represent the correlations between global digital media use and be well-being states. CI = confidence interval; IM = instant message; SNS l network site.

Table 2 Meta-Analysis of Social Network Site Usa and Overall Psyc ogical Well-Being

	k	N		95% CI	*Q*	I^2	τ^2
SNS interaction	5	1,366	.14***		5.43	26.32	.00
SNS self-presentation	13	3,012	.02	−.04 to .08	27.92	57.01	.01
SNS entertainment	2	5	.11*	.007–.20	1.44	30.74	.00
SNS content consumption	9	3,38	−.14**	to −.08	25.40**	68.51	.01

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$. *r* rep n the effect size between overall psychological well-being (where the six indicators were collapsed) each SNS use variables. The valences of the effect sizes of anxiety, depression, l and stress re reversed. The reversed statistics represent the correlations between globa gital m ia use and b er well-being states. CI = confidence interval; SNS = social network site

with effect sizes of self-esteem satisfaction to create a score of overall psychological well-being. Results showed that S interacti d SNS entertainment were related, with better psychological well-being. Only SN content consumpt as associated with poorer psychological well-being. SNS self-presentation ot significantly associated with well-being. See Table 2 for detailed information.

Moderation analyses

We used ps hological well-being va ables as moderators and conducted separate analyses. Results are presented Tables to in Supporting Information Appendix II. The findings were basically consistent with th overall di al media use effects, though some individual effects were not significant. Only the as ciation o M use and self-esteem was contrary to its overall positive effects ($r = -.28$; $k = 1$; $P <$). Seco ly, we ex ined directionality and culture as moderators. We examined whether global di dia use in enced psychological well-being, or vice versa (see Supporting Information Table). The d ional of the longitudinal studies served as a categorical moderator. Longitudinal re available nly three of the media: texts, SNS use, and IM. Surprisingly, all longitudinal effects ere not significant, suggesting both selection and influence effects of media use might be

non-existent. But the lack of results may also have been caused by the small n[umb]er of longitudin[al] studies. Culture was treated as another categorical moderator. The analyses of phone ca[lls] ($Q_{between}$ = [.]; P = .45), IM ($Q_{between}$ = .30; P = .59), and SNS use ($Q_{between}$ = 2.61; P = .11) [di]d not produce [sig]nificant results. Finally, we also used age and gender as moderators, but no [eff]ects were significant.

Publication bias analysis

At first, after visually checking the funnel plots, we found obvio[us] asymmetries in the non-significant areas of texting and online gaming, suggesting the possibil[ity] that the asymmetries were due to publication biases. However, missing effects in significant ar[eas] suggested the asymmetries were more likely to have been caused by reasons such as study quality. [We] imputed the missing studies in the gray areas, and found the adjusted effects for texting and onlin[e] gaming were, respectively, .13 and − .17. All p-uniform publication bias tests were not significant, indicating no need for adjustment. All p-curve plots showed a shape that was right skewed and not flatter than 33%, suggesting that all analyses have evidential value (see Figure in Supporting Information Appendix I). Combined, these tests showed there were minimal biases in the significant effect sizes.

Discussion

Our results provided some support for all three theoretical propositions. Both the stimulation and displacement patterns were found, consistent with the original proposals by Kraut et al. (1998). Moreover, the patterns differed according to the [me]dium, consistent with Daft and Lengel's (1986) media richness theory. Not all results were as predicted. We begin with a summary of the findings, and then elaborate upon their theoretical implications.

Main findings: Digital media and well-being

Across multiple studies, the more often people made and received telephone calls, the better their overall well-being. Texting was also positively correlated with well-being. In contrast, SNS usage and online gaming were negatively related to well-being. IM showed a weak positive correlation with well-being, but it fell short of significance, so no conclusions can be drawn. Recent literature has suggested that mobile IM is a convenient tool for people to instantly address close ties (Cui, 2016). But the literature we analyzed involved studies with traditional IM, rather than mobile messaging.

As one would assume for such a complex variable as well-being, the effects of digital communication were rather small. Five of the effects were nearly identical in size (phoning, texting, and online gaming). SNS usage had a smaller effect size, which was about the same as that of IM, but given the vastly greater number of published studies, the SNS usage effect was significant, unlike the IM effect.

Given the larger amount of data available on SNS usage, as well as the multifunctional complexity of the medium, we performed a second set of analyses that broke SNS usage down into multiple categories. The global weak effect is a bit misleading, because different SNS activities have quite different relationships to well-being (and all but one was larger than the combined overall effect). Interactions around online entertainment had significant, positive links to well-being. Self-presentation also correlated positively with well-being, but the effect was very small. The largest effect we found in our entire meta-analysis was a negative correlation between well-being and SNS content consumption.

Further analyses suggested that the global effects of SNS use (already small) may have been artificially inflated by publication biases. Meanwhile, the effects of telephone calls may have been

understated by publication biases. The other effects were apparently not affected b blication bias, nor did we find any evidence of *p*-hacking.

Implications

Rather than drawing a sweeping conclusion that digital media are gener good or d for well eing, our results suggest a more nuanced view. They seem most consisten th the soning th digital media enhance well-being when they facilitate social interactions with imp elationshi artners, but detract from well-being when they displace such interactions.

Positive links to well-being were found for the media designe or direct communi , which can include not just verbal content, but also affective communicati hone calls allow people to talk one-to-one, and phoning is often used to connect with close rel onshi tners. Callers know not only what the other party says, but can also glean emotional in mation fro tone of voice and other cues. Although texting lacks the voice tone channel for communicating emoti deficit that has, to some extent, been rectified by the proliferation and wid d use of emotion symbols (emojis) and some acronyms (e.g., "lol" for "laughing out loud"), st people still use it to communicate with close relationship partners because of its privacy feature eople who use e media frequently may tend to have closer relationships than those who do no and so their well-b g is better. These results fit the stimulation hypothesis proposed by Kraut et al 998), which says t digital communication can strengthen social connections to important people i e's life. As the st and most obvious example, telephone calls enable people to stay in regular contact w d while traveling far from them.

IM resembles texting but typically uses a computer keyboard, so longer messages are practical. It too may be used for communicating with cl but it may also be useful for discussions in business and research. Again, people who use it m may have better social bonds than other people. The size of the effect was consistent with this alysis, t it was not significant. More research is needed.

Online gaming is not something done pri ily with intimate partners. It can be done as a solitary activity or in interaction with a great many peopl ostly including strangers and mere acquaintances. We found a significant, negati ship betwe online gaming and well-being, consistent with the displacement hypothesis. ending considerable ti e playing online games may replace interacting with significant others, ther being ei er cause of deficiencies in close relationships.

As we noted, there we far more ies examining the effects of SNSs than any of the other digital media, in terms of well-be Alth gh there was an overall weak, positive effect, which indeed may have been inflated by publicat ias (so that the overall true effect may be zero), further analyses suggest the overall e ct or lack there ay be misleading. Breaking down SNS usage into different activities revealed ltiple effects in differe directions. Interacting with others via SNSs was positively associated with w g, consistent with the view that digital communication can link to happiness by virtue of co ecting wi her people. Likewise, online entertainment was positively related to well-being. This might also reflect s bonds, insofar as people may watch entertainment with others or, at least, sha favorite videos with them. To be sure, it may also be that entertainment directly enhances well-bein because entertainment is designed to be fun. If the entertainment value were the main reason for the sitive co ation, however, then presumably playing games would also raise well-being but, as we w, online ming was egatively related to well-being.

found weak but s significant relationship between SNS self-presentation and well-being, such tha g more inf mation about oneself was associated with greater happiness and self-esteem. Self-presenta desi ed for social interaction, but posting content is not itself directly interactive. positive in well-being is unsurprising. People probably post more positive than negative inform on about themselves, so posting more information may boost positive feelings about oneself,

and people who already have positive views of themself may be more likely than ers to present suc information online.

In contrast to these positive effects, SNS content consumption had a gative relations ll-being; indeed, this was the largest single effect we found. Content consum tion, also known as bro ing, refers to reading what other people post (but not interacting with them lt is, ther ore, highly relevant to what Kraut et al. (1998) identified as displacement. The browsi individu spends tim reading about other people online, and this may replace time spent actually acti with sign ant other people. Moreover, as we noted, browsing may cause negative f lings bec the con t posted by others is positively skewed, so that social comparison will ma readers feel re egative about their own lives (Yang, 2016).

Limitations and future directions

As with any literature review, our conclusions were constrained by the nature the available evidence. Most obviously, our conclusions are correlational an ude causal inferences. Digital communication may cause changes in well-being, or different els of well-being may cause people to change their use of digital media. It may be, as Kraut et al. (19) hypothesized, t spending time on digital media (especially gaming and browsing) replaces me ingful interactions ith significant others, thereby causing a drop in well-being. Alternatively, unh py people may b more likely than happy ones to spend time browsing and gaming. What limited e nce is availa regarding longitudinal patterns suggests bidirectional causality (e.g., Kross et al., 2013), hink should probably be the default assumption for now. Dienlin, Masur, and Trepte (2017) suggested that the effects of digital media use may not manifest immediately, and m l weeks or months later. The extreme imbalance in the literature in terms of study des calls for ore l gitudinal or experimental studies in the future.

Besides, the classifications of media types e literature reviewed were quite coarse; even breaking SNSs into types of behavior may be insufficie y granular. The media which form the basis of the classifications could be expli y tre d as multid nsional or as composites of behavioral features. In the future, for any medium research uld ask how much interpersonal communication was occurring, how interactive the com unication n information about the parties was revealed, how positive the experience as, and so th.

Last, we note that dig ed usage is highly complex, and so generalizations should be tempered with the recognitio of many tions. To conclude that "phone calls make people happy," even if broadly correct, uld mislead if it to acknowledge that undoubtedly many people occasionally make or receiv eeply upsetting phone calls. Our effects were generally small, but the effect sizes probably refl the ed natures of the effects, rather than the weaknesses of the medium. That is, a weak net impact of ph on happiness is probably a result of some calls bringing joy while a few others caused anger or sorrow. umably there are far more pleasant than unpleasant phone calls, but the bad es may have stronger effects, consistent with the general pattern that negative events have more chological impacts than positive ones (Baumeister, Bratslavsky, Finkenauer, & Vohs, 2001).

C luding marks

Given ital media ve permeated almost every aspect of people's lives, across almost all countries, they provi imp ant case for examining how technology and communication affect human being. The nt research provides two new insights into the relationship of digital media use and ychological well-being: (a) whether the global effect of one digital medium's use on well-being

is negative or positive depends upon the intimacy available through the media (Liu & Yang, 2016) it resides in; and (b) different types of media activities are associated with well-be differen ways. Overall, our findings suggest that the effects of digital media use on ps ological well-b upon the closeness of the relationships maintained and how the media are d. Future research sho d focus on additional variables that may explain these digital medias' eff s. Moreo , we doubt that communication technology has finished its latest revolution. Unders ding ho e curren edia relate to human well-being could possibly inform the development of a nal chnologie so as to yield optimal results for human relationships and well-being.

Supporting Information

Additional Supporting Information may be found in the on e version of this artic

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All materials have been made publicl vailable v ence Framework and can be accessed at https://osf.io/2y6r3/. The authors have r rted a measures, conditions, and data exclusions, and the procedure to determine the sample sizes.

References

Aguinis, H., Sturman, M , & Pierc A. (2007). Comparison of Three Meta-Analytic Procedures for Estimating Moderat Effec f Categorical Variables. *Organizational Research Methods*, 11(1), 9–34. doi:10.1177/ 944281 896

Baumeister, R. F. (1 2). A self-pres ional view of social phenomena. *Psychological Bulletin,* 91, 3–26. doi:10.1 /0033-2909.91.1.3

Baumeister, R. F a sky, E., Finkenauer, C., & Vohs, K. D. (2001). Bad is stronger than good. *Review of General P chology,* 3–370. doi:10.1037/1089-2680.5.4.323.

Baumeister, R., & Leary, M. (19 The need to belong: Desire for interpersonal attachments as a fundament human motivation. *Psychological Bulletin*, 117, 497–529. doi:10.4324/9781351153683-3

Baym, N K., Zhang, Y. B., & Lin, M. C. (2004). Social interactions across media: Interpersonal com unicatio n the Internet, telephone and face-to-face. *New Media & Society*, 6(3), 299–318. d 0.1177/1 4448040 438

Blai L., Crai W. M., P er, D., & Connolly, J. (2008). Adolescents online: The importance of Inter vity choic o salient relationships. *Journal of Youth and Adolescence,* 37(5), 522–536. doi:10.100 964- -9262-7

ein, M., Hed L., Higgins, J., & Rothstein, H. (2014). *Comprehensive meta-analysis version 3 [Co puter software]*. Englewood, NJ: Biostat.

Burke, M., & Kraut, R. E. (2016). The relationship between Facebook use and ...eing depends o... communication type and tie strength. *Journal of Computer-Mediated Communica...*1, 265–2... doi:10.1111/jcc4.12162

Chan, M. (2014). Multimodal connectedness and quality of life: Examini... the influ...nces of tech...logy adoption and interpersonal communication on well-being across t...ife span. *...urnal of Computer-Mediated Communication*, 20(1), 3–18 https://doi.org/10.1111/jc...12089.

Chu, P. S., Saucier, D. A., & Hafner, E. (2010). Meta-analysis of the rel...chip...etween so...l support and well-being in children and adolescents. *Journal of Social a...Clinica...hology,* 2...), 624–645. doi:10.3724/sp.j.1042.2013.01357

Çikrıkci, Ö. (2016). The effect of internet use on well-bei... Meta-analysis. *Comp...ters in Human Behavior,* 65, 560–566. doi:10.1016/j.chb.2016.09.021

Cooper, H., Hedges, L., & Valentine, J. (Eds.). (2019). *T... handbo...f research synthesis and meta-analysis*. New York: Russell Sage Foundation. http://www.jstor.org/sta...7758/9781610448864

Cui, D. (2015). Beyond "connected presence": Multimedia mobile instant messag...ng in close relationship management. *Mobile Media & Communication*, ...–36. doi:10.1177/2050157915583925

Daft, R. L., & Lengel, R. H. (1986). Organizati...al information ...quirements, media richness and structural design. *Management Science*, 32(5...554–571. doi:10.1...7/mnsc.32.5.554

Deters, F. G., & Mehl, M. R. (2012). Does p...ing Facebook stat... updates increase or decrease loneliness? An online social networking exp...ment. *Social Psyc...logy and Personality Science,* 4, 579–586. doi:10.1037/e514472015-698

Dienlin, T., Masur, P. K., & Trepte, S. (2017). Reinforcem...placement? The reciprocity of FtF, IM, and SNS communication and their effects on loneliness and life satisfaction. *Journal of Computer-Mediated Communication*, 22(2), ...4.12183.

Ellison, N. B., Steinfield, C., & Lamp... C. (201... Connection strategies: Social capital implications of Facebook-enabled commun...ion ...ractices. *New Media & Society*, 13(6), 873–892. doi:10.1177/1461444810385389

Ellison, N. B., Vitak, J., Gray, R..., Lampe, C. (...4). Cultivating Social Resources on Social Network Sites: Facebook Relatio...ip M...tenance Be...iors and Their Role in Social Capital Processes. *Journal of Computer-M...iated Co...munication*, 19(4), 855–870. doi:10.1111/jcc4.12078

Festinger, L. (1954). A...heory of ...ison processes. *Human Relations,* 7(2), 117–140. doi:10.1177/00187...5400700...2

Goffman, E. (1959). *The pr...on of self in everyday life*. Garden City, NY: Anchor.

Goodman-Deane, ...Mieczakow...A., Johnson, D., Goldhaber, T., & Clarkson, P. J. (2016). The impact of communi...on technologies o...nd relationship satisfaction. *Computers in Human Behavior*, 57, 219–22... ...10.1016/j.chb.2015.11.053

Gray, R., Vita..., Ea... F. W., & Ellison, N. B. (2013). Examining social adjustment to college in the age of soci...edia: Factor...fluencing successful transitions and persistence. *Computers & Education,* 67, 193–207. doi:10.1016/j.c...edu.2013.02.021

Hayes, ..., & Krippendorff, K. (2007). Answering the call for a standard reliability measure for coding da... *Commu...ication Methods and Measures*, 1, 77–89. doi:10.1080/19312450709336664

Her...otou, C., ...ambouri, M., & Winters, N. (2014). Dispelling the myth of the socio-emotionally ...issatisfie...gamer. *Co...uters in Human Behavior,* 32, 23–31. doi:10.1016/j.chb.2013.10.054

Hig... J. ... & Thomp...n, S. G. (2002). Quantifying heterogeneity in a meta-analysis. *Statistics in Mea...*21(11), 1...9–1558. doi:10.1002/sim.1186

...ang, C. (20... ...In...net use and psychological well-being: A meta-analysis. *Cyberpsychology, Behav... and Social N...working,* 13, 241–249. doi:10.1089/cpb.2009.0217

Hunter, J. E., & Schmidt, F. L. (2004). *Methods of meta-analysis: Correcting error bias in research findings* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Kim, H. S., Sherman, D. K., & Taylor, S. E. (2008). Culture and social supp *American Psy* 63(6), 518–526. doi:10.1037/0003-066X

Krasnova, H., Widjaja, T., Buxmann, P., Wenninger, H., & Benbasat . (2015) esearch Note—Why following friends can hurt you: An exploratory investiga n of the fects of y on social networking sites among college-age users. *Information Sy R arch*, 26, 5–605. doi:10.1287/isre.2015.0588

Kraut, R. E., & Burke, M. (2015). Internet use and psychologic well-being: Ef f ctivity and audience. *Communications of the ACM,* 58(12), 94–100. doi 1145/2739043

Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopha & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involve ent and p logical well-being? *American Psychologist,* 53, 1017–1031. doi:10.1037/0003-066x.53.9.1017

Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D., Lin, N., . . . Ybarra, O. (2013). acebook use predicts declines in subjective well-being in young adults *ne,* 8, e69841. http://dx.doi.org/10.1371/journal.pone.0069841.

LaRose, R., Wohn, D. Y., Ellison, N., & Steinfield, (2011). Faceboo nds: Compulsive social networking and adjustment to college. Proceedings f the international a ociation for the development of the information society. ICT 2011.

Lenhart, A., Smith, A., Anderson, M., Duggan, M. Perrin, A 015). Teens, technology and friendships. *Pew Research Center*. Retrieved from https pewinternet.org/2015/08/06/teens-technology-and-friendships/2015-08-06_teens-and-friendships_0-01-2/.

Lipsey, M. W., & Wilson, D. B. (2001). *Practical lysis* (Vol. 49). Thousand Oaks, CA: Sage Publications.

Liu, D., Ainsworth, S. E., & Baumeister, R. F. 016) A meta-analysis of social networking online and social capital. *Review of General Psychology,* 69–391. doi:10.1007/978-1-4614-6170-8_100409

Liu, D., & Baumeister, R. F. (20 *Social netwo g online and personality of self-worth: A meta-analysis. Journal of Researc Pers lity,* 64, 79 doi:10.1016/j.jrp.2016.06.024

Liu, D., & Brown, B. B. (2 4). Self-d closure on social networking sites, positive feedback, and social capital among inese co *Computers in Human Behavior,* 38, 213–219. doi:10.1016/j.chb.201 003

Liu, D., & Yang, C. C. (2016). che of electronic communication channels in friendship: A meta-analysis. *Journal Computer-M ted Communication,* 21, 451–466. doi:10.1111/jcc4.12175

Peters, J. L., Sutton J. J., Jones, D. R., A s, K. R., & Rushton, L. (2008). Contour-enhanced meta-analysis funn ts help distinguish publication bias from other causes of asymmetry. *Journal of Clinical Epi iolo* (10), 991–996. doi:10.1016/j.jclinepi.2007.11.010

Ryff, C. D. 989). Happ s is everything, or is it? Explorations on the meaning of psychological well-being. *Jo l of Personality and Social Psychology*, 57(6), 1069–1081. doi:10 37/0022-3514.57.6.1069

Ryff, C. & Keye C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Pe ality an ocial Psychology,* 69, 719–727. doi:10.1037/0022-3514.69.4.719

Schl er, B. R. 980). Imp sion management: The self-concept, social identity, and interpersonal re s. M nterey, CA rooks/Cole. doi:10.2307/2067758

Schmidt, F. & Hunter E. (2014). *Methods of meta-analysis: Correcting error and bias in research f dings* . CA lications.

Sheer, V. C. (2011). Teenagers' use of MSN features, discussion topics, and onli[illegible]endship develo[illegible] ment: The impact of media richness and communication control. *Communicatio[illegible]terly*, 59[illegible], 82–103. doi:10.1080/01463373.2010.525702

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014a). P-curve: A ke[illegible]o the file drawer. *Jou[illegible]al of Experimental Psychology: General*, 143(2), 534–547. doi:10.1177/17[illegible]6916145[illegible]988

Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2014b). P-curv[illegible]and effe[illegible]size: Cor[illegible]ing for publication bias using only significant results. *Perspectives on Psy[illegible]gic[illegible]cience*, 9([illegible]666–681. doi:10.1177/1745691614553988

Suh, E., Diener, E., Oishi, S., & Triandis, H. C. (1998). The[illegible]ifting basis o[illegible]faction judgments across cultures: Emotions versus norms. *Journal o[illegible]ersonality and Social P[illegible]chology*, 74(2), 482–493. doi:10.1037/0022-3514.74.2.482

Tandoc, E. C., Ferrucci, P., & Duffy, M. (2015). F[illegible]book us[illegible]vy, and depression among college students: Is facebooking depressing? *Computers in Hum[illegible]Behavior*, 43, 139–146. doi:10.1016/j.chb.2014.10.053

Valkenburg, P. M., & Peter, J. (2007a). Preadolescent[illegible]dolescents' online communication and their closeness to friends. *Developmental Psycholog[illegible]*43, 267–277. doi[illegible]10.1037/0012-1649.43.2.267

Valkenburg, P. M., & Peter, J. (2007b). Online c[illegible]mmunication and[illegible]olescent well-being: Testing the stimulation versus the displacement hypot[illegible]is. *Journal of Com[illegible]ter-Mediated Communication*, 12(4), 1169–1182. doi:10.1111/j.1083-6101.2[illegible]00368.x

Van Assen, M. A., van Aert, R., & Wicherts, J. M. (2[illegible]Meta-anal[illegible]s using effect size distributions of only statistically significant studies. *Psychological Met[illegible]*, 293–309. doi:10.1037/met0000025

Verduyn, P., Lee, D. S., Park, J., Shablack, H., Orvell, A., Bayer, J., & Kross, E. (2015). Passive Facebook usage undermines affective well-b[illegible]. [illegible]d longitudinal evidence. *Journal of Experimental Psychology: General,* 144, 480[illegible]88. doi:[illegible]1037/xge0000057

Yang, C. C. (2016). Instagram use, loneline[illegible]nd[illegible]ial comparison orientation: Interact and browse on social media, but don't compare. *Cyberpsy[illegible]gy, Behavior, and Social Networking,* 19(12), 703–708. doi:10.1089/cyber.2016.020[illegible]

Yang, C.-c., & Brown, B. [illegible](2015). Motives for[illegible]ing Facebook, patterns of Facebook activities, and late adolescents' s[illegible]ial adjus[illegible]ent to college. *Journal of Youth and Adolescence,* 42, 403–416. doi:10.1007/s10964-[illegible]2-9836-x

Yang, C.-c., & Brown[illegible]B. (20[illegible]). Online self-presentation on Facebook and self-development during the college[illegible]tion. *Journal of Youth and Adolescence,* 45, 402–416. doi:10.1007/s1[illegible]64-015-038[illegible]

Yang, C.-c., Bro[illegible], B. B., & Braun, [illegible](2014). From Facebook to cell calls: Layers of electronic intimacy i[illegible]llege students' interpersonal relationships. *New Media & Society*, 16(1), 5–23. doi:10.11[illegible]1461[illegible]12472486