

Does Online Technology Make Us More or Less Sociable? A Preliminary Review and Call for Research

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Abstract

How does online technology affect sociability? Emerging evidence—much of it inconclusive—suggests a nuanced relationship between use of online technology (the Internet, social media, and virtual reality) and sociability (emotion recognition, empathy, perspective taking, and emotional intelligence). Although online technology can facilitate purely positive behavior (e.g., charitable giving) or purely negative behavior (e.g., cyberbullying), it appears to affect sociability in three ways, depending on whether it allows a deeper understanding of people's thoughts and feelings: (a) It benefits sociability when it complements already-deep offline engagement with others, (b) it impairs sociability when it supplants deeper offline engagement for superficial online engagement, and (c) it enhances sociability when deep offline engagement is otherwise difficult to attain. We suggest potential implications and moderators of technology's effects on sociability and call for additional causal research.

Keywords

empathy, sociability, technology, virtual reality, human-computer interaction

Two prominent competing views over modern technology come from two unlikely sources: the two most recent popes. Pope Benedict XVI (Lazar, 2010) voiced concern about mobile technology, stating that young people “establish forms of communication that do not increase humaneness but instead risk increasing a sense of solitude and disorientation” (para. 2). Pope Francis (May, 2016), on the other hand, has called the Internet a “gift from God,” stating, “The networks of human communication have made unprecedented advances. The Internet, in particular, offers immense possibilities for encounter and solidarity” (paras. 10 and 11).

These two opposing viewpoints are also echoed by less pious sources. In *Alone Together*, renowned media scholar Sherry Turkle (2012) presents a starkly pessimistic view of technology's effect on humans, suggesting that “We seem determined to give human qualities to objects and content to treat each other as things” (p. xiv) In contrast to Turkle's pessimism, leading media theorist Keith N. Hampton (2015) states, “What has changed is that communication technologies have made many of our relationships more persistent and pervasive. This, in turn, is transforming how we relate to

those around us, in what are mostly positive ways” (para. 3).

More recently, an *Atlantic* article by Jean Twenge (2017a) titled “Have Smartphones Destroyed a Generation?” sifts through longitudinal studies of mental health to argue that online technology is harming our social lives. Twenge writes, “Social-networking sites like Facebook promise to connect us to friends. But the portrait of iGen teens emerging from the data is one of a lonely, dislocated generation” (para. 28). Yet Twenge's book, *iGen* (2017b), also argues that online technology makes this “dislocated” generation more inclusive and empathic toward others of dissimilar sexual identities, races, and ethnicities: “They're exquisitely tolerant and have brought a new awareness of equality, mental health, and LGBT rights” (p. 612).

These dueling perspectives—Pope Benedict XVI versus Pope Francis, Turkle versus Hampton, and Twenge's

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positive versus negative views—seem to be reflected in the scientific record. One large-scale study analyzed self-reported empathy from 72 samples of American college students ($N = 13,737$) and found that empathy decreased from 1979 to 2009—which the researchers partially attributed to increasing Internet use (Konrath, O'Brien, & Hsing, 2010). Of course, decreasing empathy could also be tied to increases in individualism (Santos, Varnum, & Grossman, 2017) and political partisanship (Andris et al., 2015) and perhaps also to changing parenting practices and societal expectations for success (Konrath et al., 2010). However, the negative relationship between Internet use and empathy is consistent with research showing that people who connect to others via technology are more likely to live alone and neglect civic institutions (Hampton, Sessions, & Ja Her, 2011; Klinenberg, 2012; Lofland, 1998; Putnam, 2000). Given that some of the work cited here was conducted before online technology use became universal, it is important to note that these patterns seem to persist in more recent years when online technology has become widespread.

In contrast, other scholarly work presents a more optimistic view. Research demonstrates that frequent Internet use is associated with higher trust because it allows for open information exchange and community development (Beaudoin, 2008; Shah, McLeod, & Yoon, 2001) and more community participation (Hampton & Wellman, 2003; Wellman, Haase, Witte, & Hampton, 2001). Frequent use of certain mobile applications designed with psychiatric treatment in mind may also help improve mental health disorders through enhancing online social support and connection (Dobbs, 2017).

These contradictory findings—that Internet use functions as both social connector and separator—are further muddied by research that reveals a more complex relationship between online technology and sociability. To unravel this complexity, we systematically explore the emerging science of online technology's effects on social understanding and social sensitivity.

Exploring Sociability

Most research on the psychological effects of technology has focused on social connection and its inverse, social isolation (Amichai-Hamburger & Ben-Artzi, 2003; Kraut et al., 2002; Kraut et al., 1998; Morahan-Martin & Schumacher, 2003). Although social connection is undoubtedly important because it predicts health and longevity (Cacioppo & Patrick, 2008), technology may also affect *sociability*. Sociability is defined as people's capacity and tendency to be sociable—to recognize and respond positively to others' mental states (thoughts, feelings, beliefs, intentions, desires).

Sociability includes diverse and related psychological processes:

- Empathy, an “other-oriented emotion elicited by and congruent with the perceived welfare of someone in need” (Batson, 2009, p. 11), which also includes mentalizing (considering others' mental states) and experience-sharing (vicariously sharing one's mental states) and prosocial concern (expressing motivation to improve others' mental experiences; Zaki & Ochsner, 2012);
- Emotional intelligence (the general capacity to understand others' emotions, to assimilate one's emotions into thought, and to express and regulate one's own emotions; Mayer, Salovey, Caruso, & Cherkasskiy, 2011);
- Perspective taking (akin to mentalizing; the capacity to read and infer others' mental states; Frith & Frith, 2006); and
- Emotion recognition (the accurate identification of others' emotions from facial expressions or vocal tone; Elfenbein & Ambady, 2002).

Although we acknowledge that these processes can diverge from each other (e.g., self-reported empathy and accurate emotion recognition can diverge from each other; Zaki, Bolger, & Ochsner, 2008), all these processes have a common essential attribute—each involves the perception of others' minds (Waytz, Gray, Epley, & Wegner, 2010; Wegner & Gray, 2016). Colloquially, sociability involves appreciating the mental depth of others, looking beyond the words and actions of superficial interaction to accurately intuit others' thoughts and feelings.

Initial Inconclusive Empirical Investigations

To investigate the link between online technology use and sociability, we attempted to examine several existing data sources. First, we constructed a broad, global data set using 2016 Internet penetration rates per country (i.e., the number of Internet users as a percentage of a country's population; Internet Live Stats, 2016) as a proxy for online technology use. To capture empathy, we obtained country-level empathy scores from a massive study of self-reported empathic concern (using the subscale from the interpersonal reactivity index; M. H. Davis, 1983) from 104,365 participants online in 63 countries (Chopik, O'Brien, & Konrath, 2017).¹ There was a significant negative correlation between Internet penetration and empathy, $r(60) = -.31$, $p = .016$ (see Fig. 1), suggesting that people in countries with higher Internet availability have lower levels of empathy—although we note that respondents were not necessarily nationally representative, and sample size varied across country.

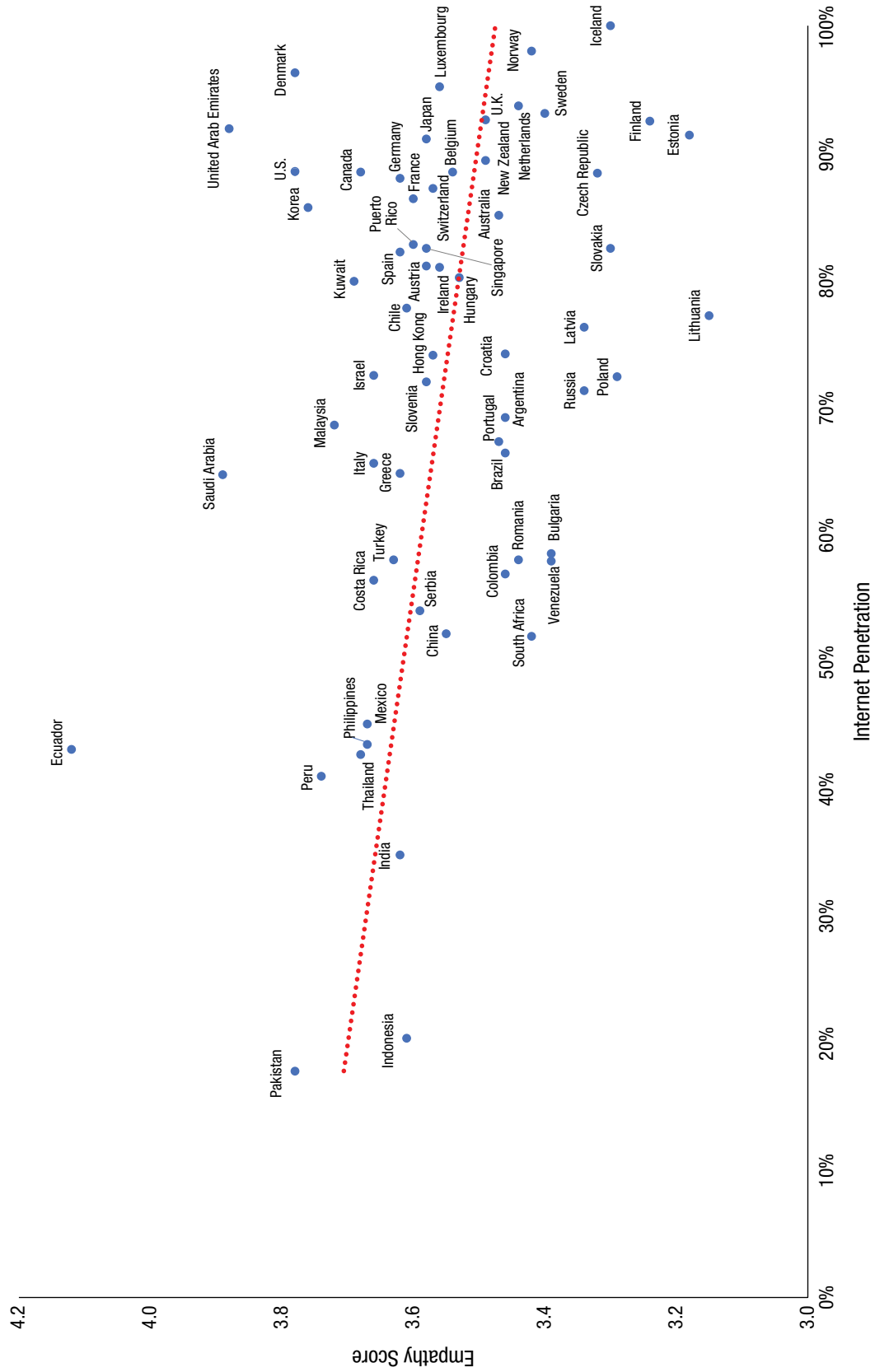


Fig. 1. Empathy and Internet penetration. The scatterplot (with best-fitting regression line) shows the relationship between empathy and Internet penetration by country. Note that empathy scores reflect country-level scores of self-reported empathic concern, and Internet penetration refers to number of Internet users as a percentage of a country's 2016 population.

We then submitted these data to several robustness checks. First, we examined two additional variables that could account for this relationship: gross domestic product (GDP) and individualism. We took country-level GDP (in billions of U.S. dollars) for 2016 from the International Monetary Fund's (2017) World Economic Outlook Database, and we took individualism scores from Geert Hofstede's (2017) research database, in which each country's individualistic versus collectivistic tendencies (i.e., the extent to which the self-concept is defined in terms of "I" rather than "we") have been calculated using large-scale data. GDP was not correlated significantly with either Internet penetration or empathy (p s > .17), and in a regression analysis in which Internet penetration and GDP were entered as simultaneous predictors of empathy, Internet penetration predicted empathy, $\beta = -0.32$, $t(59) = 2.61$, $p = .011$, but GDP did not ($p > .11$). Results were the same when we excluded the United States and China, which exhibited GDP values 3 SD s above the mean.

Individualism was correlated with both Internet penetration, $r(60) = .64$, $p < .001$, and empathy, $r(60) = -.34$, $p = .007$. A regression in which Internet penetration and individualism were entered as simultaneous predictors of empathy revealed that neither predicted empathy (p s > .12). This finding suggests that individualism does not predict empathy over and above Internet penetration when accounting for both variables. In addition, although we consider empathy to be the "outcome variable" in our analyses, for exploratory purposes, we also performed a regression analysis predicting Internet penetration using individualism and empathy as predictors. The results showed that individualism predicted Internet penetration, $\beta = 0.60$, $t(59) = 5.72$, $p < .001$, but empathy did not ($p = .34$), which suggests a stronger relationship between individualism and Internet penetration than between empathy and Internet penetration.

We also examined the correlation between empathic concern and Internet penetration after excluding Ecuador; its empathy score (4.12) fell just outside 3 SD s of the mean (4.08). We found that this correlation remained nearly significant, $r(59) = -.25$, $p = .051$, suggesting that this result is not meaningfully driven by one outlier, although ultimately our sample size is smaller than is desirable to produce a stable estimate (Schönbrodt & Perugini, 2013). Overall, these analyses suggest a negative relationship between empathy and Internet penetration but also suggest one that is ultimately inconclusive and potentially dependent on other variables.

To address issues of sample size, third variables, and representativeness of sample, we also sought additional data, specifically from the United States. The only appropriate data were the 2002 and 2004 versions of

the General Social Survey (GSS; J. A. Davis, Smith, & Marsden, 2007), which asked a nationally representative American sample seven questions about empathic concern. Items (e.g., "I often have tender, concerned feelings for people less fortunate than me") were rated from 1 (*does not describe me very well*) to 5 (*describes me very well*). Reverse-scoring appropriate items; coding "don't know," "NA," and no-answer responses as blank; and averaging these items produced an empathy composite ($\alpha > .71$).

To assess online technology use, we identified two measures, one assessing how much time (per week) respondents spent using e-mail and one assessing time spent using the Internet (not including e-mail). The 2002 survey also asked how much time spent on the web involved chatting online (e.g., in discussion forums). Note that these items screen out people who report no computer use or access to Internet through WebTV and come from a time before the proliferation of online technology and social media. Nevertheless, they capture prevailing practices of online technology use at the time.

For 2002 data, empathy did not significantly correlate with chatting online, $r(310) = .005$, $p = .93$, but negatively correlated with time spent e-mailing, $r(911) = -.07$, $p = .047$. Among those using the Internet for purposes other than e-mail, empathy was marginally negatively correlated with time spent using the Internet, $r(754) = -.06$, $p = .076$. We acknowledge that these correlations are small given the large sample sizes. In addition, the correlation between empathy and non-e-mail Internet use became nonsignificant when we controlled for respondents' age and gender ($r = -.03$, $p = .34$), although the negative correlation between empathy and e-mailing remained significant when we controlled for age and gender ($r = -.07$, $p = .049$). For the 2004 data, the only correlation we could compute, time spent on the web and empathy, was not significant, $r(828) = -.04$, $p = .30$. Thus, results from the GSS again hint at a negative relationship between online technology use and empathy but are largely inconclusive.

The inconclusive patterns revealed in these three data sets (i.e., our Internet penetration analysis and the two GSS samples) suggest a more nuanced relationship between sociability and online technology use. In this article, we summarize the existing literature on online technology and sociability and report that—among the existing evidence—there is support for both positive and negative effects of technology on sociability. Despite some clear cases in which online technology has uniformly positive or negative effects on sociability, we suggest that its impact depends mostly on how it is used—on whether it allows a deeper understanding of other minds.

Online Technology and Sociability: A Question of Enabling Interpersonal Depth

As we noted above, sociability is about understanding the thoughts and feelings of others: divining motivations that drive actions, seeing emotions that define experiences, and being able to share someone's perspective. Research examining offline interactions reveals that sociability is increased through experiencing interpersonal depth, which is the type of engagement one experiences with a partner in a socially close relationship: personal exchanges that are frequent and rich, enabling people to know others' thoughts, feelings, and desires. Deep (as opposed to superficial) engagement in offline interactions builds many capacities of sociability, including emotion recognition (Elfenbein & Ambady, 2003), empathy (Beeney, Franklin, Levy, & Adams, 2011), perspective taking (McPherson Frantz & Janoff-Bulman, 2000), and emotional intelligence (Schutte et al., 2001), and the same is likely to be true for online interactions. Online technology use should increase sociability when it provides interpersonal depth and gives a clearer sense of other people's minds. Conversely, online technology should decrease sociability when it provides only superficial interactions and prevents a deeper understanding of other people.

Note that online interactions differ from offline interactions. In many cases, online technology seems specifically designed to obscure mental depth by providing anonymity and increasing social distance. As the old cartoon goes, "On the Internet nobody knows you're a dog"; online technology obscures not only people's identities but also their underlying thoughts and emotions. Consider the amount of social and affective information conveyed in an offline conversation compared with an online twitter post. An offline conversation relies on unbounded speaking, which communicates emotion and confidence (or lack thereof) via tone, pitch changes, and pauses (Gobl & Ní Chasaide, 2003; Kraus, 2017). In contrast, a tweet relies on a mere 280 written characters, which strips away nuance and conveys emotional experience only through exclamations points or trite emojis. Even e-mail, which allows for unlimited writing, is often misinterpreted because it lacks clear cues to people's underlying mental processes (Byron, 2008). We are quick to acknowledge that online interactions do sometimes allow for deep interpersonal connection, given that some people find their spouses in chatrooms and online game rooms (Dutton et al., 2009). However, we suggest that there is at least a relative asymmetry, such that others' minds are more obscured online than offline.

Even if online technology is more distancing than offline interactions, it still probably allows for increased

interpersonal understanding when people already have a deep offline connection. Compare reading the tweet of your best friend or a stranger. With your best friend, you already understand their typical thoughts and feelings (see Stinson & Ickes, 1992), giving the tweet both context and an emotional richness that further deepens your understanding of your friend's mental processes—thereby building sociability. In contrast, the tweet of a stranger lacks any underlying context, yielding less information about underlying mental states and undermining sociability. Of course, for people who lack any deep offline relationships, then even the relatively superficial insight into other minds provided by online technology may be better than nothing.

More concretely, we suggest three relationships between online technology and sociability:

1. Online technology should build sociability when it complements already deep offline engagement—in which people already have access to other's thoughts and feelings (Fig. 2; Arrow 1).
2. Online technology should impair sociability when it pulls people away from this deep offline engagement, redirecting them to relatively superficial relationships—those in which people lack access to others' thoughts and feelings (Fig. 2; Arrow 2).

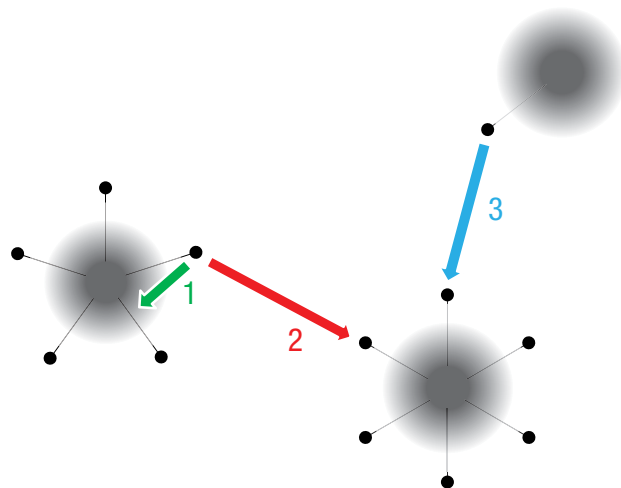


Fig. 2. Three proposed relationships between online technology and sociability within a social landscape. Linked nodes represent offline connections, arrows represent online connections, and darker shading represents people's deeper thoughts and feelings, which are relatively hard to access in online interactions. Three possibilities: Online technology could increase sociability by providing additional access to the thoughts and feelings of relatively deep preexisting offline relationships (Arrow 1). Online technology could decrease sociability by replacing deeper offline relationships with superficial online relationships in which underlying thoughts and feelings are difficult to observe (Arrow 2). Online technology could increase by sociability in situations where deep offline engagement is completely lacking—even superficial online engagement is likely to be better than nothing (Arrow 3).

3. Online technology should improve sociability—even when relatively superficial—for people who otherwise lack deep offline social engagement with others (Fig. 2; Arrow 3). For example, someone suffering from severe autism or social anxiety may have access to others' thoughts and feelings only through online technology (Kandalajt, Didehbani, Krawczyk, Allen, & Chapman, 2013).

This model therefore suggests that the consequences of online technology use depend on whether it encourages or inhibits interpersonal depth. This relationship depends not only on the characteristics of the user—the scope and depth of their offline networks—but also on the specific kind of online technology used. Facebook, with its ability to share volumes of family pictures, probably provides broader insight into people's feelings than does reading the comments section of an online pornography video.

Although the term *online technology* is vague, we define it as technical means used to connect people to a platform not physically present, which includes the

Internet, mobile applications, and virtual reality. We acknowledge that virtual reality does not always require Internet connectivity; it falls under our definition because it transports people beyond their current offline physical reality—it involves creating a proxy presence for oneself to interact with others. Compared with other online technologies, virtual reality may involve interacting with less proximal (and more fictive) others, but given the relative dearth of literature on technology and sociability, we erred toward overincluding relevant research.

Our literature review identified all articles we could find that examined associations between the specific technologies identified here and the specific sociability capacities identified above—empathy, emotional intelligence, perspective taking, and emotion recognition. We therefore did not include literature on outcomes or correlates of sociability, such as social anxiety, homophily, and intimacy, although we do address these constructs in our general discussion. In Table 1, we sort the empirical literature reviewed here in terms of technology type and sociability dimension; this also reveals the limited

Table 1. Matrix of Empirical Articles Exploring the Relationship Between Different Kinds of Online Technology (Columns) and Sociability (Rows)

	Internet	Mobile Applications	Virtual Reality
Empathy	<ul style="list-style-type: none"> • Steffgen, König, Pfetsch, and Melzer (2011) • Topcu and Erdur-Baker (2012) • Brewer and Kerslake (2015) • Wei (2007) • Foubert, Brosi, and Bannon (2011) • Vossen and Valkenburg (2016) • Collins (2014) • Hamissi, Babaie, Hosseini, and Babaie (2013) • Melchers, Li, Chen, Zhang, and Montag (2015) 	<ul style="list-style-type: none"> • Steffgen et al. (2011) • Topcu and Erdur-Baker (2012) • Brewer and Kerslake (2015) • Vossen and Valkenburg (2016) • Jeong and Lee (2015) 	<ul style="list-style-type: none"> • Cheng, Chiang, Ye, and Cheng (2010) • Oh, Bailenson, Weisz, and Zaki (2016) • Kalyanaraman, Penn, Ivory, and Judge (2010) • Ahn, Le, and Bailenson (2013)
Perspective taking	<ul style="list-style-type: none"> • Topcu and Erdur-Baker (2012) • Vossen and Valkenburg (2016) • Alloway, Runac, Quershi, and Kemp (2014) • Kruger, Epley, Parker, and Ng (2005) 	<ul style="list-style-type: none"> • Topcu and Erdur-Baker (2012) • Vossen and Valkenburg (2016) 	<ul style="list-style-type: none"> • Kandalajt, Didehbani, Krawczyk, Allen, and Chapman (2013)
Emotion Recognition		<ul style="list-style-type: none"> • Uhls et al. (2014) 	<ul style="list-style-type: none"> • Kandalajt et al. (2013) • Ke and Im (2013) • Moore, Cheng, McGrath, and Powell (2005) • Cheng and Fan (2008) • Hopkins et al. (2011) • Rus-Calafell, Gutiérrez-Maldonado, and Ribas-Sabaté (2014)
Emotional Intelligence	<ul style="list-style-type: none"> • Parker, Taylor, Eastabrook, Schell, and Wood (2008) • Herodotou, Kambouri, and Winters (2011) 	<ul style="list-style-type: none"> • Beranuy, Oberst, Carbonell, and Chamarro (2009) • van Deursen, Bolle, Hegner, and Kommers (2015) 	

or nonexistent nature of certain literatures, which we revisit in the general discussion.

Good or Bad?

An outlet for prosociality

Online technology can promote sociability when it brings people together to raise money and awareness for social issues. Consider the “ice-bucket challenge,” in which people posted online videos of themselves dumping buckets of ice water over their heads and asking friends to either do the same or donate to amyotrophic lateral sclerosis (ALS) research. Despite the arguably frivolous premise, this movement raised more than \$115 million for the ALS Association (Rogers, 2016). Online social media enabled the ice-bucket challenge to propagate easily through social networks and provided visible “social proof” of others’ participation, which allowed money to be raised more effectively than if this event had only taken place offline (Koohey & Koohey, 2014; Sutherland, 2016).

Empirical research also reveals that online technology enables people to express empathy offline. In a 2011 Pew Survey (Rainie, Purcell, & Smith, 2011), Americans reported feeling that the Internet helped them to donate money, volunteer, and provide emotional support to others. The Internet has also given rise to new forms of activism that increase participation in various offline social movements and causes (Earl, Kimport, Prieto, Rush, & Reynoso, 2010). Open questions remain whether this online participation translates into offline behavior (Earl & Kimport, 2011; Gladwell, 2010). For example, one large-scale analysis of Facebook “causes” found that whereas many people “like” a charitable cause, this seldom translates into actual donations (Lewis, Gray, & Meierhenrich, 2014). Nevertheless, technology makes activism easier by providing a low-cost platform for outreach and organization and provides a public forum to display commitment. At least one study found that signing an online petition increases people’s donations to a related charity, supporting a possible link between online and offline activism (Y. H. Lee & Hsieh, 2013). In sum, evidence suggests the possibility for online technology—and the Internet in particular—to facilitate sociability by easily allowing people to express prosocial concern for others.

An outlet for antisociality

Of course, online technology can also be used specifically for antisocial means. Social communities can form online specifically for the purposes of criticizing, harming, and exposing others in embarrassing ways, such

as some forums on the discussion website Reddit. The “dark web” (a set of networks not indexed by traditional search engines) enables people to coordinate illegal activities such as distributing child pornography or recruiting people for terrorist activities.

The ease with which information and misinformation circulates broadly, anonymously, and quickly on the Internet also creates new opportunities to harm people personally. In 2012, Amanda Todd posted a video on YouTube describing how a stranger she met online blackmailed and cyberbullied her. This cyberbully circulated a nude photo of Todd that he had pressured her to take, eventually creating a fake Facebook profile and contacting her real-life classmates, who ridiculed Todd. The day after posting this video, Todd committed suicide, clearly illustrating the potentially destructive outcomes of cyberbullying.

Cyberbullying, like many of the behaviors described in this section, represent augmented versions of behaviors that can be performed offline as well (i.e., traditional bullying). Online technology enables people to perform these harmful behaviors more anonymously and often more efficiently, exacerbating the negative consequences for sociability. Many studies reveal an association between cyberbullying—aggressive online behavior—and declines in empathy (Brewer & Kerslake, 2015; Kowalski, Giumetti, Schroeder, & Lattanner, 2014; Steffgen, König, Pfetsch, & Melzer, 2011; Topcu & Erdur-Baker, 2012). In one large-scale study (Steffgen et al., 2011), researchers assessed more than 2,000 secondary school students in Luxembourg, examining their *lack* of empathy (i.e., whether they believed that victims of online harassment deserved it) and the frequency with which they engaged in cyberbullying through social media and direct online communication. Students who reported engaging in more cyberbullying possessed less empathy, suggesting two possible causal associations: Reduced empathy can contribute to cyberbullying and engaging in cyberbullying can reduce empathy.

Sociability is also likely to be affected by playing violent video games, which often occurs online and through virtual-reality technology. One meta-analysis demonstrated that violent online video games reduce empathy and increase antisocial behavior (Anderson et al., 2010), and another demonstrated that, whereas playing prosocial video games reduces aggression, playing violent video games increases aggression (Greitemeyer & Mugge, 2014). Despite the strength of these effects, most empirical research examining video games and sociability typically uses correlational analyses with self-reports (Funk, Buchman, Jenks, & Bechtoldt, 2003; Wei, 2007; Zhen, Xie, Zhang, Wang, & Li, 2011). As with cyberbullying, the relationship between violent video-game play and low

sociability might be bidirectional. However, the use of longitudinal analyses (Krahé, Busching, & Möller, 2012), experiments (Bartholow, Sestir, & Davis, 2005), and the meta-analytic techniques noted here (Anderson et al., 2010; Greitemeyer & Mugge, 2014) can better provide causal evidence.

Beyond cyberbullying and violent video-game play, excessive online pornography consumption may also reduce sociability. The Internet makes it easy to access varied forms of pornography, including violent pornography (Short, Black, Smith, Wetterneck, & Wells, 2012), which is associated with reduced empathy for victims of sexual assault (Foubert, Brosi, & Bannon, 2011). Other work finds that addictive Internet use, which includes pornography consumption, is tied to lower emotional intelligence (Parker, Taylor, Eastabrook, Schell, & Wood, 2008). The conclusions of these studies are tentative because they rely largely on the self-reports of self-selected participants and do not establish causality; nevertheless, research generally supports the idea that antisocial online behavior reduces sociability, just as antisocial offline behavior spurs further disregard for others (Martens, Kosloff, Greenberg, Landau, & Schmader, 2007; Martens, Kosloff, & Jackson, 2010).

Online Technology: Beyond Good or Bad

Although online technology can directly facilitate prosociality and antisociality, links between technology and sociability are probably more nuanced. Just as research finds digital-screen use to have neither inherently negative nor inherently positive effects on mental well-being (Przybylski & Weinstein, 2017), so too is online technology likely to both help and harm sociability. Again, we suggest that online technology use can improve sociability when it reinforces otherwise deep offline relationships and can hinder sociability when it detracts from these deeper offline relationships in favor of superficial online-only relationships. Although superficial online-only interactions can detract from sociability, we acknowledge that it can improve sociability if it is someone's only means of social engagement. In other words, online technology enhances sociability when people use it to bolster or create relationships with prospective or existing offline friends, but it is associated with diminished sociability when used excessively—unless face-to-face social engagement does not come easily.

Deepening preexisting offline interactions

Existing research suggests that communicating with one's friends online has a positive relationship with overall perceptions of friendship quality (K. Davis, 2013) and relationship quality with offline friends

(Valkenburg & Peter, 2007). The one comprehensive longitudinal study of online technology and sociability found a positive relationship between social-media use and empathy in 942 Dutch adolescents (Vossen & Valkenburg, 2016). This study measured self-reported use of instant-messaging applications and social-network websites, empathic concern (termed "sympathy" by the authors), cognitive empathy (understanding others' feelings), and affective empathy (sharing others' feelings). Increased social-media use predicted increased cognitive and affective empathy (although it did not affect empathic concern) across two time points, demonstrating a potential causal pathway: Social-media use *increased* empathic processes. However, in this study, most technology use was only moderate (e.g., on average people used social media for 11 hr per week at Time 1 and 17 hr per week at Time 2).

Although less capable of establishing causal links, three cross-sectional studies have also measured social-media use and social skills. Two of them showed similar positive relationships—using Facebook to chat with friends (many of whom were offline friends) corresponded to higher self-reported perspective taking for males (Alloway, Runac, Quershi, & Kemp, 2014) and corresponded to increased empathic concern for both males and females (Collins, 2014). The other cross-sectional study showed an inconsistent relationship between online activity and empathy, in part because online activity was operationalized to include watching television (Carrier, Spradlin, Bunce, & Rosen, 2015). However, this study showed that those online activities that increased face-to-face interaction enhanced empathy for females.

Together, these studies reveal the benefits of using online technology to complement offline relationships. One study suggests that Facebook functions primarily as a tool for staying connected, and the chat function offers opportunities for some users to practice their social skills (Alloway et al., 2014). Another suggests that Facebook gives people more opportunities than they would have otherwise to engage with others and to empathize (Collins, 2014). Overall, online technology can help maintain relationships, strengthen empathy, and improve perspective taking when people use it to supplement off-line communication. As we describe next, despite its benefits as a supplement to social engagement, online technology is a poor replacement for offline communication.

Replacing offline interactions with superficial online interactions

People often use social media primarily because they desire social connection (Gangadharbatla, 2008; Sheldon, Abad, & Hinsch, 2011). However, online connection does not sufficiently substitute for face-to-face connection in

providing social support (P. S. Lee, Leung, Lo, Xiong, & Wu, 2011)—or in enhancing social skills (Kruger, Epley, Parker, & Ng, 2005).

At least one study showed that people who crave online connectivity and depend obsessively on their mobile phones have less emotional intelligence, particularly in terms of emotion regulation (Beranuy, Oberst, Carbonell, & Chamarro, 2009, but see van Deursen, Bolle, Hegner, & Kommers, 2015). An Iranian study of medical students showed that Internet addiction was correlated with lowered emotional intelligence (Hamissi, Babaie, Hosseini, & Babaie, 2013).

Likewise, a study of Korean nursing students found that smartphone addiction was related to experiences of personal distress—rather than empathic concern—in response to others' suffering (Jeong & Lee, 2015), consistent with surveys from China and Germany showing that Internet overuse corresponds to lower self-reported empathy (Melchers, Li, Chen, Zhang, & Montag, 2015). Other research examining 1,051 American and European video-game players measured emotional intelligence and showed that lower emotional intelligence is related to frequently playing the top-selling massively multiplayer online role-playing game, *World of Warcraft* (Herodotou, Kambouri, & Winters, 2011).

Two experiments also provide suggestive *causal* evidence that overreliance on online technology can reduce social skills. The first examined 51 students who spent 5 days at an overnight camp where computers, mobile phones, and television were banned. These students were avid technology users, spending on average almost 1 hr per day texting, more than 2 hr per day watching TV, and more than 1 hr per day playing video games (Uhls et al., 2014). Compared with a matched control group that continued using online technology, the technology-deprived group showed improved emotion recognition. Of course, it is unclear whether the absence of technology or some other aspect of the camp accounted for this effect, but it is likely that increased opportunities for offline social interaction can enhance sociability. It is also possible that reducing technology use has the greatest benefits for the most avid users.

A second experiment suggests that the mere presence of mobile technology can diminish sociability (Przybylski & Weinstein, 2013). Researchers randomly assigned people to communicate about an important or unimportant topic while sitting next to a mobile phone or not. When the phone was present, participants who discussed important issues reported less connection with their conversation partner, less trust, worse perceived relationship quality, and less perceived empathy from their partner. Although this study does not assess participants' own empathy—or their baseline

use of online technology—it also provides the possibility for a negative relationship between online technology and sociability, given the relationship between empathy and trust (Batson & Moran, 1999; Singer et al., 2006).

Note that existing research does not suggest a trade-off between mere time spent online and time spent offline in social activities; some research on adolescents indicates a positive relationship between Internet use and participation in real-world sports and clubs (Romer, Bagdasarov, & More, 2013). Other work has shown that Internet use supports “neighboring” behavior, communicating with one’s neighbors both on and offline (Hampton & Wellman, 2003). Rather than suggesting a simple inverse relationship between time spent online and offline, we suggest that the *way* people interact socially through online technology can compromise the ability to exhibit sociability more broadly.

Providing interaction for those who lack in-depth offline interactions

Even if online technology offers a lower-quality substitute for in-person relationships, it may benefit those who lack opportunity or capacity for extensive offline social connection and interaction. Several lines of research in offline contexts show how interventions can improve sociability in those with related deficits. For example, one study showed that administering oxytocin, a hormone implicated in social bonding, improved empathic accuracy in individuals who are high on the autism spectrum but not individuals who are low on the autism spectrum (Bartz et al., 2010). Another study showed that explicit perspective-taking instructions increased empathic concern among people high in maladaptive narcissism but not among people low in maladaptive narcissism (Hepper, Hart, & Sedikides, 2014). Likewise, a study showed that when psychopaths viewed emotion-laden videos of others, they generally showed less empathy-related brain activation but showed normal levels of empathy when explicitly instructed to empathize with the people in the videos (Meffert, Gazzola, den Boer, Bartels, & Keysers, 2013).

Consistent with this work, research reveals that online technology can improve sociability for those with autism. Autistic individuals can learn sociability online because this setting offers greater flexibility in pace of communication and reduced stress in decoding nonverbal signals (Benford & Standen, 2009; Burke, Kraut, & Williams, 2010). Numerous studies have used computer mediated virtual environments to enhance the social competence of those with autism (Beardon, Parsons, & Neale, 2001; Cheng & Fan, 2008; Cheng, Moore, McGrath, & Fan, 2005; Mitchell, Parsons, & Leonard, 2007; Moore,

Cheng, McGrath, & Powell, 2005), resulting in some tangible benefits to sociability.

In one study, three children (8–10 years of age) on the autism spectrum represented themselves with a 3-D avatar and interacted with other avatars in various social situations, such as someone cutting the queue in a restaurant line (Cheng, Chiang, Ye, & Cheng, 2010). They were then asked questions tapping empathy (e.g., “How do you feel when someone suddenly cuts in line in front of you?”); appropriate responses were rewarded by an expressive avatar, and inappropriate responses were corrected. Empathy, measured at baseline and after this intervention, was operationalized in terms of responses of tolerance, respect, and kindness toward others’ misfortune. All three participants showed gains in empathy because of this virtual environment intervention. A similar study of four children (9 or 10 years of age) simulated social interaction through virtual reality and showed gains in the ability to correctly interpret bodily gestures and facial expressions (Ke & Im, 2013).

Other studies using technology have revealed similar gains in sociability among neurodivergent individuals, but many used small samples. In one study with 49 participants, avatar-based virtual environments successfully trained autistic individuals on facial recognition and emotion recognition (Hopkins et al., 2011). A similar study with only eight autistic young adults found improvements and emotion recognition resulting from a 5-week training that used virtual reality to engage participants in various social tasks (Kandalaf et al., 2013). In another study with 12 participants, a similar avatar-based virtual-reality program enhanced emotion perception among schizophrenic individuals (Rus-Calafell, Gutiérrez-Maldonado, & Ribas-Sabaté, 2014). Another study with 49 participants used a computerized detective game that generated marked improvements in general social competence (including capacities that require empathy) for autistic children (Beaumont & Sofronoff, 2008).

Other simulation-based technology can help enhance sociability in these populations as well. One study that used multitouch tablets included music, puzzle-solving, photography, and drawing applications to train individuals on emotion recognition, understanding others’ interests, and predicting others’ emotions. Over a 2-week period, use of these apps led to higher observer ratings of sociability in 26 autistic children (Hourcade, Bullock-Rest, & Hansen, 2012). In another study, three autistic individuals observed videos in which a model performed a target behavior to be imitated; these participants showed gains in communication skills and understanding of others’ emotions (Sansosti & Powell-Smith, 2008). Taken together, these studies complement

work suggesting that online technology can improve the sociability of the socially impaired.

Of course, performance on lab-based sociability tasks does not always predict real-world behavior (particularly for autistic individuals; see Fombonne, Siddons, Achard, Frith, & Happé, 1994), and only some of these studies (e.g., Beaumont & Sofronoff, 2008; Kandalaf et al., 2013; Rus-Calafell et al., 2014) examined and demonstrated gains in real-world social functioning. Nonetheless, these studies show that by providing a naturalistic environment for socially impaired individuals to learn social skills, online technologies appear to enable individuals to compensate for social deficit and, in some cases, to *correct* for these deficits to produce improvements over time.

Online technology can also provide a “better than nothing” substitute for people for whom face-to-face social interactions are challenging or difficult to find. Studies with hearing-impaired individuals (Barak & Sadovsky, 2008), elderly individuals who are physically restricted (Delello & McWhorter, 2015; Shillair, Rikard, Cotten, & Tsai, 2015), and patients with breast cancer (Fogel, Albert, Schnabel, Ditkoff, & Neugut, 2002) all revealed that online technology use is positively associated with social support and possibly with sociability.

Some recent studies also suggest that virtual reality can improve sociability in a different context in which offline engagement is difficult or lacking: empathizing with socially distant, typically disliked, or stigmatized targets. That is, virtual reality can enhance empathy for groups or individuals toward which people are not naturally inclined to empathize. One study demonstrated that young people who were made to feel economically threatened by the elderly reported more empathy (and less antagonism) toward them after engaging in an immersive virtual reality exercise in which they embodied an elderly person (Oh, Bailenson, Weisz, & Zaki, 2016). Virtual reality can also be used to increase empathy toward individuals with schizophrenia. One study used virtual reality to allow participants to experience schizophrenia symptoms (i.e., hallucinations) during a pharmacy visit. Participants who experienced this simulation later reported more positive attitudes and more empathy toward people with schizophrenia compared with those in control conditions (Kalyanaraman, Penn, Ivory, & Judge, 2010). Other work showed that simulating red-green color-blindness using a virtual-reality experience produced more feelings of oneness and helping behavior toward color-blind people compared with a condition in which participants were asked to imagine being color-blind (Ahn, Le, & Bailenson, 2013). These measures represent close proxies to the experience-sharing and prosocial concern components of empathy.

Another study examined the effect of virtual-reality simulation in a negotiation context and found that participants who experienced the perspective of their negotiation opponent through the virtual simulation developed greater trust with the opponent and made greater concessions in the negotiation than participants who simply received information about the opponent's perspective (Gehlbach et al., 2015). Online technology may therefore hold promise in improving situational sociability and can improve relationships with socially distant others *if* it produces engagement with these individuals and their mental experiences.

General Discussion

This article summarizes existing work on the relationship between using online technology (the Internet, mobile applications, virtual reality) and sociability (empathy, perspective taking, emotional intelligence, emotion recognition). Although we have attempted to provide a nuanced picture of this relationship, we acknowledge that our conclusions sometimes hinge on limited data (see Table 1), which is unavoidable given this nascent literature. Because work on this topic is still emerging, we devote the rest of our review to identifying important areas of future research.

Moderating factors: Development, generation, and socioeconomic status

The research we have reviewed covers studies involving a wide range of ages, from young children to older adults. Given developmental differences in sociability as well as developmental differences in technology use, age is likely to be a critical moderator of the effects described here. For example, research on adolescents suggests that social-media use has double-edged effects on social connection, identity development, and general psychological well-being—similar to what we describe here for sociability. Social media enables adolescents to join social communities but also exposes them to opportunities for ostracism and alienation (Allen, Ryan, Gray, McInerney, & Waters, 2014; see also, Valkenburg & Peter, 2009). This pattern is likely to extend to sociability as well, given that Facebook use in adolescents is associated with both narcissism and virtual empathy (Rosen, 2011). On the other hand, online technology use may have a uniformly negative effect on younger children in supplanting their still-developing sociability capacities (Blakemore & Choudhury, 2006) and a uniformly positive effect on older adults, who—lacking mobility—may have fewer opportunities for offline social engagement (Rosso, Taylor, Tabb, & Michael, 2013). Some research suggests some negative

effects for children (Işık & Alkaya, 2017) and positive effects for elderly adults (Bradley & Poppen, 2003) for general psychosocial health and social interaction, but this research did not examine sociability per se. Future work can examine the role of development more definitively.

Similar to age, generation is likely to moderate the relationship between online technology use and sociability. Comprehensive studies reveal much higher use of online technology in more recent generations compared with previous ones (Perrin, 2015; Rideout, Foehr, & Roberts, 2010). This increase could influence the effects of technology use on sociability in several ways. Psychologist and technology expert, Larry D. Rosen (2010), who calls today's children the "iGeneration," suggests that these technology-steeped children are more selfish and less sociable. On the other hand, increased experience with online technology might mean that this generation is more capable of using technology to complement offline social interaction, thereby boosting sociability. Cross-generational comparisons can examine these patterns further.

Socioeconomic status (SES) is another variable that is likely to moderate the relationship between online technology use and sociability. Those with higher SES have more access to the Internet (Fox, 2005; Hargittai, 2010; Wellman, 2001) and use this access for "capital-enhancing" online activities in which they gain access to useful information (Zillien & Hargittai, 2009), sometimes resulting in improved health (Wangberg et al., 2007). This kind of online technology use may help those higher in SES to develop sociability, despite research suggesting more broadly that the rich (compared with the poor) are generally less concerned with the emotions and perspectives of others (Kraus, Piff, Mendoza-Denton, Rheinschmidt, & Keltner, 2012). Again, we urge future research on the role of SES in moderating the effects of online technology on sociability.

Implications for related phenomena: Social anxiety and intimacy

Our literature review focused on sociability, but it also has implications for two closely related phenomena. One is social anxiety, the tendency to experience distress in social situations (La Greca, Dandes, Wick, Shaw, & Stone, 1988), which seems to interact both positively and negatively with online technology use. Some research shows that high social anxiety is related to problematic social-media use (e.g., using Facebook out of fear of being disliked; Lee-Won, Herzog, & Park, 2015). Another study showed that exposing people with high social anxiety to someone's Facebook profile before meeting the person in the profile increased

physiological arousal (Rauch, Strobel, Bella, Odachowski, & Bloom, 2014). Conversely, other work has shown that for adolescent boys with high social anxiety, chatting with others online relates to higher perceived friendship quality (Desjarlais & Willoughby, 2010). Thus, consistent with our model, work on social anxiety suggests online technology can both complement and supplant offline interaction.

Intimacy is another related phenomenon influenced by online technology. Although dating applications and websites have dramatically expanded people's ability to find close relationships, these relationships may not be of high quality (Finkel, Eastwick, Karney, Reis, & Sprecher, 2012). People are often dishonest in their online profiles (Guadagno, Okdie, & Kruse, 2012; Toma, Hancock, & Ellison, 2008)—or at least unrealistically optimistic about themselves—which leads to unfulfilled expectations when people meet offline. People also strategically represent themselves on social media (e.g., Facebook; Gil-Or, Belz, & Turel, 2015), which suggests an interesting paradox: Online technology provides opportunities for people to consider other perspectives, but the perspectives that people offer online might not reflect their true beliefs and feelings.

Geopolitical consequences

The work we have examined here largely involves the effect of online technology use on sociability for individuals. Yet, given that societies—and their political systems—emerge from the interaction of individuals, it is worth exploring the effects of online technology on a broader scale.

In the wake of recent elections, some have suggested that online technology contributes to homophily by creating “echo chambers” in which people are exposed only to the ideas they already endorse (Boutyline & Willer, 2017). Consistent with this idea, considerable research suggests that Internet use—especially social-media use—facilitates the formation of ideologically homogeneous groups that shield people from dissenting ideas (Colleoni, Rozza, & Arvidsson, 2014; Garrett, 2009; Quattrociocchi, Scala, & Sunstein, 2016; Zuckerman, 2013, but see Flaxman, Goel, & Rao, 2016). Substantial research demonstrates that homogeneity and tightness within an in-group is associated with greater out-group antagonism (Braun & Koopmans, 2010; Choi & Bowles, 2007; Cohen, Montoya, & Insko, 2006), so the echo chambers created by online media may help explain the increasing political polarization (Prior, 2007) and perhaps even the rise of online hate groups (Sunstein, 2009).

However, counter to the echo-chamber idea, recent work suggests that using the Internet in an undirected fashion incidentally *increases* exposure to views from

one's ideological out-groups (Fletcher & Nielsen, 2017; see also Flaxman et al., 2016). This research showed that across multiple countries (Australia, Italy, the United Kingdom, and the United States), people who use YouTube, Facebook, and Twitter encounter a more ideologically diverse set of news sources than people who do not use social media.

Whether such exposure to the ideas of out-groups actually enhances sociability toward out-group members is an open question though. Indeed, online technology may in fact decrease tolerance toward out-groups. As Figure 2 suggests, online technology can complement already-deep offline relationships—with people who probably share your ideological views—but does not naturally reveal the deeper thoughts and feelings of out-group members who are met only online. Therefore, superficial exposure to the minds of out-group members (Arrow 2) makes it easy for people to caricature and deride them and their ideas to in-group members (Arrow 1). This dynamic seems to characterize Twitter (where Fletcher & Nielsen, 2017, found particularly high incidental exposure to ideologically dissimilar views): People are often exposed to tweets of “the other side” only when the tweets are embedded—and ridiculed—within tweets of people they already follow.

Beyond the polarization of groups of individuals, there may be even more macro-level effects of online technology on sociability. Consider the finding that individuals' mood states expressed on Twitter predict the “mood” (success or failure) of national stock markets (Bollen, Mao, & Zeng, 2011), which hints that individual effects may translate to societal phenomena.

We suggest that, as with individual effects, the societal effects of online technology are multifold. Governments ranging from Mexico to Russia have used the Internet for antisocial means, including spying or sabotaging their perceived opponents both within and outside their countries. China monitors its own citizens and thwarts antigovernment sentiments through social-media applications such as WeChat (Ruan, Knockel, Ng, & Crete-Nishihata, 2016). The United States engages in considerable surveillance of its citizens through online channels as well, the extensive nature of which we know because of whistleblower Edward Snowden's testimony.

Although online technology can undermine free expression, access to online technology also appears to make societies more respectful and tolerant of others. Analyses of country-level values over multiyear periods (using the World Values Survey) have demonstrated that a country's technological advancement (which includes advancement of Internet and communication technologies) is positively associated with a country's endorsement of emancipative values, which

include equality, desire for universal freedom, and acceptance of homosexuality (Welzel, 2014).

Online technology seems—perhaps paradoxically—to facilitate open and democratic citizenships while also aiding closed and authoritarian governments. Future research is certainly needed to explore whether this tension truly exists and—if it does—how to reconcile these two trajectories.

Methodological opportunities

Research on technology and sociability is relatively sparse and rapidly changing. Not only does Table 1 reveal entire gaps in the literature but also it shows that even existing work is limited because it (a) often relies on correlational studies that do not permit for causal claims, (b) frequently compares use of online technology to no use of online technology, rather than to some comparable “control” activity, and (c) usually focuses on specific populations or technology-related activities (limiting its generalizability). Future research must address these shortcomings.

Most critically, studies on the relationship between use of online technology and social skills need to randomly assign people to use online technology before measuring sociability. This research should also better isolate the “online” element of online technology as opposed to technology in general. For example, research that compares chatting online to not chatting at all confounds the specific activity (chatting) with extent of online technology use. Future research can disentangle these variables by providing tightly controlled comparison conditions.

Future experimental research should also compare different types of technology use and social skills. Online technology encompasses diverse forms, ranging from Facebook messaging to virtual-reality environments, which are likely to have different effects on social skills. Moreover, different online technology types may have specific effects on specific social skills—perhaps Facebook messaging deepens empathic concern for old friends, whereas virtual reality enhances the ability to take new perspectives of individuals one would not normally encounter. Different technology types also enable different methods of use—people can use Facebook messaging for aggressive stalking or bullying and can use virtual reality to simulate violence, both of which might diminish empathy. In addition, different technologies can be used for similar purposes—for example, one could attempt to experience what it is like to be a dissimilar other through a virtual-reality experience or through accessing YouTube videos of people unlike oneself. Ultimately, we believe that *type of use* (i.e., how online technology is used) has a

more significant impact on sociability than the type of technology itself, but investigating these interactions between type, method, and user characteristics would provide a more nuanced picture of the impact of online technology.

Research should also examine different social populations because impairments in social functioning are not uniform. Although both those with autism and those with psychopathy have deficits in empathy, technological interventions may help these groups to differing degrees. For example, compared with those with psychopathy, activating empathy for those with autism relies more on establishing social connection (Gillespie, McCleery, & Oberman, 2014), and technology may be able to help establish this connection. Future research might also examine not only the impact of online technology on those with social deficits, but also test its effects on those with above-average social skills.

Future research should also better distinguish between sociability as an ability and sociability as a tendency. Most research on online technology use cannot distinguish between these types; we believe that in many cases, technology affects both similarly. For example, virtual-reality training seems to build sociability as a skill for individuals with autism (Kandalaf et al., 2013), but it might do so by increasing the tendency for them to interact with others. For other populations with intact skills but with limited opportunities for face-to-face interaction (e.g., the elderly), technology use may specifically increase the tendency for sociability.

Finally, future research can also explore whether engaging with online technology changes people’s opportunities to engage in the socioemotional processes that define sociability, such as empathy and perspective taking. In her 2015 book, *Reclaiming Conversation*, Sherry Turkle (2015) suggested that increased engagement with technology may lead people to immerse themselves in idealized online identities that help them to avoid those in-person and in-depth conversations in which we “allow ourselves to be fully present and vulnerable . . . where empathy and intimacy flourish and social action gains strength” (p. 20). Future research can explore whether online technology alters not only people’s capacity for sociability but also their selection of situations in which they might employ this capacity.

Concluding Remarks

Technology can help us be more angelic, providing a low-cost way to reach out to others and lift them up. However, by distancing us from tangible emotional signals of others’ suffering, it can also unleash the worst of our demons. Although online technology allows us to help and harm others, it is not inherently good or

evil; instead it is likely to reinforce people's preexisting prosociality and antisociality. Research suggests that technology can supplement sociability in offline interactions—as long as it does not replace face-to-face interaction. Perhaps the greatest promise for online technology is for those with impaired social skills: Many studies reveal how the sociability of those with autism is improved through online and virtual interventions.

Online technology is still in its infancy. But as famed futurist Ray Kurzweil (2003) writes, we may soon have “full-immersion visual-auditory environments” and “will be able to enter [them] . . . either by ourselves or with other ‘real’ people” (para. 9). Will these powerful online environments enable us to be more or less in tune with other people's emotions? Our review suggests that the impact of online technology on sociability may depend on whether online technology enables altruism or spite and whether the interactions it affords enable or disable deeper interactions with others. But most of all, this review suggests that more conclusive research is needed to truly reveal whether online technology makes us kind or cruel.

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Note

1. The Internet penetration rate for South Korea was used for what the authors of the empathy study indicated simply as “Korea,” and Taiwan was excluded from analysis because no Internet penetration score was available. In the secondary analyses, “Korea” was indicated for the gross domestic product (GDP) data, and “South Korea” was used for individualism

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