Do the Socially Rich Get Richer? A Nuanced Perspective on Social Network Site Use and Online Social Capital Accrual

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The benefits of using social network sites (SNS) have spurred heated debate in academia and popular culture alike. This study sought to address the debate by formulating a new, nuanced framework highlighting two conceptual distinctions: (a) preference for versus problem in one's interpersonal relations, and (b) SNS use versus the benefits of such use. Mixed-effects meta-analysis was performed in 178 independent samples from seven regions worldwide ($n = 108,068$; age range $= 13$–68). Eligible studies were those that examined an association between at least one common proxy measure of the socially rich (vs. poor; i.e., extraversion, social anxiety, or loneliness) and a criterion measure (i.e., SNS use or online social capital). The results revealed a complex picture. SNS use was positively correlated with both extraversion and social anxiety, although the social anxiety–SNS use correlation was significant for adult samples rather than adolescent samples. Online social capital was positively correlated with extraversion but inversely correlated with loneliness. Our conclusion is that extraverted individuals use SNS to enhance their opportunities for social interactions and can acquire more online social resources, whereas adults who are socially anxious use SNS to compensate for their social deficits but such effort is unrelated to online social resource accumulation. Individuals who feel lonely tend to obtain few such resources. However, most of the studies examined the leisure use of Facebook. We advocate more thorough testing of our hypotheses in future research on therapeutic SNS use and/or the use of SNS other than Facebook.

Public Significance Statement
Scholars and social critics have been debating whether social network sites are of greater benefit to those who acquire more or less social resources in face-to-face interactions. This meta-analysis seeks to inform the debate by proposing a nuanced perspective that differentiates between preference for and problem in interpersonal relations, and between social network site use and the benefits of such use.

Keywords: Facebook, online social media, social capital, social network site, social networking site

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In today's digital era, most people make regular use of social network sites (SNS) such as Facebook and Twitter, which are online platforms that allow users to create profiles and communicate with others (e.g., Riva, Cipresso, & Wiederhold, 2016). Given their ease of operation and accessibility, SNS afford a convenient rendezvous point that is free of time and geographical constraints. As of January 2019, Facebook was ranked the most popular SNS, with 2.3 billion active users worldwide, followed by YouTube with 1.9 billion users and Instagram with 1 billion (Statista, 2019).

The mass appeal of SNS has attracted considerable research attention. The most frequently cited definition of SNS is that put forward by Boyd and Ellison (2007; see also Ellison & Boyd, 2013), who proposed three core characteristics. First, SNS allow users to create their own profiles, which others can view online. Second, such sites allow users to connect with other site members and compile a list of connections. Third, SNS permit users to view and traverse both their own connection lists and those of other members.

Do the Socially Rich or Poor Get Richer? A Heated Debate

Researchers exploring the social benefits of SNS have proposed that the sites act as virtual communities that facilitate the provision and exchange of online social capital (e.g., Chambers, 2013).

Online social capital refers to the tangible or intangible resources individuals obtain from their online social networks. Such resources, once secured, can confer further psychological and social benefits upon their owners (Williams, 2006). Online social capital is the most widely adopted indicator of online social resources (Ellison, Steinfield, & Lampe, 2007; Williams, 2006). There are divergent views on SNS use and its related social benefits, resulting in heated debate in academia and popular culture alike.

The debate, which focuses on who benefits most from SNS use, can be summarized by two rival hypotheses: the rich-get-richer/ social enhancement and poor-get-richer/social compensation hypotheses (e.g., Poley & Luo, 2012; Zywica & Danowski, 2008). Both hypotheses similarly propose that SNS use varies with the level of social capital garnered through offline interpersonal interactions, but the hypotheses differ in their predictions of the beneficiaries of such use. The rich-get-richer hypothesis, also commonly referred to as the social enhancement hypothesis, states that individuals who can secure greater offline social capital tend to benefit more from SNS use because SNS serve as an additional networking channel to leverage their already large reservoir of social resources. In contrast, the poor-get-richer hypothesis, also commonly referred to as the social compensation hypothesis, posits that individuals who are more disadvantaged in offline social capital accrual tend to benefit more because SNS serve as an alternative networking channel to expand their scant pool of such resources.

The literature reports mixed findings, with some studies substantiating the rich-get-richer/social enhancement hypothesis (e.g., Liu & Brown, 2014; Wilson, Fornasier, & White, 2010), and others the poor-get-richer/social compensation hypothesis (e.g., Hu, Kim, Siwek, & Wilder, 2017; Rains & Keating, 2011). As each hypothesis has received empirical support, it is possible that both are valid.

A Nuanced Perspective on SNS Use and Social Capital Accrual

The meta-analytic study reported herein sought to clarify this vexed debate by embedding the two seemingly paradoxical hypotheses in a single conceptual framework. Our proposed framework addresses two conceptual issues, the first of which refers to the distinction between preference for and problem in interpersonal relations. The framework is grounded in uses and gratifications theory (e.g., West & Turner, 2010), whose major premise is that individuals become active consumers of mass media to gratify some fundamental needs. Applying this theory to the contemporary context of SNS, we assume that users actively engage in SNS activities to satisfy their socialization needs, which are crucial for communication effectiveness and psychological well-being across cultures (e.g., Bowlby, 1982; Cheng, Cheung, & Montasem, 2016). Despite the universality of these intrinsic needs (R. M. Ryan & Deci, 2002), we posit that individuals vary in social capital accumulation due to differences in some proxy attributes of the socially rich.

The proposed framework also highlights the distinction between SNS use and benefits of such use. Although attitude-behavior theories postulate that motivation is a prerequisite in the behavioral engagement process (Triandis, 1980), a systematic review of the literature reveals generally weak or modest empirical links be-

tween the display of behaviors and their corresponding consequences (Sheeran, 2002), likely because planned behaviors do not necessarily result in their intended outcome. Given the inconsistent associations between behaviors and their outcomes, we maintain that SNS use and subsequent benefits should be tested separately.

Our framework thus permits alternative, more nuanced analysis of the "rich- versus poor-get-richer" controversy. First, we differentiate between preference for and problem in interpersonal relations, allowing independent predictions to be made for each type of proxy measure used for distinguishing between the socially rich and poor. Second, we propose a conceptual distinction between SNS use and the benefits derived therefrom. Figure 1 illustrates our 2 × 2 framework that summarizes these two proposals and the predictions derived from our nuanced analysis.

Preference for Versus Problem in Interpersonal Relations as Distinct Proxies

When testing the hypothesized differences between the socially rich and poor, researchers differ in the proxy measure used to assess these individual differences. Some examine personality characteristics pertaining to preference for interpersonal relations that in turn foster social capital accrual in offline or face-to-face contexts, and adopt such personality measures as the extraversion subscale of the NEO Personality Inventory (Costa & McCrae, 1992). Others examine problems in interpersonal relations that hinder this accrual, and adopt such instruments as the Social Interaction Anxiety Scale (Mattick & Clarke, 1998) and UCLA Loneliness Scale (Russell, 1996). These major proxy constructs—extraversion, social anxiety, and loneliness—are widely regarded as cognates, with the socially rich (vs. poor) viewed as having high (vs. low) scores in extraversion but low (vs. high) scores in both social anxiety and loneliness. Espousing this view, many researchers formulate mirror-opposite predictions for these two types of proxy measures accordingly. For instance, Ryan and Xenos (2011) predicted that individuals higher in extraversion were more likely to be Facebook users while those higher in loneliness were more likely nonusers.

Our study, in contrast, considers investigating the distinctions between proxy measures assessing preference for interpersonal relations

	Proxy Measure of Socially Rich (vs. Poor)	
	Preference for Interpersonal Relations (Major construct: extraversion)	Problem in Interpersonal Relations (Major constructs: social anxiety, loneliness)
SNS Use	Theoretical underpinning: arousal-based theories of extraversion-introversion Hypothesized effect: social enhancement Predicted results (correlation): positive	Theoretical underpinning: hyperpersonal communication theory Hypothesized effect: social compensation Predicted results (correlation): positive
Benefit of SNS Use	Theoretical underpinning: broaden-and-build theory Hypothesized effect: rich-get-richer Predicted results (correlation): positive	Theoretical underpinning: displacement theory Hypothesized effect: rich-get-richer Predicted results (correlation): negative

Criterion Measure

Figure 1. A 2 × 2 framework of the proposed nuanced perspective on social network site (SNS) use.

and those assessing problem in such relations. A review of the personality literature demonstrates that the two clusters of measure differ in several important respects. First, individuals exhibiting abundant interpersonal difficulties (e.g., high in social anxiety) experience immense fear of social interactions, but those with low preference for interpersonal relations (e.g., low in extraversion) have no bearing on such fear (e.g., Henderson, Zimbardo, & Carducci, 2010). Second, individuals having abundant interpersonal difficulties do enjoy being with people, but their social behavior is constrained by their heightened concerns over unfavorable evaluations from others (e.g., Mellings & Alden, 2000). Those having low preference for interpersonal relations, in contrast, generally enjoy being alone and seek to spend time in solitude (e.g., Zelenski & Sobocko, 2013). Finally, individuals facing interpersonal difficulties lack social skills, whereas the levels of social competence are similar for people characterized by low and high preference for interpersonal relations (e.g., Lieberman & Rosenthal, 2001). Moreover, studies testing the associations between these two clusters of proxy measure consistently document inverse correlations (e.g., Amichai-Hamburger & Ben-Artzi, 2003; Mund & Neyer, 2016; Naragon-Gainey, Rutter, & Brown, 2014; von Soest, Luhmann, Hansen, & Gerstorf, 2018), but the magnitude of these correlations is generally weak to moderate (i.e., ranging from $-.10$ to $-.30$). Such results indicate that preference for interpersonal relations and problem in such relations are separate, albeit inversely related, rather than mirror opposites.

This nuanced perspective allows for testing the possibility that individuals characterized by diverse relations-oriented constructs may exhibit a similar intensity of SNS use while differing in such use due to differences in their extent of need satisfaction. For example, individuals high in extraversion tend to be more active in face-to-face interactions (e.g., Argyle & Lu, 1990a; Seel, 2012), and are thus more likely to have their socialization needs fulfilled in the real-life social world. To further gratify those needs, these individuals may utilize SNS to expand their already bountiful pool of social resources (i.e., social enhancement). In contrast, those high in social anxiety may be more sensitive to others' reactions and feel more uncomfortable in face-to-face interactions (e.g., Argyle & Lu, 1990a; Seel, 2012), and are thus less likely to have their socialization needs fulfilled in real-life social relations. To fulfill their unmet socialization needs, these individuals may use SNS to supplement their limited pool of social resources (i.e., social compensation).

A major advantage of our bifurcated predictions is that they permit more comprehensive comparisons, ultimately enabling a richer understanding of the mechanisms underlying SNS use and online social capital accrual. Specifically, our proposed preference-problem distinction allows for comparisons both within (e.g., differences in SNS use between high and low extraversion) and between (e.g., differences in SNS use between individuals low in extraversion and those high in social anxiety) types of proxy measure. Our proposed model thus makes distinct predictions for SNS use and online social capital accrual among different types of proxy measure.

SNS Use Versus Benefits of SNS Use as Distinct Criteria

In addressing the "rich- versus poor-get-richer" debate, some studies focus on SNS use (e.g., Amichai-Hamburger, Kaplan, & Dorpatcheon, 2008; Ryan & Xenos, 2011), whereas others focus on social capital (e.g., Reer & Krämer, 2017; Weiqin, Campbell,

Kimpton, Wozencroft, & Orel, 2016). Also, many researchers use "rich-get-richer hypothesis" and "social enhancement hypothesis," and likewise "poor-get-richer hypothesis" and "social compensation hypothesis," interchangeably. For instance, Sheldon (2012) wrote: "According to this social compensation hypothesis, or the poor-get-richer hypothesis, the Internet's anonymity and reduced cues might stimulate online self-disclosure because there is no fear of being rejected" (p. 1961).

This common practice implies that individuals who use SNS with the goal of compensating for their unmet socialization needs (i.e., social compensation) are likely to achieve that goal by engaging in SNS activities (i.e., poor get richer). Although engagement in SNS activities has been found to increase users' social capital through relationship maintenance and social support provision (e.g., Billedo, Kerkhof, & Finkenauer, 2015; Li, Chen, & Popiel, 2015), scholars and health care professionals alike have raised concerns over the dark side of SNS use, with the most notable problem being Internet or social network addiction (e.g., Cheng & Li, 2014; Young, Kuss, Griffiths, & Howard, 2017). Besides, an array of interpersonal problems, including romantic jealousy, unfriending, cyberbullying victimization, and cyberstalking, have also been linked to SNS use (e.g., Cohen, Bowman, & Borchert, 2014; Hong, Kim, Thornberg, Kang, & Morgan, 2018; Sasaki, Kawai, & Kitamura, 2016; Smoker & March, 2017).

As SNS can facilitate both favorable and unfavorable interpersonal outcomes, our proposed framework advocates distinguishing SNS use from the benefits of such use. Three types of outcome are possible. First, greater SNS use elicits predominantly desirable interpersonal experiences online, resulting in increased online social capital. Second, greater SNS use elicits predominantly undesirable interpersonal experiences online, resulting in reduced online social capital. Third, greater SNS use elicits both desirable and undesirable online interpersonal experiences that balance out each other, resulting in no changes in online social capital. Hence, "Who uses SNS more?" and "Who benefits more from SNS use?" should be regarded as distinct, albeit related, research questions, with SNS use and online social capital adopted as separate criteria in hypothesis testing.

Contributions and Predictions of the Proposed Nuanced Perspective

Our proposed nuanced perspective, aimed at refining the "rich-versus poor-get-richer" debate, contributes new knowledge to the literature in three major ways. First, as noted, we put forward preference for and problem in interpersonal relations as distinct types of proxy measure for differentiating between the socially rich and poor, and we also distinguish SNS use from its benefits. The preference-problem and use-benefit distinctions thus serve as an organizing framework for systematic formulation of the four theory-driven predictions (see Figure 1), as described in the next section.

Second, we do not view the social enhancement/rich-get-richer hypothesis and social compensation/poor-get-richer hypothesis as two opposing perspectives, but rather advocate disentangling them into four separate hypotheses. Such disentanglement affords greater flexibility in hypothesis formulation and testing; allowing, for instance, social enhancement and social compensation to be viewed as two compatible rather than competing motives under-

lying SNS use. Hence, it is reasonable to predict that some users engage in SNS activities to enhance their current pool of social resources, whereas others do so to compensate for their existing social deficits. Social enhancement and social compensation can coexist among SNS users with dissimilar psychological characteristics. In addition, a hypothesized social compensation effect does not necessarily imply the presence of a poor-get-richer effect. We posit that it is possible to use SNS in pursuit of social compensation but to actually obtain fewer social resources through SNS activities (i.e., the flip side of the rich-get-richer effect).

Third, we take no side in the debate. In our view, all four hypotheses are potentially tenable, and their tenability depends largely on the type of proxy measure used for differentiating between the socially rich and poor (i.e., preference for or problem in interpersonal relations) and research question being addressed (i.e., "Who uses SNS more" or "Who benefits more from SNS use?"). In formulating our predictions, we review the major theories and relevant findings pertaining to each condition and select hypotheses that match the theoretical postulations and empirical evidence.

Preference for Interpersonal Relations and SNS Use: Social Enhancement

We predict that the social enhancement hypothesis is more tenable for explicating individual differences in SNS use in studies focusing on extraversion. Our prediction stems from arousal-based theories of extraversion–introversion (e.g., Eysenck, 1991; Strelau, 1987), which postulate that individuals differ vastly in their reactions to environmental stimulation and preferences for interpersonal relations. Specifically, individuals high in extraversion (i.e., extraverts) tend to experience understimulation and boredom when alone, and they are energized by social interactions and therefore strongly motivated to engage in outgoing, gregarious behavior. However, such understimulation and boredom are largely absent in individuals low in extraversion (i.e., introverts), who may even feel overstimulated by social interactions and thus demonstrate a preference for solitary activities (Zelenski & Sobocko, 2013).

Applying these theories to online communication, we predict that extraverts, who actively seek social interactions to cope with their frequent understimulation, may regard SNS as an additional networking channel to gratify their need to feel energized. Although extraverts are active on SNS, they do not regard online interactions as a substitute for face-to-face interactions (Amiel & Sargent, 2004). Rather, evidence demonstrates that extraverts perceive online social interactions as an extension of their offline interactions, with similar behaviors displayed in both types of social context (e.g., Back et al., 2010; Gosling, Augustine, Vazire, Holtzman, & Gaddis, 2011) and their friends in offline contexts becoming members of their online social networks (e.g., Ellison et al., 2007; Ross et al., 2009). Given their already extensive social networks and ample social resources in the offline world (e.g., Pollet, Roberts, & Dunbar, 2011; Swickert, Rosentreter, Hittner, & Mushrush, 2002), extraverts further expand their social networks by initiating new social connections and reinforcing existing ones in SNS interactions (e.g., James & Mazer, 2012; Tosun & Lajunen, 2010). We thus predict the social enhancement hypothesis to hold in studies examining individual differences in preference for interpersonal relations (i.e., extraversion) and SNS use.

Problem in Interpersonal Relations and SNS Use: Social Compensation

For studies focusing on problems in interpersonal relations (i.e., social anxiety and loneliness), the social compensation hypothesis may be more applicable to explicating the hypothesized differences in SNS use. Our proposition is derived from research documenting a strong motivation to seek social support through online channels among individuals facing difficulties in face-to-face interactions (e.g., Caplan, 2007; Chan & Cheng, 2016). These findings imply that cyberspace offers an additional platform for social interactions, and these individuals' unmet needs for socializing may be gratified in this alternative context.

The advantages of online social interactions are stated in hyperpersonal communication theory (Walther, 1996). According to this theory, digital communication involves a time delay and minimal audiovisual cues, characteristics that afford a more relaxing communication environment for individuals having interpersonal difficulties by reducing expectations of interpersonal threats and bolstering social confidence. Corroborative findings indicate that Internet users scoring higher in social anxiety tend to display greater self-confidence and less inhibition when they are online than offline (e.g., Roberts, Smith, & Pollock, 2000; Scealy, Phillips, & Stevenson, 2002). They also engage in greater self-disclosure and self-expression in online (vs. offline) communication (e.g., Sheeks & Birchmeier, 2007; Weidman et al., 2012). In summary, hyperpersonal communication theory posits that SNS offer fertile grounds for individuals facing interpersonal difficulties to compensate for the deficits in their face-to-face interactions. Hence, we predict the social compensation hypothesis to be more viable than the social enhancement hypothesis for studies focusing on problems in interpersonal relations (i.e., social anxiety and loneliness) and SNS use.

Preference for Interpersonal Relations and Benefits of SNS Use: The Socially Rich Get Richer

For studies that target individual differences in preference for interpersonal relations, the rich-get-richer hypothesis is predicted to be the most useful for explicating individual differences in online social capital accrual. This prediction is derived from the broaden-and-build theory (Fredrickson, Huppert, Baylis, & Keverne, 2005), which posits that positive emotions facilitate awareness of a wider variety of strategies (the broaden process), which in turn foster the accumulation of personal and social resources (the build process). The theory is particularly useful in explaining the social behavior of extraverts because positive emotionality constitutes the conceptual core of extraversion (e.g., Hermes, Hagemann, Naumann, & Walter, 2011; Rusting & Larsen, 1997). Extraverts tend to be proactive in developing social contacts and to spend more time socializing, and their active social participation gratifies their socialization needs and brings them joy and pleasure (e.g., Argyle & Lu, 1990b; Srivastava, Angelo, & Vallereux, 2008). The broaden-and-build theory further proposes reciprocal dynamics between positive emotions and resource-building (Fredrickson et al., 2005). Extraverts' optimism and expanded scope of social action further hone their social skills, allowing them to build more extensive social networks; and the interactions

therein in turn provide them with greater emotional support and happiness.

Extending these theoretical postulations to online social contexts, we propose that extraverts accumulate extra online social resources by actively engaging in SNS activities because their pleasant personalities and positive relations with existing network members lay a foundation for attracting further social resources from such activities. This proposal is in line with empirical evidence documenting the process underlying the accrual of online social resources (Weiqin et al., 2016), which shows that extraverts are successful in securing both tangible and emotional support through Facebook interactions with family and close friends because of their active outgoing behavior rather than passive information-seeking behavior. There is also evidence indicating that SNS constitute an effective outlet for extraverts to broaden their social networks and create opportunities to acquire additional online social resources (e.g., Kraut et al., 2002; Tang, Chen, Yang, Chung, & Lee, 2016). On the basis of the broaden-and-build theory and these related findings, we expect the rich-get-richer hypothesis to be the most tenable for studies testing the associations between preference for interpersonal relations (i.e., extraversion) and accumulation of online social capital.

Problem in Interpersonal Relations and Benefits of SNS Use: The Socially Poor Get Poorer

Finally, we predict the flip side of the rich-get-richer hypothesis (i.e., the socially poor get poorer) to account for individual differences in online social capital accrual in studies targeting problems in interpersonal relations, because the broaden-and-build theory also posits the deleterious role of unpleasant emotions in narrowing the scope of social action (Fredrickson et al., 2005). For instance, individuals high in social anxiety may avoid face-to-face interactions for fear of being unfavorably evaluated (e.g., Leary & Kowalski, 1995) and those high in loneliness tend to perceive themselves as cut off from others (Rotenberg et al., 2010), and the social resources of these individuals are thus scant. Such individuals may thus be expected to be highly motivated to engage in SNS activities in an attempt to compensate for their social deficits resulting from an avoidance of face-to-face interaction.

Displacement theory, however, postulates that such an attempt may be futile. This theory is grounded in McCombs' (1972) classic principle of relative constancy, which assumes that the total time spent on interpersonal communication is constant (Putnam, 1995). Investing more time in SNS activities thus leads to less time allocated to face-to-face interactions (Nie, Hillygus, & Erbring, 2002). Although everyone faces the issue of time displacement, individuals with more secure intimate relations are less likely to be affected because communication time per se is less crucial for maintaining long-term, established relations than newly developed ones (e.g., Badr, Acitelli, Duck, & Carl, 2000; Emmers-Sommer, 2004). Time displacement may be particularly problematic for individuals having interpersonal difficulties who use SNS to escape from unsatisfactory offline social relations (Nowland, Necka, & Cacioppo, 2018). Devoting more time to SNS results in less time to maintain intimate relations and improve social skills in real-life interactions. More important, although online communication appears less intrusive than face-to-face communication, communication skills are still imperative in effective interactions

and social capital-building through SNS use (e.g., Courtois, All, & Vanwynsberghe, 2012; E.-J. Lee & Kim, 2014). For example, lonely individuals are found to receive less social support than others and be more vulnerable to cyberbullying (Eden, Heiman, & Olenik-Shemesh, 2016). In light of these theories and empirical evidence, we also propose a rich-get-richer effect in studies investigating problems in interpersonal relations (i.e., social anxiety and loneliness) and acquisition of online social capital.

Age Differences in Social Compensation Effect

Uses and gratifications theory postulates that individuals use SNS to fulfill their need to socialize (e.g., Chen, 2011; Raacke & Bonds-Raacke, 2008). A previous review reported the socialization need to be positively associated with age (Rhodes, 1983), and we thus propose age as a moderator in the present hypothesis testing. As individuals grow older, they become more prone to separation from members of their social networks. For instance, children leave home ("empty nest syndrome") and relocation to a different region or country result in social isolation and shrinkage in offline social networks (e.g., Cornwell & Waite, 2009; Dennerstein, Dudley, & Guthrie, 2002). However, the compensation theory of role loss and social participation postulates that social resource losses can be compensated by substituting one social network for another (Ferraro, 1984). In line with that theory, studies have demonstrated that older people often compensate for such losses by increasing their engagement in social activities and expanding their social networks (e.g., Donnelly & Hinterlong, 2010; Li, 2007).

Offline and online social networks are found similar in structure (Dunbar, Arnaboldi, Conti, & Passarella, 2015), and it is thus reasonable to infer that the foregoing theory also applies to the online context, particularly for older "digital migrants" who are viewed to have distinct levels of information technology literacy from younger "digital natives" who were born and raised in the cyber era (e.g., Repique, 2013; H.-Y. Wang, Sigerson, & Cheng, 2019). Because of the proliferation of simpler, user-friendlier interfaces and widgets (e.g., Chou & Liu, 2016; Hart, Chaparro, & Halcomb, 2008), SNS also become an indispensable communication medium for "digital migrants" to connect people across distance and time (e.g., Berry, 2011; Morrison, 2010). Evidence documents that information technology can mitigate the social isolation of older adults by allowing them to develop new social contacts and reconnect with family members who have moved away (e.g., Bobillier Chaumon, Michel, Tarpin Bernard, & Croisile, 2014; Chou & Liu, 2016). Older people also report gaining a sense of social empowerment and community by partaking in online social interactions (e.g., Delello & McWhorter, 2017; McMellon & Schiffman, 2002). We thus predict stronger social compensation effects for older (vs. younger) individuals with problems in interpersonal relations, as their socialization needs are likely to be stronger because of greater shrinkage in their offline social networks.

Method

To address these various conceptual and empirical controversies in a scientific manner, we performed large-scale meta-analysis, a statistical technique that combines data from a pool of individual

studies to provide an overall summary statistic (e.g., Cooper, 2010; Hunter & Schmidt, 2004). Meta-analysis is further able to explain a body of inconsistent findings using moderator analysis, which identifies the factors (moderators) that potentially influenced the findings of individual studies. Our meta-analysis was conducted in compliance with the Meta-Analysis Reporting Standards (APA Publications and Communications Board Working Group on Journal Article Reporting Standards, 2008) and Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (Moher et al., 2015).

Conceptualization of Study Variables

Our meta-analysis examined the associations between three proxy constructs of the socially rich versus poor (i.e., extraversion, social anxiety, and loneliness) and two criterion variables (i.e., SNS use and online social capital). The definitions of these variables, given below, were derived from seminal work (e.g., Ellison et al., 2007; Leary, 1995; Peplau, 1985; Watson & Clark, 1997; Williams, 2006) and had been adopted in previous meta-analytic reviews (e.g., Allen & Walter, 2018; Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Kashdan, 2007; Liu, Ainsworth, & Baumeister, 2016; Liu, Kirschner, & Karpinski, 2017).

Extraversion is widely used to define preference for interpersonal relations, which reflects a strong desire to take part in social activities (e.g., Gifford & Gallagher, 1985). Five-factor theories of personality conceptualize extraversion as a broad personality dimension that comprises a cluster of relations-oriented characters such as gregariousness, assertiveness, friendliness, and active social participation (e.g., Digman, 1990; McCrae & Costa, 1999). There is compelling evidence demonstrating the robustness of the five-factor model of personality across instruments, sample characteristics, cultural regions, and ratings (e.g., McCrae & Terracciano, 2005; O'Sullivan, Strauser, & Wong, 2012).

Social anxiety and loneliness are the major indicators of problems in interpersonal relations, which hinders one's engagement in interactions with people (e.g., Shaw, 1981). Social anxiety refers to the experience of shyness, fretfulness, and/or tension aroused in social situations (Leary, 2013). According to the cognitive process model (e.g., Mellings & Alden, 2000; Schlenker & Leary, 1982), social anxiety refers to subjective appraisals of personal inadequacies, such as anticipation of poor self-presentation in interpersonal interactions and interpretation of others' evaluations of oneself as unfavorable.

Loneliness is characterized by negative thoughts and feelings of inadequacy in social relations (e.g., de Jong Gierveld, van Tilburg, & Dykstra, 2006; Heinrich & Gullone, 2006). The social psychological theory of loneliness postulates that such thoughts and feelings arise from a discrepancy between one's actual and desired quantity or quality of social relations (Peplau, Miceli, & Morasch, 1982). Social needs theory further posits that distinct types of such relations gratify diverse social needs, with loneliness varying across those types of relations (Weiss, 1973, 1998). For example, social loneliness stems from a perceived lack of support within one's social network and is more prominent in casual groups (e.g., colleagues, friends), whereas emotional loneliness stems from feelings of inadequate intimacy and is more prevalent in close relations (e.g., family members, spouses; Vincenzi & Grabosky, 1987; Weiss, 1973).

SNS use refers to the amount of time and effort spent engaging in activities on SNS (e.g., Sigerson & Cheng, 2018; Smock, Ellison, Lampe, & Wohn, 2011). It is important to note that intensive SNS use can indicate either high engagement or addiction (Charlton & Danforth, 2007), with the former representing average use and the latter representing problematic use that is associated with psychological maladjustment (e.g., Cheng, Cheung, & Wang, 2018; Griffiths, 2013). There is empirical evidence showing high engagement and addiction to be conceptually distinct (e.g., Brunborg et al., 2013; Loton, Borkoles, Lubman, & Polman, 2016), and our meta-analysis thus focuses only on average SNS engagement. In addition, volitional and nonvolitional SNS use should be differentiated. Volitional use involves a deliberate choice to engage in SNS activities for leisure or entertainment in lieu of other pastimes, whereas nonvolitional use refers to a lack of such choice or use in fulfilling work or academic requirements (e.g., Saad, Yunus, Embi, & Yasin, 2014). As our study is grounded in uses and gratifications theory, which views users as active rather than passive consumers of social media, the present meta-analysis focuses only on volitional SNS use for leisure or entertainment purposes.

Finally, online social capital is derived from the construct of social capital, which is broadly defined as resources generated through transactions within a social network (e.g., Coleman, 1988; Portes, 1998). The growing popularity of SNS has expanded the scope of social capital research to the online context (Williams, 2006). Online social capital is a multidimensional construct comprising three components (e.g., Nahapiet & Ghoshal, 2000): (a) a structural component that examines the online social network properties such as size and density that channel the flow of resources (e.g., Shen, Monge, & Williams, 2014); (b) a relational component examining the mechanisms that facilitate the accrual of resources in existing online networks, creation of new online networks for potential resources, or both (e.g., Kobayashi, Ikeda, & Miyata, 2006); and (c) an outcome component investigating the resources gained through online social interactions such as emotional support and personal advice (e.g., Stefanone, Kwon, & Lackaff, 2012).

Inclusion and Exclusion Criteria

Studies were eligible for inclusion if they reported an association between at least one aforementioned proxy measure and at least one criterion measure, all of which adhered to the foregoing conceptualizations. To identify as many studies as possible, no restrictions were placed on academic discipline, publication date or status, language, country, participant demographics, or research design.

Studies were excluded if they (a) contained no quantitative data (e.g., case studies and reviews); (b) examined only online social media whose characteristics did not meet Ellison and Boyd's (2013) definition of SNS (e.g., WhatsApp and WeChat, which contain no public or semipublic profiles); (c) did not assess actual SNS use (e.g., investigated intention or motive alone); (d) focused only on problematic or addictive SNS use (e.g., Facebook or other social network addiction); (e) investigated SNS use for nonleisure purposes; (f) examined offline social capital only; (g) failed to report relevant correlations or sufficient statistics to compute the

correlations; and/or (h) did not contain full texts (e.g., abstracts of theses or conference papers).

Literature Search Strategies

The initial literature search was conducted in June 2017 by two reviewers with graduate degrees in social psychology and prior experience in meta-analysis. Both were blinded to the study's objectives and hypotheses until all statistical analyses had been completed. Additional literature searches were conducted in December 2017 and August, 2018 to identify reports published up to July 31, 2018.

The searches were initially carried out on the ProQuest, Scopus, and Web of Science databases using a range of SNS-related terms (e.g., "social network site*," "online social network*," "social media," and "Twitter"). A wildcard (*) was used to locate all variants of a term (e.g., "online social networks" and "online social networking"). Following these electronic database searches, the reviewers retrieved additional potentially relevant reports and gray literature by searching Google Scholar, the COS Conference Papers Index, ProQuest Dissertations & Theses A&I, and the reference sections of reviews on similar topics (e.g., Prizant-Passal, Shechner, & Aderka, 2016; Verduyn, Ybarra, Resibois, Jonides, & Kross, 2017).

The reviewers identified and omitted duplicate records using two reference management software packages: Endnote version X7.8 (Thomson Reuters) and Mendeley Desktop Version 1.17.6 (Mendeley Ltd.). Google Translate was used to translate titles and abstracts written in unfamiliar languages, and native speakers or language experts were then consulted to code the articles written in those languages.

The two reviewers were first coached on the definitions of all target variables and the literature selection criteria, and they then conducted initial scanning based on titles and abstracts. Reports that did not meet the eligibility criteria were excluded. If reports' potential relevance could not be clearly ascertained from their titles and abstracts, their full texts were retrieved and perused. The literature search and screening process resulted in 161 relevant reports.

Measures

Table 1 lists all of the relevant proxy and criterion measures used in the reports identified in the meta-analysis. As the number of reports is sizable, the diversity of measures is comparable to that in previous meta-analyses. We followed the common practice of summarizing and coding the range of measures in terms of their operationalization (e.g., Pinquart & Sorensen, 2001; Schry & White, 2013), with the results reported in Table 1.

Extraversion. Extraversion was assessed by the corresponding subscales of several trait personality measures, of which the Big Five Inventory (John, Donahue, & Kentle, 1991) was the most widely adopted (28%). Our list of extraversion measures was very similar to those of other meta-analyses using the five-factor model of personality (e.g., Kayiş et al., 2016; Prinzie, Stams, Deković, Reijntjes, & Belsky, 2009).

Social anxiety. Previous studies have operationalized social anxiety in terms of perceived personal inadequacies, with the Shyness Inventory (Cheek & Melchior, 1990) the most commonly used. The range of social anxiety measures were consistent with previous meta-analyses (e.g., Kashdan, 2007; Prizant-Passal et al., 2016).

Loneliness. There are three major types of loneliness measures in the literature: (a) single-item measures (e.g., Berg, Mellström, Persson, & Svanborg, 1981); (b) unidimensional measures that yield a global index of loneliness, such as the UCLA Loneliness Scale (Russell, 1996); and (c) multidimensional measures that examine various facets of loneliness, such as the Loneliness-Deprivation Scale (de Jong Gierveld, 1987). Our dataset was consistent with those of previous meta-analytic reviews (e.g., Deckx, van den Akker, & Buntinx, 2014; Holt-Lunstad et al., 2015) in revealing the UCLA Loneliness Scale to be the dominant measure (75%). Only 10% of the reports therein adopted a multidimensional measure, and none adopted single-item measures.

SNS use. SNS use is measured by both quality and quantity indicators. The former typically reflect the perceived intensity of SNS engagement, which refers to a user's subjective appraisals of his or her emotional connection to a particular SNS and the extent of its integration into his or her life (e.g., Ellison et al., 2007; Sigerson & Cheng, 2018), whereas the latter employ the duration and frequency of SNS use to quantify the level of such use (e.g., Panek, Nardis, & Konrath, 2013; J. Wang, Jackson, Zhang, & Su, 2012). Many of the reports in our meta-analysis used both of these types.

Twenty percent adopted measures assessing quality of SNS use, with the Facebook Intensity Scale (Ellison et al., 2007) the most commonly used for examining individual differences in psychological engagement. With respect to quantity measures, 21% assessed time spent on SNS, although a larger number (59%) assessed the frequency of engagement in a range of SNS activities. We followed previous practice by categorizing these frequency counts into six major types of activities (e.g., Liu et al., 2017): (a) status updates; (b) number of photo or video uploads; (c) social interactions, such as number of comments, Wall posts, "Likes," and shares; (d) information-seeking, such as browsing SNS pages or searching them for information; (e) entertainment/recreation, such as game-playing and video-watching; and (f) number of SNS friends or groups. Overall frequencies (e.g., number of Facebook logins) and alternative frequency measures were categorized as "others." Social interactions and the number of SNS friends/groups were the most widely adopted behavioral indicators of SNS use.

Online social capital. Online social capital was assessed in three major ways: (a) structural characteristics, such as network size and strength of ties; (b) relational characteristics, such as bridging-bonding and reciprocity; and (c) perceived outcomes, such as online social support. These three types of measures, similar to those used in traditional (offline) social capital research, were all represented in our dataset. More than half (59%) of the reports used instruments that examine online relational social capital, with the Internet Social Capital Scales (Williams, 2006) the most popular. Network size, the only objective indicator of online social capital, was used in about a quarter (22%).

To the best of our knowledge, no instruments have been developed specifically to investigate online social support. Hence, researchers commonly modify items from such existing measures as

Table 1
Proxy and Criterion Measures by Operationalization

Measure (author/authors, year)	Number of reports
Proxy measure: Extraversion	
Big Five Inventory (John, Donahue, & Kentle, 1991)	22
NEO Personality Inventory (Costa & McCrae, 1992)	19
Ten-Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003)	14
International Personality Item Pool (Goldberg et al., 2006)	8
Eysenck Personality Questionnaire (Eysenck & Eysenck, 1975)	4
Big Five Personality Factors Inventory (Caprara, Barbaranelli, Borgogni, & Perugini, 1993)	2
Other measures used in one report only	11
Proxy measure: Social anxiety	
Shyness Inventory (Cheek & Melchior, 1990)	12
Fear of Missing Out Scale (Przybylski, Murayama, Dehaan, & Gladwell, 2013)	8
Social Interaction Anxiety Scale (Mattick & Clarke, 1998)	6
Fear of Negative Evaluation Scale (Watson & Friend, 1969)	4
Social Anxiety Scales for Children and Adolescents (La Greca, 1999)	4
Liebowitz Social Anxiety Scale (Liebowitz, 1987)	3
Social Phobia Scale (Mattick & Clarke, 1998)	3
Interpersonal Sensitivity subscale of Brief Symptom Inventory (Derogatis, 1993)	2
Personal Report Communication Apprehension (McCroskey, 1982)	2
Social Anxiety subscale of Self-Consciousness Scale (Scheier & Carver, 1985)	2
Social Phobia and Anxiety Inventory (Turner, Beidel, Dancu, & Stanley, 1989)	2
Other measures used in one report only	18
Proxy measure: Loneliness	
Unidimensional construct	
UCLA Loneliness Scale (Russell, 1996)	39
Three-Item Loneliness Scale (Hughes, Waite, Hawkley, & Cacioppo, 2004)	3
Other measures used in one report only	5
Multidimensional construct	
Social and Emotional Loneliness Scale for Adults (DiTommaso & Spinner, 1993)	4
Other measures used in one report only	1
Criterion measure: SNS Use	
Quality of SNS use–Perceived intensity	
Facebook Intensity Scale (Ellison, Steinfield, & Lampe, 2007)	25
Facebook Questionnaire (Ross et al., 2009)	6
Social Media Use Integration Scale (Jenkins-Guarnieri, Wright, & Johnson, 2013)	2
Modified Online Communication Attitudes Scale (Ledbetter, 2009)	2
Other measures used in one report only	24
Quantity of SNS use—Duration	
Time spent on SNS	61
Quantity of SNS use—Frequency	
Status updates	13
Number of photo or video uploads	18
Social interactions	66
Information seeking	6
Entertainment/recreation	8
Number of SNS friends or groups	36
Others	26
Criterion measure: Online social capital	
Structural characteristics	
Network size	7
Relational characteristics	
Internet Social Capital Scales (Williams, 2006)	10
Facebook Social Connectedness scale (Grieve, Indian, Witteveen, Tolan, & Marrington, 2013)	2
Other measures used in one report only	7
Outcome	
Modified Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988)	2
Other measures used in one report only	4

Note.   SNS = social network site.

the Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988) and apply them to the SNS context, a practice followed in 19% of the reports included in the dataset.

Coding Procedures

To ensure a structured coding procedure, a coding scheme was created prior to report screening. All reports targeted for inclusion

were coded independently by the same two reviewers, with a two-stage procedure performed to enhance intercoder agreement (Yin, 2003). In the first stage, each reviewer extracted data from 10% of the reports as a trial run, with any discrepancies between the two reviewers discussed with the first author before they completed data extraction in the second stage.

Krippendorff's alpha (α) was computed using the SPSS macro KALPHA (Hayes & Krippendorff, 2007) to assess coding agreement. A coefficient of 1 indicates perfect interreviewer reliability, 0 indicates no such reliability, and a negative coefficient indicates systematic disagreement between the reviewers. Strong intercoder reliability is demonstrated by a coefficient of .80 or above (Krippendorff, 2004).

Coding Variables

Correlation coefficient. As the present meta-analysis examined the associations between a proxy measure of the socially rich (vs. poor) and both SNS use and online social capital, the effect size estimate is indicated by Pearson product–moment correlation coefficient (r) for ease of interpretation (Rosenthal & DiMatteo, 2001). For reports in which this statistic was unavailable, the coders extracted the relevant statistics (e.g., t value and sample size) and transformed them into r values using Lüdecke's (2017) "esc" statistical package written in the "R" programming language (R Development Core Team, 2018). The Krippendorff's alpha coefficient indicated good agreement between the reviewers ($\alpha = .94$).

Report and sample characteristics. Most of the reports examined more than one relevant correlation coefficient. Each study was thus assigned a unique code to indicate that various correlation coefficients came from the same source. The following data were coded for each report: author(s), publication year ($\alpha = .98$), publication status (0 = unpublished, 1 = published; $\alpha = 1.00$), and SNS platform studied ($\alpha = 1.00$). For each independent sample, the reviewers also recorded the sample size ($\alpha = .98$), sex composition (% of men; $\alpha = .92$), age composition (average age; $\alpha = .98$ and age range), and country of origin ($\alpha = .95$).

Types of measure. As noted previously, some diverse measures were categorized according to their operationalization (see Table 1). Specifically, a dummy variable (i.e., unidimensional vs. multidimensional) was adopted for the loneliness measures. A code of 1 was assigned to the multidimensional measure, with the remaining ones receiving a 0.

The categorical variable of type of SNS use measure consisted of three levels: perceived intensity, duration, and frequency. For the dummy variable of quality (vs. quantity) of use, the measure of perceived intensity was assigned a code of 1, with the other two assigned 0. For the dummy variable of time assessment, only the duration measure was assigned a code of 1, with the remainders assigned 0.

Finally, different types of online social capital measure were collapsed to three levels: structural characteristics, relational characteristics, and outcome. For the dummy variable of subjectivity, the measure assessing structural characteristics was coded as 0, and the other two as 1. For the dummy variable of outcome, the outcome measure was coded as 1, and all others as 0.

A Priori Statistical Analytic Plan

As many of the included reports contained more than one sample and correlation, three-level mixed-effects meta-analysis was conducted to address the problem of dependence among correlations within a single study (e.g., M. W. L. Cheung, 2014; Konstantopoulos, 2011). In this analysis, the dataset was characterized by a hierarchical structure, which involves the clustering of dependent correlations within the included reports at Level 2 and then a comparison of correlations between the reports at Level 3. Unless otherwise specified, all analyses were carried out using three statistical packages in the "R" programming language (metaSEM by M. W. L. Cheung, 2015; robumeta by Fisher & Tipton, 2015; metafor by Viechtbauer, 2010).

We performed three major sets of statistical analysis. First, main effect meta-analysis was conducted to examine the magnitude and direction of each proxy measure's correlation with SNS use and online social capital, respectively. The parameter estimates and corresponding 95% confidence intervals (CIs) were computed with the maximum likelihood estimation method (M. W. L. Cheung, 2014). The magnitude of a correlation was evaluated against Cohen's (1988) criteria (small: $.10 \leq r < .30$; moderate: $.30 \leq r < .50$; large: $r \geq .50$), and its significance determined by the 95% CI (Lipsey & Wilson, 2001). A CI excluding 0 indicated a significant correlation coefficient.

Second, heterogeneity tests were run to determine whether the magnitude and direction of a correlation varied according to certain study characteristics. Specifically, Cochran's Q statistic was adopted to test the null hypothesis that the correlations included in the meta-analysis were homogeneous or consistent (e.g., Hedges & Olkin, 1985). Moreover, total random variance (τ^2), which estimated the amount of inconsistency or variation across correlations, was examined at two levels: Level-2 variance [$\tau^2_{(2)}$] reflecting within-study inconsistencies and Level-3 variance [$\tau^2_{(3)}$] reflecting between-study inconsistencies, respectively. The relative measure of heterogeneity (I^2) estimated the extent of cross-correlation inconsistency (Higgins, Thompson, Deeks, & Altman, 2003), and was also examined at Level 2 [$I^2_{(2)}$] and Level 3 [$I^2_{(3)}$].

Finally, moderator analysis was conducted to explain the variation in the magnitude and direction of correlation across the included reports. With reference to well-established benchmarks (e.g., Hedges & Olkin, 1985; Higgins et al., 2003), such analysis would be performed if two conditions were met: Cochran's Q-statistic was significant ($p < .05$) and the I^2 index showed moderate to large variations in the results across studies ($I^2 \geq .50$). Prior to the analysis, cases with missing values in the moderating variables were removed. The estimated regression coefficient (b) and its corresponding p value were examined, and the explained variance on the correlations was evaluated at both Level 2 [$R^2_{(2)}$] and Level 3 [$R^2_{(3)}$].

A significant regression coefficient for the moderator of age composition indicated that the average age of sample and corresponding effect size were linearly associated. Then we performed the Johnson-Neyman technique (Preacher, Curran, & Bauer, 2006), an alternative to the conventional simple-slopes technique that was conducted based on arbitrary values (typically 1 SD above or below the mean of a moderator). We chose the Johnson-Neyman technique instead because it precisely yields the critical value of a moderator at which a moderating effect begins or ceases

to be significant. The value was derived from the online calculator on http://quantpsy.org/interact/mlr2.htm (Preacher et al., 2006).

Given the diversity of measures employed in the pool of reports included, we also examined the possible moderating effects of type of measure. For these categorical moderators, a significant regression coefficient indicated variations in the magnitude of correlation across types. Hence, for each type of measure assessing a particular construct, the correlation was computed separately, with the correlations then compared.

Tests for Possible Bias

Study quality. Although a major advantage of meta-analysis is its wide coverage of reports for hypothesis testing, those reports may differ greatly in methodological rigor, with poor-quality reports potentially compromising the meta-analytic results. To address the issue of study quality, we examined the moderating effects of seven major indicators (see, e.g., Cheng et al., 2016; Cheng, Lau, & Chan, 2014), three of which were included to assess sample quality.

First, the sampling method indicator evaluates whether probability sampling was adopted to draw a group of participants from a population. Studies using sampling methods that involve some form of random selection (e.g., stratified and cluster sampling; see Som, 1995 for a complete list) were assigned a score of 1, with 0 for others (Krippendorff's $\alpha = .95$).

Second, the sample heterogeneity indicator shows whether the demographic characteristics of the participants in a sample are similar (e.g., Thompson, 2002). The members of a homogeneous sample share similar demographic characteristics such as age range (e.g., adolescents) or occupation (e.g., teachers). Studies with heterogeneous samples comprising two or more demographic groups (e.g., students and working adults) were assigned 1 point, with 0 points given to those with homogeneous samples ($\alpha = .95$).

Third, the sample description indicator reflects the quality of sample characteristic reporting. Although a good sample design is essential to minimize sampling biases and errors, good reporting quality is equally important in enabling readers to judge the generalizability of the results yielded from a given sample (Bangert-Drowns, Wells-Parker, & Chevillard, 1997). Reports having clear descriptions of a sample's demographic characteristics and recruitment process (see Bangert-Drowns et al., 1997 for details) received 1 point, whereas those having unclear or missing descriptions 0 points ($\alpha = .94$).

The four remaining indicators evaluate the quality of a study's measurements and methodology. First, the measurement validity indicator reflects whether effort has been made to test a given measure's ability to assess the construct it was developed to assess (e.g., Anastasi & Urbina, 1996). The reviewers' ratings were guided by the criteria proposed by Holmbeck et al. (2008). Specifically, a score of 1 was assigned to "well-established" measures with (a) at least two peer-reviewed articles published by different research teams, (b) information (e.g., item list, scoring scheme) facilitating quality judgment and replication, and (c) detailed statistics revealing good psychometric properties. A score of 0.67 was assigned to "approaching well-established" measures with (a) at least two peer-reviewed articles published by the same or different research teams, (b) information allowing quality judgment and replication, and (c) weak, unclear, or missing psychometric evi-

dence. A score of 0.33 was assigned to "promising" measures that met the criteria of an "approaching well-established" measure, with the exception of being published in only one peer-reviewed article. Measures that fulfilled none of the criteria received no score. As many of the reports included in our meta-analysis employed more than one relevant measure, this indicator was represented by the proportion of valid measures, with scores ranging from 0 (none validated) to 1 (all validated; $\alpha = .86$).

Second, the measurement reliability indicator assesses whether the items of the relevant measures were consistent with each other. Interitem consistency or reliability was evaluated against a widely accepted gold standard (Cronbach's alphas $\geq .70$; e.g., Streiner, 2003). The indicator was represented by the proportion of reliable measures, and thus also ranged from 0 (none reliable) to 1 (all reliable; $\alpha = .90$).

Third, the study methodology indicator shows whether a report includes one or more research methodologies to address the problem of common-method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). It took a value of 1 for reports adopting two or more methodologies (e.g., self- and peer-reports, questionnaire and experiment), and of 0 otherwise ($\alpha = 1.00$).

Finally, the study design indicator reveals whether a report adopted a data collection strategy that included more than two time points. This indicator was dummy-coded (0 = a single time point; 1 = two or more time points; $\alpha = 1.00$).

Publication bias and selective reporting.[1] Meta-analysis is also subject to publication bias, with studies reporting significant (vs. nonsignificant) results and those larger (vs. smaller) in scale having a greater chance of publication (e.g., Thornton & Lee, 2000). Accordingly, small-scale studies yielding weak findings or failing to support the hypotheses they tested are usually more difficult to retrieve in literature searches, resulting in potentially inflated findings. We adopted five commonly used methods to detect potential publication bias. Unless otherwise specified, these tests were carried out using Comprehensive Meta-Analysis software (Version 2.2.020; Biostat, 2015).

First, moderator analysis was performed to examine whether the magnitude and direction of correlation differed between published and unpublished reports. Results showing significantly stronger correlations for published than unpublished reports suggested the existence of publication bias, signaling that the overall correlation derived from the included reports might be inflated. These analyses were performed using the metaSEM program (M. W. L. Cheung, 2015).

Second, Vevea and Hedges' (1995) weight-function model was adopted to examine whether the magnitude of a correlation changed under four conditions of potential publication bias: (a) "moderate one-tailed selection," referring to a moderate probability of publishing studies reporting nonsignificant findings or fail-

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[1] With the exception of the first moderator analysis, all of the tests described in this section were performed with two-level meta-analyses, because no available tests can be conducted with three-level meta-analyses. To deal with the problem of dependent effect sizes in two-level meta-analyses, we employed weighted procedures when averaging multiple correlations within a single report (Borenstein et al., 2009). Specifically, all correlations within a report were first converted into Fisher's Z (Hedges & Olkin, 1985) and weighted by the inverse variance weight (Lipsey & Wilson, 2001), and the weighted correlations were then averaged and converted back to obtain an overall correlation for each study.

ing to support a hypothesis; (b) "severe one-tailed selection," referring to a low probability of publishing studies yielding nonsignificant findings or findings inconsistent with hypotheses; (c) "moderate two-tailed selection," referring to a moderate probability of publishing reports with nonsignificant findings; and (d) "severe two-tailed selection," referring to a low probability of publishing reports revealing nonsignificant findings. Publication bias was deemed a concern if the magnitude of a correlation adjusted by one of these conditions was considerable weaker than the unadjusted correlation. The weight-function model was tested using the "weightr" statistical package in the "R" programming language (Coburn & Vevea, 2017).

Third, the trim-and-fill method was used to first estimate the number of missing reports, and then compute an adjusted correlation by taking the missing reports into account (Duval, 2005). Similar to the weight-function model, publication bias would be a possibility if the strength of an adjusted correlation was greatly reduced.

Finally, both Egger's linear regression method (Egger, Davey Smith, Schneider, & Minder, 1997) and Begg's rank correlation test (Begg & Mazumdar, 1994) were used to detect small study bias, that is, the tendency for smaller studies to have greater precision than larger studies. These methods reveal whether an observed correlation is related to sample size or its associated standard errors, and small study bias is likely when the relationship is significant.

Outlier and sensitivity analyses. In addition to study quality and publication bias, the third source of bias that can distort meta-analytic findings is extreme values or outliers. The popular method of boxplot analysis was employed to identify possible outliers. After removal of outliers, the magnitude of the correlations was very similar to that derived from the full analysis for each proxy measure, as revealed by the overlapping 95% CIs. Because this analysis indicated that the findings derived from the entire sample were not influenced by outliers, all subsequent analyses were performed using the full dataset.

Two sensitivity analyses were conducted to evaluate the robustness of the meta-analytic findings by determining whether they had been influenced by any particular study (Borenstein, Hedges, Higgins, & Rothstein, 2009). First, one-study remove (leave-one-out) analysis was performed to check for changes in the overall correlation when studies were omitted from the pool of reports one at a time. Second, cumulative analysis checked for such changes when studies were successively added to the pool. Before running cumulative analysis, we sorted the reports by sample size in descending order to gauge whether the overall correlation would change with a reduction in statistical precision. Both analyses were performed using Comprehensive Meta-Analysis software (Version 2.2.020; Biostat, 2015).

Results

Descriptions of the Dataset

The literature search and screening process was summarized in Figure 2. The final dataset contained 706 correlations derived from 161 reports completed between January 2008 and July 2018. About one third of the reports (32%) examined SNS in general, with the remainder focusing on individual SNS, of which Face-

book was the most common (57%), with Instagram ranking a distant second (2%). SNS examined by less than 1% of the included reports (e.g., Twitter, LinkedIn) were categorized as "others."

The reports subjected to meta-analysis contained 178 independent samples with 108,068 participants (mean number = 607). On average, 40% of participants were men, and the mean age was 24.61 (SD = 8.85; range = 13–68). The samples were drawn from seven world regions: 37% from North America, 6% from Oceania, 14% from Northern/Western Europe, 8% from Southern/Eastern Europe, 30% from Asia, 4% from the Middle East, and 1% from Africa.[2] Descriptions of the samples in each report are given in the online supplementary materials.

Tests for Social Enhancement and Social Compensation Effects

To evaluate the tenability of the hypothesized social enhancement and social compensation effects, we tested the correlation (r) between each relevant proxy measure (i.e., extraversion, social anxiety, or loneliness) and SNS use. Separate analyses were undertaken for each of these constructs. The meta-analytic findings are summarized in Table 2.

The left panel of Table 2 shows that the overall correlation between extraversion and SNS use was positive and significant (r = .15), indicating greater SNS use in participants scoring higher in extraversion. These findings provided support for the social enhancement hypothesis. The overall correlation between social anxiety and SNS use was also positive and significant (r = .10), indicating that participants who are more socially anxious also tend to make greater use of SNS. This finding is in line with the social compensation hypothesis. The correlation between loneliness and SNS use, in contrast, was nonsignificant (r = .01), thus failing to provide support for the social compensation hypothesis.

In summary, the mixed findings of our meta-analysis indicate that the applicability of the social enhancement and social compensation hypotheses depends on which proxy measure is adopted: reports examining extraversion tend to support the former, whereas those examining social anxiety tend to support the latter but no such support was found for those examining loneliness.

Tests for Socially Rich- and Poor-Get-Richer Effects

To evaluate the tenability of the hypothesized rich-get-richer and poor-get-richer effects, we tested the correlation between each proxy measure and online social capital. As shown in the right panel of Table 2, the overall correlation between extraversion and online social capital was positive and significant (r = .20), providing support for the rich-get-richer effect.

Similarly, there was an inverse and significant correlation between loneliness and online social capital (r = −.22). These

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[2] To examine whether there were any differences in findings yielded from samples with diverse sex compositions or drawn from different cultural regions, we conducted moderator analysis using sex composition and Hofstede's (2001) cultural dimensions as moderators, respectively. Hofstede's four major cultural moderators are individualism, power distance, masculinity, and uncertainty avoidance (all retrieved from http://www.geerthofstede.com/research-vsm). Neither moderating effect was significant.

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┌──────────────────────┐      ┌──────────────────────┐
│   Database search     │      │  Additional searches  │
│    (n = 4,987)        │      │     (n = 155)         │
└──────────┬───────────┘      └──────────┬───────────┘
           │                             │
           └─────────────┬───────────────┘
                         ▼
              ┌──────────────────────┐
              │    Unique records     │
              │     (n = 3,147)       │
              └──────────┬───────────┘
                         │
                         ▼
              ┌──────────────────────┐        ┌──────────────────────────────┐
              │   Records screened    │        │ Records excluded:             │
              │     (n = 3,147)       │───────▶│ no empirical data (n = 518)   │
              └──────────┬───────────┘        │ irrelevant SNS/criterion (n =  │
                         │                     │ 1,581)                         │
                         │                     │ No full-text available (n =    │
                         │                     │ 105)                           │
                         │                     └──────────────────────────────┘
                         ▼
              ┌──────────────────────┐        ┌──────────────────────────────┐
              │  Full-text reports    │        │ Records excluded:             │
              │  screened (n = 943)   │───────▶│ no empirical data (n = 42)    │
              └──────────┬───────────┘        │ irrelevant SNS/criterion (n =  │
                         │                     │ 659)                           │
                         │                     │ insufficient information (n =  │
                         │                     │ 51)                            │
                         │                     │ No full-text available (n =    │
                         ▼                     │ 30)                            │
              ┌──────────────────────┐        └──────────────────────────────┘
              │ Reports included in   │
              │ meta-analysis (n = 161)│
              └──────────────────────┘
```
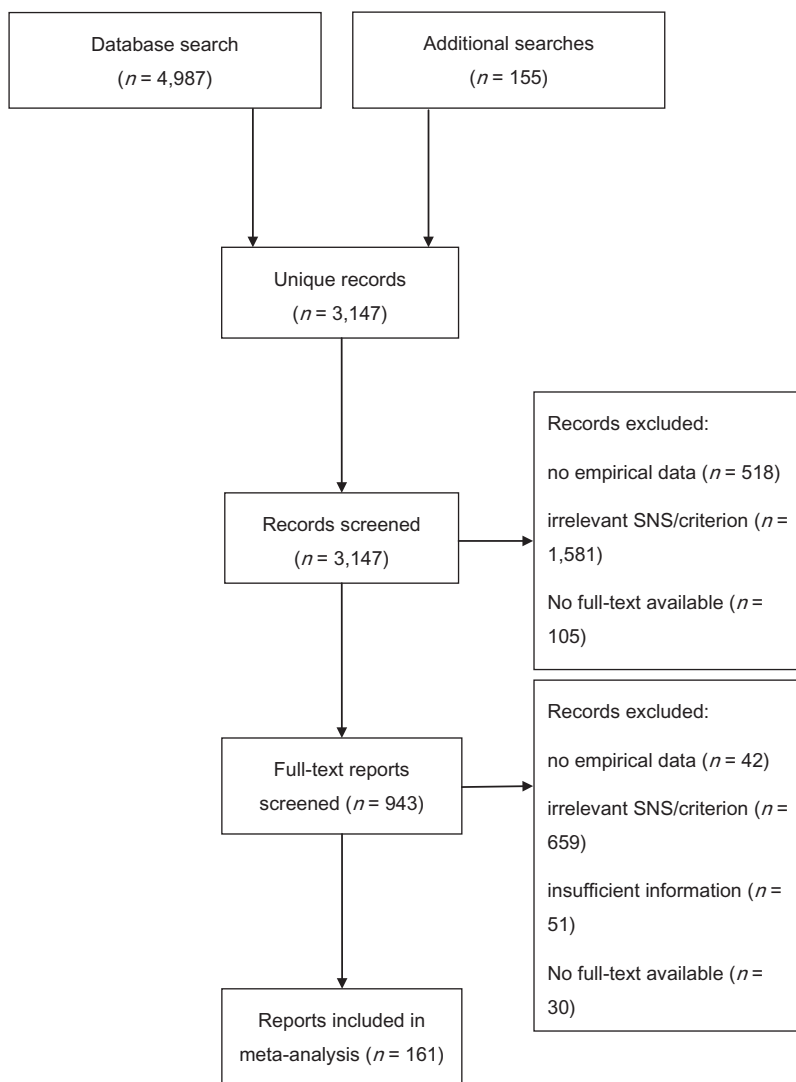
Figure 2. Flowchart summarizing the literature search and study selection.

findings yielded further evidence for the rich-get-richer effect. Although an inverse correlation was also found between social anxiety and online social capital ($r = -.09$), this correlation was nonsignificant.

Moderator Analyses

Age. We tested the hypothesized moderating effect of age composition, and found it to be significant only for the correlation between social anxiety and SNS use, $\beta = .02$, 95% CI [.002, .023], $p = .01$. As shown in the metaregression plot in Figure 3, the lower limit of 95% CI intersected with the *x* axis ($r = .00$) at the critical age point of 20.02 years, indicating that social anxiety was significantly associated with SNS use for samples with an average age greater than this critical age point.

Subgroup comparisons were thus performed based on this critical age point. The results showed that the positive social-anxiety–SNS use correlation was significant for the group whose average age was over 20.02 years, $r = .14$, $p < .01$, whereas the correlation was positive but nonsignificant for the group whose average age was below this critical age point, $r = .08$, $p = .11$. These findings indicate that the social compensation hypothesis is relevant to only adult samples but not adolescent samples for studies that examined social anxiety and SNS use, and the strength of the correlation tends to be stronger for samples with larger average ages.

Type of measure. We next examined the possible moderating effects for each type of measure. Most were nonsignificant, but there were three exceptions. First, the type of SNS use measure (quality vs. quantity of SNS use) had a significant moderating effect in reports investigating the association between social anxiety and SNS use ($b = .09$, $SE = .03$, $p = .0026$, $R^2_{(2)} = .0601$, $R^2_{(3)} = .0284$). Subgroup analysis revealed that reports assessing SNS use with quality indicators of perceived intensity ($r = .18$, 95% CI [.10, .25]) yielded a relatively stronger correlation than

Table 2
Summary of Tests Examining the Correlation of Proxy Measures With Social Network Site Use and Online Social Capital

Criterion	Social network site use			Online social capital		
Proxy measure	Extraversion	Social anxiety	Loneliness	Extraversion	Social anxiety	Loneliness
Main-effect analysis						
Averaged r	.1537	.0997	.0149	.2029	−.0924	−.2207
Lower 95% CI	.1250	.0535	−.0172	.1616	−.2055	−.3708
Upper 95% CI	.1823	.1459	.0469	.2441	.0207	−.0707
k	250	194	196	29	15	22
Tests for heterogeneity						
Q	3,545.33**	5,983.38**	6,117.60**	177.72**	199.42**	600.86**
df	249	193	195	28	14	21
$I^2_{(2)}$	.6019	.3763	.5865	.8983	.0392	.1071
$I^2_{(3)}$	.3094	.5869	.3551	.0007	.9111	.8729
$\tau^2_{(2)}$	.0159	.0152	.0130	.0136	.0012	.0066
$\tau^2_{(3)}$	.0082	.0237	.0079	.0000	.0269	.0534

Note. CI = confidence interval; df = degree of freedom; k = number of correlations; $I^2_{(2)}$ and $I^2_{(3)}$ = percentage of heterogeneity variance to total variance at Level 2 (within-study) and Level 3 (between-studies); Q = Cochran's Q-statistic; r = Pearson product-moment correlation coefficient; $\tau^2_{(2)}$ and $\tau^2_{(3)}$ = total amount of heterogeneity variance at Level 2 (within-study) and Level 3 (between-studies).
** $p < .01$.

those using quantity indicators of duration or frequency ($r = .07$, 95% CI [.02, .12]).

Second, the dimensionality of loneliness measure had a significant moderating effect in reports examining the association between loneliness and SNS use ($b = .12$, $SE = .05$, $p = .0092$, $R^2_{(2)} = .0000$, $R^2_{(3)} = .2161$). Although the correlation was nonsignificant for reports using unidimensional measures of loneliness ($r = .0013$, 95% CI [−.03, .03]), the correlation was positive and
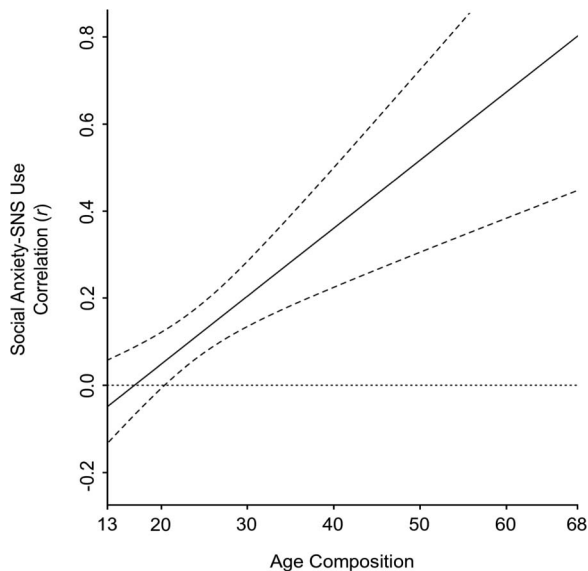

Figure 3. Metaregression plot for the correlation coefficient of social anxiety–SNS use by age composition of samples. The solid line represents linear predictions for the correlation coefficient, while the dashed lines represent the upper and lower limits of 95% confidence interval. The horizontal dotted line shows a null association ($r = .00$), and the lower limit of 95% confidence interval intersects with this line at the critical age point of 20.02 years.

significant for those using multidimensional measures ($r = .12$, 95% CI [.00, .24]).

Third, the type of SNS use measure was also found to be a significant moderator in reports studying the correlation between loneliness and SNS use ($b = .07$, $SE = .02$, $p = .0021$, $R^2_{(2)} = .0412$, $R^2_{(3)} = .1001$). The correlation between loneliness and SNS use was positive and significant for reports adopting quantity measures assessing the duration of SNS use ($r = .08$, 95% CI [.02, .13]), but nonsignificant for those adopting measures that assessed either the perceived intensity or frequency of such use ($r = −.0057$, 95% CI [−.04, .03]). Although the main effect meta-analysis revealed the overall correlation between loneliness and SNS use to be nonsignificant, these moderator analyses indicate that the correlation is positive and significant for reports employing multidimensional measures of loneliness or those investigating time spent on SNS use.

Tests for Possible Bias

Study quality. Moderator analysis was also performed to test for the possible influence of study quality. The moderating effects of study quality were nonsignificant (ps ranging from .06 to .98) with one exception: the moderating effect of sampling was significant for reports examining the correlation between extraversion and SNS use ($b = .13$, $SE = .06$, $p = .02$, $R^2_{(2)} = .00$, $R^2_{(3)} = .16$).

Subgroup comparisons further revealed that the positive extraversion–SNS use correlation was stronger and the variability across the pool of reports was also greater for reports that used probability sampling ($r = .26$, 95% CI [.07, .45]), compared with those that did not employ such sampling ($r = .15$, 95% CI [.12, .17]). Overall, we concluded that the present meta-analytic findings were not confounded by study quality.

Publication bias and sensitivity analysis. Table 3 summarizes the results of the various tests conducted to detect publication bias. The moderator analysis showed no significant differences in the magnitude of the correlations between published and unpublished studies ($ps > .18$). Although there were differences between

Table 3
Summary of Various Tests of Publication Bias[a]

Criterion	SNS use			Online social capital		
Proxy measure	Extraversion	Social anxiety	Loneliness	Extraversion	Social anxiety	Loneliness
Moderator analysis (unpublished reports = 0; published reports = 1)						
b	−.03	.02	−.01	n/a	−.23	−.01
SE	.07	.06	.05	n/a	.12	.01
p	.68	.75	.79	n/a	.06	.27
Vevea and Hedges' Weight-Function Model[b]						
Unadjusted averaged r	.17	.11	.02	.21	−.11	−.24
Lower 95% CI	.14	.06	−.02	.17	−.22	−.37
Upper 95% CI	.21	.16	.05	.26	.00	−.10
Moderate one-tailed model	.20	.10	.02	.22	−.11	−.26
Severe one-tailed model	.20	.11	−.01	.22	−.16	−.30
Moderate two-tailed model	.21	.09	.04	.21	−.13	−.28
Severe two-tailed model	.21	.11	.01	.21	−.17	−.32
Trim-and-fill method						
Adjusted averaged r	.18	.11	.02	.21	−.14	−.35
Lower 95% CI	.14	.06	−.01	.16	−.26	−.45
Upper 95% CI	.21	.16	.05	.25	−.03	−.24
Begg's Rank Correlation Test						
Kendall's τ b	.13	−.07	−.08	−.05	−.07	.20
Egger's Linear Regression Test						
b	.18	.37	−1.11	−1.61	1.19	3.04
Lower 90% CI power	−1.00	−1.59	−2.26	−3.56	−3.27	−1.28
Lower 90% CI power	1.37	2.33	.03	.34	5.64	7.37

Note. b = unstandardized b coefficients; CI = confidence interval; n/a = not available because there are no unpublished reports in this dataset; r = Pearson product-moment correlation coefficient; τb = rank order correlation, SE = standard error.
[a] With the exception of the first moderator analysis, findings from all of the tests were obtained from two-level meta-analyses because of the unavailability of three-level meta-analytic methods.   [b] The weights of all four selection methods were obtained from Table 1 of Vevea and Woods' (2005) article.

some of the adjusted and unadjusted correlations for both the weight-function and the trim-and-fill models, there were only slight differences in magnitude. Moreover, Egger's linear regression test and Begg's rank correlation test found no evidence of small study bias. Taken together, these tests suggest that the meta-analytic findings are largely stable and robust to publication bias.

Discussion

The meta-analysis reported herein aims to address the ongoing debate over who benefits most from SNS use by making conceptual distinctions between proxy measures assessing preference for and problem in interpersonal relations as well as between criterion measures assessing SNS use and the benefits of such use. Rather than viewing the social enhancement/rich-get-richer hypothesis and social compensation/poor-get-richer hypothesis as two sets of opposing perspectives, we regard them as four compatible hypotheses that are equally valid under different conditions. In line with that view, our findings portray a complex picture that cannot be summarized by any simple answer to the aforementioned debate, as the tenability of any particular hypothesis varies according to which proxy and criterion measures are adopted.

Consistent with our predictions derived from arousal-based theories of extraversion–introversion and broaden-and-build theory, both the social enhancement and rich-get-richer hypotheses are substantiated by studies that investigated individual differences in extraversion, a major proxy construct of the socially rich (vs. poor)

that indicates preference for interpersonal relations. For our predictions derived from hyperpersonal communication theory and displacement theory, however, the social compensation and rich-get-richer hypotheses receive partial support in studies that examined individual differences in social anxiety and loneliness, both of which are major proxy constructs of the socially poor (vs. rich) that indicate problems in interpersonal relations. Specifically, the social compensation hypothesis is held in studies that used social anxiety as a proxy, whereas the rich-get-richer hypothesis is held in studies that focused on loneliness. As expected, no support is found for the poor-get-richer hypothesis. In summary, these results indicate that social compensation and poor-get-richer effects are not cognates, providing some support for our differentiation of SNS use and the benefits of such use, and for our view of social enhancement, social compensation, rich-get-richer effects, and poor-get-richer effects as separate hypotheses.

Nuanced Analysis of SNS Use

Our nuanced analysis extends the literature by showing that the strength of the social compensation effects varies by age, type of proxy measure assessing the socially rich (vs. poor), and type of criterion measure assessing SNS use. Instead of providing a simple answer of whether the socially rich or poor use SNS more, our study identifies three groups of individuals who use SNS more than others and their patterns of such use tend to differ vastly: (a) extraverts, who tend to do so for social enhancement purposes; (b) adults exhibiting social anxiety, who tend to be relatively more

psychologically engaged in SNS for social compensation purposes; and (c) individuals reporting loneliness through multidimensional measures, whose relatively large amount of time spent on SNS tends to be for social compensation purposes. Despite their similarity in high levels of SNS use, the three groups differ considerably in the benefits of such use. Specifically, online social capital is positively related to extraversion, unrelated to social anxiety, and inversely related to loneliness.

The data partially support our prediction of an age moderation effect, as we identify a significant social compensation tendency among adult SNS users but no such tendency among adolescent users. Nevertheless, these age differences are confined to studies that examined social anxiety, which is in line with the findings of earlier meta-analysis revealing similar age differences in the association between social anxiety and general Internet use (Prizant-Passal et al., 2016). As the social compensation hypothesis posits that individuals with social deficits are motivated to use SNS to expand their scant social resources, age-related differences in various types of SNS motivation offer a plausible explanation for the moderating effect of age.

An analysis of SNS motivation reveals that users from different age groups tend to engage in SNS for diverse purposes. For instance, adolescents have a greater likelihood of using SNS for nonsocial purposes, including seeking entertainment and passing time (e.g., Dhir & Tsai, 2017; Hollenbaugh & Ferris, 2014). Although social motivation of SNS use, such as maintaining social relations and connecting with other users, is also common among adolescents (e.g., C. M. K. Cheung, Chiu, & Lee, 2011; Kim, Sohn, & Choi, 2011), nonsocial motivation has been typically identified as the strongest predictor of their SNS use (e.g., Alhabash, Chiang, & Huang, 2014; Dhir & Tsai, 2017). In contrast, adults adopt SNS primarily for gratifying their socializing needs (e.g., Jung & Sundar, 2016; Moorman & Bowker, 2001), and they are less likely to engage in SNS for entertainment or passing time than their adolescent counterparts (Dhaha & Igale, 2013; Hollenbaugh & Ferris, 2014). Taken together, these studies indicate that adults tend to use SNS more for social than nonsocial purposes, whereas the reverse pattern is the case for adolescents. Such age-related variations may explain in part why social compensation effects are relevant for the former group but not the latter.

The empirical evidence further attests to the tenability of our proposal to disentangle the roles of diverse proxy measures of the socially poor (vs. rich) when studying individual differences in SNS use. Specifically, although social compensation effects are similarly found for individuals reporting high social anxiety scores and those reporting high loneliness scores from multidimensional measures, these groups differ vastly in the quality (vs. quantity) of SNS use and the accumulation of online social capital. For SNS use, the present study shows that adult SNS users displaying social anxiety tend to be more psychologically engaged; that is, they are more likely to utilize SNS primarily for emotional connection and to integrate SNS interactions into their lives (e.g., Ellison et al., 2007; Orosz, Tóth-Király, & Bőthe, 2016). Although these adults also tend to spend more time on SNS and take part in SNS activities more frequently than their counterparts who are less socially anxious, those differences are relatively small compared with psychological engagement in SNS activities. Hence, the results indicate that social compensation effects are particularly

relevant to the quality of SNS use among adults displaying social anxiety.

The pattern of findings is quite different for loneliness, with the magnitude of its correlation with SNS use varying by the type of loneliness measure employed. Although overall social compensation effects on loneliness are not found, our nuanced analysis identifies these effects in studies adopting multidimensional scales, most notably the Social and Emotional Loneliness Scale for Adults (DiTommaso & Spinner, 1993) that assesses social loneliness and two components of emotional loneliness, namely family and romantic loneliness. However, the social compensation effects are largely absent in studies using unidimensional scales, most notably the UCLA Loneliness Scale (Russell, 1996), a widely adopted scale representing social loneliness alone (Cramer & Barry, 1999). It is thus reasonable to infer that social compensation effects may be more relevant to emotional loneliness but largely irrelevant to social loneliness.

For the benefits of SNS use, the present results indicate that online social capital is unrelated to social anxiety but inversely related to loneliness. As noted above, individuals reporting high loneliness scores from multidimensional measures merely spend more time surfing the SNS without much psychological engagement. As most SNS serve a vast array of features and applications (e.g., S. Lin & Liu, 2012), some individuals may utilize SNS for nonsocial purposes, such as reading Twitter news and playing Facebook games alone (e.g., Krause, North, & Heritage, 2014; Sariyska et al., 2018). These differences in quality (vs. quantity) of SNS use imply that time spent on SNS activities per se may not foster or even hinder social capital accrual, because displacement theory postulates that time spent on one activity (e.g., playing Facebook games by oneself) may decrease time spent on other activities (e.g., chatting with others). Such results highlight the importance of distinguishing quality from quantity of SNS use.

Unlike individuals displaying loneliness, those exhibiting social anxiety are psychologically involved when using SNS. However, the benefits of such use are not found for individuals exhibiting social anxiety. This is probably because these individuals tend to use SNS to establish new social ties rather than maintaining current, more intimate ones (e.g., Correa, Hinsley, & de Zúñiga, 2010). Although forming new social connections through SNS has the potential to reap new sources of social capital, such weak social ties can also bring a host of interpersonal hassles such as invasion of social privacy and cyberbullying (e.g., Brandtzæg, Lüders, & Skjetne, 2010; Hong et al., 2018). The null association between social anxiety and online social capital suggests that the benefits and costs of SNS use tend to balance each other out for individuals exhibiting social anxiety (e.g., Cheng, Wong, & Tsang, 2006; Strazdins & Broom, 2007). These novel findings imply that expanding one's social networks merely by making new online friends may not necessarily help gain more online social capital.

Taken together, studies focusing on various measures assessing problem in interpersonal relations yield differential findings, indicating the imperative to distinguish between social anxiety and loneliness when studying SNS use. These two constructs similarly refer to unfavorable appraisals of one's interpersonal relations and deficiency in social communication skills (Jones, Rose, & Russell, 1990), but they conceptually differ in some important ways. Specifically, social anxiety stems primarily from hypersensitiveness to inadequacies of one's qualities displayed in public that may elicit

others' criticisms (e.g., Creed & Funder, 1998), whereas loneliness is derived mainly from the perception of a disparity between the desired and actual states of one's interpersonal relations (e.g., Rokach & Heather, 1997). In addition, individuals high in social anxiety tend to avoid face-to-face interactions because they feel embarrassed in these situations under public scrutiny (e.g., Ruscio et al., 2008), and their social avoidance may enhance their motivation to utilize SNS as an alternative platform to make up for their social deficits. However, such social avoidance is largely absent among individuals high in loneliness; and ironically, these individuals may even ignore the abundant social support rendered by their social network members and still feel lonely (e.g., Ernst & Cacioppo, 1999). Studies corroborate these notions by revealing positive and moderately strong correlations between social anxiety and loneliness, which typically range from .30 to .50 (e.g., Halldorsson & Creswell, 2017; Jones et al., 1990), indicating limited conceptual overlaps between these two constructs (see, e.g., Brown, 2006 for the statistical criteria). In these respects, such differences highlight that social anxiety and loneliness should not be reduced to the same psychological phenomenon when studying problems in interpersonal relations.

To sum up, our new, intricate findings contribute to the literature by clarifying that both SNS use and the accumulation of online social capital are influenced by multiple factors, namely preference for interpersonal relations, problem in interpersonal relations, quality (vs. quantity) of SNS use, and demographic characteristics (i.e., age). Such highly intricate findings call for a more nuanced approach to portray a full picture of individual differences in SNS use and its benefits.

Theoretical Implications

The results of our meta-analysis may have implications for theoretical advancement in the realms of psychology, sociology, communication science, and public health. The research question regarding "Who uses and benefits most from SNS?" has been actively debated among scholars in these disciplines over the past two decades (e.g., Zywica & Danowski, 2008), and a variety of proxy measures have been employed to differentiate individuals who are socially rich from those who are socially poor (e.g., Crick & Ladd, 1993; Hirsch, Meynen, & Clark, 2004; Rubin, Munz, & Bommer, 2005; Segrin & Passalacqua, 2010). To extend this body

of literature, we here introduce a nuanced model that advances current knowledge by delineating the complexities of the relational dynamics underlying SNS use and online social capital accrual.

In the literature, three major proxy constructs of the socially rich (vs. poor)—extraversion, social anxiety, and loneliness—are widely regarded by researchers as cognates, but our meta-analysis demonstrates that such a uniform conceptualization is suboptimal for informing controversies and empirical inconsistencies. Guided by the present findings, we propose instead an alternative approach that distinguishes among these diverse proxy constructs. Such a nuanced differentiation allows for more refined predictions and comparisons both within a particular construct (e.g., high vs. low loneliness in support-seeking) and between constructs (e.g., loneliness and support-seeking vs. extraversion and support-seeking).

In light of the present findings, we challenge the commonly accepted view of social enhancement and social compensation as mutually exclusive processes underlying SNS use, and point to the necessity of examining more than one proxy construct of the socially rich (vs. poor) to achieve a comprehensive evaluation of multiple compatible hypotheses. It is also worth noting that the findings yielded by studies that adopted proxy measures of the socially rich (i.e., extraversion) are not just mirror opposites of those yielded by studies that adopted proxy measures of the socially poor (i.e., social anxiety and loneliness), supporting our view of regarding these two types of proxy measures as assessing relatively independent constructs. More important, our complex findings on social anxiety and loneliness imply that it is imperative to further differentiate these two types of proxy construct, as discussed in depth below.

Adopting uses and gratifications theory as its theoretical foundation, our proposed nuanced model highlights three main factors that play a pivotal role in SNS use and online social capital accrual: preference for interpersonal relations, problem in interpersonal relations, and quality (vs. quantity) of SNS use. Table 4 shows the components and key predictions of this model. We formulate two propositions to explain individual differences in SNS use. First, social enhancement is associated with *high preferences for but low problems in social relations*, and thus the social enhancement hypothesis is proposed to be tenable for explaining and predicting SNS use among individuals with varying levels of extraversion. As shown in Table 4, individuals high in

Table 4

A Nuanced Approach to the Study of Social Network Site Use and Online Social Capital Accrual

Relations-oriented construct assessed	Proxy measure of socially rich (vs. poor)			
	Extraversion	Social anxiety	Emotional loneliness	Social loneliness
Preference for offline interpersonal relations	high	low	low	low
Preference for online interpersonal relations	high	high	high	low
Problem in interpersonal relations	low	high	high	high
Quality (vs. quantity) of social network site use	high quality (perceived intensity)	high quality (perceived intensity)	high quantity (duration)	moderate quantity (duration)
Purpose of social network site use	*social enhancement*	*social compensation*	*social compensation*	neither *social enhancement* nor *compensation*
Online social capital accrual	*rich-get-richer* (increment)	neither *rich*-nor *poor-get-richer*	*rich-get-richer* (decrement)	*rich-get-richer* (decrement)

Note. Hypotheses formulated for testing are in italics.

extraversion tend to exhibit a strong desire for interacting with others and frequently seek opportunities to mingle, and are generally energetic and enthusiastic in social activities (e.g., Argyle & Lu, 1990a; Watson, Clark, McIntyre, & Hamaker, 1992). These socially adept individuals tend to regard the online social world as an additional venue for socializing with others (e.g., Kraut et al., 2002; Tang et al., 2016). They actively engage in online social activities (e.g., Gosling et al., 2011; Seidman, 2013), and the way they behave in those activities is very similar to the way they behave in face-to-face activities (e.g., Back et al., 2010; Tosun & Lajunen, 2010). Hence, individuals higher in extraversion are more likely to use SNS to enhance their existing relations than those lower in this personality dimension.

Second, social compensation is associated with *high problems in social relations* and *high preferences for online social relations*, and thus the social compensation hypothesis is proposed to be valid for explaining and predicting SNS use among individuals with varying levels of social anxiety and emotional loneliness. Characterized by a chronic fear of others' critical judgments, individuals high in social anxiety tend to avoid face-to-face interactions (e.g., Clark & Wells, 1995; Kocovski & Endler, 2000). Although individuals high in emotional loneliness do not generally have deficient social networks (de Jong Gierveld et al., 2006; e.g., Green, Richardson, Lago, & Schatten-Jones, 2001), they are motivated to flee from problem-ridden relations that elicit emotional loneliness (Dykstra & Fokkema, 2007). For both groups, a solution to their interpersonal problems is to evade unpleasant face-to-face interactions but engage in online social activities because of the common perception of the Internet as a less intimidating communication channel or emotional refuge that can compensate for relational deficits in the offline world (e.g., Cheng, Sun, & Mak, 2015; Weidman et al., 2012). These two groups of individuals are thus more prone to use SNS to make up for their current scant social resources.

Although individuals high in social loneliness also experience abundant problems in offline social interactions, they have low preferences to connect with others in both offline and online contexts (e.g., Jin, 2013; Nowland et al., 2018), and therefore we predict that this construct is unrelated to SNS use. Neither the social enhancement hypothesis nor social compensation hypothesis is deemed tenable for explaining and predicting SNS use among individuals with varying levels of social loneliness.

Compared with the complex set of predictions formulated for SNS use, the prediction for explicating online social capital accrual is more straightforward. We maintain that the rich-get-richer hypothesis is a good candidate for explaining and predicting changes in levels of online social capital across different proxy constructs of the socially rich (vs. poor). The present meta-analytic findings identify two factors that are crucial for such changes: *problem in social relations* and *quality (vs. quantity) of SNS use*. Increment in levels of online social capital is characterized by both an absence of relational problems (e.g., high social competence, low social avoidance) and a high quality of SNS use (e.g., psychological engagement, self-expression). In this light, with their already large social networks and adept social skills, individuals high in extraversion are likely to garner additional online social capital through interacting with others in cyberspace (e.g., Lin, Peng, Kim, Kim, & LaRose, 2012; Weiqin et al., 2016).

In contrast, the absence of such benefits is characterized by the presence of relational problems (e.g., high social deficits, high interpersonal conflict), a mere high quantity of SNS use (e.g., frequent gameplay or browsing of Twitter news to kill time), or both. Despite their online social participation, individuals high in social anxiety or loneliness may receive few online social resources (e.g., Vergeer & Pelzer, 2009; C. Young & Strelitz, 2014). This is because their deficient social skills and a huge amount of time spent on SNS may only foster development of new online social networks, which constitute only weak social ties with acquaintances, but may fail to build trust with and reap social resources from strong ties with family members and bosom friends (e.g., Hargittai & Hsieh, 2010; Weiqin et al., 2016).

In short, the proposed nuanced model highlights several influential factors that interact to yield variations in SNS use and online social capital accrual. Our new model is thus expected to be of benefit to scholars, researchers, and practitioners interested in understanding individual differences in both of these psychological phenomena in the cyber era.

Research Implications

Our work also has research implications, not least its clarification of previously reported weak or inconclusive evidence. For example, of the three proxy measures considered, only loneliness is found to be unrelated to SNS use. As noted above, close examination of the null findings reveals the magnitude of the correlation between them to vary by the type of loneliness measure adopted. Specifically, the correlation is positive and significant for studies assessing loneliness using multidimensional measures. It is noteworthy, however, that the majority of studies included in our meta-analysis adopted a unidimensional perspective that assumes the experience of loneliness to remain largely stable across social contexts, and thus employed measures that assess general feelings of loneliness such as the UCLA Loneliness Scale (Russell, 1996). This practice is common not only in the SNS literature, but also in the psychology literature in general. For instance, in a previous meta-analysis of loneliness among older adults (Pinquart & Sorensen, 2001), none of the studies used multidimensional measures to assess loneliness. In another meta-analysis evaluating the effectiveness of psychological interventions to mitigate loneliness (Masi, Chen, Hawkley, & Cacioppo, 2011), less than one fifth of the studies employed such measures for their outcome evaluations. Such a unidimensional perspective may result in premature conclusions being drawn from loneliness studies yielding null findings.

A major methodological issue with unidimensional measures is their inability to distinguish among social circumstances that elicit various dimensions of loneliness. For instance, emotional loneliness often stems from issues with close family members or romantic partners, whereas social loneliness is generally related to issues concerning friends or casual acquaintances (e.g., DiTommaso & Spinner, 1997; Weiss, 1973). However, the most widely adopted unidimensional scale, the UCLA Loneliness Scale, captures social loneliness alone (Cramer & Barry, 1999). More studies adopting a multidimensional perspective—and employing such multidimensional measures as the Social and Emotional Loneliness Scale for Adults (DiTommaso & Spinner, 1997)—are needed to disentangle the possibly intricate associations of loneliness and

to formulate distinct hypotheses for each dimension of loneliness across an array of social contexts. The findings presented herein suggest that it is reasonable to infer that some dimensions of loneliness yield stronger associations with SNS use and online social capital than others. The use of multidimensional approaches will enrich both SNS studies and the broader psychology literature by affording more definite conclusions about the varying role of loneliness in diverse social circumstances.

Practical Implications

Finally, our work has further implications for practitioners, particularly those interested in designing online interventions to help the socially "poor" to grow "richer." Although our findings provide ample support for the rich-get-richer hypothesis with respect to online social capital accrual through SNS use, it should be noted that all of the studies included examined voluntary engagement in SNS primarily for leisure purposes. Research shows that this type of unguided SNS use, if excessive, can lead to adverse outcomes such as addiction and social alienation (e.g., Sigerson, Li, Cheung, & Cheng, 2017; Tzavela, Karakitsou, Halapi, & Tsitsika, 2017).

A different type of SNS use, namely, guided or therapeutic SNS use, is increasingly gaining recognition as a promising tool for treating both psychological and interpersonal problems (e.g., George, Dellasega, Whitehead, & Bordon, 2013; S. W. Lee et al., 2016), particularly as SNS have become the predominant communication platform in the digital era. However, studies evaluating the efficacy of online intervention programs in mitigating depression and loneliness have yielded mixed evidence (see Seepersad, 2015 for a review). Close examination of the literature shows the programs with limited usefulness, higher drop-out rates, and greater passive involvement to be those lacking guidance from facilitators (e.g., Horgan, McCarthy, & Sweeney, 2013).

Online intervention programs featuring such guidance are reported to be more effective in mitigating loneliness and social anxiety in participants with scant offline social networks (e.g., Ellis, Campbell, Sethi, & O'Dea, 2011; Letourneau et al., 2012), a phenomenon apparently consistent with the poor-get-richer hypothesis. In these guided programs, facilitators encourage participants to interact with social network members via SNS, which are free of time and geographical constraints and thus offer an additional avenue for maintaining contact with and nourishing existing social relations (e.g., Stewart, Barnfather, Magill-Evans, Ray, & Letourneau, 2011).

The results of our meta-analysis further indicate a positive correlation between age and SNS use among individuals with varying levels of social anxiety, and adults with greater social anxiety tend to use SNS more than their adolescent counterparts. Our findings provide insight into the use of SNS as an alternative networking channel for adults with social anxiety. Older adults in general are more prone to a loss of social ties than younger individuals, and deteriorating health conditions further exacerbate the difficulty of connecting with others (Cotten, Anderson, & McCullough, 2013). Older adults with social anxiety face additional difficulties establishing new social ties through face-to-face interactions, and the less-threatening online environment afforded by SNS thus provides potential opportunities for expanding a shrinking social circle (Sinclair & Grieve, 2017). Under facilita-

tors' guidance, SNS can thus become a reliable means of acquiring social "wealth," especially for older adults exhibiting social anxiety.

To sum up, although the findings presented herein fail to support the poor-get-richer hypothesis, their empirical applicability may be confined to unguided SNS use for leisure purposes. Our review suggests that the socially poor can grow richer by acquiring online social capital through guided SNS use in well-designed online intervention programs. Practitioners and researchers should further test the poor-get-richer hypothesis by evaluating the effectiveness of guided SNS use for therapeutic purposes.

Research Caveats and Future Directions

Like all meta-analyses, our work is constrained by the pool of studies that met our eligibility criteria. Most of the studies deemed eligible examined SNS use using popular measures that primarily assess three major aspects of such use: perceived intensity, frequency, and time spent on SNS (e.g., Junco, 2012; Olufadi, 2016). Most of these measures do not differentiate between active (e.g., posting, commenting) and passive (e.g., viewing, lurking) SNS use. For instance, an SNS user who spends two hours per day posting pictures and news about him or herself may have dissimilar online experiences and consequences to another who spends the same amount of time merely viewing posts without responding. Recent studies have demonstrated the differential influence of active and passive use on social capital accrual (Lee, Kim, & Ahn, 2014). Including more studies investigating active versus passive SNS use would allow future meta-analyses to conduct more refined hypothesis-testing.

Given that Facebook remains the most popular SNS by far (Statista, 2019), it is unsurprising that more than half the studies deemed eligible for this meta-analysis examined Facebook. Hence, our findings may not be generalizable to other popular SNS due to their distinct features. For instance, Facebook's real-name policy encourages users to connect primarily with members of their offline social network, thus emphasizing the strengthening of preexisting ties (Phua, Jin, & Kim, 2017), whereas Twitter's privacy policy allows pseudonyms for anonymous communication with individuals with whom users may have no real-life interactions (e.g., key opinion leaders, strangers with common interests), thereby broadening users' social networks through new online connections (Buccafurri, Lax, Nicolazzo, & Nocera, 2015; Hofer & Aubert, 2013). Moreover, research shows Facebook and Twitter to be more appealing to more and less sociable individuals, respectively (Hughes, Rowe, Batey, & Lee, 2012). In these respects, the seemingly less robust poor-get-richer hypothesis is more likely to hold in research on Twitter use, although no studies to date have tested that possibility. Hence, future studies targeting SNS other than Facebook are needed for a more comprehensive understanding of the social benefits conferred by a range of SNS.

Conclusion

Given their ubiquitous presence in daily life, SNS have drawn considerable public and scholarly attention. Heated debate has inevitably emerged, and in the present work we sought to address several unresolved contentions through meta-analysis. The findings reported herein clarify a major such contention by demon-

strating that two seemingly opposed hypotheses (i.e., social enhancement and social compensation) are complementary, with each having greater explanatory utility for specific characteristics of SNS users' interpersonal relations. In addition, our findings demonstrate that social compensation and poor-get-richer effects are not cognates, indicating the need to distinguish SNS use from the benefits of such use. We thus advocate the adoption of a nuanced approach that differentiates among both proxy and criterion measures. However, current SNS research is rather narrow in scope, focusing primarily on the unguided, leisure use of Facebook or SNS in general. Further endeavors are needed to expand the SNS literature by revisiting the hypotheses investigated herein across various types of SNS interactions (e.g., active vs. passive, public vs. private), popular platforms (e.g., Twitter, Instagram), and therapeutic contexts (e.g., guided SNS use among socially "poor" clients).

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Correction to Stanley, Carter, and Doucouliagos (2018)

In the article "What Meta-Analyses Reveal About the Replicability of Psychological Research," by T. D. Stanley, Evan C. Carter, and Hristos Doucouliagos (*Psychological Bulletin*, 2018, Vol. 144, No. 12, pp. 1325–1346. http://dx.doi.org/10.1037/bul0000169), the Open Science Framework (OSF) URL for the data has now been included in the author note. The online version of this article has been corrected.

http://dx.doi.org/10.1037/bul0000203