MUNI FSS

JOURNAL OF PSYCHOSOCIAL RESEARCH ON CYBERSPACE
CYBERPSYCHOLOGY

Yang, Q., Liu, J., & Rui, J. (2022). Association between social network sites use and mental illness: A meta-analysis. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace, 16*(1), Article 1.
https://doi.org/10.5817/CP2022-1-1

Association Between Social Network Sites Use and Mental Illness: A Meta-Analysis

Qinghua Yang[1], Jiangmeng Liu[1,2], & Jian Rui[1,3]

[1] Texas Christian University, Fort Worth, USA
[2] Seattle University, Seattle, USA
[3] South China University of Technology, Guangzhou, China

Abstract

The existing literature shows mixed results of how the use of social networking sites (SNSs) is related to mental health. Some studies provided evidence that SNS users are more mentally healthy because of the exchanged social support, while others argued that users tend to engage in upward social comparison, which would result in mental illness. To shed light on this relationship, we conducted a meta-analytic review to examine a) the association between SNS use and mental illness and b) the factors that moderate the association. A total of 1,451 studies were retrieved from six databases (i.e., Communication & Mass Media Complete, PsycINFO, Academic Search Complete, Web of Science, PubMed, and Medline), among which 37 empirical studies (N = 84,955) were eligible for meta-analysis based on the inclusion criteria (i.e., empirical and quantitative studies with human subjects, including sufficient statistical information for effect size computation, concerned with SNS use and mental illness). Results showed that SNS use is associated with not only the likelihood of experiencing overall mental illness (r = .11) but also specific illness, including depression (r = .10), suicidal ideation (r = .22), schizophrenia/mania (r = .09), and ADHD/hyperactivity (r = .27). In addition, the intensity of SNS use, continuous measurement (vs. categorical), and participants' health condition were found as positive moderators, whereas adopting social support as the theoretical framework and the proportion of African American participants as negative moderators of the association between SNS use and mental illness. Implications of the current study were discussed.

Keywords: meta-analysis; social networking sites; mental illness; social support; social comparison

Editorial Record

First submission received:
July 19, 2020

Revisions received:
June 11, 2021
November 7, 2021
January 6, 2022

Accepted for publication:
January 7, 2022

Editor in charge:
David Smahel

Introduction

Social network sites (SNSs) have become a ubiquitous component of everyday communication. As of 2021, about 84% of U.S. adults aged from 18-29 (and 72% of the public across different age groups) use at least one SNS

platform (Pew Research Center, 2021). The increased prevalence of SNSs suggests that it is critical to understand the potential association between the use of SNSs and health outcomes of communicating via these platforms.

Despite the prevalence of SNSs, how SNS use relates to mental health is under debate (Best et al., 2014). The extant scholarship provides a wide spectrum of mixed empirical evidence regarding their relationship (e.g., Marino et al., 2018; Song et al., 2014). Some empirical studies documented that SNS use (e.g., time spent, number of SNS accounts, usage frequency) is associated with not only decreased subjective well-being and quality of life (e.g., Bevan et al., 2014; Wang et al., 2017; Woods & Scott, 2016), but also mental illness (e.g., Andreassen et al., 2016; Barry et al., 2017; Błachnio et al., 2015). Mental illness is defined as a mental, behavioral, or emotional disorder causing serious functional impairment, such as depression, psychiatric disorder, obsessive-compulsive disorder [OCD], oppositional defiant disorder, and schizophrenia (American Psychiatric Association, 2017; NIMH, 2017). On the other hand, however, insignificant or even positive correlations were also observed between SNS use and life satisfaction (e.g., Berryman et al., 2018; G. Lee et al., 2011), and between SNS use and reduced mental illness (e.g., Chop, 2015; Klee et al., 2016; Rosen et al., 2013).

Given the population of SNS users and the large variance of empirical evidence, scholarly efforts have been made to provide a clearer picture of the relationship between SNS use and mental health by systematically synthesizing the existing literature. For instance, meta-analyses were conducted to examine how Facebook use is associated with loneliness (Song et al., 2014) and well-being (Marino et al., 2018), and Baker and Algorta (2016) systematically reviewed the relationship between overall SNS use and depression. However, previous meta-analytic reviews focused on either a specific SNS platform (e.g., Song et al., 2014) or non-pathological mental-health-related issues, such as loneliness, psychological distress, or well-being (Huang, 2017; Marino et al., 2018; Song et al., 2014). Although Baker and Algorta (2016) systematically reviewed the relationship between online social networking and depression, they did not analyze the overall effect or moderator, leaving the overall association between SNS use and mental illness as well as what factors may moderate this association unknown. To fill the gap in the literature, the current study is conducted with two-fold objectives. First, this meta-analytic review will generate cumulative knowledge about the associations between the use of SNSs and mental illness. Second, a series of moderator analyses will be conducted to illuminate which SNS-related, theoretical, methodological, and demographic factors influence the aforementioned associations and how.

SNS Use and Mental Illness

Mental illness could substantially limit patients' major life activities or even result in premature mortality (NIMH, 2017). Such negative impacts of mental illness have long been studied by scholars and psychiatrists. Recent studies have documented empirical evidence of associations between using SNSs and mental illness. For instance, Sherlock and Wagstaff (2019) found a strong positive correlation between the use of Instagram and the level of depression among Australian undergraduate students. In the same vein, moderate correlations were observed between youth and young adults' SNS use and suicidal thoughts (Mérelle et al., 2017) and ideation (Sampasa-Kanyinga & Hamilton, 2015). On the flip side, however, a negative (Masedu et al., 2014) or null association (Stanton et al., 2017) was reported between depression and Facebook use by other scholars. Such large variance in effect sizes (ESs) makes a comprehensive synthesis and moderator analyses imperative. Therefore, we applied meta-analysis, a powerful method to synthesize quantitative research, in the current study, to illuminate the association between SNS and mental illness. The cumulative evidence generated from this meta-analysis is expected to shed light on the scholarship of SNSs' health effects and guide SNS-based interventions to improve users' mental health.

Research Questions

To fill the gap in the literature by clarifying the association between SNS use and mental illness out of the mixed empirical evidence, we proposed the first research question:

RQ1: What is the overall association between SNS use and mental illness?

Given that the effect of SNS use depends on the specific type of mental illness (Rosen et al., 2013), we also examined the association between SNS use and specific mental illness (e.g., depression, suicidal ideation, schizophrenia/mania, ADHD).

RQ2: What is the association between SNS use and specific mental illness (e.g., depression, suicidal ideation, schizophrenia/mania, ADHD)?

To examine the heterogeneity of the ESs, SNS-related, theoretical (social support, social comparison), methodological, and demographic variables were analyzed as potential moderators.

SNS-Related Moderators

Each SNS platform exhibits a unique array of technological features and affordances (DeVito et al., 2017), which shape the psychological motives and outcomes of using these sites. The extant literature provides a wide spectrum of empirical research showing that the effect of SNS use depends on the specific platform (Utz et al., 2015) and usage pattern (Baker & Algorta, 2016). From the uses and gratifications perspective, both Instagram and Snapchat are used for presenting a popular self, passing time and entertainment, although the predominance of one-on-one communication via Snapchat makes it more likely to be used among strong ties for maintaining close relationships as well (Kircaburun et al., 2020). Besides maintaining relationships and passing time, Facebook and Twitter are typically consumed to gain information and fulfill education gratifications (Kircaburun et al., 2020) but may primarily contain weak-tie relationships with low feelings of affection and commitment (Song et al., 2014). Given the previous finding that image-based social media platforms (e.g., Instagram, Snapchat) make interactions more intimate and realistic, use of Instagram and Snapchat could potentially decrease loneliness and increase life satisfaction to a larger extent than other SNS platforms (e.g., Facebook, Twitter; Pittman & Reich, 2016), which in turn is less likely to associate with mental illness.

Usage pattern refers to the way by which the SNSs have been used, such as active usage (i.e., activities that facilitate direct exchanges with other users), passive usage (i.e., monitoring other users' activities without engaging in direct exchanges), or addictive usage (i.e., devoting so much time and effort to activities on SNSs that they impair other important life areas) (Andreassen et al., 2016; Verduyn et al., 2017). Empirical studies measured SNS use subjectively and documented that mental illness is associated negatively with active SNS use, which involves actively producing content (i.e., posting content, liking/commenting on others' posts), but positively with passive use, also known as passive consumption of content (i.e., viewing photos without liking or commenting; Escobar-Viera et al., 2018; Trifiro & Gerson, 2019). Such conclusions echoe the findings from a critical review (Verduyn et al., 2017). Besides actively and passively using SNSs, addictive use of Facebook was found to be a significant predictor of depression (Brailovskaia, Rohmann, Bierhoff, Margraf, et al., 2019) and suicidal ideation (Brailovskaia et al., 2020) via longitudinal studies. Thus, the aforementioned SNS-related factors may explain the heterogeneity of ESs in the current sample and thereby deserve examination.

Theoretical Moderators

Theoretical framework, which bolsters researchers' arguments and guides their inquiry of SNS use, was examined as a potential moderator, to shed light on whether and how results might be rationalized in different ways. Two types of theory-driven engagement are enabled on SNSs—social support exchanges and social comparison. Social support is defined by the "degree to which individuals perceive that they are cared for, loved, esteemed, and valued by significant others, such as family members and friends" (Brailovskaia, Rohmann, Bierhoff, Schillack, et al., 2019, p. 167). SNSs enable users to provide and receive social support with their contacts, especially informational and emotional support (Frison & Eggermont, 2016; Oh et al., 2014). Despite the different mechanisms posited by the *main effect* and *buffering models* (see Cohen & Wills, 1985 for review), both models suggest the positive effects of social support on physiological and psychological outcomes. Therefore, social support exchanges have been adopted as the theoretical framework in previous research to explain the negative or insignificant association between SNS use and mental illness.

In contrast, exposure to users' information and life may prompt individuals to engage in upward social comparisons (i.e., comparing with a superior individual) with their SNS contacts (Festinger, 1954). Such comparison may increase SNS users' stress and reduce their self-evaluation, which in-turn negatively affects their emotions and mental health (Feinstein et al., 2013; Kross et al., 2013; Liu et al., 2016). Given the opposing effects of SNS use on mental health suggested by social support and social comparison theoretical frameworks, which theory was

applied to guide or frame the primary studies may be related to the ESs and, therefore, was examined as a potential moderator.

Methodological Moderators

The outcome of SNS use may depend on whether the effect is measured cross-sectionally or longitudinally (Brailovskaia & Margraf, 2017, 2018; Kross et al., 2013), given that mental illness generally develops over a period of time. In this sense, the study design (cross-sectional or longitudinal) may explain the variances in the associations as a potential moderator. Moreover, various operational definitions have been applied to both SNS use and mental illness. For instance, SNS use, measured subjectively in primary studies, was operationalized as the distinction between user and nonuser (Utz & Breuer, 2017), time spent using SNSs (Berryman et al., 2018), SNS use intensity (N. B. Ellison et al., 2007), and the frequency of SNS use (Barry et al., 2017), and mental illness as a dichotomized diagnosis (Akkın Gürbüz et al., 2017) or a continuous checklist measure (Barry et al., 2017). The variation of construct operationalization may influence the ESs and should be examined as methodological moderators (Carpenter, 2020). Thus, the study design, the operationalization of SNS use and mental illness, and other routine methodological moderators (e.g., sample, sampling technique; Lipsey & Wilson, 2001; Noar et al., 2007) were included in the moderator analyses.

Demographic Moderators

Finally, characteristics of participants such as age, gender, race/ethnicity, and health condition were also examined as potential moderators. For instance, a previous meta-analysis documented that the association between problematic Facebook use and psychological distress was larger among older samples, which could be explained by the chronic-stress model that the risk is higher with longer cumulative exposure to SNSs (Marino et al., 2018). Furthermore, gender (Baker & Algorta, 2016) and race/ethnicity (Lin et al., 2016) were found to influence the association between online social networking and depression. Given that the correlations are bidirectional, it is possible that healthy and at-risk individuals (e.g., psychiatric patients) vary in the manner of using SNSs, which may result in different effects. Based on the aforementioned evidence or arguments, we proposed the third research question:

RQ3: Are the associations between SNS use and mental illness moderated by (a) SNS-related (e.g., platform, usage pattern), (b) theoretical (social comparison, social support), (c) methodological (e.g., study design, operationalization, sample type), and (d) demographic variables (e.g., age, gender, race/ethnicity, health status)?

Participants' *age* (operationalized as the mean age of the sample), *gender* (operationalized as the percentage of female participants in the sample), and *race/ethnicity* (operationalized as the percentage of White, African American, Hispanic, and Asian participants in the sample) were analyzed as continuous moderators. We operationalized participants' health condition as a binary variable including two levels— i.e., general healthy adults or minors or at-risk population (e.g., psychiatric patients, adults exposed to earthquake; see Table 1[1] for the detailed operationalization of each moderator).

Table 1. *Operationalization and Results of Moderators Analyzed in the Study.*

Moderator	Operationalization	Effect Size	Heterogeneity		
			Q	*df*	*p*
SNS-Related Factors					
1) Platform	1 = general/unspecified	r = .14, 95% CI [.09, .18], p < .001	3.79	4	.44
	2 = Facebook	r = .09, 95% CI [.01, .16], p < .001			
	3 = Instagram	r = .20, 95% CI [-.14, .53], p = .25			
	4 = Twitter	r = .03, 95% CI [-.05, .10], p = .45			
	5 = Other	r = .08, 95% CI [-.02, .17], p = .12			
2) Type of use	1 = active and passive (or unspecified)	r = .08, 95% CI [.04, .13], p < .001	26.63	3	<.001
	2 = active only	r = .08, 95% CI [.02, .13], p < .01			
	3 = passive only	r = .08, 95% CI [.03, .13], p < .01			
	4 = problematic or addictive	r = .32, 95% CI [.24, 40], p < .001			

Theoretical Framework					
1) Social support	1 = not applied	r = .16, 95% CI [.10, .21], p < .001	7.17	2	.03
	2 = passing mention	r = .08, 95% CI [.04, .13], p < .001			
	3 = applied as the primary framework	r = .02, 95% CI [-.07, .12], p = .60			
2) Social comparison	1 = not applied	r = .09, 95% CI [.04, .13], p < .001	3.50	2	.17
	2 = passing mention	r = .15, 95% CI [.03, .26], p = .01			
	3 = applied as the primary framework	r = .17, 95% CI [.11, .22], p < .001			
Method					
1) Study design	1 = cross sectional	r = .11, 95% CI [.08, .15], p < .001	0.62	1	.43
	2 = longitudinal	r = .19, 95% CI [-.24, .61], p = .39			
2) Sampling technique	1 = probabilistic	r = .12, 95% CI [-.06, .30], p = .20	0.04	1	.85
	2 = non-probabilistic	r = .11, 95% CI [.08, .15], p < .001			
3) Sample	1 = general population	r = .09, 95% CI [.04, .15], p < .001	0.95	1	.33
	2 = students	r = .13, 95% CI [.08, .18], p < .001			
Measurement					
1) SNS use (a)	1 = single-item	r = .06, 95% CI [.02, .11], p < .01	11.34	1	<.001
	2 = multiple item	r = .14, 95% CI [.10, .17], p < .001			
2) SNS use (b)	1 = continuous variable	r = .14, 95% CI [.10, .17], p < .001	4.50	1	.03
	2 = categorical variable	r = .05, 95% CI [-.03, .13], p = .22			
3) SNS use (c)	1 = self-reported				
	2 = observed	--	--	--	--
4) Mental illness (a)	1 = single-item	r = .05, 95% CI [-.04, .14], p = .29	2.54	1	.11
	2 = multiple item	r = .13, 95% CI [.09, .16], p < .001			
5) Mental illness (b)	1 = continuous variable	r = .14, 95% CI [.10, .18], p < .001	5.42	1	.02
	2 = categorical variable	r = .04, 95% CI [-.03, .11], p = .28			
6) Mental illness (c)	1 = self-reported				
	2 = observed	--	--	--	--
Participants' Demographics					
Health condition	1 = general healthy adults or minors	r = .14, 95% CI [.10, .18], p < .001	8.47	1	<.01
	2 = at-risk population (e.g., psychiatric patients, adults exposed to earthquake)	r = .01, 95% CI [-.06, .08], p = .76			
Age	Mean age of the sample	β_0 = .16 (p <.001), β_1 = -.001 (p = .36)	0.83	1	.36
Gender	Percentage of female participants	β_0 = .13 (p <.001), β_1 = -.000 (p = .43)	0.62	1	.43
Race/Ethnicity	Percentage of White participants	β_0 = .11 (p <.001), β_1 = -.000 (p = .43)	0.61	1	.43
	Percentage of African Americans	β_0 = .15 (p <.001), β_1 = -.001 (p < .01)	8.34	1	<.01
	Percentage of Hispanic participants	β_0 = .11 (p <.001), β_1 = .004 (p = .26)	1.27	1	.26
	Percentage of Asian participants	β_0 = .12 (p <.001), β_1 = .001 (p = .52)	0.41	1	.52

Note. SNS use (c) and mental illness (c) were coded but not analyzed as potential moderators because of the lack of variance in the current sample; specifically, all the SNS use was self-reported while only Abu Rahal et al. (2018) and Akkın Gürbüz et al. (2017) observed mental illness. Participants' *age*, *gender*, and *race/ethnicity* were analyzed as continuous moderators. β_0 = intercept of meta-regression, β_1 = slope of meta-regression. For the theoretical framework moderators, a study was coded as "applied as the primary framework" when social comparison or social support theory was introduced and summarized as the guiding theory of the study and was coded as "passing mention" when social comparison or social support theory was briefly mentioned without detailed introduction or summary in the study.

Method

Literature Search

Comprehensive searches of the *Communication & Mass Media Complete*, *PsycINFO*, *Academic Search Complete, Web of Science*, *PubMed* and *Medline* databases were conducted on July 31, 2018, to identify potentially eligible studies in peer-reviewed journals and conference proceedings as well as dissertations and theses, published or presented

later than 1997, when the first SNS study appeared (Boyd & N. B. Ellison, 2007). Search queries were formulated using a combination of search terms with Boolean operators: ("mental illness" OR "mental health" OR "mental disorder") AND ("social media" OR "online social network*" OR "social network* site*" OR Facebook OR YouTube OR WhatsApp OR Instagram OR Twitter OR LinkedIn OR Snapchat OR Pinterest). The eight SNSs specified in the search term are the most widely used ones in the U.S (Pew Research Center, 2021). Attempts were made to solicit unpublished work through CRTNET.

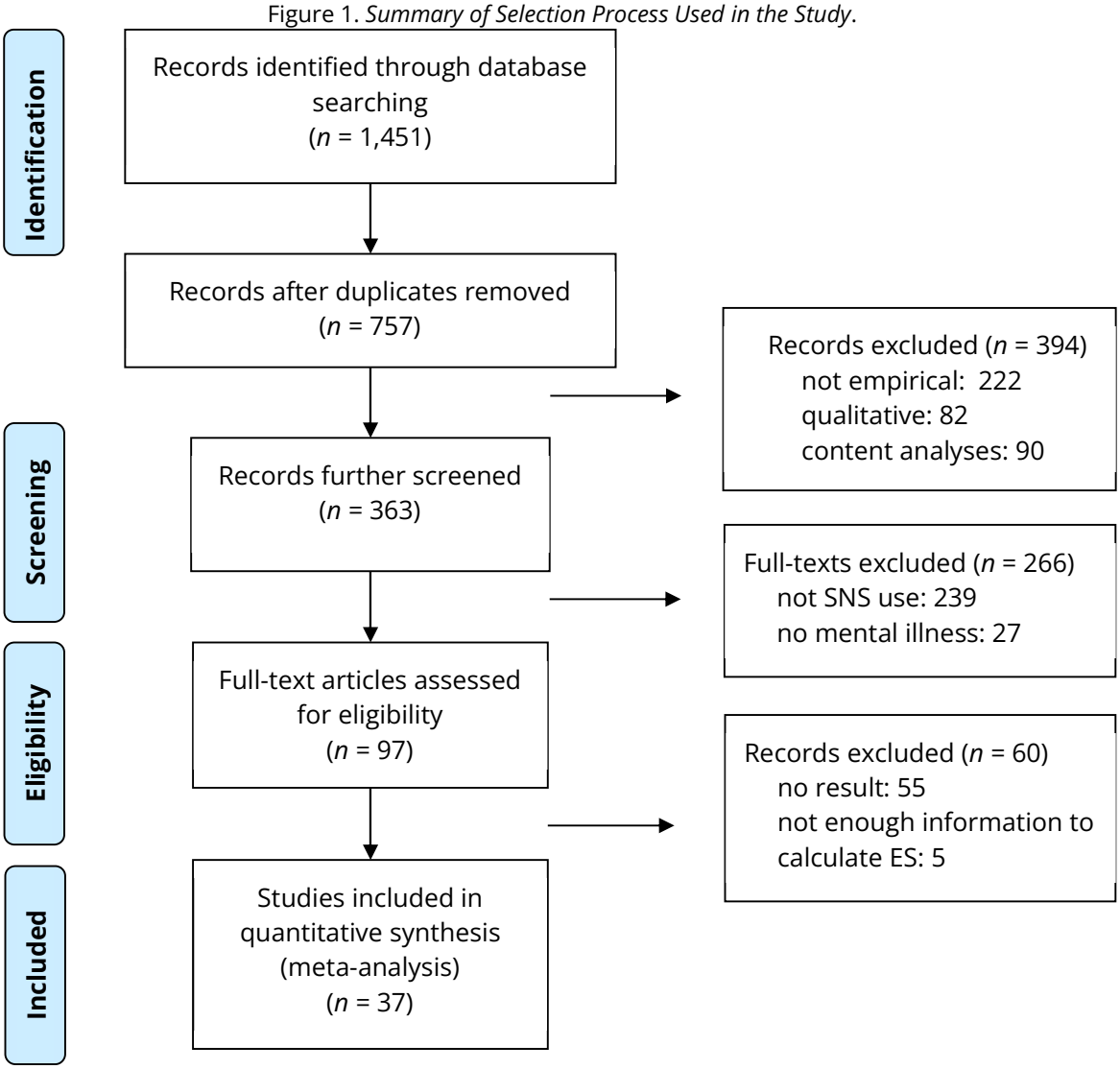
Table 2. *Overview of the Studies Included in the Meta-Analysis.*

Study	***N***	**Sample**	**Location**	**Age (*M*)**	**Female (%)**	**Social Support**	**Social Comparison**
Abu Rahal et al. (2018)	427	psychiatric patients	Israel	41.2	52.5	--	--
Akkın Gürbüz et al. (2017) [c]	100	depressed adolescents vs. not	Turkey	15.3	60.2	--	--
Andreassen et al. (2016)	23533	Norwegian	Norway	35.8	65.0	--	--
Barry et al. (2017) [c]	113	parents and adolescents	US	15.3	51.3	--	--
Berryman et al. (2018) [c]	467	college students	US	19.7	71.7	mention	--
Bhat et al. (2018)	855	hospital employees and college students	US	43.6	85.0	--	--
Błachnio et al. (2015)	672	native speaker of Polish	Poland	27.5	65.0	--	--
Block et al. (2014)	19776	US adults	US	45.4	51.7	--	--
Brailovskaia & Margraf (2016) [c]	945	college students	Germany	23.7	69.95	framework	--
Brailovskaia & Margraf (2017) [a, c]	179	German college students	Germany	22.5	77.1	--	--
Brailovskaia & Margraf (2018)	633	German college students	Germany	21.8	66.2	--	--
Brailovskaia et al. (2018)	520	German adults	Germany	22.4	75.0	--	--
Ceglarek & Ward (2016) [c]	570	US 18-24	US	19.8	62.6	framework	--
Chop (2015)	143	US adults	US		49.0	mention	--
Coyne et al. (2017)	704	US mothers	US	30.4	100.0	mention	framework
Datu et al. (2012) [c]	200	undergraduates	Philippine			--	mention
Davis (2013)	135	mothers of children with autism	US	41.8	100.0	framework	--
J. M. Ellison (2012) [c]	257	female college students	US	20.1	100.0	mention	framework
Escobar-Viera et al. (2018)	702	Reddit users	US	23.4	56.1	mention	--
Fardouly et al. (2018) [c]	284	preadolescents	Australia	11.2	49.1	--	framework
Feinstein et al. (2013) [a, c]	268	US college students	US	19.7	62.0	--	framework
Klee et al. (2016)	210	veterans with mental illness	US	56.8	9.8	--	--
S.-L. Lee et al. (2015) [c]	156	college students	Malaysia	20.9	67	--	--
Lin et al. (2016) [b]	1787	young adults 19-32	US	25.7	49.7	mention	mention
Masedu et al. (2014) [b]	806	adults exposed to earthquake	Italy		47.5	mention	--
Mérelle et al. (2017) [b, c]	21053	early adolescence	Netherland	14.4	50.6	--	mention
Parent et al. (2019)	402	general adults	US	33.4	0	mention	mention
Primack et al. (2017) [b]	1768	young adults	US		50.1	mention	mention
Sampasa-Kanyinga & Hamilton (2015) [b, c]	5126	students in grades 7 to 12	Canada	15.2	48	mention	--
Settanni et al. (2018) [c]	283	adolescent Facebook users	Italy	15.3	49.8	--	--
Sherlock & Wagstaff (2019) [c]	129	undergraduates	Australia	24.6	100	--	framework
Simoncic et al. (2014) [c]	237	undergraduates	US	18.8	47.3	mention	--
Stanton et al. (2017)	412	Black women	US	24.3	100	mention	--
Tiggermann & Slater (2015) [c]	204	primary school girls	Australia	11.6	100	--	mention
Ward (2018) [c]	82	adolescents	US	16.2	73.2	--	framework
Zeeni et al. (2018) [c]	244	undergraduates	Lebanon	18.1	63.9	mention	mention
Zhang (2017) [b, c]	573	undergraduates	China, HK	20.0	59.7	framework	--

Note. [a] Longitudinal design. [b] Probabilistic sampling. [c] Student sample.

The search terms resulted in 1,451 studies, the abstracts (and full text, as necessary) of which were reviewed for relevance. Citations were evaluated for inclusion of qualified studies. All potentially eligible studies were examined to determine the extent of relevance. Studies were screened and excluded if they 1) were duplicate studies (*n* = 694); 2) were not empirical (e.g., editorials, literature reviews) (*n* = 222); 3) were qualitative (*n* = 82) or content analyses (*n* = 90); 4) did not include results (e.g., research protocols) (*n* = 55); 5) did not measure SNS use (*n* = 239); or 6) did not measure a mental illness (*n* = 27). For those studies where insufficient statistical information is available to calculate an ES, the corresponding authors were contacted. Five studies, whose authors neither replied nor measured the information needed for ES computation, were further excluded. Therefore, 37 survey studies were deemed eligible and retained for quality assessment (see Table A1 for details) and meta-analysis (see Table 2 for details). A flow diagram detailing the study selection process appears in Figure 1.

Figure 1. *Summary of Selection Process Used in the Study*.



Inter-Coder Reliability

In the inclusion and exclusion process, two coders independently coded 10% of the initial corpus of studies and reached .95 agreement using *Krippendorff's alpha*. When coding the moderators, two independent coders coded 15% of the included studies, and achieved an agreement of .86 or above for all variables[2]. Given the satisfactory inter-coder reliability, they proceeded to independently code half of the remaining sample.

Effect Size Extraction and Calculation

Pearson's *r* was computed as the basic unit of analysis (i.e., effect size [ES]) for the current study (Hunter & Schmidt, 2004; Rosenthal, 1991). To meet the assumption of independence, in the cases of multiple ESs extracted for the

same mental illness variable, we computed an average ES to be included in the analysis unless they differ in focal moderator(s) (Becker, 2000).

Two steps were followed to convert the ESs to a common metric. First, all ESs were corrected for attenuation. Because the unreliability of the measure represents the random measurement error, the removal of measurement error by attenuation correction improves the precision of meta-analysis (Hunter & Schmidt, 2004). We corrected the attenuation using the formula $r_c = \frac{r_0}{\sqrt{\alpha_{SNS}\,\alpha_{SMI}}}$, where α_{SNS} and α_{SMI} represent the reliability of SNS use and mental illness measures respectively in Cronbach's α. Second, we transformed the correlation coefficients into Fisher's *z* (using *z* = 0.5ln ($\frac{1+r}{1-r}$), var_z = $\frac{1}{n-3}$), as the range restriction of *r* (-1, 1) violates the normality assumption. Fisher's *z* was computed back to *r* (using *r* = $\frac{e^{2z}-1}{e^{2z}+1}$) reported in the article.

Overview of Meta-Analysis

The current meta-analysis used the variance-weighted analysis (Cooper et al., 2009; Hedges & Olkin, 1985): the overall weighted ES was computed by weighting the unbiased ES (r_c) by the inverse of its associated variance ($W_i = 1/\mathrm{V}_i$). We tested the overall homogeneity of ESs using *Q* statistics to determine whether all effects are from the same population. The overall ES was computed under the random effects models (REM), which does not assume that the ESs are not from the same population and incorporates between-studies uncertainty in the computation (Borenstein et al., 2009).

In the moderator analysis, ANOVA-like models were conducted to analyze categorical moderators (e.g., SNS platform, sampling technique). The $Q_{between}$ statistics was applied to explore if moderators explain between-group variations in ESs under the mixed-effect models (MEM), which allows true variation of effects within the subgroups of studies (Borenstein et al., 2009). We applied the same logic when using meta-regression modeling[3] to analyze continuous moderators (e.g., percentage of female participants, mean age). In the cases where moderator analyses are statistically significant, post-hoc analysis using Tukey contrasts with adjusted *p*-value was conducted for pairwise comparison. The analyses were conducted using *Metafor* and *Multcomp* packages in *R* software.

Results

Quality Assessment

Based on the JBI Critical Appraisal Checklist for Analytical Cross Sectional Studies (Moola et al., 2017), the first and second authors assessed the quality of retained 37 studies, by assigning a score between 0 and 3 to each criterion based on whether it was met (3 points) or not (0 point), or whether it was incomplete or uncertain (1 or 2 points depending on the extent to which it impacts the quality of the study) in the primary studies (see Table A1 for details). We calculated the arithmetic mean of the points, and comments were also provided to explain the reasons why a 0-2 point was granted. Based on the JBI Critical Appraisal Checklist, all studies presented satisfactory quality (*M* = 2.88, *SD* = 0.16, *Min* = 2.43, *Max* = 3.00) and were, therefore, included in the meta-analysis.

Overall Analysis

In total, 84,955 unique participants were included in the analysis. 76 ESs were extracted and detailed in Table 3, including the attenuated [r_0] and correlated [r_c] correlation coefficients. *RQ1* was proposed to examine the overall magnitude of the correlation between SNS use and mental illness. *Q* statistics was statistically significant under the REM using Restricted Maximum Likelihood Estimation method (Q_{total} (*df* = 75) = 4597.27, *p* < .001), indicating the heterogeneity of the ESs. Under REM, the sample weighted mean ES for correlation between SNS and the likelihood of experiencing overall mental illness[4] is *r* = .11 (95% CI [.08, .15], *p* < .001), which is small but statistically significant (Cohen, 1988). Figure A1 presented a forest plot of ESs extracted from included studies and the overall ES. *RQ1* was answered.

RQ2 was formulated to understand the magnitude of the correlation between SNS use and specific mental illness. Thus, mental illnesses examined in the current sample were first categorized into depression (*k* = 47), suicidal

ideation (k = 4), schizophrenia/mania (k = 12), and ADHD or hyperactivity (k = 4), based on the literature in mental health and psychiatry (Bellenir, 2000; Abu Rahal et al., 2018). Because only three ESs were extracted for general mental illness (Klee et al., 2016; Abu Rahal et al., 2018), three for PTSD (Klee et al., 2016; Masedu et al., 2014), two for OCD (Andreassen et al., 2016; S.-L. Lee et al., 2015), two for borderline personality (J. M. Ellison, 2012), one for conduct disorder (Barry et al., 2017), they were not analyzed as individual categories. The weighted mean correlation ESs for SNS use and each mental illness category are .10 for depression (95% CI [.06, .14], $p < .001$), .22 (95% CI [.04, .40], $p < .05$) for suicidal ideation, .09 for schizophrenia/mania (95% CI [.01, .16], $p < .05$), and .27 for ADHD or hyperactivity (95% CI [.11, .43], $p < .01$), which were all significant.

Table 3. *Attenuated (r_0) and Correlated (r_c) Correlation Coefficients, and Reliability Coefficients (α) of Meta-analyzed Studies.*

Study	Mental Illness	SNS	Use	α_{SNS}	α_{SMI}	r_0	r_c
Abu Rahal et al. (2018)	mental illness [b,c]	FB [a,b]	general	--	--	-.20	-.20
	mental illness [b,c]	FB [a]	general	--	--	.08	.08
Akkın Gürbüz et al. (2017)	depression [b,c]	general [a]	general	--	--	.20	.20
	depression [b,c]	general [a,b]	passive	--	--	-.02	-.02
	depression [b,c]	general [a,b]	active	--	--	.08	.08
Andreassen et al. (2016)	ADHD	general	addictive	.88	.87	.41	.47
	OCD	general	addictive	.88	.87	.33	.38
	depression	general	addictive	.88	.75	.19	.23
Barry et al. (2017)	ADHD	general [a]	general	--	.94	.21	.22
	conduct disorder [a,b]	general [a]	general	--	--	.05	.05
	depression	general [a]	general	--	.9	.24	.25
Berryman et al. (2018)	depression	general [a]	general	--	.9	.04	.04
Bhat et al. (2018)	depression	general [b]	general	--	.9	.17	.18
Błachnio et al. (2015)	depression	FB	addictive	.92	.89	.45	.50
Block et al. (2014)	depression [a,b]	general	general	--	--	.06	.06
Brailovskaia & Margraf (2016)	depression	FB [a,b]	general	--	.83	-.08	-.09
Brailovskaia & Margraf (2017)	depression	FB [a]	general	--	.88	-.03	-.03
Brailovskaia & Margraf (2018)	depression	general [a]	general	--	.91	.03	.03
Brailovskaia et al. (2018)	depression	FB [a]	general	--	.92	.03	.03
Ceglarek & Ward (2016)	depression	general [a]	general	--	.88	-.10	-.10
	depression	general	addictive	.83	.88	.14	.16
	paranoia	general [a]	general	--	.73	-.06	-.07
	paranoia	general	addictive	.83	.73	.14	.18
Chop (2015)	depression	FB [a]	general	--	.93	.13	.13
Coyne et al. (2017)	depression	general [a]	general	--	.92	.10	.10
	depression	general [a]	passive	--	.92	.11	.11
Datu et al. (2012)	depression	FB [a]	general	--	.83	.04	.04
Davis (2013)	depression	autism-related SNS [a,b]	general	--	.87	.11	.12
J. M. Ellison (2012)	depression	general	active	.83	.9	.14	.16
	depression	general	passive	.80	.9	.10	.11
	mania, paranoia	general	active	.83	.77	.13	.16
	mania, paranoia	general	passive	.80	.77	.10	.12
	schizophrenia	general	active	.83	.79	.16	.20
	schizophrenia	general	passive	.80	.79	.14	.18
	suicidal ideation	general	active	.83	.91	.06	.06
	suicidal ideation	general	passive	.80	.91	.03	.03
	borderline personality	general	active	.83	.85	.15	.17

	borderline personality	general	passive	.80	.85	.11	.14
Escobar-Viera et al. (2018)	depression	general	active	.80	.92	.01	.01
	depression	general	passive	.72	.92	.08	.10
Fardouly et al. (2018)	depression	general	passive	.91	.83	.04	.05
Feinstein et al. (2013)	depression	FB	general	.94	.88	.37	.40
Klee et al. (2016)	schizophrenia [a,b]	FB [a,b]	general	--	--	-.07	-.07
	PTSD [a,b]	FB [a,b]	general	--	--	.10	.10
	Bipolar [a,b]	FB [a,b]	general	--	--	.16	.16
	depression [a,b]	FB [a,b]	general	--	--	.20	.20
	schizophrenia [a,b]	Twitter [a,b]	general	--	--	-.09	-.09
	PTSD [a,b]	Twitter [a,b]	general	--	--	.04	.04
	Bipolar [a,b]	Twitter [a,b]	general	--	--	.07	.07
	depression [a,b]	Twitter [a,b]	general	--	--	.15	.15
	mental illness [b]	general [b]	general	--	--	.00	.00
S.-L. Lee et al. (2015)	OCD	FB	addictive	.83	.91	.29	.33
Lin et al. (2016)	depression	general [a]	general	--	.95	.24	.25
Masedu et al. (2014)	depression [a,b]	FB [a, b]	general	--	--	-.19	-.19
	PTSD [a,b]	FB [a, b]	general	--	--	-.20	-.20
Mérelle et al. (2017)	suicidal thoughts [a]	general [b]	addictive	.82	--	.33	.37
Parent et al. (2019)	depression	general [a]	general	--	.92	.16	.17
Primack et al. (2017)	depression	general	general	--	.92	.21	.22
Sampasa-Kanyinga & Hamilton (2015)	suicidal ideation [b]	general [a,b]	general	--	--	.37	.37
Settanni et al. (2018)	ADHD	FB	addictive	.84	.7	.19	.25
	ADHD	FB [a]	general	--	.7	.10	.12
Sherlock & Wagstaff (2019)	depression	Instagram [a]	general	--	.93	.49	.51
Simoncic et al. (2014)	depression	FB	active	.83	.87	.04	.05
	depression	FB [a]	general	--	.87	.10	.11
Stanton et al. (2017)	depression	FB [a]	general	--	.94	.00	.00
	depression	Instagram [a]	general	--	.94	-.06	-.06
	depression	Tumblr [a]	general	--	.94	.11	.11
	depression	Twitter [a]	general	--	.94	-.01	-.01
	depression	blogs	general	.82	.94	.12	.14
	depression	general (using #) [a,b]	active	--	.94	-.02	-.02
Tiggermann & Slater (2015)	depression	FB/MySpace	general	--	.79	.19	.21
Ward (2018)	depression	FB	general	.86	.85	.17	.20
	depression	Instagram	general	.73	.85	.12	.15
Zeeni et al. (2018)	depression	general	passive	.87	.87	-.11	-.13
	depression	general	active	.81	.87	-.03	-.04
Zhang (2017)	depression	FB [a]	general	--	.86	.01	.01

Note. r_0 = attenuated or observed effect size. r_c = corrected or unattenuated effect size. SNS = social networking site. ADHD = attention-deficit/hyperactivity disorder. OCD = obsessive-compulsive disorder. PTSD = Post-traumatic stress disorder. FB = Facebook. All SNS use variable was self-reported in meta-analyzed studies. [a] Single-item measure. [b] Categorical variable. [c] Clinical diagnosis.

In addition, we also assessed the magnitude of heterogeneity of the current sample. The large I^2 value (97.83%), an index representing the ratio of true heterogeneity to total variance across observed ESs, indicates substantial between-study variances (Higgins et al., 2003). We computed the Birge's ratio (*Q/df* = 61.29), which is much larger than the threshold (if Birge's ratio equals one, the variance of the sample is only sampling error, and the larger the ratio is, the "truer" heterogeneity exists). Furthermore, because sampling error variance (S_e^2 = 0.0041) only

accounted for 18.89% of the total variance (S^2 = 0.0217), it can be concluded that the presence of moderator(s) accounted for the large between-study heterogeneity, which makes moderator analyses warranted.

Moderator Analysis

SNS-Related Moderators

Despite the differences across social media platforms in terms of their affordances and association with mental health (DeVito et al., 2017; Utz et al., 2015), which social medium was examined did not moderate the ESs ($Q_{between}$ (df = 4) = 3.79, p = .44). The pattern of social media usage, however, turned out to be a significant moderator ($Q_{between}$ (df = 3) = 26.63, p < .001). Although we did not detect any significant difference in the associations between mental illness and general (active and passive combined) use (r = .08, 95% CI [.04, .13], p < .001), active use (r = .08, 95% CI [.02, .13], p < .01) or passive use (r = .08, 95% CI [.03, .13], p < .01)[5], they were all much lower than the association between mental illness and problematic/addictive SNS use (r = .32, 95% CI [.24, 40], p < .001) at α = .001 level.

Theoretical Framework

Social support was found to be a significant theoretical moderator ($Q_{between}$ (df = 2) = 7.17, p < .05). The weighted mean ESs for studies without mentioning social support (r = .16, 95% CI [.10, .21], p < .001) and for studies that briefly mentioned social support (r = .08, 95% CI [.04, .13], p < .001) were both statistically significant; however, when social support was applied as the theoretical framework, the weighted mean ES (r = .02, 95% CI [-.07, .12], p = .60) was not significant and lower than the mean ESs of the other two categories in pairwise comparison (p < .01). The significant moderating effect indicates that, when social support was applied as the theoretical framework, the primary studies were less likely to report a significant correlation between SNS use and mental illness, compared to those with social support not or briefly mentioned. Social comparison as the theoretical framework was not a significant moderator ($Q_{between}$ (df = 2) = 3.50, p = .17). In other words, the mean ESs were not impacted by choice of adopting social comparison as the theoretical framework or not.

Methodological Moderators

For all the eligible studies, whether they were conducted longitudinally or cross-sectionally ($Q_{between}$ (df = 1) = .62, p = .43), used probabilistic or non-probabilistic sampling ($Q_{between}$ (df = 1) = .04, p = .85), or were based on general population or students ($Q_{between}$ (df = 1) = .95, p = .33) turned out to be non-significant moderators. However, how the focal constructs were measured significantly influenced the association between them. Specifically, when SNS use was operationalized as a continuous variable (r = .14, 95% CI [.10, .17], p < .001) or using multiple items (r = .18, 95% CI [.13, .23], p < .001), the mean ES was significantly larger than the ES produced by studies measuring SNS use as a categorical variable (r = .05, 95% CI [-.03, .13], p = .22; $Q_{between}$ (df = 1) = 4.50, p < .05) or using a single item (r = .06, 95% CI [.02, .11], p < .01; $Q_{between}$ (df = 1) = 11.34, p < .001)) respectively. Regarding the measurement of mental illness, the number of items was not a significant moderator ($Q_{between}$ (df = 1) = 2.54, p = .11). However, when it was operationalized as a continuous variable (r = .14, 95% CI [.10, .18], p < .001), the mean ES would be larger than that extracted in studies with mental illness measured as a categorical variable (r = .04, 95% CI [-.03, .11], p = .28; $Q_{between}$ (df = 1) = 5.42, p < .05).

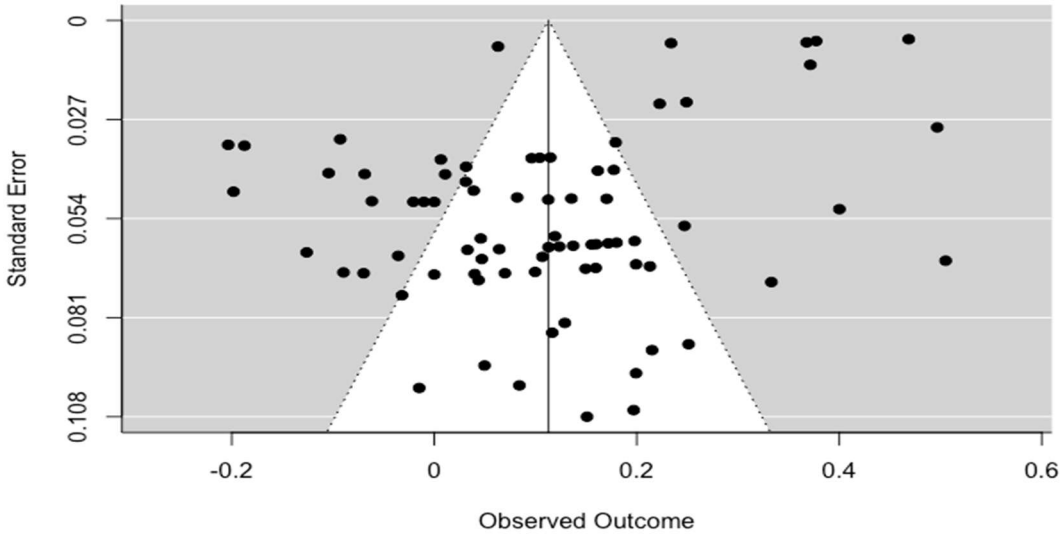
Demographic Moderators

We found neither participants' age ($Q_{between}$ (df = 1) = .83, p = .36) nor gender ($Q_{between}$ (df = 1) = .62, p = .43) as a significant moderator. However, the mean correlation between SNS and mental illness was significantly larger on healthy (r = .14, 95% CI [.10, .18], p < .001) than on at-risk populations (r = .01, 95% CI [-.06, .08], p = .76) ($Q_{between}$ (df = 1) = 8.47, p < .01). Regarding the race and ethnicity, with additional one percentage of African American population in the sample, the mean ES decreases by .002 (95% CI [-.003, -.002], p < .001; $Q_{between}$ (df = 1) = 8.34, p < .001), while other races or ethnicities did not have significant moderating effects. *RQ3* was addressed.

Publication Bias

Because the publication status depends on the statistical significance of study results, multiple analytic approaches were implemented to check for a potential publication bias (Sutton, 2009). First, a funnel plot was used to examine whether ESs from studies with smaller sample size show more variability than those from studies with larger sample size. As shown in Figure 2, the funnel plot of ESs was generally symmetric, which showed consistency with Egger's Regression Test (1997) for funnel plot asymmetry (z = -1.34, p = .18), providing evidence for the absence of publication bias. Given that the funnel plot interpretation may be open to subjectivity, the Rosenthal's (1979) fail-safe N was further examined, which was 63,647 and much larger than the tolerance level (5k +10 = 345). Thus, publication bias was not a concern for the current sample.

Figure 2. *Funnel Plot of Effect Sizes to Check Publication Bias for Current Study.*



Discussion

Given the mixed empirical findings in the literature regarding the association between SNS use and mental illness, we conducted a comprehensive meta-analysis of 37 studies to examine this relationship. Although no causal argument can be made given the entirety of the sample is survey studies and the relationship between SNS use and the likelihood of experiencing mental illness could be bi-directional, the findings of overall and moderator analyses provide not only implications on understanding SNSs' health effects but also guidance for SNS-based mental health intervention design. The results of overall and moderator analyses will be discussed in the following paragraphs.

Overall Association

The primary contribution of the current meta-analysis was to clarify the overall association between SNS use and the likelihood of experiencing mental illness (RQ1) out of the mixed empirical evidence. Our results showed a significant and positive correlation between SNS use and the users' likelihood of suffering from mental illness. The RQ2, asking about whether and how using SNSs is associated with a specific illness, was addressed by the significantly positive correlation between SNS use and depression, suicidal ideation, schizophrenia/mania, and ADHD, respectively. The finding shows consistency with a previous meta-analytic review (Huang, 2017), which documented a negative correlation between time spent on SNS and psychological well-being. Although no causality can be established by the current study, there exists meta-analytic evidence that the more one uses SNS, the higher likelihood that he or she suffers from mental illness, which echoes to SNSs' negative effects of upward social comparison on psychological well-being documented by existing literature (Feinstein et al., 2013; Kross et al., 2013; Liu et al., 2016). With distant acquaintances consisting of a large portion of online social networks (Bond et al., 2012), the tendency of comparing our actual self to the gilded idealized others on SNSs will be likely to have detrimental effects on mental health, especially for those who have a low level of self-esteem (Liu et al., 2016). On

the other hand, given that no causality could be established by the current meta-analysis examining correlations, it is plausible that individuals suffering from or vulnerable to mental illness are more likely to use SNSs, which could help them cope with their stress or symptoms. For instance, in post-disaster environments, where routine personal interactions are interrupted, individuals use SNSs frequently, which serve as an important tool to exchange information and support, to cope with depression and post-traumatic stress disorders (PTSD) and maintain psychological well-being (Masedu et al., 2014). Similar findings were documented by Davis (2013), who reported that caregivers of children with autism spectrum disorders turn to SNSs as support groups to mitigate their stress and depression.

Moderator Analyses

The association between SNS use and the likelihood of experiencing mental illness is not universal and may be moderated by SNS-related (RQ3a), theoretical (RQ3b), methodological (RQ3c), and demographic (RQ3d) factors. The current meta-analysis further contributes to the literature by systematically examining whether and how each of the abovementioned moderators influences the focal association.

Although previous literature suggests that passive SNS use is the primary cause of negative effects by involving users in upward comparison whereas active SNS use may enhance mental health by enabling self-expression (Stanton et al., 2017; Verduyn et al., 2015), we did not find any significant difference between them in the current meta-analysis, which answered RQ3a. The null result suggests the existence of more nuanced differences in the content and mechanisms of active and passive uses of SNSs, which renders dichotomized understanding of SNS usage pattern insufficient and deserves further investigation, such as the development of a continuous and universal measure of passive and active SNS use (Gerson et al., 2017; Trifiro & Gerson, 2019). In line with existing literature (Andreassen & Pallesen, 2014), clear evidence emerged from the moderator analysis that excessive or addictive SNS use has a large correlation with mental illness, on which cautions should be exercised. Over-dependence on SNSs may blur the perceived reality and virtuality and undermine users' personal and social life, which ultimately contributes to the likelihood of experiencing mental illness.

RQ3b was addressed by the results that the social support framework was a significant moderator whereas the social comparison framework was not. In other words, whether social comparison theory was applied as a framework does not moderate the ESs in the current sample. This finding is congruent with our earlier interpretation of the overall association, in the sense that the magnitude of effect observed in the associations between SNS use and the likelihood of suffering from mental illness, was independent of the authors' decisions to adopt social comparison as the theoretical framework or not. The non-significant finding may be attributed to the ubiquity or inevitability of social comparison experienced by SNS users. It is widely acknowledged that individuals tend to unremittingly and subconsciously compare themselves to others in almost every aspect (e.g., job, promotion, marriage, appearance, personal achievements, etc.), and SNSs afford abundant opportunities for such comparison (Cramer et al., 2016; Mussweiler & Rüter, 2003). The non-significant findings may also be attributed to the complex nature of social comparison on SNS (Cramer et al., 2016; Liu et al., 2016). Social comparison can elicit both positive and negative effects, depending on individual differences, such as individual's chronic self-esteem and comparison motivations (e.g., self-evaluation vs. self-enhancement). Therefore, social comparison was less likely to be adopted post hoc when a significant negative association was observed.

On the other hand, when social support was not mentioned, the studies identified significantly larger average ES than those adopting social support as a theoretical framework. Social support, as a communication behavior, improves mental health by intervening in the appraisal or the impact of stress (Cohen & Wills, 1985; House, 1981) and therefore is considered as a positive outcome of using SNSs. According to the buffering hypothesis (Cohen & Wills, 1985), social support is most important when people are under acute or chronic stress, in which case the social support users experienced could cushion ("buffer") the negative consequences brought by the stress and prevent them from being overwhelmed. However, the significant moderator analysis suggested that the social support theory was selectively applied by the authors of primary studies who reported lower ESs. Such selection preference is not necessarily the evidence of a post hoc decision-making but may reflect the complexity of the association between social support and reduced likelihood of experiencing mental illness. For instance, it was documented that offline social support moderates the association between social media use and mental health whereas online support mediates such association (Brailovskaia, Rohmann, Bierhoff, Schillack, et al., 2019).

However, online and offline support were not differentiated in most of the included studies and, therefore, not meta-analyzed. It should be noted that the current study did not measure social support or social comparison, and thus cannot testify the universality of these two mechanisms among SNS users. Instead, the results of moderator analyses provide plausible rationales to better understand the relationships between SNS use and the likelihood of experiencing mental illness. Given the complexity of social support mechanisms performed on SNSs, we also call for future studies to differentiate between online and offline social support in conceptualization and operationalization when examining the psychological mechanisms underlying the relationships between SNS use and mental health. Such specificity of examining online and offline individually will generate clear evidence about how the association between SNS use and mental health is related to support from users' online and offline social networks.

Furthermore, we found the operationalization of the two correlational variables as an important set of moderators, which answered RQ3c. The results indicated that the mean ES was larger among studies using multiple items (vs. one item) to measure SNS use, showing consistency with Hedges and Olkin's (1985) argument that one-item measure is less reliable than multiple-item measure and consequently susceptible to larger measurement error. Such imprecision fails to explain partial variance of the variable and, therefore, attenuates the correlation. Furthermore, operationalizing SNS use or mental illness on a continuous matric also produced larger ES than on a categorical matric. From the measurement perspective, the application of category scaling cannot specify the magnitude of a relationship or effect, of which the sensitivity, precision, and quantitative meaning are lost (Lodge, 1981). Therefore, the categorical matrices may compromise the full range of social science research and produce a smaller effect than the continuous matrices. From the diagnostic perspective, we did not find the significant effect between SNS use and dichotomously measured mental illness, which is probably because the effect did not reach the threshold of clinically significant mental illness. However, when we increase the granularity by examining mental illness continuously, we did observe an effect. Given this, future research is suggested to operationalize SNS use and mental illness using magnitude scaling and multi-item variables.

Last but not least, as a response to RQ3d, participants' health status and the percentage of African American participants were significant moderators. Social support as a significant theoretical moderator partially explains the moderating effect of participants' health status such that we found the association between SNSs use and the likelihood of experiencing mental illness statistically significant among general adults and minors but not patients suffering from mental illness. One possible explanation is the ceiling effect, because there is not much room for further deterioration of at-risk population's mental health. Furthermore, compared with the general population, individuals confronted with psychological distress are more likely to join a computer-mediated support group (CMSG) on SNSs (Davis, 2014; Klee et al., 2016; Masedu et al., 2014), where they enjoy greater opportunities to receive informational and emotional support, which tend to reduce their risk of deteriorating to mental illness and improve quality of life eventually (Wright et al., 2011; Yang, 2020). Despite the challenges of CMSGs (i.e., reduced nonverbal cues, possible hurtful remarks, higher demand for technology), SNSs provide unprecedented opportunities for mentally distressed people to benefit from CMSGs, especially when they are short on time or mobility, more comfortable communicating anonymously and asynchronously, or discuss sensitive issues (Wright et al., 2011).

In addition to participants' health status, our results indicated that the proportion of African American users also significantly moderated the ES, which might be explained by their unique manner of SNS use. Because SNSs such as Twitter serve as a convenient and cost-efficient platform for African American users to foster positive racial identity and collective Black community (Bradford, 2017; Brock, 2012; Stanton et al., 2017), they are presumably more prone to benefit from the social support and self-expression via SNSs and resistant to the negative consequences.

Limitations and Suggestions for Future Research

Despite the contributions, several limitations of this study should be noted. First, although a comprehensive literature search was implemented and the researchers tried to include as many unpublished studies as possible, the sample size of several specific platforms remains small. For instance, only three studies (Sherlock & Wagstaff, 2019; Stanton et al., 2017; Ward, 2018) and two studies (Klee et al., 2016; Stanton et al., 2017) meeting inclusion criteria examined the relationship between mental illness and use of Instagram and Twitter respectively. Such a

small sample size hinders meaningful conclusions from being drawn for these specific platforms, and our knowledge about how mental illness would be related to using YouTube, Pinterest, Snapchat, LinkedIn, and WhatsApp, although listed as the most widely used SNSs in the U.S. (Pew Research Center, 2021), is missing with no empirical study identified. Given the dearth of literature focusing on the influence of these SNSs on mental health, more scholarly work on understudied platforms would be imperative for a better understanding of the relationship between mental illness and using SNSs beyond Facebook.

Second, the current study does not serve as direct testing of the social support or social comparison mechanism via SNS use. For instance, the current meta-analysis does not attempt to examine the interaction between stressor and social support proposed in buffering model or delve into the difference between main effect and buffering models. Instead, the moderating effect of applying social support or social comparison as the theoretical framework was analyzed in order to explore how researchers theoretically rationalize or explain the relationship between the likelihood of experiencing mental illness and SNS use. Without directly measuring social support or social comparison in primary research, results of this moderator analysis cannot testify the mechanisms but rather provide a plausible explanation and a direction for future research investigating the underlying mechanism of the relationship. It should also be noted that social support and social comparison's impacts may vary across different mental illnesses (e.g., depression, OCD, suicidal ideation); however, the scrutiny of the mechanism of specific mental illness was hindered by the limited data points. Empirical studies would be needed in future scholarly endeavors to systematically test the effects of social support and social comparison on specific mental illness via SNS use and provide a more definite interpretation of the mechanisms.

Finally, although an attempt was made to examine a comprehensive list of SNS-related, theoretical, methodological, and demographic moderators, the current meta-analysis is inevitably limited to the constructs assessed in the primary studies. Therefore, several important factors that may be crucial in influencing the relationship between SNS use and the likelihood of suffering from mental illness, such as the specific activities of users' SNS engagement (e.g., looking at photos of cats versus trolling message boards for groups with whom the SNS user has ideological or political disagreements) and their engagement in positive or negative online behaviors, were not examined as potential moderators due to their infrequency in included studies. Therefore, we call for future research that takes a close examination of the valence and specific activities of users' SNS engagement, and how they are related to mental health. With the cumulation of empirical studies, further meta-analysts are suggested to analyze additional conceptually and methodologically important moderators.

Conclusion

As the first quantitative synthesis of the existing empirical findings on multiple SNSs and mental illness, this study provided significant and unique contributions to the literature by clarifying the inconsistent findings and pointing out the caveat of a significantly positive correlation between SNS use and the likelihood of experiencing mental illness, which generated cumulative knowledge. Furthermore, the results of moderator analyses shed theoretical light on a) the competing hypotheses explaining the association between SNS use and the likelihood of suffering from mental illness, deducted from the social support and social comparison theories, and b) the moderating effects of theoretical, methodological, SNS-related, and demographic factors. Finally, the study offered methodological and practical suggestions for SNS researchers and users. While users enjoy the benefits of online social networks, users and scholars should always be cautious of the dark side of SNSs, especially problematic SNS use. In conclusion, it is of the utmost importance for users to be aware of the complex relationships between SNS use and mental illness, and strategically consume SNSs to improve mental health.

Footnotes

[1] When analyzing SNS platform, we combined Tumblr (k = 1), Twitter (k = 2), and blogs (k = 1) into "other" category, given their low frequency in the current sample.

[2] The inter-coder reliability of coded variables is .98 for theory, .86 for social media use pattern, 1.00 for participants' health status, 1.00 for research method, .91 for social media measures, and .89 for mental illness measures.

[3] Meta-regression is the common approach of analyzing continuous variable. Similar to the use of regression in primary studies to assess the relationship between one or more independent variables and a dependent variable, the same logic can be applied to meta-analysis. The key difference, however, is that in meta-analysis, the independent variables are at the level of the study (i.e., study characteristics) rather than the level of subject and dependent variable is the effect size extracted from the primary studies.

[4] Studies meta-analyzed in the current study varied in whether mental illness was measured generally, specifically (e.g., depression), continuously, and categorically (see Table 3 for details). Given this, effect sizes in this meta-analysis reflect greater or lesser likelihood of experiencing mental illness rather than, specifically, likelihood of receiving a clinical diagnosis of mental illness.

[5] The *p* values presented here indicated significant association between mental illness and each type of SNS use (i.e., general, active, passive), but no significance difference was detected across these three pairs of association ($p < .05$).

Conflict of Interest

The Author(s) declare(s) that there is no conflict of interest.

References

** References marked with an asterisk indicate studies included in the meta-analysis.*

*Abu Rahal, Z., Vadas, L., Manor, I., Bloch, B., & Avital, A. (2018). Use of information and communication technologies among individuals with and without serious mental illness. *Psychiatry Research*, *266*, 160–167. https://doi.org/10.1016/j.psychres.2018.05.026

*Akkın Gürbüz, H. G., Demir, T., Gökalp Özcan, B., Kadak, M. T., & Poyraz, B. Ç. (2017). Use of social network sites among depressed adolescents. *Behaviour & Information Technology*, *36*(5), 517–523. https://doi.org/10.1080/0144929X.2016.1262898

American Psychiatric Association. (2017). *What is mental illness?* https://www.psychiatry.org/patients-families/what-is-mental-illness

*Andreassen, C. S., Billieux, J., Griffiths, M. D., Kuss, D. J., Demetrovics, Z., Mazzoni, E., & Pallesen, S. (2016). The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. *Psychology of Addictive Behaviors, 30*(2), 252–262. https://doi.org/10.1037/adb0000160

Andreassen, C. S., & Pallesen, S. (2014). Social network site addiction: An overview. *Current Pharmaceutical Design*, *20*(25), 4053–4061. https://doi.org/10.2174/13816128113199990616

Baker, D. A., & Algorta, G. P. (2016). The relationship between online social networking and depression: A systematic review of quantitative studies. *Cyberpsychology, Behavior, and Social Networking, 19*(11), 638–648. https://doi.org/10.1089/cyber.2016.0206

*Barry, C. T., Sidoti, C. L., Briggs, S. M., Reiter, S. R., & Lindsey, R. A. (2017). Adolescent social media use and mental health from adolescent and parent perspectives. *Journal of Adolescence*, *61*, 1–11. https://doi.org/S0140-1971(17)30131-8

Becker, B. J. (2000). Multivariate meta-analysis. In H. E. A. Tinsley & S. D. Brown (Eds.), *Handbook of applied multivariate statistics and mathematical modeling* (pp. 499–525). Academic Press.

Bellenir, K. (Ed.). (2000). *Mental health disorders sourcebook* (2nd ed.). Omnigraphics.

*Berryman, C., Ferguson, C. J., & Negy, C. (2018). Social media use and mental health among young adults. The *Psychiatric Quarterly*, *89*(2), 307–314. https://doi.org/10.1007/s11126-017-9535-6

Best, P., Manktelow, R., & Taylor, B. (2014). Online communication, social media and adolescent well-being: A systematic narrative review. *Children and Youth Services Review, 41*, 27–36. https://doi.org/10.1016/j.childyouth.2014.03.001

Bevan, J. L., Gomez, R., & Sparks, L. (2014). Disclosures about important life events on Facebook: Relationships with stress and quality of life. *Computers in Human Behavior*, *39*, 246–253. https://doi.org/10.1016/j.chb.2014.07.021

*Bhat, S., Pinto-Zipp, G., Upadhyay, H., & Polos, P. G. (2018). "To sleep, perchance to tweet": In-bed electronic social media use and its associations with insomnia, daytime sleepiness, mood, and sleep duration in adults. *Sleep Health*, *4*(2), 166–173. https://doi.org/10.1016/j.sleh.2017.12.004

*Błachnio, A., Przepiórka, A., & Pantic, I. (2015). Internet use, Facebook intrusion, and depression: Results of a cross-sectional study. *European Psychiatry*, *30*(6), 681–684. https://doi.org/10.1016/j.eurpsy.2015.04.002

*Block, M., Stern, D. B., Raman, K., Lee, S., Carey, J., Humphreys, A. A., Mulhern, F., Calder, B., Schultz, D., Rudick, C. N., Blood, A. J., & Breiter, H. C. (2014). The relationship between self-report of depression and media usage. *Frontiers in Human Neuroscience*, *8*, Article 712. https://doi.org/10.3389/fnhum.2014.00712

Bond, R. M., Fariss, C. J., Jones, J. J., Kramer, A. D. I., Marlow, C., Settle, J. E., & Fowler, J. H. (2012). A 61-million-person experiment in social influence and political mobilization. *Nature*, *489*(7415), 295–298. https://doi.org/10.1038/nature11421

Borenstein, M., Hedges, L. V., Higgins, J. P. T., & Rothstein, H. R. (2009). *Introduction to meta-analysis*. John Wiley & Sons.

boyd, d. m., & Ellison, N. B. (2007). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, *13*(1), 210–230. https://doi.org/10.1111/j.1083-6101.2007.00393.x

Bradford, J. H. (2017). Selfies, subtweets, & suicide. In S. Y. Evans, K. Bell, & N. K. Burton (Eds.), *Black women's mental health: Balancing strength and vulnerability* (pp. 75–88). State University of New York Press.

*Brailovskaia, J., & Margraf, J. (2016). Comparing Facebook users and Facebook non-users: Relationship between personality traits and mental health variables – An exploratory study. *PLoS One*, *11*(12), Article e0166999. https://doi.org/10.1371/journal.pone.0166999

*Brailovskaia, J., & Margraf, J. (2017). Facebook addiction disorder (FAD) among German students—A longitudinal approach. *PLoS One*, *12*(12), Article e0189719. https://doi.org/10.1371/journal.pone.0189719

*Brailovskaia, J., & Margraf, J. (2018). What does media use reveal about personality and mental health? An exploratory investigation among German students. *PLoS One*, *13*(1), Article e0191810. https://doi.org/10.1371/journal.pone.0191810

Brailovskaia, J., Rohmann, E., Bierhoff, H.-W., Margraf, J., & Köllner, V. (2019). Relationships between addictive Facebook use, depressiveness, insomnia, and positive mental health in an inpatient sample: A German longitudinal study. *Journal of Behavioral Addictions*, *8*(4), 703–713. https://doi.org/10.1556/2006.8.2019.63

Brailovskaia, J., Rohmann, E., Bierhoff, H.-W., Schillack, H., & Margraf, J. (2019). The relationship between daily stress, social support and Facebook addiction disorder. *Psychiatry Research*, *276*, 167–174. https://doi.org/10.1016/j.psychres.2019.05.014

*Brailovskaia, J., Schillack, H., & Margraf, J. (2018). Facebook addiction disorder in Germany. *Cyberpsychology, Behavior and Social Networking*, *21*(7), 450–456. https://doi.org/10.1089/cyber.2018.0140

Brailovskaia, J., Teismann, T., & Margraf, J. (2020). Positive mental health mediates the relationship between Facebook addiction disorder and suicide-related outcomes: A longitudinal approach. *Cyberpsychology, Behavior, and Social Networking*, *23*(5), 346–350. https://doi.org/10.1089/cyber.2019.0563

Brock, A. (2012). From the blackhand side: Twitter as a cultural conversation. *Journal of Broadcasting & Electronic Media*, *56*(4), 529–549. https://doi.org/10.1080/08838151.2012.732147

Carpenter, C. J. (2020). Meta-analyzing apples and oranges: How to make applesauce instead of fruit salad. *Human Communication Research*, *46*(2–3), 322–333. https://doi.org/10.1093/hcr/hqz018

*Ceglarek, P. J. D., & Ward, L. M. (2016). A tool for help or harm? How associations between social networking use, social support, and mental health differ for sexual minority and heterosexual youth. *Computers in Human Behavior*, *65*, 201–209. https://doi.org/10.1016/j.chb.2016.07.051

*Chop, A. B. (2015). *Effects of Facebook usage and how it relates to personality, life satisfaction, perceived social support, and depression* [Doctoral dissertation, Alliant International University]. ProQuest Dissertations and Theses database.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum.

Cohen, S., & Wills, T. A. (1985). Stress, social support, and the buffering hypothesis. *Psychological Bulletin*, *98*(2), 310–357. https://doi.org/10.1037/0033-2909.98.2.310

Cooper, H. M., Hedges, L. V., & Valentine, J. C. (Eds.). (2009). *The handbook of research synthesis and meta-analysis* (2nd ed.). Russell Sage Foundation.

*Coyne, S. M., McDaniel, B. T., & Stockdale, L. A. (2017). "Do you dare to compare?" Associations between maternal social comparisons on social networking sites and parenting, mental health, and romantic relationship outcomes. *Computers in Human Behavior*, *70*, 335–340. https://doi.org/10.1016/j.chb.2016.12.081

Cramer, E. M., Song, H., & Drent, A. M. (2016). Social comparison on Facebook: Motivation, affective consequences, self-esteem, and Facebook fatigue. *Computers in Human Behavior, 64,* 739–746. https://doi.org/10.1016/j.chb.2016.07.049

*Datu, J. A., Valdez, J. P., & Datu, N. (2012). Does Facebooking make us sad? Hunting relationship between Facebook use and depression among Filipino adolescents. *International Journal of Research Studies in Educational Technology*, *1*(2), 83–91. https://doi.org/10.5861/ijrset.2012.202

*Davis, L. A. (2013). *Parenting stress and use of online support among mothers of children with autism* [Doctoral dissertation, The University of South Dakota]. ProQuest Dissertations and Theses database.

DeVito, M. A., Birnholtz, J., & Hancock, J. T. (2017). Platforms, people, and perception: Using affordances to understand self-presentation on social media. In *Proceedings of the 2017 ACM Conference on Computer Supported Cooperative Work and Social Computing – CSCW '17* (pp. 740–754). ACM. https://doi.org/10.1145/2998181.2998192

Egger, M., Smith, G. D., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *BMJ*, *315*(7109), 629–634. https://doi.org/10.1136/bmj.315.7109.629

*Ellison, J. M. (2012). *College women and social networking sites: Reasons for use and related mental health constructs* [Doctoral dissertation, The University of North Dakota]. ProQuest Dissertations and Theses database. https://commons.und.edu/theses/1282 Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook

"Friends:" Social capital and college students' use of online social network sites. *Journal of Computer-Mediated Communication*, *12*(4), 1143–1168. https://doi.org/10.1111/j.1083-6101.2007.00367.x

*Escobar-Viera, C. G., Shensa, A., Bowman, N. D., Sidani, J. E., Knight, J., James, A. E., & Primack, B. A. (2018). Passive and active social media use and depressive symptoms among United States adults. *Cyberpsychology, Behavior, and Social Networking*, *21*(7), 437–443. https://doi.org/10.1089/cyber.2017.0668

*Fardouly, J., Magson, N. R., Johnco, C. J., Oar, E. L., & Rapee, R. M. (2018). Parental control of the time preadolescents spend on social media: Links with preadolescents' social media appearance comparisons and mental health. *Journal of Youth and Adolescence*, *47*(7), 1456–1468. https://doi.org/10.1007/s10964-018-0870-1

*Feinstein, B. A., Hershenberg, R., Bhatia, V., Latack, J. A., Meuwly, N., & Davila, J. (2013). Negative social comparison on Facebook and depressive symptoms: Rumination as a mechanism. *Psychology of Popular Media Culture*, *2*(3), 161–170. https://doi.org/10.1037/a0033111

Festinger, L. (1954). A theory of social comparison processes. *Human Relations*, *7*(2), 117–140. https://doi.org/10.1177/001872675400700202

Frison, E., & Eggermont, S. (2016). Exploring the relationships between different types of Facebook use, perceived online social support, and adolescents' depressed mood. *Social Science Computer Review*, *34*(2), 153–171. https://doi.org/10.1177/0894439314567449

Gerson, J., Plagnol, A. C., & Corr, P. J. (2017). Passive and active Facebook use measure (PAUM): Validation and relationship to the reinforcement sensitivity theory. *Personality and Individual Differences*, *117*, 81–90. https://doi.org/10.1016/j.paid.2017.05.034

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. Academic.

Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). Measuring inconsistency in meta-analyses. *BMJ*, *327*(7414), 557–560. https://doi.org/10.1136/bmj.327.7414.557

House, J. S. (1981). *Work stress and social support*. Addison-Wesley.

Huang, C. (2017). Time spent on social network sites and psychological well-being: A meta-analysis. *Cyberpsychology, Behavior, and Social Networking*, *20*(6), 346–354. https://doi.org/10.1089/cyber.2016.0758

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

Kircaburun, K., Alhabash, S., Tosuntaş, Ş. B., & Griffiths, M. D. (2020). Uses and gratifications of problematic social media use among university students: A simultaneous examination of the Big Five of personality traits, social media platforms, and social media use motives. *International Journal of Mental Health and Addiction*, *18*(3), 525–547. https://doi.org/10.1007/s11469-018-9940-6

*Klee, A., Stacy, M., Rosenheck, R., Harkness, L., & Tsai, J. (2016). Interest in technology-based therapies hampered by access: A survey of veterans with serious mental illnesses. *Psychiatric Rehabilitation Journal*, *39*(2), 173–179. https://doi.org/10.1037/prj0000180

Kross, E., Verduyn, P., Demiralp, E., Park, J., Lee, D. S., Lin, N., Shablack, H., Jonides, J., & Ybarra, O. (2013). Facebook use predict declines in subjective well-being in young adults. *PLoS Ones, 8*(8), Article e69841. https://doi.org/10.1371/journal.pone.0069841

Lee, G., Lee, J., & Kwon, S. (2011). Use of social-networking sites and subjective well-being: A study in South Korea. *Cyberpsychology, Behavior, and Social Networking*, *14*(3), 151–155. https://doi.org/10.1089/cyber.2009.0382

*Lee, S.-L., Park, M. S.-A., & Tam, C.-L. (2015). The relationship between Facebook attachment and obsessive-compulsive disorder severity. *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, *9*(2), Article 6. https://doi.org/10.5817/CP2015-2-6

*Lin, L. Y., Sidani, J. E., Shensa, A., Radovic, A., Miller, E., Colditz, J. B., Hoffman, B. L., Giles, L. M., & Primack, B. A. (2016). Association between social media use and depression among US young adults. *Depression and Anxiety*, *33*(4), 323–331. https://doi.org/10.1002/da.22466

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis*. Sage Publications.

Liu, J., Li, C., Carcioppolo, N., & North, M. (2016). Do our Facebook friends make us feel worse? A study of social comparison and emotion. *Human Communication Research*, *42*(4), 619–640. https://doi.org/10.1111/hcre.12090

Lodge, M. (1981). *Magnitude scaling: Quantitative measurement of opinions*. Sage Publications.

Marino, C., Gini, G., Vieno, A., & Spada, M. M. (2018). The associations between problematic Facebook use, psychological distress and well-being among adolescents and young adults: A systematic review and meta-analysis. *Journal of Affective Disorders*, *226*, 274–281. https://doi.org/10.1016/j.jad.2017.10.007

*Masedu, F., Mazza, M., Di Giovanni, C., Calvarese, A., Tiberti, S., Sconci, V., & Valenti, M. (2014). Facebook, quality of life, and mental health outcomes in post-disaster urban environments: The L'Aquila earthquake experience. *Frontiers in Public Health*, *2*, Article 286. https://doi.org/10.3389/fpubh.2014.00286

*Mérelle, S. Y. M., Kleiboer, A. M., Schotanus, M., Cluitmans, T. L. M., Waardenburg, C. M., Kramer, D., van de Mheen, D., & van Rooij, A. J. (2017). Which health-related problems are associated with problematic video-gaming or social media use in adolescents? A large-scale cross-sectional study. *Clinical Neuropsychiatry: Journal of Treatment Evaluation*, *14*(1), 11–19.

Moola, S., Munn, Z., Tufanaru, C., Aromataris, E., Sears, K., Sfetc, R., Currie, M., Lisy, K., Qureshi, R., Mattis, P., & Mu, P.-F. (2017). Systematic reviews of etiology and risk. In E. Aromataris & Z. Munn (Eds.), *JBI manual for evidence synthesis*. The Joanna Briggs Institute.

Mussweiler, T., & Rüter, K. (2003). What friends are for! The use of routine standards in social comparison. *Journal of Personality and Social Psychology*, *85*(3), 467–481. https://doi.org/10.1037/0022-3514.85.3.467

National Institute of Mental Health. (2017). *Mental illness.* https://www.nimh.nih.gov/health/statistics/mental-illness.shtml

Noar, S. M., Benac, C. N., & Harris, M. S. (2007). Does tailoring matter? Meta-analytic review of tailored print health behavior change interventions. *Psychological Bulletin*, *133*(4), 673–693. https://doi.org/10.1037/0033-2909.133.4.673

Oh, H. J., Ozkaya, E., & LaRose, R. (2014). How does online social networking enhance life satisfaction? The relationships among online supportive interaction, affect, perceived social support, sense of community, and life satisfaction. *Computers in Human Behavior*, *30*, 69–78. https://doi.org/10.1016/j.chb.2013.07.053

*Parent, M. C., Gobble, T. D., & Rochlen, A. (2019). Social media behavior, toxic masculinity, and depression. *Psychology of Men & Masculinity, 20*(3), 277–287. https://doi.org/10.1037/men0000156

Pew Research Center. (2021). *Social media use in 2021.* http://www.pewinternet.org/2021/04/07/social-media-use-in-2021/

Pittman, M., & Reich, B. (2016). Social media and loneliness: Why an Instagram picture may be worth more than a thousand Twitter words. *Computers in Human Behavior*, *62*, 155–167. https://doi.org/10.1016/j.chb.2016.03.084

*Primack, B. A., Shensa, A., Escobar-Viera, C. G., Barrett, E. L., Sidani, J. E., Colditz, J. B., & James, A. E. (2017). Use of multiple social media platforms and symptoms of depression and anxiety: A nationally-representative study among U.S. young adults. *Computers in Human Behavior*, *69*, 1–9. https://doi.org/10.1016/j.chb.2016.11.013

Rosen, L. D., Whaling, K., Rab, S., Carrier, L. M., & Cheever, N. A. (2013). Is Facebook creating "iDisorders"? The link between clinical symptoms of psychiatric disorders and technology use, attitudes and anxiety. *Computers in Human Behavior, 29*(3), 1243–1254. https://doi.org/10.1016/j.chb.2012.11.012

Rosenthal, R. (1979). The file drawer problem and tolerance for null results. *Psychological Bulletin*, *86*(3), 638-641. https://doi.org/10.1037/0033-2909.86.3.638

Rosenthal, R. (1991). *Meta-analytic procedures for social research* (Rev. ed.). Sage Publications.

*Sampasa-Kanyinga, H., & Hamilton, H. A. (2015). Social networking sites and mental health problems in adolescents: The mediating role of cyberbullying victimization. *European Psychiatry*, *30*(8), 1021–1027. https://doi.org/10.1016/j.eurpsy.2015.09.011

*Settanni, M., Marengo, D., Fabris, M. A., & Longobardi, C. (2018). The interplay between ADHD symptoms and time perspective in addictive social media use: A study on adolescent Facebook users. *Children and Youth Services Review*, *89*, 165–170. https://doi.org/10.1016/j.childyouth.2018.04.031

*Sherlock, M., & Wagstaff, D. L. (2019). Exploring the relationship between frequency of Instagram use, exposure to idealized images, and psychological well-being in women. *Psychology of Popular Media Culture*, *8*(4), 482–490. https://doi.org/10.1037/ppm0000182

*Simoncic, T. E., Kuhlman, K. R., Vargas, I., Houchins, S., & Lopez-Duran, N. L. (2014). Facebook use and depressive symptomatology: Investigating the role of neuroticism and extraversion in youth. *Computers in Human Behavior*, *40*, 1–5. https://doi.org/10.1016/j.chb.2014.07.039

Song, H., Zmyslinski-Seelig, A., Kim, J., Drent, A., Victor, A., Omori, K., & Allen, M. (2014). Does Facebook make you lonely? A meta-analysis. *Computers in Human Behavior*, *36*, 446–452. https://doi.org/10.1016/j.chb.2014.04.011

*Stanton, A. G., Jerald, M. C., Ward, L. M., & Avery, L. R. (2017). Social media contributions to strong Black woman ideal endorsement and Black women's mental health. *Psychology of Women Quarterly*, *41*(4), 465–478. https://doi.org/10.1177/0361684317732330

Sutton, A. J. (2009). Publication bias. In B. S. Cooper, L. V. Hedges, & J. C. Valentine (Eds.), *The handbook of research synthesis and meta-analysis* (pp. 435–452). Russell Sage Foundation.

*Tiggemann, M., & Slater, A. (2015). The role of self-objectification in the mental health of early adolescent girls: Predictors and consequences. *Journal of Pediatric Psychology*, *40*(7), 704–711. https://doi.org/10.1093/jpepsy/jsv021

Trifiro, B. M., & Gerson, J. (2019). Social media usage patterns: Research note regarding the lack of universal validated measures for active and passive use. *Social Media+ Society*, *5*(2). https://doi.org/10.1177/2056305119848743

Utz, S., & Breuer, J. (2017). The relationship between use of social network sites, online social support, and well-being. *Journal of Media Psychology*, *29*(3), 115–125. https://doi.org/10.1027/1864-1105/a000222

Utz, S., Muscanell, N., & Khalid, C. (2015). Snapchat elicits more jealousy than Facebook: A comparison of Snapchat and Facebook use. *Cyberpsychology, Behavior, and Social Networking*, *18*(3), 141–146. https://doi.org/10.1089/cyber.2014.0479

Verduyn, P., Lee, D. S., Park, J., Shablack, H., Orvell, A., Bayer, J., Ybarra, O., Jonides, J., & Kross, E. (2015). Passive Facebook usage undermines affective well-being: Experimental and longitudinal evidence. *Journal of Experimental Psychology: General*, *144*(2), 480–488. https://doi.org/10.1037/xge0000057

Verduyn, P., Ybarra, O., Résibois, M., Jonides, J., & Kross, E. (2017). Do social network sites enhance or undermine subjective well-being? A critical review. *Social Issues and Policy Review*, *11*(1), 274–302. https://doi.org/10.1111/sipr.12033

Wang, J. L., Gaskin, J., Rost, D. H., & Gentile, D. A. (2017). The reciprocal relationship between passive social networking site (SNS) usage and users' subjective well-being. *Social Science Computer Review*, *36*(5), 511–522. https://doi.org/10.1177/0894439317721981

*Ward, K. (2018). *The impact of social media use on adolescent mental health and social participation* [Doctoral dissertation, Alliant International University]. ProQuest Dissertations and Theses database.

Woods, H. C., & Scott, H. (2016) #Sleepyteens: Social media use in adolescence is associated with poor sleep quality, anxiety, depression and low self-esteem. *Journal of Adolescence*, *51,* 41–49. https://doi.org/10.1016/j.adolescence.2016.05.008

Wright, K. B., Johnson, A. J., Bernard, D. R., & Averbeck, J. (2011). Computer-mediated social support: Promises and pitfalls for individuals coping with health concerns. In T. L. Thompson, R. Parrott, & J. F. Nussbaum (Eds.), *The Routledge handbook of health communication* (pp. 349–362). Routledge.

Yang, Q. (2020). Understanding computer-mediated support groups: A revisit using a meta-analytic approach. *Health Communication*, *35*(2), 209–221. https://doi.org/10.1080/10410236.2018.1551751

*Zeeni, N., Doumit, R., Abi Kharma, J., & Sanchez-Ruiz, M.-J. (2018). Media, technology use, and attitudes: Associations with physical and mental well-being in youth with implications for evidence-based practice. *Worldviews on Evidence-Based Nursing*, *15*(4), 304–312. https://doi.org/10.1111/wvn.12298

*Zhang, R. (2017). The stress-buffering effect of self-disclosure on Facebook: An examination of stressful life events, social support, and mental health among college students. *Computers in Human Behavior*, *75*, 527–537. https://doi.org/10.1016/j.chb.2017.05.043

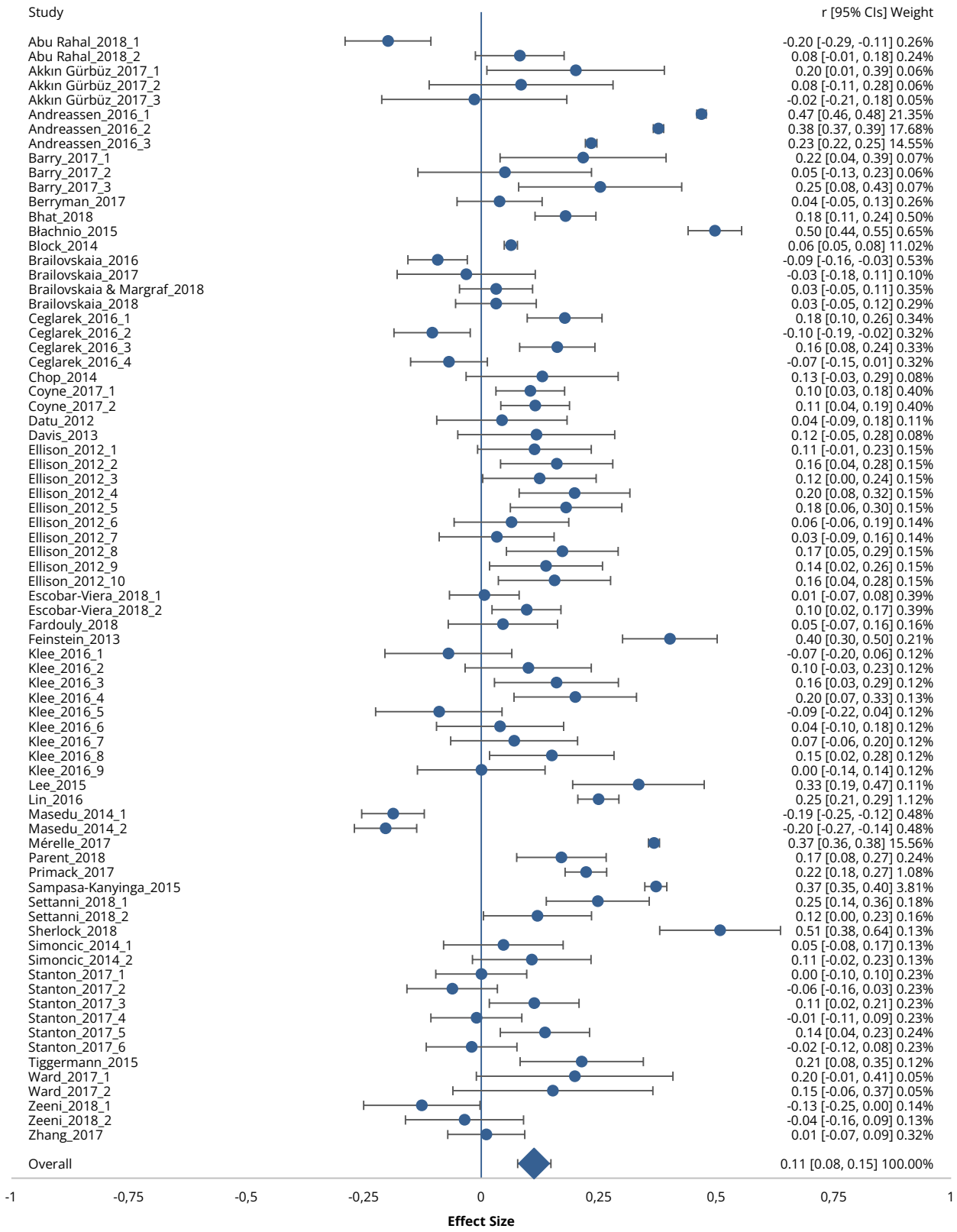
Appendix

Table A1. *Criteria for the Quality Assessment of the Studies Included in the Meta-analysis.*

	Item	Description	Yes (3 points)	Uncertain/Incomplete (1/2 points)	No (0 point)	Mean	Comments
1.	Inclusion Criteria	Provided clear inclusion and exclusion criteria they developed prior to curettement of participants					
2.	Study setting	Clear description of the study procedure was provided and the study was appropriately conducted					
3.	SNS use measure	The use of SNSs was measured in a valid and reliable way					
4.	Identifying confounders	Identified confounding factors that may bias the association					
5.	Addressing confounders	Applied appropriate strategies to deal with effects of confounding factors					
6.	Mental illness measure	Participants' mental illness was measured in a valid and reliable way					
7.	Statistical analysis	Used appropriate statistical analysis and provided sufficient information					

Note. SNS= social networking site. The items were adapted from JBI Critical Appraisal Checklist (Moola et al., 2017)

Figure A1. *Forest Plot Of Meta-Analysis On The Association Between SNS Use And Mental Illness*.



About Authors

Qinghua Yang (Ph.D., University of Miami) is an Assistant Professor in the Department of Communication Studies at the Texas Christian University. Her research focuses on health communication and new media and technology. Her recent work in these areas has been published in *Communication Monographs*, *Journal of Communication*, *Journal of Medical Internet Research mhealth & uhealth*, *Journal of Health Communication*, and *Health Communication*.

Jiangmeng (Helen) Liu (Ph.D., University of Miami) is an Assistant Professor of Strategic Communication at Seattle University. Her research centers on strategic communication in the context of new media as well as social media's effect on mental health. Her papers have been published in journals including *Human Communication Research*, *Internet Research*, *Computers in Human Behavior*, *Public Relations Review*, *Journal of Advertising*, *Journalism & Mass Communication Quarterly*.

Jian Raymond Rui (Ph.D., University at Buffalo, the State University of New York) is a professor at Department of New Media and Communication, South China University of Technology. Integrating new technology and interpersonal communication, Dr. Rui's research has been published in *Computers in Human Behavior*, *Information, Communication, and Society, Mass Communication and Society*, among others.

✉ **Correspondence to**
Qinghua Yang, Assistant Professor, TCU Box 298045, Fort Worth, TX 76129, USA, q.yang@tcu.edu