

Problematic Social Media Use in Adolescents and Young Adults: A Meta-Analysis

Holly Shannon, Katie Bush, Paul J Villeneuve, Kim GC Hellemans, Synthia Guimond


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Holly Shannon^{1,2} BSc; Katie Bush¹ BA; Paul J Villeneuve^{2,3*} PhD; Kim GC Hellemans^{2*} PhD; Synthia Guimond^{1,2,4*} PhD

¹Department of Psychiatry The Royal's Institute of Mental Health Research University of Ottawa Ottawa CA

²Department of Neuroscience Carleton University Ottawa CA

³School of Mathematics and Statistics Carleton University Ottawa CA

⁴Department of Psychoeducation and Psychology Université du Québec en Outaouais Gatineau CA

*these authors contributed equally

Corresponding Author:

Synthia Guimond PhD
Department of Psychiatry
The Royal's Institute of Mental Health Research
University of Ottawa
1145 Carling Ave
Ottawa
CA

Abstract

This study sought to systematically examine problematic social media use in youth and its association with symptoms of depression, anxiety, and stress. Our hypothesis was that problematic social media use increased the risk of each mental health outcome measure. A systematic search was conducted to identify studies in adolescents and young adults, using the databases Engineering Village, Psycinfo, Pubmed, and Web of Science. A total of 21 studies were identified in our review and included in the meta-analysis. Our meta-regression shows moderate, but statistically significant correlations between problematic social media use and depression ($r = .257$, $p < .001$), anxiety ($r = .342$, $p < .001$), and stress ($r = .313$, $p < .001$). We did not find evidence of heterogeneity of these summary correlations by age. This study provides further evidence of the association between problematic social media use and negative mental health among adolescents and young adults, and supports future research to focus on the underlying mechanisms of problematic use.

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Problematic Social Media Use in Adolescents and Young Adults: A Meta-Analysis

Holly Shannon^{1,2}, Katie Bush¹, Paul J. Villeneuve^{2,3}, Kim Hellemans², Synthia Guimond^{1,2,4}

1. Department of Psychiatry, The Royal's Institute of Mental Health Research, University of Ottawa, Ottawa, Canada

2. Department of Neuroscience, Carleton University, Ottawa, Canada

3. School of Mathematics and Statistics, Carleton University, Ottawa, Canada

4. Department of Psychoeducation and Psychology, Université du Québec en Outaouais, Gatineau, QC, Canada

Abstract

This study sought to systematically examine problematic social media use in youth and its association with symptoms of depression, anxiety, and stress. Our hypothesis was that problematic social media use increased the prevalence of each mental health outcome. A systematic search was conducted to identify studies in adolescents and young adults, using the databases Engineering Village, Psycinfo, Pubmed, and Web of Science. A total of 18 studies were identified, with a total of 9269 participants in our review and included in the meta-analysis. Our meta-regression shows moderate, but statistically significant correlations between problematic social media use and depression ($r = .273$, $p < .001$), anxiety ($r = .348$, $p < .001$), and stress ($r = .313$, $p < .001$). We did not find evidence of heterogeneity of these summary correlations by age, gender, or year of publication. This study provides further evidence of the association between problematic social media use and negative mental health among adolescents and young adults and supports future research to focus on the underlying mechanisms of problematic use of social media.

Technology is ever evolving, with more and more diverse activities becoming possible on screen-based devices. With this increasing engagement in the digital world, social networking sites have become an increasingly popular activity, especially among younger populations [1]. Adolescents and young adults represent a unique population in terms of social media users, as they are the first generations to grow up in a highly digitized society. Social media use is highly normative among young individuals: In 2016, 97.5% of young adults in the US reported using at

least one social media site regularly [2]. However, participating in a heavy screen-based lifestyle may come at a cost. A wealth of evidence suggests higher levels of social media use are associated with symptoms of anxiety [3-5], symptoms of depression [3,6-8], decreased psychological well-being [9], lower self-esteem [3], psychological distress [10-12] and loneliness [5]. A meta-analysis in young adults reports a small correlation between depressive symptoms and adolescent social media use, defined by frequency of use [13]. However, along with the evidence supporting the negative impacts of social media use, some reports suggest there may exist positive outcomes following use. For example, social media use has also been linked to higher quality of life, social support, well-being, and reduced stress [14-15].

Aside from excessive use of social media, typically defined on the basis of hours of use, the term of problematic use characterizes individuals who experience addiction-like symptoms as a result of their social media use [5]. Problematic social media use reflects a non-substance related disorder by which detrimental effects occur as a result of preoccupation and compulsion to excessively engage in social media platforms despite negative consequences [16]. While there exists no official diagnostic term or measurement, Andreassen et al. developed the Facebook Addiction Scale which measures features of substance use disorder such as salience, tolerance, preoccupation, impaired role performance, loss of control, and withdrawal to systematically score problematic Facebook use [17]. This scale has been widely used to conceptualize problematic use as a behavioural addiction and has therefore also been modified to measure overall problematic social media use, instead of focusing on Facebook specifically [18]. Similar to high frequencies of social media use, problematic social media use has also been associated with poor mental health outcomes such as depression, anxiety, decreased well-being and lower self-esteem [1,17,19-22]. A recent meta-analysis by Cunningham et al., (2021), found that problematic social media use was a stronger predictor of depressive symptoms when compared to the measure of time spent on social networking sites [23]. Therefore, based on previous evidence, problematic social media use may be more imperative to examine than hours spent on social media platforms.

Researchers recognize youth and students as a vulnerable group compared to adults because their increased use of social media is occurring during a time of identity formation, where they are free to explore various life possibilities and develop new values [2]. Furthermore, their use occurs when critical brain circuits involved in emotion regulation and motivation are continuing to

undergo development [25]. As social media plays a large role in their day to day lives, patterns and frequency of use have the potential to become problematic. On this level, youth are more at risk for facing cyberbullying [24], finding it difficult to disengage from the media, and allowing it to interfere with their social relationships [26], and this puts them at risk for experiencing negative emotional and psychosocial outcomes [27]. Therefore, younger individuals are a vulnerable group of social media users, and it is important to better understand the outcomes for well-being that are associated with this type of problematic social media use. Yet, the magnitude of impact social media has on adolescents and emerging adults, especially when considering problematic use, remains unclear.

With this background, we systematically examined and summarized, with the most current evidence, the strength of association between problematic social media use and multiple mental health outcomes. Specifically, we considered depressive symptoms, anxiety symptoms and stress. Our a priori hypothesis was that problematic social media use adversely impacts all mental health outcomes measured. In addition, age, gender, and year of publication was investigated as covariates in the relationship between problematic social media use and all mental health outcome variables.

Methods

This meta-analysis was registered with the International Prospective Register of Systematic Reviews (Prospero: CRD42021222309). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were followed [28].

Inclusion and exclusion criteria

The present systematic review included measures of problematic social media use, with depressive symptoms, anxiety symptoms, and stress as outcome measures, assessed by validated instruments. The studies included were cross-sectional and provided a measure of association between problematic use and at least one of the mental health outcomes. Studies must have included a measure of problematic use from the participants, simply indicating if the participant was a user of social media was not acceptable (ex. grouping users vs. non-users of social media). Social media use was also examined in general, without focusing on specific activities (ex. studies looking at specific

screen content or comparisons on social media platforms, etc.) or a specific platform (ex. Facebook). Problematic social media use scales must have been validated to specifically measure social media use in terms of addictive use, comprising criteria used when measuring substance use disorders. Studies included were restricted to English language, and ages 12 to 30 years old. Studies were excluded if they only measured frequency or problematic use of the internet in general, as social media use specifically must have been measured. Studies were also excluded if social media was being used as a treatment/intervention or in a focus-group setting. Finally, studies were excluded if they only measured social media use in clinical populations.

Literature search

A systematic literature search was conducted in April 2021 using the databases Engineering Village, PsycInfo, Pubmed, and Web of Science using the terms: "social media", "social networking", "mental health", "depression", "depressive symptoms", "anxiety", and "stress". These search terms were used to quantify social media use in terms of problematic use.

Assessment of quality

All eligible studies were assessed for quality using an adapted version of the Newcastle-Ottawa quality assessment scale for cross-sectional studies was used to score the risk of bias for each study [29]. All studies were independently rated by HS and KB and given a score out of 10. Conflicts in scoring were resolved by discussion, see Appendix A.

Data Extraction

For each study identified as eligible, the following information was extracted; study identification (authors, year of publication, country conducted), study design (sample size, age range, mean age, gender, questionnaire used to measure problematic social media use), outcome variables (questionnaire used to measure each outcome, measure of association). See Appendix A for questionnaires used to measure problematic use and outcome variables for each study included in the meta-analysis.

Statistical analysis

To quantify the association between problematic social media use with depressive symptoms, anxiety symptoms, and stress, we used Pearson's correlation coefficient (r). Problematic use was considered on a continuum, based on the score obtained from the questionnaire used that measures problematic use as addiction-like tendencies. All data analysis was performed using the statistical software Stata [30]. A random effects model was used, as it does not assume a common effect size across studies. The variance of r was calculated in order to obtain the standard error for each correlation coefficient. The effect size in all groups of analysis had a 95% confidence interval. Publication bias was evaluated by producing a funnel plot, and by performing Egger's test. Age, gender, and year of publication were investigated as covariates by adding mean age, the percentage of male participants reported, and publication year for each study into separate meta-regression analyses.

Results

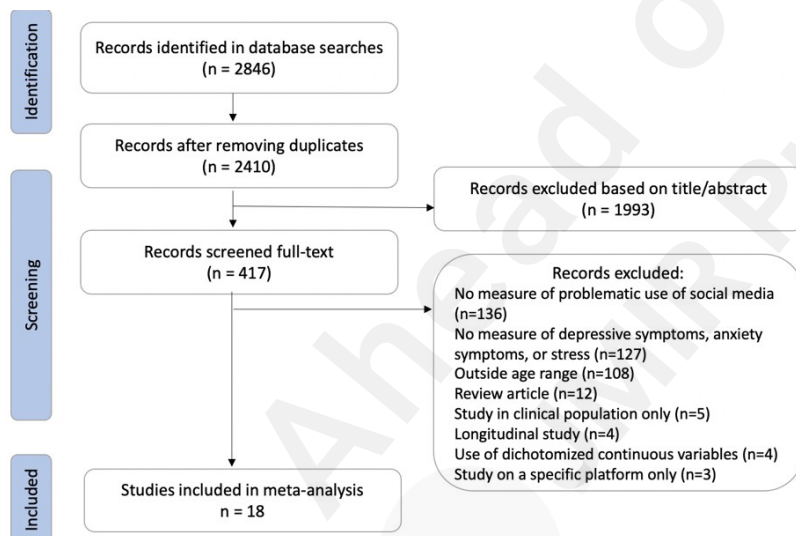


Figure 1. Flow chart of the search process and studies included.

Literature search

The literature search yielded 2846 articles, with 2410 articles remaining after duplicates were removed (see Fig 1). Articles were screened based on titles and abstract to remove any records that were not quantitative, did not assess one of the outcomes, or were longitudinal. After the first screening 417 articles were considered to be eligible and were then screened based on full-text to exclude any remaining records that did not meet the inclusion criteria. Of the remaining articles, 4 were excluded as they were reporting results using dichotomized continuous variables. These studies separated participants into groups based on the scores of their respective scales, and therefore could not be used in our current meta-analysis. Additionally, any unpublished data was obtained by contacting the corresponding author. One study included reported statistics distinct to two separate samples, therefore the two samples were coded independently [42]. The results from

Kim et al, (2020) were excluded from the meta-regression, as mean age was not reported or received when contacted [37]. The correlation from Giordano et al, (2021) with problematic social media use was reported as a combined score of depressive and anxiety symptoms which therefore could not be included in the meta-analysis [43]. However, all variables were pooled together for the meta-regression analyses, so it was included when examining age, gender, and publication year as covariates. Details on the final 18 studies and 9269 total participants included are summarized in table 1.

Table 1. Summary of included studies on the relationship between social media use and outcome variables.

First author (year)	Sample Size	% Males	Age Range (mean)	Country	Problematic use & depression	Problematic use & anxiety	Problematic use & stress	Problematic use & depression and anxiety combined
Holmgren (2017) [31]	442	48.4%	18-21 (18.86)	USA	$r = 0.29$			
Wang (2018) [32]	365	48.0%	14-18 (16.29)	China	$r = 0.18$			
Apaolaza (2019) [33]	346	48.3%	17-26(18.73)	Spain			$r = 0.49$	
Hou (2019) [34]	641	25.6%	17-25 (19.9)	China	$r = 0.22$	$r = 0.22$	$r = 0.11$	
Kircaburun (2019) [24]	470	40.4%	14-18 (16.29)	Turkey	$r = 0.03$			
Mitra (2019) [35]	264	37.8%	18-25 (21.56)	India	$r = 0.39$			
Chen (2020) [36]	437	29.5%	16-30 (24.21)	China		$r = 0.29$		
Kim (2020) [37]	209	85.2%	15-18 (N/A)	China		$r = 0.20$		
Kircaburun, Demetrovics (2020) [38]	344	18.0%	18-25 (20.87)	Turkey	$r = 0.22$			
Kircaburun, Griffiths (2020) [39]	460	39.0%	18-26 (19.74)	Turkey	$r = 0.34$			
Stockdale (2020) [26]	385	47.0%	17-19 (18.01)	USA	$r = 0.28$	$r = 0.24$		
Wong (2020) [40]	300	40.7%	18-24 (20.89)	Hong Kong	$r = 0.336$	$r = 0.344$	$r = 0.384$	
Yildiz (2020) [41]	451	52.5%	13-17 (15.5)	Turkey		$r = 0.58$		
Brailovskaia; Lithuanian sample (2021) [42]	1640	31.5%	18-29 (19.09)	Lithuania	$r = 0.305$	$r = 0.329$	$r = 0.246$	
Brailovskaia; German sample (2021) [42]	727	24.6%	18-29 (21.47)	Germany	$r = 0.396$	$r = 0.461$	$r = 0.411$	
Giordano (2021) [43]	428	49.1%	13-19 (17.38)	USA				$r = 0.314$
He (2021) [44]	218	0%	19-23 (19.6)	China			$r = 0.23$	
Kilincel (2021) [45]	1142	36.8%	12-18 (15.6)	Turkey		$r = 0.417$		

*Not all studies measured all three outcomes. Giordano et al., (2021) assessed anxiety and depression combined, and was therefore only included in the meta-regression analyses [43].

Problematic Social Media Use and Depressive Symptoms

When examining depression as an outcome, 11 studies presented associations between problematic social media use in adolescents and young adults. The Center of Epidemiologic Studies Depression Scale was most commonly used to measure depressive symptoms. The summary meta-regression correlation between problematic social media use and depressive symptoms was 0.273 (95% CI = 0.215-0.332, $p < 0.001$). There was heterogeneity in the measures of association across the studies (Figure 2) with an $I^2 = 83.2\%$, $Q^2 = 59.69$, $p < 0.001$. The funnel plot (see Appendix A) shows slight asymmetry, suggesting slight publication bias, however Egger's test for small-study effects was not significant ($p = 0.35$).

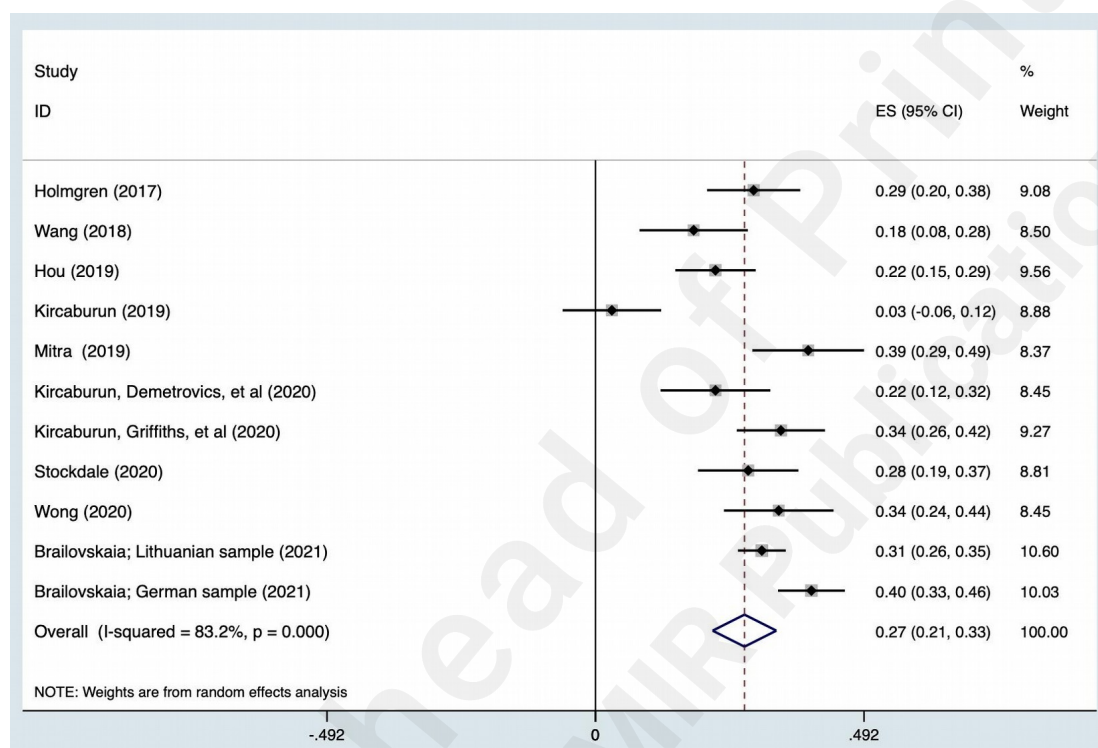


Figure 2. Forest plot of depressive symptoms and problematic social media use by year.
Problematic Social Media Use and Anxiety Symptoms

When examining anxiety symptoms as an outcome, 9 studies were identified measuring an association with problematic social media use in adolescents and young adults. The Depression Anxiety Stress Scale was most commonly used to measure anxiety symptoms. The summary meta-regression correlation between problematic social media use and anxiety symptoms was 0.348 (95% CI = 0.270-0.426, $p < 0.001$). There was substantial heterogeneity in the measures of association across the studies (Figure 3) with an $I^2 = 91.6\%$, $Q^2 = 94.75$, $p < 0.001$. The funnel plot (see Appendix A) shows asymmetry, suggesting some publication bias being present, however Egger's test for small-study effects was not significant ($p = 0.296$).

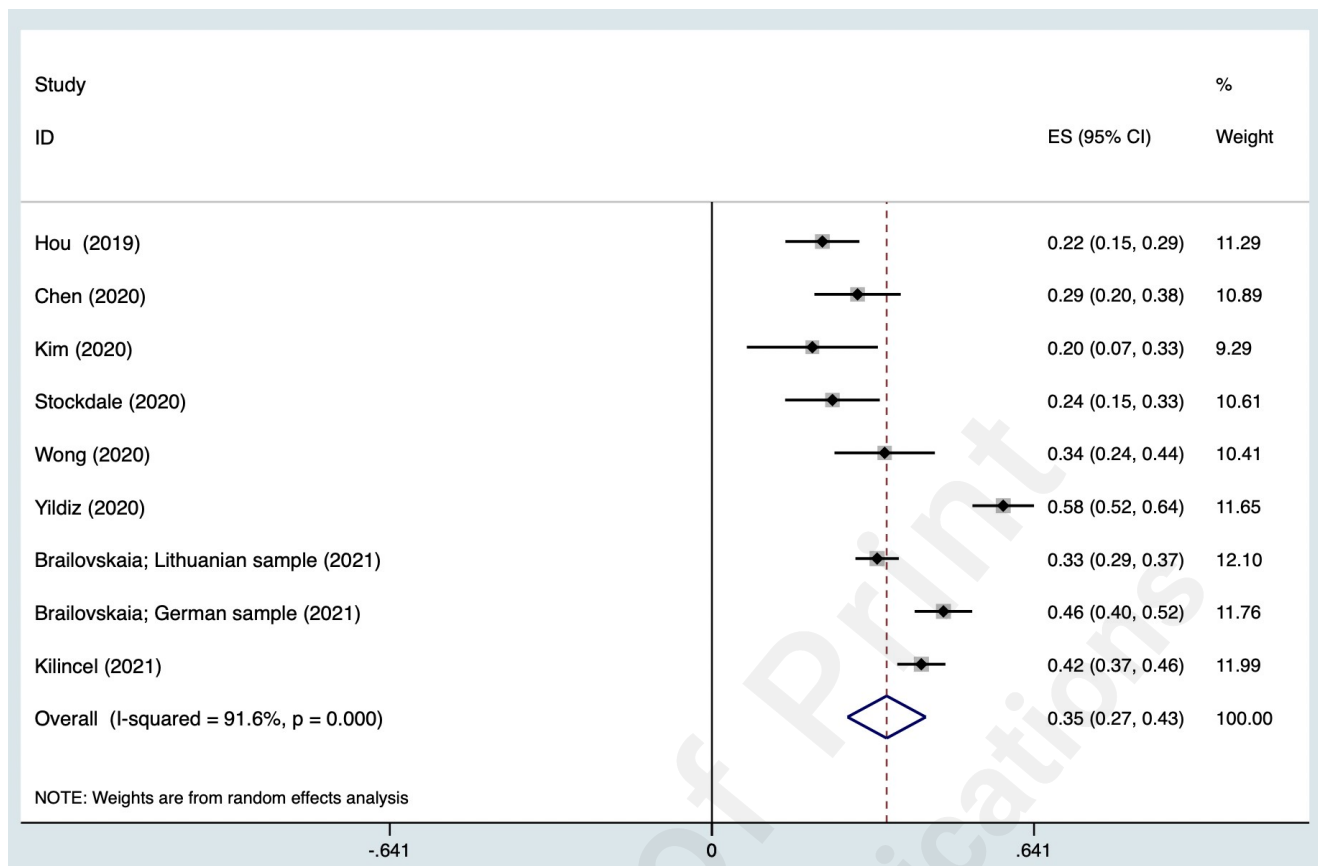


Figure 3. Forest plot of anxiety symptoms and problematic social media use by year.

Problematic Social Media Use and Stress

Finally, when examining stress as an outcome, only 6 studies were identified measuring an association with problematic social media use in adolescents and young adults. The summary meta-regression correlation between problematic social media use and stress was 0.313 (95% CI = 0.203-0.423, $p < 0.001$). There was heterogeneity in the measures of association across the studies (Figure 4) with an $I^2 = 92.6%$, $Q^2 = 67.59$, $p < 0.001$. The funnel plot (see Appendix A) shows symmetry, suggesting no publication bias, with no significant bias from Egger's test as well ($p = 0.788$).

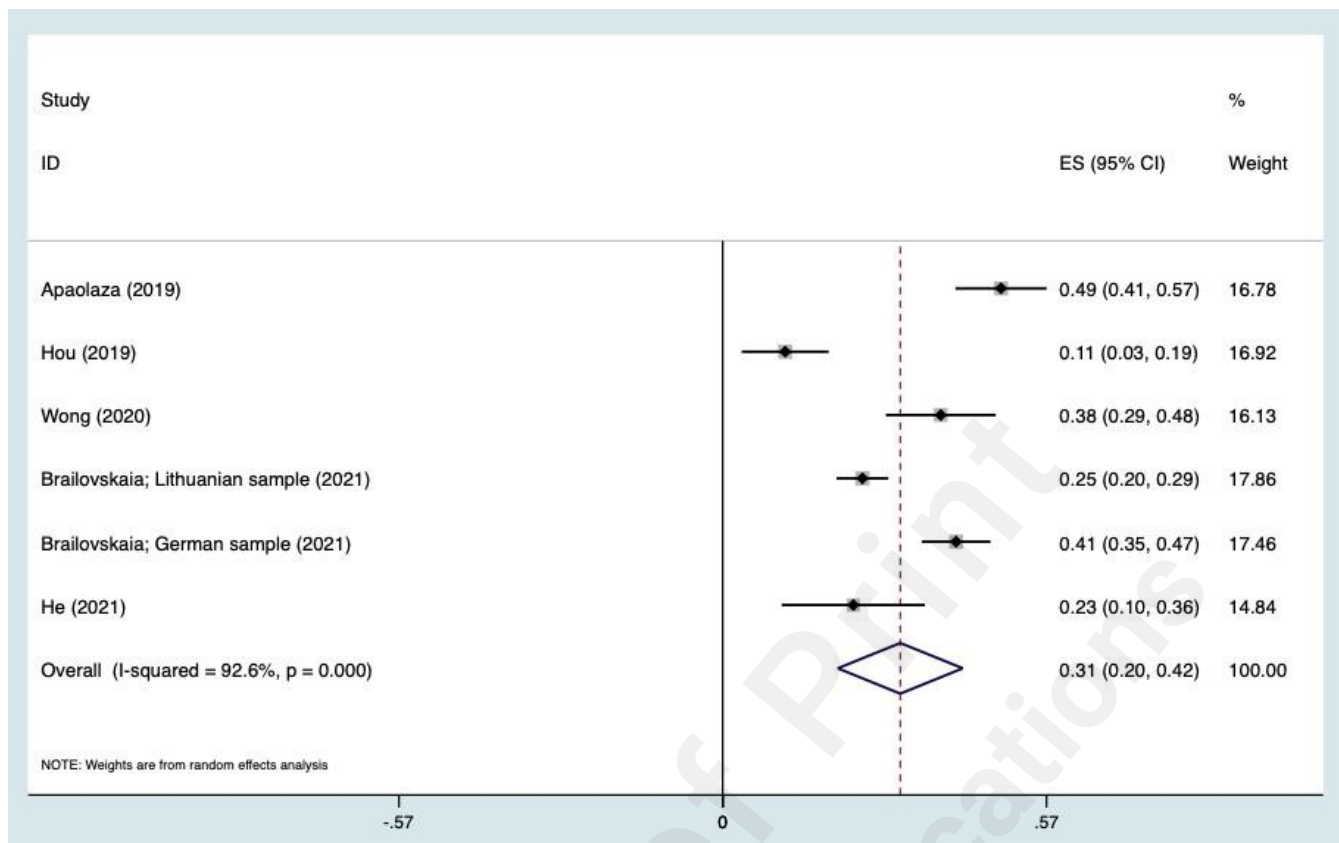


Figure 4. Forest plot of stress and problematic social media use by year.

Moderators of Problematic Social Media Use

The meta-regression assessing the impact of age as a covariate on the relationship between problematic social media use and all mental health outcomes combined showed that age was not significantly moderating the relationships ($p = 0.748$). When examining gender as a covariate in the relationship between problematic social media use and all mental health outcomes, gender did not significantly moderate the relationship ($p = 0.246$). Finally, year of publication also did not significantly moderate the relationship between problematic social media use and all mental health outcomes when added as a covariate ($p = 0.090$). See Appendix A for meta-regression plots.

Discussion

This meta-analysis reports outcome measures of depression, anxiety, and stress in association with problematic social media use, specifically among adolescents and young adults. There is evidence for a significant relationship between problematic social media use in youth and negative mental health outcomes, particularly higher depression and anxiety symptoms, and greater stress. The strongest correlation was observed with anxiety, however this also presented the most heterogeneity, likely due to the variety of assessments used to quantify symptoms of anxiety

in the individual studies.

Although the correlations are moderate, this meta-analysis provides further evidence for the possible harms of problematic social media use. Previous meta-analyses examining time spent on social media and mental health show very small effect sizes, with most correlations being reported below $r = 0.20$ [46-48]. One explanation for previously small correlations observed is the variability of social media content itself and the ways individuals are using or viewing their social media accounts. There has been evidence of multiple variables that can influence the severity of mental health outcomes such as night-time specific use, passive use, the number of social media platforms, motives for using social media, etc. [3,49-52]. Problematic social media use is a distinct pattern of use characterized by “addiction-like” symptoms based on behavioural and psychological attributes. It is characterized not only by time spent on social media, but also by measuring the extent of symptoms similar to a substance related disorder, such as withdrawal, tolerance, and dependence [22]. Therefore, it could represent a more clinically meaningful behaviour to direct research towards, as a stronger relationship is seen with adverse mental health symptoms compared to previous studies investigating time spent on social networking sites or screen time in general [23,53,54].

The influence of age is still highly debated with evidence pointing towards younger social media users being more likely to have worse mental health symptoms compared to older users [55], whereas others have found no significant age effect with time spent on social media [56]. Cunningham et al (2021) found age did not moderate the relationship between problematic social media use and depression, however this was performed in a mainly adult sample [23]. Likewise, in the current meta-analysis, age did not significantly moderate the relationship between the outcome variables combined and problematic use. This is likely due to the restricted age range, as the mean age between individual studies were analogous. Higher social media usage, along with developmental vulnerabilities in adolescents and young adults has been proposed to explain the higher association with worse mental health outcomes compared to adults [57,58]. However, when looking specifically at mental health associated with problematic social media use as a behaviour, the severity of reported problematic use symptoms may be more imperative to consider rather than age. Future research could directly compare adolescents to adults to examine if a difference in

correlational strength is present, specifically when measuring problematic use.

Gender was examined as a moderator by including the percentage of male participants from each study into a meta-regression analysis. Gender did not significantly moderate the relationship between problematic social media use and mental health, suggesting the association between mental health symptoms and problematic use of social media is not different between genders. Studies included in this meta-analysis did not specify if they assessed biological sex. Future research should provide more specific results for each group for both sex and genders to allow future meta-analyses to summarize this information and provide insight into gaps in the current literature on problematic use of social media [23, 59, 60].

Year of publication did not significantly moderate the relationship between problematic social media use and mental health outcomes. Although there are increased rates of social media use in adolescents and young adults over time, this may not be directly pertinent in the strength of the association between mental health and problematic use [23, 61]. Year of publication may be more indicative of the prevalence of social media use as it increases with the growing use of technology [61]. Along with previous data, it is suggested mental health symptoms associated with problematic social media use does not appear to be worsening over time, however, longitudinal studies exploring this specifically are needed.

Strengths and limitations

This study is not without limitations. The number of studies included in each meta-analysis was limited, therefore the results are somewhat limited in power. Secondly, the results are based on cross-sectional correlational data. Therefore, a causal relationship cannot be inferred from the direct impact of social media on mental health outcomes of depressive symptoms, anxiety symptoms, or stress. It is possible that there are likely bidirectional effects between poor mental health and social media use [62]. In addition, the research studies included in the meta-analysis used did not report assessing the presence of a clinical diagnosis, therefore it is unknown what proportion of the participants already had a known or possible clinical psychiatric diagnosis. This could influence the results of the outcome variables being measured, as it is unknown if individuals are more likely to have negative social media experiences or consequences as a result of using social

media compared to individuals without a mental health diagnosis. Although the included questionnaires were previously validated, the majority of the research relies on self-report measures, also presenting as a limitation to the results reported.

Future directions

Overall, there is a lack of research providing evidence on the mental health outcomes of social media use, particularly patterns of problematic use in younger populations. In order to thoroughly understand the direct implications of problematic social media use, longitudinal studies could aid in providing more causal conclusions, as cross-sectional methodology is limited in its ability to draw conclusions beyond correlation [63]. In addition to a longitudinal design, understanding the biological basis of problematic use could contribute to understanding vulnerability to negative mental health outcomes. Future studies exploring the relationship between problematic social media and mental health outcomes would also benefit from including more detailed information on how participants are using various platforms. Indeed, there are several other scales exploring social media use that explore motivations for and mood associated with use (eg. social media use integration scale), which may provide greater depth of understanding around these associations. Finally, in traditional clinical practices for substance use disorders, treatment is often based on abstinence. For problematic social media use, total abstinence may not be a realistic option in today's technology-based culture. Therefore, there should also be an increasing focus on identifying healthy ways to use social media in order to avoid the development of problematic use.

Conclusion

Findings from this study provide further evidence of the association between problematic social media and negative mental health outcomes of depression, anxiety and stress among adolescents and young adults. Although there is a large amount of evidence pointing towards the negative impacts of social media on mental health, there is still a need for further research to provide conclusive results on the causal relationship and how it can be used without taking a toll on the mental health of users. Considering the omnipresence of social media among youth, more resources should be allocated to better understand the relationship between use and mental health symptoms, and also preventing such negative outcomes.

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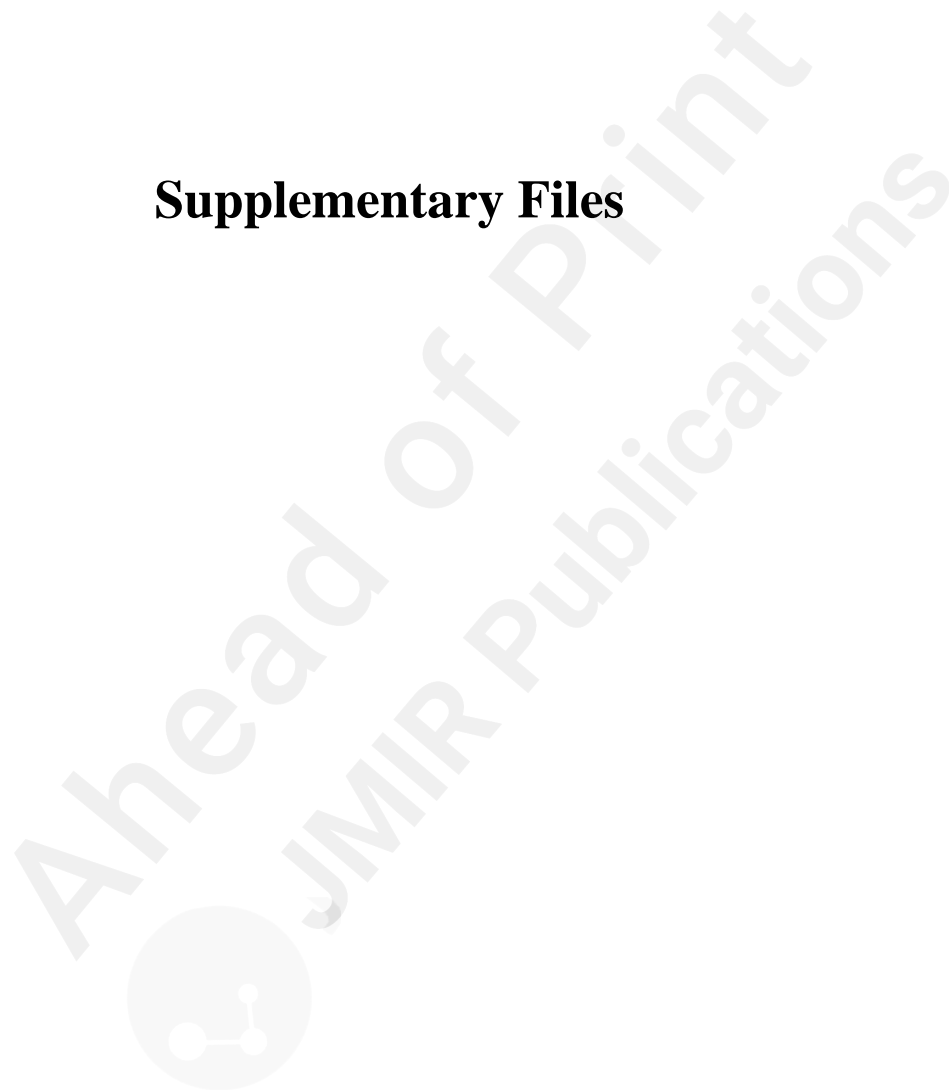
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Supplementary Files

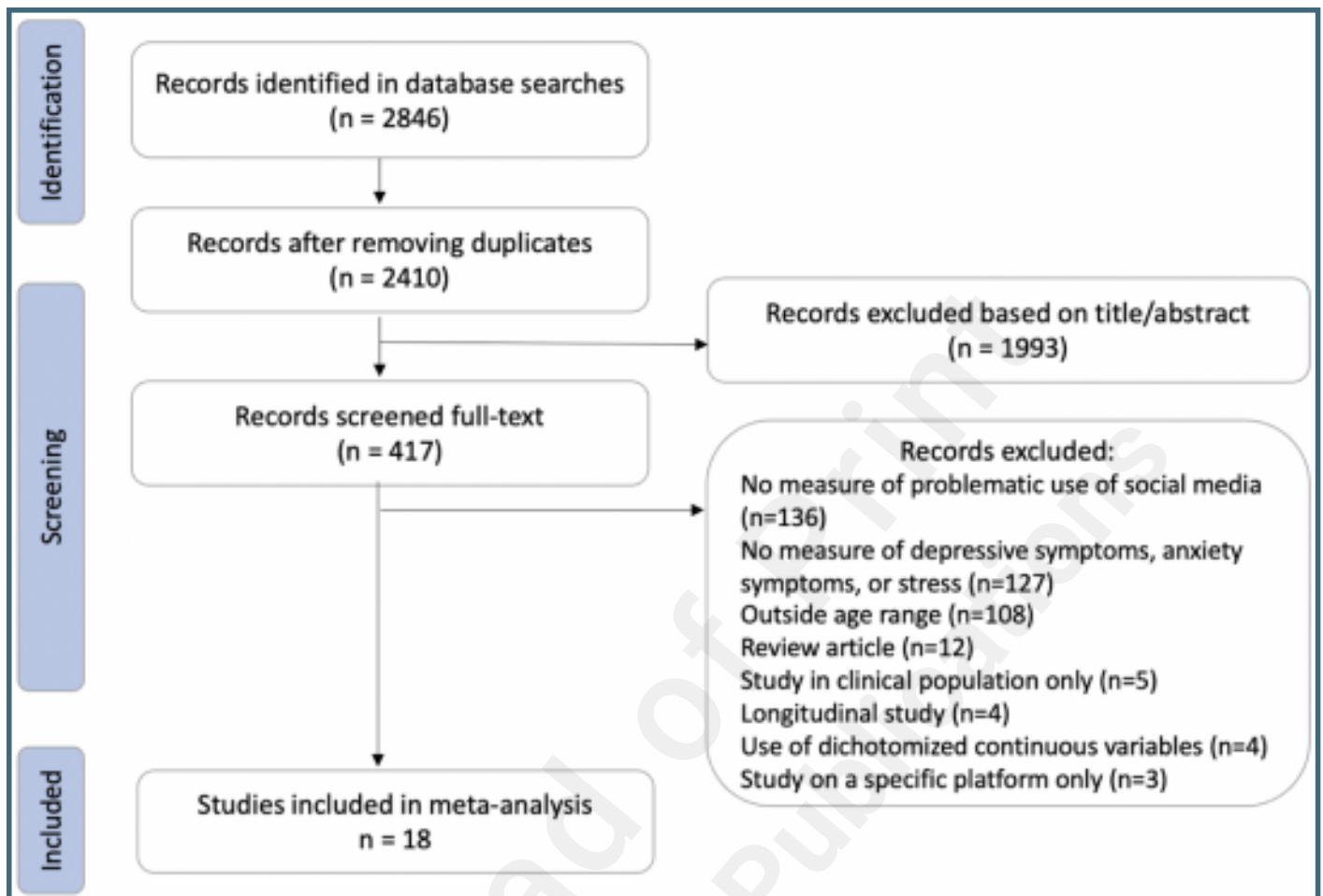


Figures

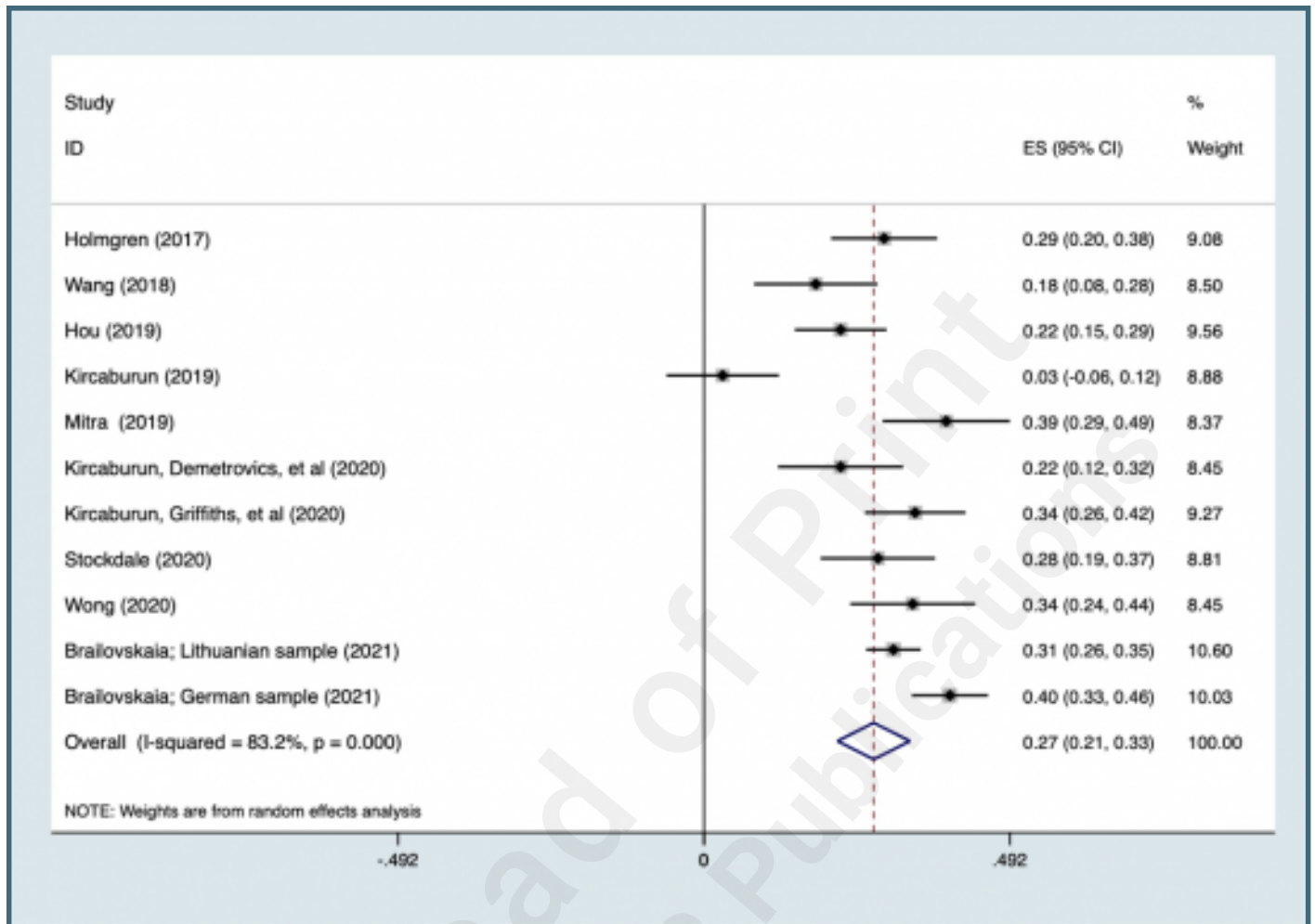
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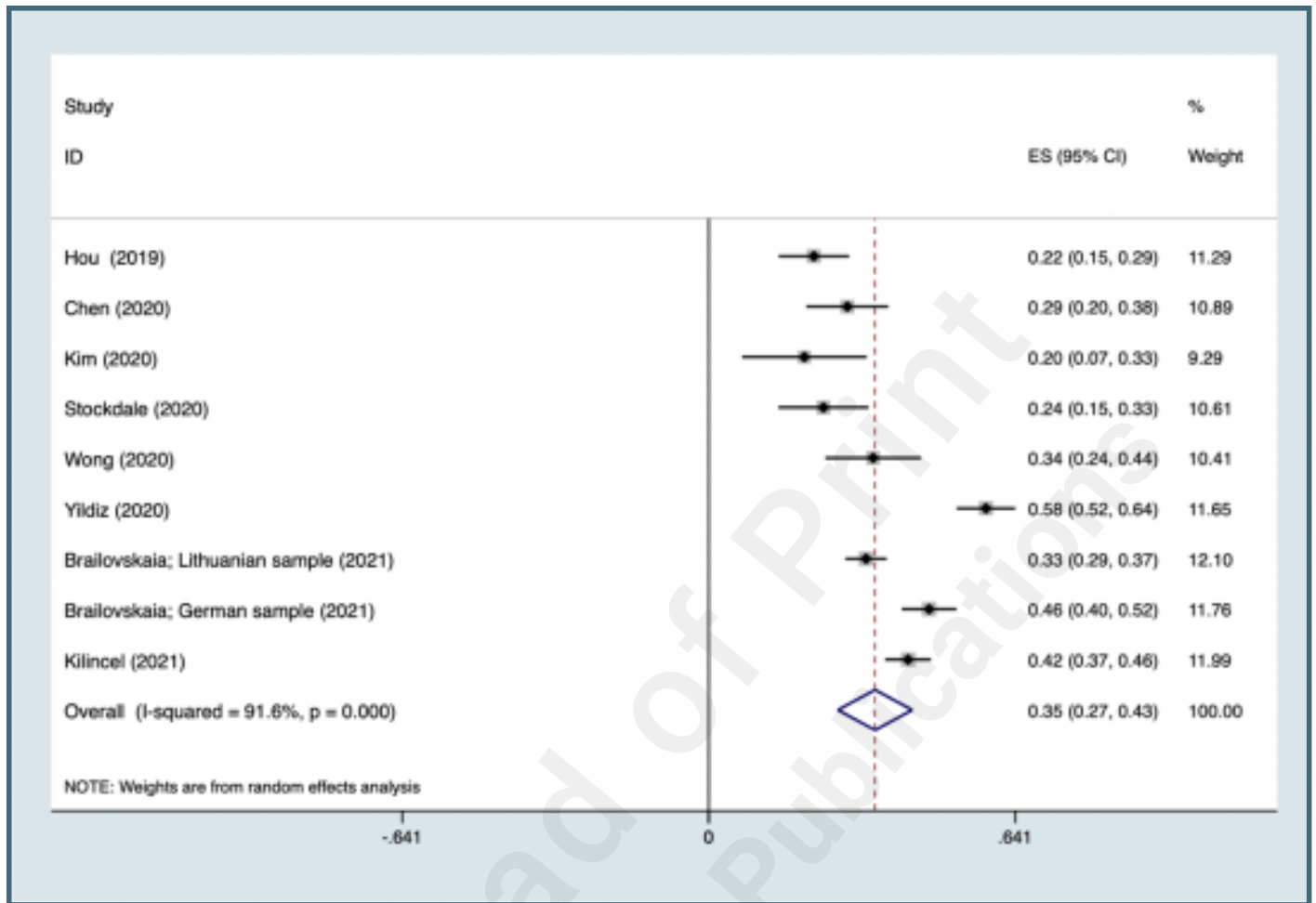
Flow chart of the search process and studies included.



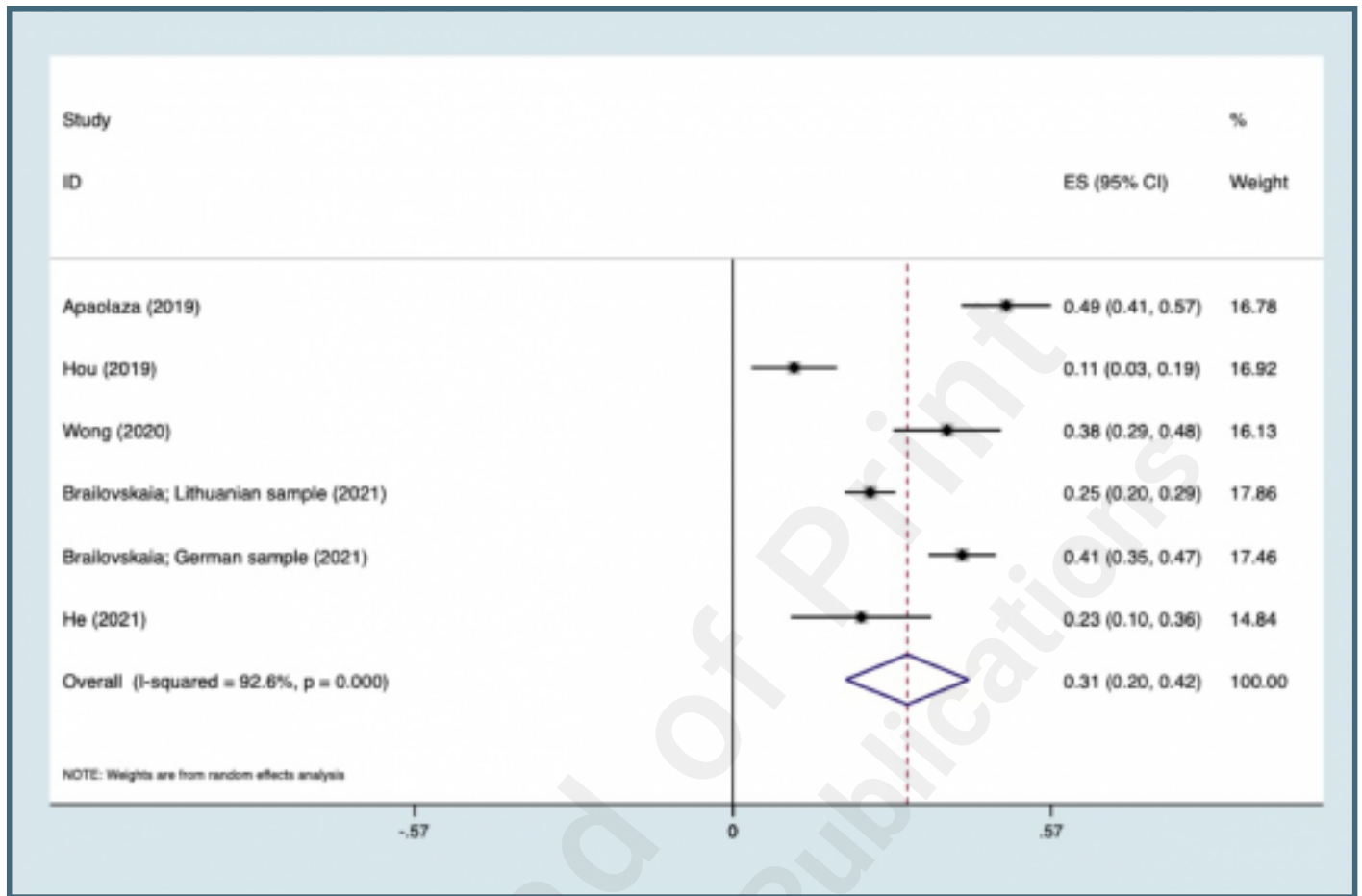
Forest plot of depressive symptoms and problematic social media use by year.



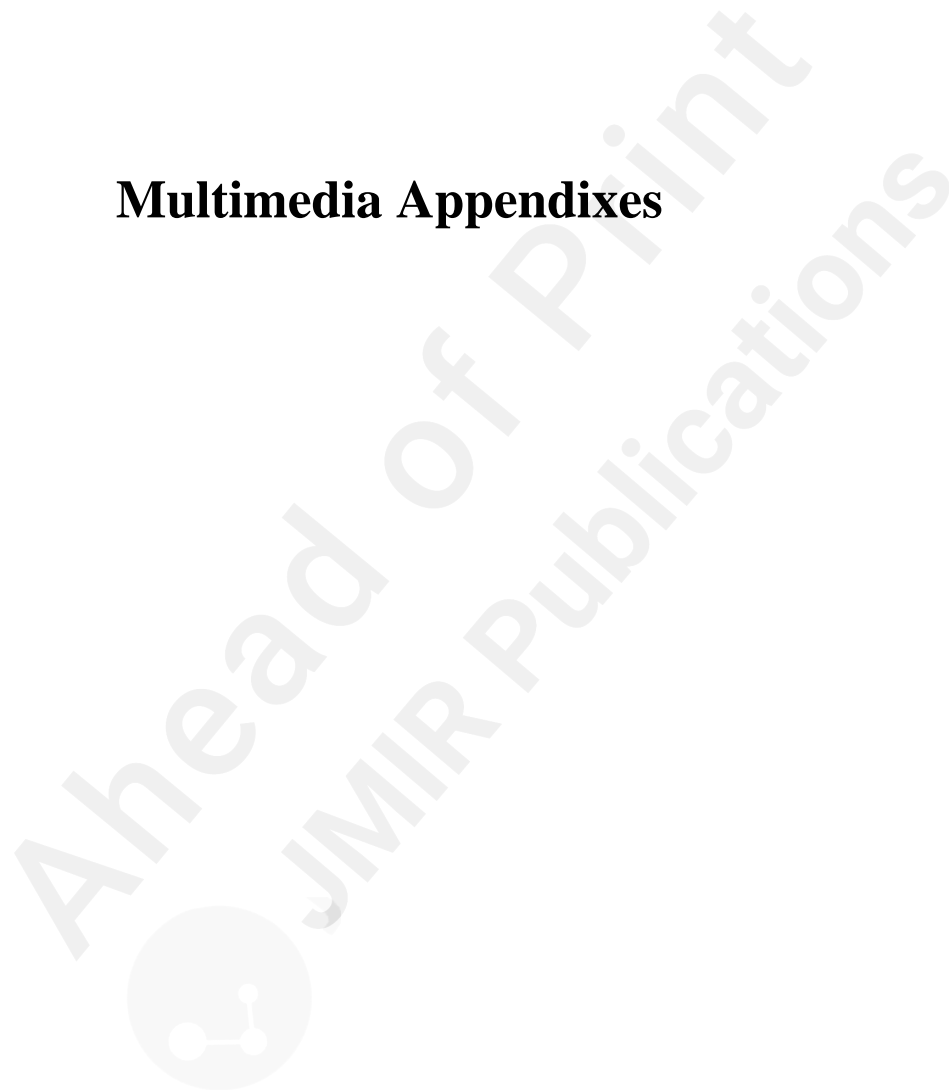
Forest plot of anxiety symptoms and problematic social media use by year.



Forest plot of stress and problematic social media use by year.



Multimedia Appendixes



Quality assessment rating for each study included in the meta-analysis. Questionnaires used for each study to measure problematic use and the outcome variables. Funnel plots and metaregressions.

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