

Social Media Addiction, Loneliness, and Fear of Missing Out: A Meta-Analysis and Directions for Future Research

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ABSTRACT

Background: This meta-analysis investigates the correlation between social media addiction (SMA), fear of missing out (FOMO), and loneliness.

Methods: The study encompasses research conducted from 2013 to 2023, exploring the connection between SMA, FOMO, and loneliness. A comprehensive literature search was conducted using databases such as PubMed, Google Scholar, Web of Science, and the National Thesis Center. Keywords such as “social media addiction,” “fear of missing out,” and “loneliness” were employed for relevant study retrieval. A total of 312 studies were identified, and, following predefined criteria, 34 studies were selected for detailed examination from that the 16 studies, comprising 9 studies on the relationship between social media addiction (SMA) and loneliness and 7 studies on the relationship between SMA and fear of missing out (FOMO) are taken for the analysis. The Pearson correlation coefficient (r) was computed as the effect size, and a random effects model was applied for the analysis.

Results: In the meta-analysis examining the relationship between SMA and loneliness, no publication bias was identified. Despite heterogeneity among the studies, the correlation effect size was determined to be 0.347 according to the random effects model. Similarly, in the meta-analysis concerning the relationship between SMA and FOMO, no publication bias was observed. Due to heterogeneity, the correlation effect size was found to be 0.647 according to the random effects model.

Conclusion: The meta-analysis demonstrated a significant, positive, and moderate relationship between SMA and loneliness. Additionally, a significant, positive, and strong association was identified between FOMO and SMA.

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INTRODUCTION

The emergence and extensive acceptance of technology have enabled communication and given rise to various disadvantages, mainly due to the overutilization of social media and the Internet. An adverse outcome that has gained significant attention is the rise of social media addiction (SMA), a behavior that has been shown in multiple research.¹ Extensive studies have shown the significant impact of social media settings on individuals, establishing them as essential components in modern life.²⁻⁴ Adolescents and young adults have been found to suffer negative consequences, such as weakened social connections, reduced academic performance, disrupted sleep patterns, and communication difficulties, as a result of their unconscious engagement with social media.⁵⁻¹¹

The increasing ubiquity of social media has brought forth a range of emotional states in social relationships, one of which is the substantial emergence of the fear of missing out (FOMO).¹² People who have FOMO struggle with bad feelings caused by constantly monitoring social media updates and the dread of missing out on new events or opportunities. Individuals struggle to address this predicament, despite their wishes and perceived obligations, resulting in negative circumstances such as addiction, depression, and anxiety disorders.^{13,14}

The prevalence of loneliness has emerged as a significant concern in modern society, rapidly intensifying and negatively impacting the quality of human existence.

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Peplau and Perlman highlight the significant influence of loneliness on both individuals and society.¹⁵ If prolonged loneliness is not addressed, it can have severe repercussions by adversely affecting mental states, increasing the likelihood of depression, and promoting suicidal tendencies.¹⁶ The rapid advancement of technology has worsened the separation from natural life, leading to a higher occurrence of loneliness in society that impacts daily living and social interactions.¹⁷ Although social networking programs provide fulfillment and enjoyment, the high occurrence of loneliness is a significant worry. Although technology facilitates rapid communication and information retrieval, it paradoxically exacerbates feelings of isolation. As a result, the number of people feeling lonely in the online world is increasing.¹⁸ Prior research has examined the correlation between addiction to social media and feelings of loneliness, uncovering elevated levels of loneliness among persons who are hooked on the internet in comparison to those who are not addicted. Further investigation reveals a direct relationship between the use of social media and a higher level of loneliness, as supported by studies.¹⁹⁻²³ The main aim of the meta-analysis study is to examine the correlation between SMA, FOMO, and loneliness.

MATERIALS AND METHODS

This study employed a meta-analytic approach to investigate the relationship between SMA and FOMO on development and loneliness.²⁴

Search Strategy

This meta-analysis, investigating the relationships between SMA, loneliness, and FOMO, was conducted in accordance with the PRISMA 2020 (preferred reporting items for systematic reviews and meta-analyses) guidelines.²⁵ Establishing explicit and suitable standards for the inclusion of studies is essential to avoid bias in publication and address concerns related to heterogeneity. The criteria for inclusion should be based on the aims of the study. A comprehensive literature search was performed

utilizing PubMed, ERIC, EBSCO, Google Scholar, and the National Thesis Centre databases. The terms “social media addiction,” “fear of missing out,” and “loneliness” were used to locate studies that investigate the connection between SMA and FOMO and loneliness.

Inclusion criteria consisted of studies published between 2013 and 2023 in English or Turkish, studies including at least 1 investigation on the relationship between SMA, FOMO, and loneliness, studies utilizing SMA scales including SMA scale (SMAS), SMAS-AF (social media addiction scale-adult form), Bergen SMAS (BSMAS), University of California, Los Angeles (UCLA) loneliness scale, and FOMO. Additional inclusion criteria were participants aged 18 years or older and data availability, including the *P* and correlation values. As the study was based on publicly available data, ethics committee approval or informed consent was not obtained.

Data Collection

A total of 312 studies were discovered, but complete texts for 38 research were not accessible. Out of the 274 studies that had complete texts available, 123 were considered unsuitable based on their title and abstract, while 30 were ruled unsuitable based on their substance. Afterwards, the remaining 121 studies were evaluated. Out of the total number of research, 47 were excluded because they did not fulfill the age criteria. This resulted in 74 studies that were eligible for comprehensive study. After conducting a comprehensive analysis, 34 research examining the correlation between addiction to social media, feelings of loneliness, and the FOMO on important events or updates were included. Nine research examining the correlation between SMA and loneliness were chosen. Furthermore, 7 research examining the correlation between SMA and FOMO were incorporated. During the comprehensive analysis, 1 study was eliminated because it lacked summary data, while another study was treated as 2 separate investigations since it reported 2 distinct conclusions. Therefore, a total of 9 papers were included in the meta-analysis to investigate the correlation between SMA and loneliness, while 7 studies were included to explore the association between SMA and FOMO (Figure 1).

Data Analysis

The meta-analysis was performed using the comprehensive meta-analysis software program. Egger's regression test is commonly used in meta-analyses to account for small-study effects and the fact that funnel plot asymmetry may arise not only from publication bias but also from factors such as study size and effect size. This method, when applied alongside the funnel plot, helps reduce bias between studies and prevent publication bias, leading to more accurate results.²⁶ Therefore, the Egger's regression approach was utilized in conjunction with funnel charting to mitigate bias among research and prevent publication

MAIN POINTS

- A meta-analysis was conducted to examine the relationships between social media addiction (SMA), fear of missing out (FOMO), and loneliness using studies from 2013 to 2023.
- A total of 34 studies were included in the analysis; 7 studies explored SMA-FOMO, and 9 studies focused on SMA-loneliness correlations.
- The correlation between SMA and loneliness was found to be moderate and positive ($r=0.347$), with no publication bias detected.
- A strong and positive correlation was identified between FOMO and SMA ($r=0.647$), also with no publication bias.
- Despite heterogeneity across studies, random effects models confirmed the robustness of both findings.

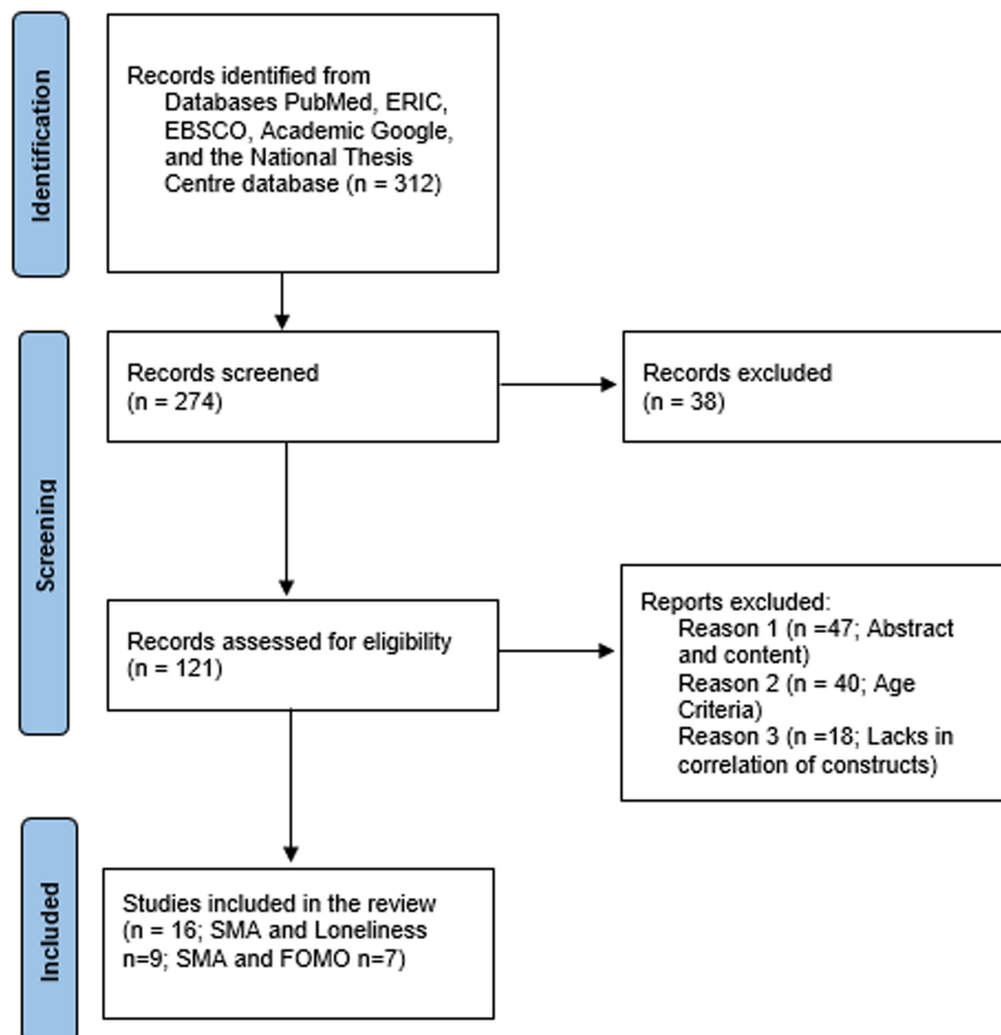
PRISMA Flow diagram

Figure 1. PRISMA flow diagram.

bias. Indicators demonstrating the absence of publication bias were determined to be a symmetrical form, the inclusion of most individual studies in the funnel plot, and a P -value greater than .05. The middle line of the funnel plot indicates the overall effect, and it is anticipated that research will group closely around this line.^{27,28} Heterogeneity assessment in meta-analyses was conducted using the Cochran Q statistic and the I^2 statistic in order to accurately evaluate the variation and effect sizes across studies. The Cochran's Q statistic is a method used to test for the presence of heterogeneity among studies, where a statistically significant level of heterogeneity is indicated by a P -value less than .05. The I^2 statistic, on the other hand, quantifies the proportion of observed variation that is due to true differences in effect sizes rather than random error or other factors.²⁹ The I^2 statistic classifies the level of variance, with $I^2 < 25\%$ indicating low heterogeneity, $25\% \leq I^2 < 50\%$ indicating moderate heterogeneity, and I^2

$> 50\%$ indicating high heterogeneity, based on the criteria established by Higgins et al³⁰ It has been noted that I^2 is not an absolute measure of heterogeneity, but rather reflects a portion of the observed variation.^{29,31} In this context, both the Cochran's Q and I^2 statistics were used in combination to provide a more accurate analysis of heterogeneity.

Quality Assessment

In the meta-analysis, the impact sizes of each trial were estimated individually and then merged. The effect size of the correlation coefficient was calculated for each study by utilizing the number of data points and the correlation coefficient. This was done to ascertain the association between SMA and feelings of loneliness and FOMO. The Fisher's z statistic was employed to determine the aggregated effect magnitude. Following Cohen's conventional benchmarks for interpreting product-moment

correlations,³² effect sizes were categorized as small ($r \approx 0.10$), medium ($r \approx 0.30$), and large ($r \approx 0.50$). Values below $r=0.10$ were considered negligible. These thresholds guided both the synthesis of pooled estimates and the narrative interpretation of the findings. The correlation effect sizes were interpreted according to the parameters established by Cohen et al.³³ According to the given information, if the value of r is less than 0.10, it is considered very weak. If the value of r is between 0.10 and 0.30, it is considered weak. If the value of r is between 0.30 and 0.50, it is considered moderate. If the value of r is between 0.50 and 0.80, it is considered strong. If the value of r is greater than or equal to 0.80, it is considered very strong. The forest plot was utilized to visually depict the influence sizes on the axes. Forest plots facilitate a more comprehensive understanding of the meta-analysis findings by visually representing the variations in effect size estimates across individual studies. The charts illustrate the effect size estimates and 95% CI ranges of each study on the axes.³⁴

Sensitivity Analysis

Exclusion of Outliers: Outliers were excluded by identifying potential data points that had impact sizes or research characteristics that significantly differed from the majority of the included studies. Outliers were identified based on statistical criteria, such as the magnitude of the impact size or indicators of study quality.

Study Quality: Sensitivity analyses were conducted to exclude studies with inferior methodological quality or higher risk of bias, as determined by quality assessment techniques such as the Newcastle-Ottawa Scale for observational studies. The purpose of this stage was to investigate whether the incorporation of studies with different levels of quality had an impact on the combined estimates.

Alternative Models: A comparison of alternative statistical models, such as random effects models against fixed-effects models, was conducted to determine the impact of model selection on the outcomes of the meta-analysis. Random effects models were specifically chosen due to the probable variation among the research included.

RESULTS

The Relationship Between Social Media Addiction and Loneliness

Publication Bias Assessment: Figure 2 illustrates the investigation of publication bias in the research that examines the correlation between SMA and loneliness. The distribution exhibits a symmetrical pattern around the average line in the majority of the 9 studies analyzed. One study, conducted by Cheng and Lau, demonstrated a negative effect size that substantially diverged from the overall trend and confidence interval. This study was retained in the main analysis but excluded in a sensitivity analysis to evaluate the robustness of the pooled estimates in the presence of a potential outlier (refer to Figure 3).

Figure 3 provides an additional visual representation of the distribution of research, showing a nearly symmetrical pattern on the graph. However, the presence of publication bias is shown by the uneven distribution exhibited at the lower end of the graph. The amount of publication bias was quantified using Egger's regression method. The procedure produced a P -value of .052, exceeding the customary threshold of .05. This indicates that there is no significant publication bias present.

Meta-Analysis Findings: The meta-analysis encompassed 9 research that examined the correlation between addiction to social media and feelings of loneliness. Forest plots were created to display the effect sizes (Pearson r),

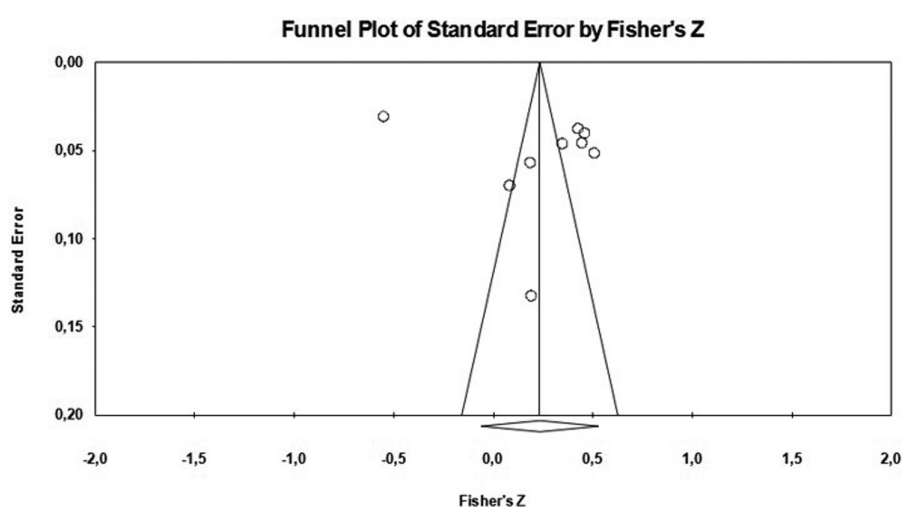


Figure 2. Funnel plot of standard error by Fisher's Z.

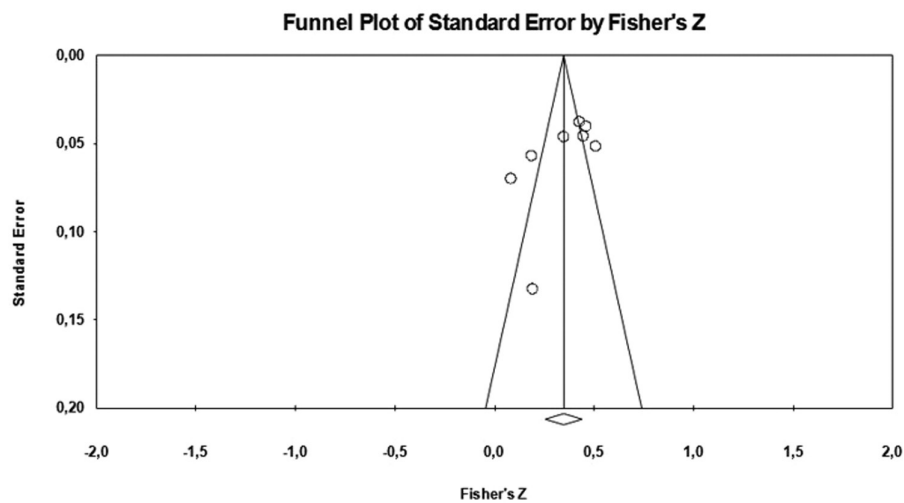


Figure 3. Funnel plot of standard error by Fisher's Z.

standard errors, 95% CIs, Z statistics, and *P*-values for each research, as summarized in Table 1.

The studies exhibited substantial heterogeneity, as evidenced by a *P*-value of $< .001$ (indicating $P < .05$) and an inconsistency level of $I^2 = 84.676$, which exceeds 50%. Due to the significant variation in the data, a random effect model was considered suitable for the analysis. Based on this model, a significant correlation was observed between SMA and loneliness, with a *P*-value of less than .001. The correlation effect size was computed as 0.347, which falls within the range of $0.30 \leq r < 0.50$, indicating a

moderate positive impact size. The Forest plot (Figure 4) indicates that the 95% CIs for individual effect sizes were predominantly within the range of 0.255-0.440. The comparatively limited span of these intervals indicates that the collective investigations yield a uniform estimation of the effect size.

The Relationship Between Social Media Addiction and Fear of Missing Out

Publication Bias Assessment: Figure 5 analyzes the presence of publication bias in studies investigating the

Table 1. Heterogeneity Test and Effect Size Results for the Relationship Between Social Media Addiction and Loneliness

Heterogeneity		Q-Value = 45.681		df _(Q) = k-1 = 8		P< .001		I ² = 84.676	
Effect size and 95% CI									
Model	Number of studies	Effect size	SE	Lower limit	Upper limit	Z	P		
Fixed	9	0.385	0.018	0.351	0.420	21.817	< .001		
Random	9	0.347	0.047	0.255	0.440	7.356	< .001		

SE (Standard Error) is calculated as the standard deviation of Fisher's z-transformed effect sizes divided by the square root of the number of studies. It represents the precision of the estimated effect size.

SE, Standard error.

The relationship between social media addiction and loneliness

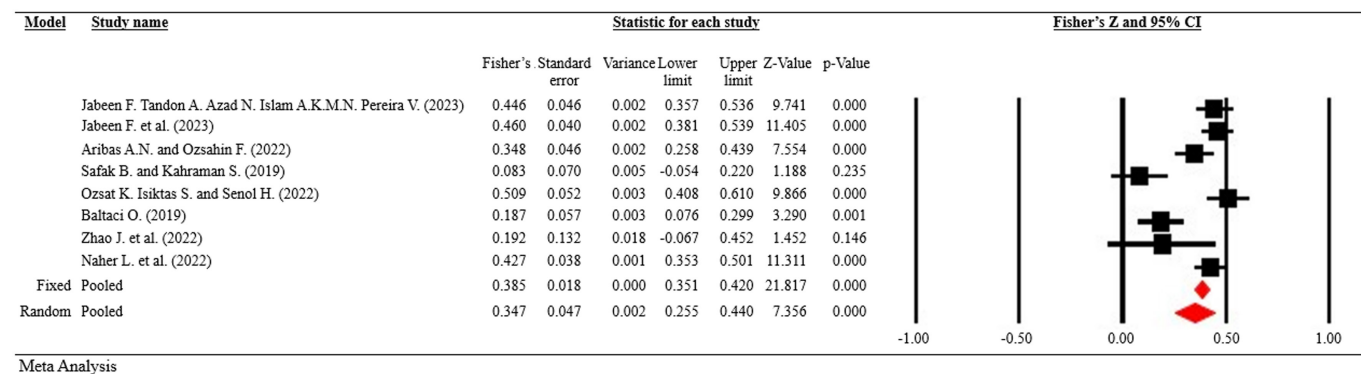


Figure 4. The relationship between social media addiction and loneliness.

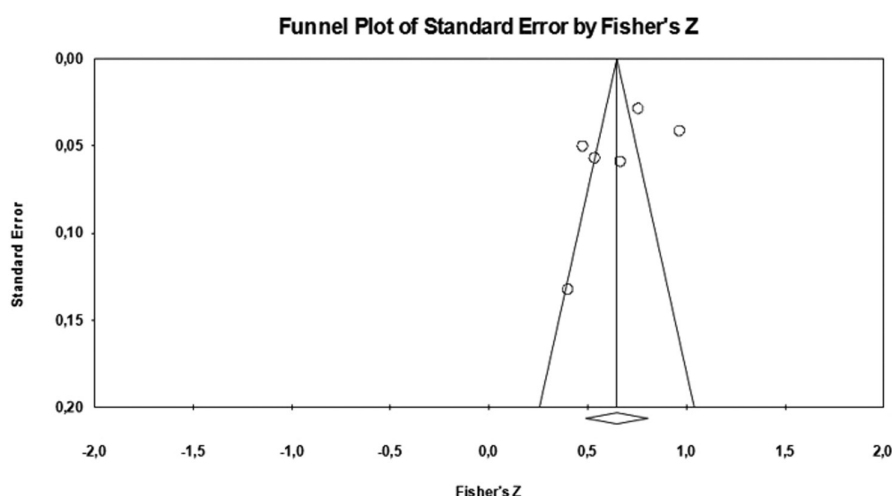


Figure 5. Funnel plot of standard error by Fisher's Z.

correlation between SMA and FOMO. The data indicates an almost symmetrical distribution of studies, while the small number of studies enhances the potential for publication bias. To evaluate this bias, the Egger's regression method was utilized, yielding a P -value of .15, which is above the threshold of 0.05. This suggests that there is no noteworthy publication bias.

Meta-Analysis Findings: The meta-analysis encompassed 7 research that investigated the correlation between SMA and FOMO. Forest plots were created to display the effect sizes (Pearson r), standard errors, 95% CIs, Z statistics, and P -values for each study, as described in Table 2.

The studies exhibited substantial heterogeneity, as evidenced by a P -value of $<.001$ (indicating $P < .05$) and an inconsistency level of $I^2 = 93.600$ (more than 50%). Due to the significant variation among the data, a random effect model was utilized. Based on this model, a significant link was observed between SMA and FOMO, with a P -value of less than .001. The correlation effect size was computed as 0.647, which falls within the range of $0.50 \leq r < 0.80$, indicating a robust positive impact size. The Forest plot (Figure 6) indicates that the 95% CIs for individual effect sizes were predominantly within the range of 0.489–0.805. The comparatively limited span of these intervals indicates that the collective investigations offer a uniform estimation of the effect size.

Sensitivity Analysis and Its Findings

A sensitivity analysis was performed to assess the reliability of the main findings about the associations among SMA, loneliness, and FOMO. The investigation demonstrated that the results remained strong and consistent when examined under several conditions. The exclusion of outliers or lower-quality studies had no substantial impact on the direction or magnitude of effect sizes. The subgroup analyses, which were conducted based on demographic parameters and study characteristics, consistently demonstrated patterns that support the generalizability of the findings from the meta-analysis.

DISCUSSION

The objective of this study is to examine the correlation between addiction to social media and 2 important psychological consequences: feelings of loneliness and FOMO on current events. This was accomplished by conducting 2 distinct meta-analyses. The initial meta-analysis investigated the correlation between addiction to social media and feelings of loneliness, whereas the subsequent study explored the link between SMA and the FOMO. The study aims to integrate the results of various research endeavors to achieve a more thorough comprehension of these relationships. A comprehensive

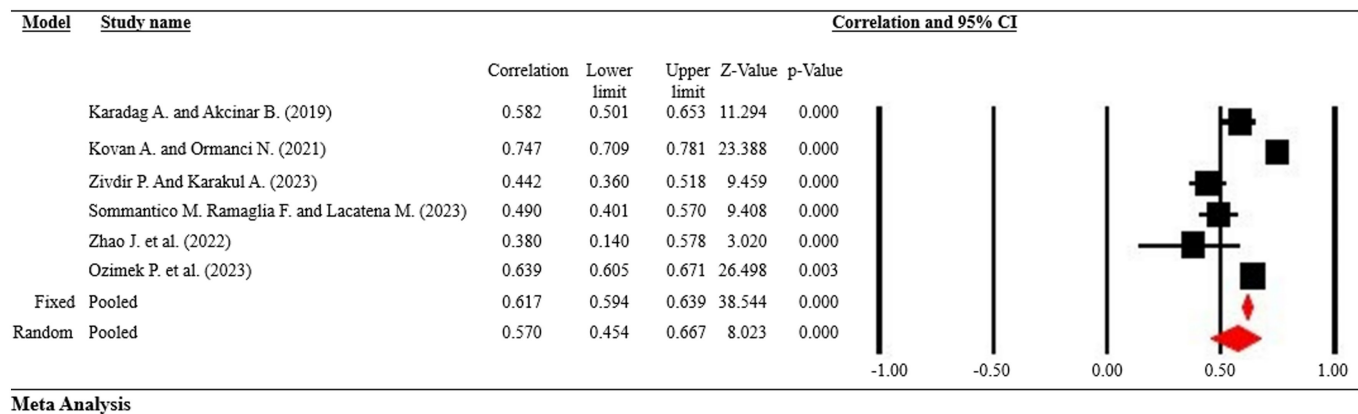
Table 2. Heterogeneity Test and Effect Size Results for the Relationship Between Social Media Addiction and Fear of Missing Out

Heterogeneity		Q-Value = 78.130		df _(Q) = k-1 = 6		P < .001		I ² = 93.600	
Effect size and 95% CI									
Model	Number of studies	Effect size	SE	Lower limit	Upper limit	Z	P		
Fixed	7	0.720	0.019	0.684	0.757	38.544	<.001		
Random	7	0.647	0.081	0.489	0.805	8.023	<.001		

SE (Standard Error) is calculated as the standard deviation of Fisher's z-transformed effect sizes divided by the square root of the number of studies. It represents the precision of the estimated effect size.

SE, Standard error.

The relationship between social media and FOMO



Meta Analysis

Figure 6. The relationship between social media and FOMO.

investigation of publication bias was conducted in the meta-analysis, which examined the correlation between SMA and loneliness using data from 8 studies. The papers were visually depicted using a funnel plot, which is a conventional technique for identifying publication bias in meta-analyses. The funnel plot displayed a symmetrical distribution of studies around the mean line, indicating the absence of significant publication bias impacting the results. To provide additional confirmation, Egger's regression test was utilized. The findings of Egger's test were statistically insignificant ($P > .05$), which further supports the conclusion that publication bias did not play a significant role in this investigation. Although there were variations in the research, as shown by significant P -values and strong I^2 statistics, the analysis was conducted using the random effects model. The random effects model is especially appropriate when there is a large degree of heterogeneity,²⁹ as it takes into account the variability within and between studies, providing a more comprehensive assessment of the impact size.³⁴ The varying results observed in studies on SMA can be attributed to several factors contributing to inter-study heterogeneity. Geographical differences reflect regional and cultural variations in social media usage habits, while differences in age groups and gender account for the diversity in individuals' patterns of platform engagement. Additionally, psychological conditions such as depression and anxiety, as well as the specific characteristics of the social media platforms used, influence the degree of addiction and thereby contribute to heterogeneity. Notably, extraordinary circumstances such as the COVID-19 pandemic have significantly increased social media usage and amplified its psychological impacts, further contributing to heterogeneity among the studies. The investigation indicated a noteworthy, favorable, and moderate association between addiction to social media and feelings of loneliness, as evidenced by a correlation coefficient (r) of 0.347. This discovery implies that individuals with elevated degrees of SMA are more prone

to experiencing heightened levels of loneliness. Utilizing a random effects model in this particular situation ensures the reliability of the findings by accounting for the diversity in study settings and demographics. The meta-analysis offers valuable insights into the correlation between addiction to social media and feelings of loneliness. The meticulous scrutiny of publication bias and the application of suitable statistical models emphasize the dependability of the results. These findings highlight the need to comprehend the psychological effects of social media usage, especially considering its continued prominence in individuals' everyday routines.

As seen in the Forest graph, the results of different studies offered further insights. The study conducted by Cheng et al³⁵ revealed a statistically significant, moderate negative correlation, whereas Zhao et al³⁶ found a statistically insignificant, mild positive correlation. Safak et al³⁷ demonstrated a non-significant, weak positive correlation, but Baltaci et al³⁸ showed a statistically significant, weak positive correlation. The remaining investigations demonstrated a statistically significant positive moderate level.³⁵⁻³⁸ This discovery, which demonstrates a substantial, favorable, and moderate correlation, is consistent with the majority of individual research examined.³⁹ The correlation between SMA and loneliness is evident, indicating a noticeable albeit mild influence. The meta-analysis examined publication bias across the 6 research to analyze the connection between SMA and the fear of losing out on new advances. The studies exhibited a symmetrical distribution around the mean line in the funnel plot, and the findings of Egger's regression test ($P > .05$) were not statistically significant, suggesting the absence of publication bias. The studies were evaluated using the random effects model, despite their high variability.

The investigation unveiled a statistically significant, positive, and robust correlation between addiction to social media and the fear of missing out ($r = 0.647$). The

Forest plot demonstrated that 3 out of the 6 studies had a modest correlation, but the other 3 suggested a robust and statistically significant correlation. This outcome corroborates the conclusions of separate investigations, affirming a substantial, favorable, and robust correlation between addiction to social media and the fear of missing out.^{40,41} The observed correlation suggests that social media addiction (SMA) exerts a significant but modest influence on fear of missing out (FOMO).

The meta-analysis results revealed substantial heterogeneity among the included studies for SMA-loneliness ($I^2=84.68\%$) and SMA-FOMO ($I^2=93.60\%$) relationships. This high level of inconsistency indicates considerable variability in effect sizes across studies, likely stemming from differences in sample characteristics (e.g., age, geographic location), research design, and measurement tools used to assess SMA, loneliness, and FOMO. Such variability justifies the use of random effects models, which account for both within-study and between-study variance. These findings align with prior methodological discussions emphasizing that I^2 should not be viewed as an absolute measure of heterogeneity but rather interpreted contextually.²⁹ Future research could further explore moderators such as cultural background, platform-specific usage patterns, or digital literacy levels to understand sources of heterogeneity and enhance the precision of effect estimates.

To summarize, the meta-analyses carried out in this study offer solid evidence that supports significant and moderate-to-strong associations between SMA, loneliness, and the fear of losing out on current events. These findings enhance the comprehension of the effects of SMA on individuals' emotional well-being and social interactions. Detecting publication bias is a complex task, and the statistical evidence of publication bias in this study emphasizes the challenge of accurately identifying bias due to the restricted availability of unpublished studies. The evaluation of publication bias may not have comprehensively captured the magnitude of bias in the absence of data from unpublished sources. Although the inclusion criteria stated a time frame from 2013 to 2023, the majority of research included in the analysis is from more recent years and mostly consists of articles and theses. The presence of this temporal bias may restrict the applicability of the results over a wider range of time periods.

Future research in this field should focus on establishing a consistent method for assessing SMA, with particular attention to maintaining uniformity in the scales and sub-levels employed. This approach would improve the ability to compare and enable more rigorous meta-analyses.⁴² Efforts to enhance accessibility to complete research papers are vital to decrease the influence of selection bias. Engaging in partnerships with academic institutions, open-access initiatives, and enhancing database accessibility can enhance the scope of studies included, making them more thorough. To address the difficulty of detecting publication bias, researchers should

investigate alternative methods to reduce bias, such as combining data from conference proceedings and preprints and promoting truthful reporting of study results. Future research should strive to include a broader and more varied selection of samples, encompassing a wider variety of demographic characteristics and geographical locations.⁴³ Implementing this technique would improve the ability to apply the findings to a wider range of situations and result in a more thorough comprehension of the connection between addiction to social media, feelings of loneliness, and the FOMO. Based on the statistically significant relationship found in this study, it is recommended to introduce conscious awareness programs, seminars, and training sessions to improve individuals' understanding of how SMA affects feelings of loneliness and FOMO on new developments.⁴⁴

Promoting the execution of new research with increased sample sizes and meta-analyses that specifically investigate the dread of being left out of new advancements would enhance the comprehension of this facet of addiction and its consequences.⁴⁵ Sensitivity analysis yielded crucial insights into the stability and dependability of the meta-analysis findings. Through a methodical examination of many scenarios and criteria, the reliability of the findings derived from the combined data was enhanced. Nevertheless, it is crucial to recognize the inherent limitations of the studies included, such as possible biases and changes in assessment methodologies, which could have impacted the overall results.

Theoretical Implications

The findings of this study, which looked into the link between SMA and the psychological effects of loneliness and FOMO, have several significant theoretical implications. These implications enhance the comprehension of the intersection between social media activities and mental health and well-being. Additionally, they contribute to broader theories on addiction, social behavior, and psychological discomfort.

Social Media Addiction and Loneliness: The considerable, positive, and moderate relationship between SMA and loneliness, as indicated by a correlation coefficient of 0.347, implies that excessive social media use is inextricably tied to feelings of loneliness. This discovery can be understood using various theoretical frameworks. The displacement hypothesis suggests that the time allocated to social media usage replaces the time that could be allocated to in-person contacts, which are typically more gratifying and efficient in reducing feelings of loneliness. The results substantiate this theory by demonstrating a positive correlation between elevated levels of SMA and increased levels of loneliness. This suggests that online connections, in terms of their quality and character, may not adequately fulfill social requirements.⁴⁶ The social comparison theory posits that individuals engage in self-evaluation by comparing themselves to others while

consuming social media content, which frequently presents idealized depictions of life. Engaging in such comparisons can result in feelings of inadequacy and loneliness. The moderate correlation observed may indicate that continuous exposure to carefully selected aspects of others' lives intensifies feelings of isolation and separation among users.⁴⁷ Lastly, the uses and gratifications theory examines the motivations behind individuals' media use, proposing that individuals experiencing preexisting emotions of loneliness may resort to social media as a means of seeking company or diversion. Nevertheless, the results suggest that this dependence can create a self-reinforcing pattern, in which the use of social media to alleviate loneliness worsens it, leading to a cycle of heightened use and heightened loneliness.

Social Media Addiction and Fear of Missing Out: The meta-analysis found a substantial positive association between SMA and FOMO, with a correlation coefficient of 0.647, highlighting social media's powerful influence on people's perceptions of social inclusion and exclusion. Self-determination theory posits that FOMO can be seen as an expression of unfulfilled social needs, particularly the need for connection and belonging.⁴⁸ The robust association implies that SMA amplifies these emotions, as users are consistently reminded of social interactions and experiences they may be absent from, hence intensifying their feelings of exclusion and their need to remain connected. The theory of behavioral addiction explains how acts that offer immediate rewards can gradually develop into obsessive patterns.⁴⁹ Social media platforms are specifically created to optimize user involvement by capitalizing on the fear of being excluded, and the significant correlation between social media dependency and FOMO substantiates the notion that these platforms can cultivate addictive tendencies, compelling users to constantly monitor and interact with social media to evade feelings of exclusion.⁵⁰ The cognitive-behavioral model of internet addiction posits that cognitive processes, namely attitudes around the use of social media, are pivotal in the formation of addiction. The widespread presence of FOMO, as seen by the significant association, emphasizes how cognitive biases regarding the imperative need to stay constantly informed and connected can fuel compulsive use of social media.

This meta-analysis has its limitations. First, self-reported data may be biased because people may underreport or overreport their social media use and feelings. Second, most included research is cross-sectional, making causal inferences difficult. To determine the directionality of SMA, loneliness, and FOMO, longitudinal research is needed. Studies with important findings are more likely to be published, which may influence publishing. Third, although Egger's regression tests did not reveal statistically significant publication bias in either the SMA-loneliness or SMA-FOMO analyses ($P=.052$ and $P=.15$, respectively),

the limited number of included studies—particularly in the SMA-FOMO subset—reduces the statistical power to detect such bias. Moreover, visual inspection of the funnel plots suggested some asymmetry, particularly in studies with smaller sample sizes. Therefore, the possibility of undetected publication bias cannot be entirely ruled out. Future meta-analyses should consider applying additional methods such as trim-and-fill analysis to further assess and adjust for potential bias in study selection and reporting.

Future Research Directions

Future studies should prioritize investigating several crucial domains to enhance the comprehension of the connections between SMA, loneliness, and FOMO. Conducting longitudinal studies is crucial for determining the order in which SMA, loneliness, and FOMO occur, as well as the cause-and-effect relationships between them. Longitudinal designs would offer significant insights into whether extended usage of social media leads to heightened experiences of loneliness and FOMO over time, or if these psychological states predispose individuals to more interaction with social media.⁵¹ Furthermore, the integration of qualitative methodologies in addition to quantitative methods has the potential to provide a more profound understanding of the subjective experiences and motives that drive social media usage. Qualitative research can investigate individuals' perceptions and interpretations of their interactions on social media, providing insight into the emotional and social dynamics that lead to feelings of loneliness and FOMO. Furthermore, it is imperative to conduct intervention research to formulate and evaluate effective approaches for alleviating the adverse consequences of SMA on feelings of loneliness and FOMO.⁵² Investigating therapies such as digital detox programs, mindfulness training, or social skills development could offer practical strategies to assist individuals in properly managing their social media usage and enhancing their overall well-being. Furthermore, researching moderating factors such as age, gender, cultural origins, and socioeconomic status might enhance the comprehension of the distinct impact of social media on loneliness and FOMO among diverse people.⁵³ Gaining insight into these aspects can provide valuable information for designing customized treatments and policies that effectively target the unique needs and susceptibilities of various demographic groups. Moreover, conducting comparative investigations across various social media platforms could unveil if distinct characteristics or usage patterns have varying impacts on feelings of loneliness and FOMO. This comparative approach could emphasize platform-specific elements that either worsen or alleviate the psychological effects of social media usage.⁵⁴ Finally, it is essential to regularly update meta-analyses with recently released papers to monitor changing patterns and validate the durability of results over time. By including these research areas, future studies can aid in the development of evidence-based

tactics that foster healthy social media habits and bolster psychological well-being in digital settings.

The findings of this meta-analysis highlight the complicated links between SMA, loneliness, and FOMO. The connections emphasize the widespread impact of social media on individuals' mental well-being, indicating that excessive use may worsen feelings of isolation and increase FOMO. Theoretical frameworks, such as the displacement hypothesis, social comparison theory, and uses and gratifications theory, offer helpful perspectives for interpreting these findings. They highlight the complex effects of social media. In the future, it is important to prioritize longitudinal studies to understand the causal dynamics and temporal sequences that underlie these interactions.

In conclusion, intervention studies play a vital role in the development of successful methods aimed at reducing the adverse impacts of SMA, fostering better online behaviors, and improving overall well-being. Conducting longitudinal studies that investigate the relationship between SMA, FOMO, and loneliness will help address existing gaps in the literature and provide significant contributions to the understanding of these phenomena.

By acknowledging and filling these areas of research deficiency and implementing interventions that are supported by empirical data, a more sophisticated comprehension of how social media influences psychological consequences can be cultivated. Understanding this information is crucial for informing policies and strategies designed to encourage positive online participation and reduce the potential negative impact on individuals' mental well-being.

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