What Causes Fatigue and What Moderates It? — A Meta-Analysis Postprint on Social Media Fatigue

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Abstract

[Purpose/Significance] To address the inconsistencies and discrepancies in existing research on the influencing factors of social media fatigue, this study employs quantitative analysis methods to systematically review and re-analyze statistical results from published empirical research literature. [Method/Process] This study extracted 72 sets comprising 224 effect sizes from 68 empirical research articles, categorized the influencing factors of social media fatigue into two major categories: contextual factors and ontological factors, and identified five moderating variables: platform type, cultural characteristics, degree of social media usage, user gender, and participant group. Using meta-analysis quantitative analysis methods, heterogeneity tests and subgroup tests were conducted to explore the effects of different factors on social media fatigue and to examine the significance of the moderating variables' influence on social media fatigue. [Results/Conclusions] The results indicate that both contextual and ontological factors exert significant positive effects on social media fatigue; both factors have stronger effects on psychological fatigue from social media than on behavioral fatigue from social media, while contextual factors demonstrate a higher correlation with social media fatigue. Additionally, the five categories of moderating factors identified in this study exhibit certain moderating effects on the relationship between ontological factors and social media fatigue, whereas the relationship between contextual factors and social media fatigue is only moderated by participant group.

Full Text

What Causes Fatigue and What Factors Regulate It? A Meta-Analysis Study on Social Media Fatigue

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Abstract: [Purpose/Significance] To address inconsistencies and discrepancies in existing research on the influencing factors of social media fatigue, this study employs quantitative analysis methods to systematically review and re-analyze statistical results from published empirical studies. [Method/Process] From 68 empirical research papers, we extracted 72 groups comprising 224 effect sizes. The influencing factors of social media fatigue were categorized into two major types: situational factors and ontological factors. Five moderating variables were identified: platform type, cultural characteristics, degree of social media usage, user gender, and subject group. Using meta-analysis quantitative methods, heterogeneity tests and subgroup tests were conducted to examine the effects of different factors on social media fatigue and to test the significance of moderating variables. [Result/Conclusion] Results indicate that both situational and ontological factors exert significant positive effects on social media fatigue. Both factors have stronger effects on social media psychological fatigue than on behavioral fatigue, while situational factors demonstrate higher correlation with social media fatigue. Additionally, the five types of moderating factors identified in this study show certain moderating effects on the relationship between ontological factors and social media fatigue, whereas the relationship between situational factors and social media fatigue is only moderated by subject group.

Keywords: meta-analysis; social media fatigue; social media psychological fatigue; social media behavioral fatigue; moderator analysis

1 Introduction

In recent years, various types of social media have developed rapidly, bringing users more information and entertainment value while also creating numerous concerns. According to the "2019 Social Marketing Report" by Zhiquan Bai Chuan [1], 68% of teenagers believe social media has negative effects on their peers, and 40% sometimes wish to return to an era without social media. A survey by the American marketing company Hill Holliday of post-1995 youth found that half of respondents had quit or were considering quitting at least one social media platform, with social media fatigue being the primary cause. Scholars have observed declining user engagement across major social media platforms [2], categorizing social media fatigue behaviors into five types: lurking, avoidance, tolerance, exit, and substitution [3]. These manifest as users posting less personal content, reducing or stopping comments, ignoring messages, and even deactivating accounts to escape social media—a phenomenon that has attracted widespread academic attention, making social media fatigue a hot research topic in recent years.

A. Patrick first proposed the concept of social media fatigue in 2004, after which

scholars explored its causes and consequences from different perspectives. Since social media fatigue occurs during social media use [4], and human behavior is normally determined by external stimuli and internal control factors [5], this paper divides influencing factors into situational and ontological factors. Current research on situational factors is relatively consistent, with scholars agreeing that information characteristics (e.g., information quality, quantity) and system functional features are primary causes. However, significant disagreements exist regarding ontological factors such as self-efficacy, privacy concerns, social comparison, and fear of missing out (FOMO). For instance, regarding self-efficacy, studies by L.F. Bright [6] and Niu Jing [7] found significant correlations with social media fatigue, while Zhang Yanfeng [8] found no correlation. In privacy concern research, Niu Jing [7] reported mixed results: privacy concerns sometimes showed non-significant effects on social media fatigue when examined alongside social interaction stressors and discontinuance intention, but were significant when treated as the sole independent variable. In social comparison research, scholars have focused primarily on upward social comparison, with inconsistent findings and limited investigation of downward or parallel comparisons. Yang Banglin [9] and Niu Gengfeng [10] found significant relationships between upward social comparison and social media fatigue, with self-esteem and upward comparison being key factors in user anxiety, while Niu Jing [7] found no significant relationship. Regarding FOMO, Bright [11] found substantial effects on social media fatigue, whereas Dhir [12] and Mali [13] found that FOMO only indirectly causes fatigue through compulsive use.

These discrepancies likely stem from differences in research perspectives, theoretical models, and samples—suggesting that relationships between situational factors, ontological factors, and social media fatigue are functions of moderating variables. Through literature review, we identified five potential moderators and examined their effects. To analyze common patterns, dissect internal relationships, and assess how moderators influence these relationships, this study employs meta-analysis, a quantitative method that treats each empirical study as a sample and integrates multiple studies into a larger sample for re-analysis. Based on Fisher's "combined p-value" principle [14], existing statistical indicators are converted into new effect sizes to determine significance. Unlike traditional literature reviews, meta-analysis uses published statistics for quantitative analysis, aggregating small samples into larger ones for more statistically credible results. This study uses meta-analysis to explore how situational and ontological factors affect social media fatigue, identify moderators, and assess their influence. The meta-analysis procedure is shown in Figure 1 [Figure 1: see original paper].

2 Concept and Measurement of Social Media Fatigue

2.1 Concept of Social Media Fatigue

Currently, no consensus exists on defining social media fatigue. Early scholars primarily viewed it as negative emotion, defining it psychologically: E. Bernstein described frustration, exhaustion, and low engagement when facing social media as social media fatigue [15]; T. Ravindran et al. defined it as "a subjective, multidimensional user experience comprising emotions such as tiredness, annoyance, irritation, disappointment, guardedness, loss of interest, or diminished motivation for social media use and interaction" [16]. With technological development and platform diversification, scholars observed increasing negative behaviors, extending definitions beyond psychology. For instance, from a cause-and-behavior perspective, market research firm Technopedia defines social media fatigue as the tendency to withdraw when overwhelmed by too many platforms, content, friends, and time spent maintaining connections [17]. From a psychological-behavioral perspective, E.M. Cramer et al. defined it as the degree to which individuals avoid or lack motivation to use social media due to perceived increases in social comparison [18]. From a composite perspective, Ji Zhongyang et al. defined it as users experiencing exhaustion and abandonment psychologically, negative emotions (anxiety, fear, depression, boredom, anger, annoyance, fatigue) emotionally, and behavioral states of discontinuance, restraint, limitation, or cessation, manifesting as lurking, blocking, ignoring, and exiting [19]. Li Hong et al. defined it as fatigue, boredom, and weariness formed during social media use due to personal, platform, and social influences, leading to reduced frequency, less time spent, or platform abandonment [2].

Based on research perspective and needs, this study defines social media fatigue as: negative psychological and behavioral effects produced during social media use due to situational and ontological factors. Social media fatigue comprises two dimensions: social media psychological fatigue (manifesting as perceived intrusion, anxiety, low value, depression, boredom, emotional exhaustion, low interest, and dissatisfaction) and social media behavioral fatigue (manifesting as lurking, reduced interaction, avoidance, negative use, blocking, escape, substitution, exit, and uninstallation).

2.2 Measurement of Social Media Fatigue

Due to definitional differences, measurement scales vary, generally categorized as unidimensional or multidimensional. Based on our definition, we measure both psychological and behavioral dimensions.

Psychological fatigue measurement assesses intrusion, fatigue, anxiety, frustration, and emotional exhaustion, with items including: "Social media use affects my normal life, work, and study," "I am constantly disturbed by notifications and push messages," "I feel disappointed when my posts receive little interaction" [20], "I find it hard to relax after continuous use," "I feel tired after using social media," "I feel exhausted from social media use," "I often feel drained

and unable to complete other tasks," "I need to concentrate during rest time after using social media" [21].

Behavioral fatigue measurement assesses abandonment, reduced interaction, blocking, and other negative behaviors, with items including: "I selectively post less or occasionally give up using," "I am overwhelmed by information and must filter it," "I am forced to abandon social media due to too many demands," "My interactions are decreasing, leading to fewer posts and updates" [8,22], "I have uninstalled or deactivated social media," "I am increasingly unwilling to share real emotions and thoughts," "I would completely abandon social media if possible" [20].

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3 Research Hypotheses

3.1 Influencing Factors of Social Media Fatigue

All phenomena have internal and external causes, and human behavior is no exception. Through literature review, we categorize social media fatigue influences into external situational factors (information overload, information quality issues, privacy violations, system feature overload, social overload) and internal ontological factors (personality traits, emotional-cognitive factors, usage habits and attitudes). Based on existing research, we summarize main influencing factors in Table 1 .

Table 1 Main Influencing Factors of Social Media Fatigue

Factor Category	Main Content (Partial)	Definition or Main Characteristics
Situational Factors (QJ)	Information Overload [23,24,25]	Information received exceeds processing time or cognitive capacity
	Information Quality Issues [26]	Inaccuracy, irrelevance, incompleteness, untimeliness, inappropriate expression, unavailability
	Privacy Violations [22,27]	Unauthorized collection/use of user data and personal information
	System Feature Overload [23,28]	Excessive functions, difficult learning, frequent updates
	Social Overload [24,25,29,30]	Too many "friends"/"followers," excessive performance demands, time/energy costs

Factor Category	Main Content (Partial)	Definition or Main Characteristics
Ontological Factors (BT)	Personality Traits (RG)	Big Five Personality [31], Self-esteem [9,10], Self-construal [33], Social Media Self-confidence [6]
	Emotional-Cognitive Factors (QG)	Self-efficacy [6,7,8,34], Impression Management [29,35], Security Concerns [6,11,29,35], FOMO [11,12,33,36]
	Usage Habits & Attitudes (SY)	Self-immersion Loss of Control [37,38], Compulsive Use [12], Flow Experience [8], Social Comparison [18]

Based on this summary, we propose:

H1: Situational factors positively influence social media fatigue.
H2: Ontological factors positively influence social media fatigue.

3.2 Moderating Variables

Moderating variables identify factors causing different results in similar variable relationships and resolve inconsistencies [39]. To explain empirical research discrepancies, we identified five potential moderators through literature analysis.

3.2.1 Platform Type: Strong vs. Weak Ties (QR vs. RR) Following sociologist M. Granovetter's social tie theory [40], social media can be divided into strong-tie (narrow-cast, social-focused: Facebook, WhatsApp, WeChat) and weak-tie (broad-cast, media-focused: Twitter, Weibo, Instagram) platforms [41]. Strong-tie platforms feature stable, frequent interactions, while weak-tie platforms create fragile connections based on shared interests [42]. Users have different motivations and needs: strong-tie users cannot easily exit social relationships and must use specific platforms regularly, sometimes feeling overwhelmed by large social circles and focusing on functional/information quality issues; weak-tie users emphasize privacy protection, impression management, and self-esteem. Platform differences lead to varying fatigue causes. Thus:

H3: Situational factors' effect on social media fatigue is stronger in strong-tie than weak-tie platforms.
H4: Ontological factors' effect on social media fatigue is stronger in weak-tie than strong-tie platforms.

3.2.2 Cultural Characteristics: Collectivism vs. Individualism (JT vs. GR) National culture differences affect psychology and behavior. Based

on sample countries in included literature, we categorize cultures as individualistic (acting as individuals rather than group members, e.g., Western countries where attitudes/behaviors are self-interest driven [43,44]) or collectivistic (low individualism, respecting groups and prioritizing collective harmony [43]). Thus:

H5: Situational factors' effect on social media fatigue is stronger in collectivistic than individualistic cultures.
H6: Ontological factors' effect on social media fatigue is stronger in individualistic than collectivistic cultures.

3.2.3 Social Media Usage Degree: Heavy vs. Light Users (HEV vs. HIG) Resource depletion theory posits that individuals have limited resources; excessive expenditure in one domain reduces resources for others [45]. When users realize they consume too much time/energy on social media, they take measures to avoid further resource loss [46], reducing usage frequency, avoiding, or exiting platforms. Research shows usage frequency significantly affects discontinuance intention [47], and excessive internet use increases depression, anxiety, and stress [48]. Most users experience boredom and fatigue after 1-3 hours of daily use, yet average usage exceeds 4 hours [49]. Light users may experience fatigue from situational factors like information/system overload and reduce usage; heavy users, exposed longer, engage in more social comparisons, worry about impressions, experience privacy concerns, self-immersion loss of control, compulsive use, and FOMO. Thus:

H7: Heavy users are less affected by situational factors than light users.
H8: Heavy users are more affected by ontological factors than light users.

3.2.4 Gender: Male vs. Female Users (Mal vs. Fel) Zhang et al.'s research indicates men are more likely than women to experience social media fatigue from overload (system, information, social) [23]; Zhang Shuwei confirmed men are more susceptible to situational factors (system feature overload, social overload) [50], with gender differences in overload perception [51]. Social role theory suggests behavioral differences stem from different social roles, leading to varied labor division, role expectations, and gender skills [52-53]. Women, being more agreeable to maintain harmony, exhibit more pleasant social behaviors (smiling, approval) [52] and are more willing to make new friends and interact on social media, thus being less affected by situational factors but more by ontological factors. Thus:

H9: Female users are less affected by situational factors than male users.
H10: Female users are more affected by ontological factors than male users.

3.2.5 Subject Group: Student vs. Social Groups (ST vs. SO) Students learn faster, accept new technologies more readily, try new things, and have lower social anxiety [54]. Younger, more tech-savvy users perceive less technostress [55], understanding and using new features faster, while social groups

perceive complexity and are more troubled by system feature overload. As social relationships increase and become distant, social groups experience more social/communication overload [44]. According to resource depletion theory, social groups, having less time/energy due to work/family demands, are more susceptible to situational factors. Students, with stronger self-esteem, comparison tendencies, and poorer self-control, are more prone to self-immersion loss of control and compulsive use. Thus:

H11: Social groups are more affected by situational factors than student groups.
H12: Social groups are less affected by ontological factors than student groups.

Based on these theories and hypotheses, the research model is shown in Figure 2 [Figure 2: see original paper].

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4 Research Design

4.1 Literature Search and Inclusion

To build our database, we searched: Chinese databases (CNKI, VIP, Wanfang, Baidu Academic) using keywords: "social media"/"social network"/"social platform" AND "fatigue"/"exhaustion"/"anxiety"/"depression"/"negative use"/"discontinuous use"/"lurking"/"substitution"; English databases (Google Scholar, Web of Science, ScienceDirect, EBSCO, Wiley Online Library) using: "social media"/"SNS"/"Facebook"/"Twitter"/"WeChat" AND "fatigue"/"exhaustion"/"anxiety"/"burnout"/"discontinuous usage"/"negative behavioral". We also checked reference lists.

Initial search date: July 5, 2020. After title/abstract screening, 216 papers were identified. Following meta-analysis standards [56,57], inclusion criteria were: studies on social media fatigue influencing factors; user-level empirical research (experiments/surveys); including at least one situational or ontological factor indicator; reporting sample size and correlation or sufficient information for conversion (β, standardized path coefficients, t, F, p, ^{2}); Chinese or English language; no duplicate data. Final sample: 68 papers (32 English, 36 Chinese including 1 conference, 12 master's theses, 23 journal papers) from China, US, Germany, South Korea, etc.

4.2 Literature Coding and Data Processing

Coding included descriptive items (author, year, sample size, subject group: student/social) and effect statistics (Pearson's r or convertible statistics). Variables were coded as situational factors, personality traits, emotional-cognitive factors, usage habits/attitudes, and outcome type (psychological/behavioral fatigue). From 68 papers, we obtained 72 independent samples with 224 effect sizes.

Table 2 Social Media Platform Type Classification

Platform Type	Platforms
Strong-tie	QQ, Facebook, WhatsApp, KakaoTalk, WeChat
Weak-tie	Twitter, Instagram, Weibo

Table 3 Cultural Characteristics by Country

Cultural Characteristic	Countries
Individualistic	US, Ireland, Germany
Collectivistic	China, South Korea, Pakistan, India, Iran

For papers with multiple independent variables reflecting one factor category, we averaged effect values. If one factor showed multi-dimensional relationships with fatigue categories, we used average effect size. For studies without direct r, we converted using: r = $[t^2/(t^2 + df)]^1/^2$; r = $[F/(F + df)]^1/^2$; r = $[\ ^2/(\ ^2 + df)]^1/^2$ (df = n-1 = n_1 + n_2 - 2); r = standardized regression coefficient; r = 0.98β + 0.05 ($\beta > 0$), r = 0.98β - 0.05 ($\beta < 0$). Two doctoral students independently coded with 92.5% consistency; disagreements were resolved through discussion.

5 Results

5.1 Overall Effects

5.1.1 Publication Bias Test We used funnel plots and fail-safe N (Nfs). The funnel plot (Figure 3 [Figure 3: see original paper]) shows most results concentrated at the top, evenly distributed around the combined effect, with minimal deviation. Nfs = 58,589 (K = 224) far exceeds the critical value of 1,130 (224$×$5 + 10), indicating minimal publication bias and reliable results.

5.1.2 Heterogeneity Test We used Q and I^2 statistics. Table 4 shows Q = 3,100.194 (P < 0.001), far exceeding df = 71, indicating heterogeneity; I^2 = 97.710% (>50%) shows 97.71% of observed variation comes from true effect differences, not random error; τ^2 = 0.105 indicates 10.5% between-study variance for weight calculation. Therefore, random-effects models were used.

Table 4 Overall Effect Heterogeneity Test

Model	K	Combined Effect r	95% CI	Q	df	p	I^2	τ^2
Fixed	72	0.335	[0.325, 0.345]	3,100.194	71	0.000	97.710	0.105
Random	72	0.318	[0.248, 0.384]	-	-	-	-	-

5.1.3 Overall Effect Hypothesis Testing **Table 5** shows situational factors correlate significantly with social media fatigue (r = 0.344, p < 0.001), supporting H1. Ontological factors also correlate significantly (r = 0.215, p < 0.001), supporting H2.

Table 5 Situational and Ontological Factors on Social Media Fatigue

Factor	Combined Effect r	95% CI	Q	p
Situational	0.344	[0.291, 0.395]	887.256	0.000
Ontological	0.215	[0.137, 0.290]	2,393.676	0.000

Tables 6 and 7 show both factors affect psychological fatigue more strongly than behavioral fatigue. Situational factors' effect on psychological fatigue (r = 0.394, p < 0.001) exceeds that on behavioral fatigue (r = 0.267, p < 0.001). Ontological factors' effect on psychological fatigue (r = 0.247, p < 0.001) exceeds that on behavioral fatigue (r = 0.175, p < 0.001). Personality traits showed no significant effects (p > 0.05). Emotional-cognitive factors and usage habits/attitudes significantly affected both dimensions, with stronger effects on psychological fatigue. These results validate that social media fatigue comprises both psychological and behavioral dimensions.

5.2 Moderating Effects

Significant heterogeneity indicates moderators affect situational and ontological factors' relationships with social media fatigue. We examined platform type (QR, RR), cultural characteristics (JT, GR), usage degree (HEA, HIG), gender (Mal, Fel), and subject group (STO, SO) through subgroup tests.

Table 8 shows platform type did not significantly moderate situational factors' effect on fatigue (QB = 0.126, p > 0.05), so H3 was not supported. Platform type significantly moderated ontological factors' effect on behavioral fatigue (QB = 16.145, p < 0.001), with stronger effects in weak-tie platforms. Emotional-cognitive factors (QB = 5.333, p < 0.05) and usage habits/attitudes (QB = 4.586, p < 0.05) also showed stronger effects on behavioral fatigue in weak-tie platforms. Thus, H4 was partially supported.

Table 9 shows cultural characteristics did not moderate situational factors' effects (QB = 1.076, p > 0.05), so H5 was not supported. Cultural characteristics significantly moderated ontological factors' effects on overall fatigue (QB = 5.045, p < 0.05) and behavioral fatigue (QB = 8.493, p < 0.01), with stronger effects in collectivistic cultures. Cultural characteristics also significantly moderated emotional-cognitive factors' effect on behavioral fatigue (QB = 4.355, p < 0.05) and usage habits/attitudes' effects on overall fatigue (QB = 9.238, p < 0.01), psychological fatigue (QB = 6.353, p < 0.05), and behavioral fatigue (QB = 5.491, p < 0.05), all stronger in collectivistic cultures. Thus, H6 was not supported.

Since usage degree, gender, and subject group were continuous variables (percentage-based), we used meta-regression (Table 10). Usage degree significantly positively moderated the ontological factors-fatigue relationship ($b = 0.6989$, $p < 0.05$), supporting H8. Gender significantly positively moderated the ontological factors-fatigue relationship ($b = 0.5680$, $p < 0.05$), supporting H10. Subject group significantly positively moderated the situational factors-fatigue relationship ($b = 0.2554$, $p < 0.05$), supporting H11. Usage degree and gender negatively (but non-significantly) moderated situational factors' effects; subject group positively moderated ontological factors' effects ($b = 0.4756$, $p < 0.01$). Therefore, H7, H9, and H12 were not supported. These moderators explained 10% of variance in situational factors-fatigue relationships and 39% in ontological factors-fatigue relationships, indicating additional unexplored factors.

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6 Conclusion and Future Directions

6.1 Conclusions

This study confirms that platform type, cultural characteristics, usage degree, gender, and subject group moderate social media fatigue relationships. Meta-analysis results confirm situational factors as crucial causes, highlighting their importance for user retention and active use. Companies should focus on information regulation and system optimization for clean, simple, user-friendly interfaces. While heavy information/advertising exposure may boost short-term awareness and sales, long-term overexposure causes user fatigue and damages reputation. Moderator effects suggest companies should adjust strategies based on platform characteristics and target users, using big data analytics (while protecting privacy) to classify users and deliver personalized content to improve retention.

This study integrates situational and ontological factors from psychological and behavioral perspectives, using meta-analysis to combine 68 studies into a larger sample for improved validity. Results quantitatively define social media fatigue's conceptual scope, clarifying psychological and behavioral dimensions. Findings reveal internal mechanisms, confirm multiple moderators, explain prior inconsistencies, and provide references for future model development.

6.2 Limitations and Future Directions

Language limitations restricted inclusion to Chinese and English papers, potentially affecting results. Few unpublished works were included. Cultural characteristic samples were imbalanced (more collectivistic than individualistic), possibly affecting results. Age and occupation may moderate relationships [18], and younger female users may experience higher fatigue [59], but limited literature prevented coding these variables.

Future research should: use experimental methods (e.g., PPG sensors [49]) to test antecedents and consequences; examine relationships between psychological and behavioral fatigue and their interactions; explore additional moderators as literature accumulates; investigate personality traits' effects in weak-tie platforms (currently no effect sizes exist); examine other platform types (knowledge-based like Zhihu, commerce-based like Taobao/Pinduoduo) beyond social platforms.

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Note: Figure translations are in progress. See original paper for figures.