**The Big-five personality traits and their link to problematic and compensatory Facebook use: A systematic review and meta-analysis**

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**Highlights**

* The direction of the association between the Big-five personality traits and both problematic Facebook use and time spent on Facebook is controversial.
* Different measurements of problematic Facebook use led to different patterns of associations.
* More robust measurements of problematic Facebook use and time spent on Facebook are needed.

**Abstract**

Social networking sites are widespread worldwide, and Facebook is the leading platform in terms of the number of users, laying the ground for potential problematic use. However, problematic Facebook use does not occur for most users but only for a minority. Previous research has found an association between the Big-five personality traits and problematic Facebook use, but the direction of these associations remains controversial. We aimed to fill this gap in knowledge through a systematic review and meta-analysis comprising 425 effect-sizes (78 studies) and 39,930 individuals (females = 33% to 89%; age range = 17 to 48 years). Extraversion and neuroticism were associated with higher daily and weekly hours spent on Facebook, while conscientiousness was negatively associated with higher daily hours and not weekly hours. However, when time spent on Facebook was assessed by validated questionnaires, different patterns of associations were observed. Except for the non-significant role of extraversion, the other personality traits were negatively associated with problematic Facebook use, while neuroticism was positively associated. When using different assessment tools was considered, extraversion remained non-significant, but different association patterns were observed. Moreover, for compensatory Facebook use, all personality traits were negatively associated with it, whereas neuroticism exhibited a positive association. Different patterns of associations in terms of strength and direction were observed depending on samples and measures characteristics; thus, definitive conclusions on the direction of the associations are impossible to draw at present. A more robust conceptualization and assessment of problematic Facebook use, as well as time spent on it, is required. Implications, limitations, and future directions are discussed.

*Keywords*: Big-five personality traits; meta-analysis; Facebook; systematic review.

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**Introduction**

One of the distinguishing features of the 21st century has been the emergence and expansion of online social networking sites (SNS) (Yamin, 2019). Among various platforms, Facebook is the leading social networking site in terms of the number of users (Boudreaux, 2022), and it is used for a variety of purposes (Montag et al., 2019), from educational (Çakiroglu et al., 2020) to social connections (Houghton et al., 2020).

 Besides its many functions and advantages, it has been shown that Facebook use can be associated with some psycho-social problems. However, not all Facebook users experience problematic use (Elhai et al., 2021; Marino et al., 2016). Just as many people experience sadness at some point in their lives but only a minority of them would be diagnosed with a depressive disorder (Ferrari et al., 2013), most people use Facebook daily, but only a minority experience maladaptive use that negatively affects their functioning (Biolcati et al., 2018). “Problematic Facebook use” has been defined as a problematic behavior that generates difficulties in various domains of life, such as intimate relations, work, school, and friendships (Marino et al., 2018). Furthermore, Kardefelt-Winther (2014), based on the Compensatory Internet Use Theory (CIUT), conceptualized internet use as a substitute for something which is needed but is not available. Accordingly, “compensatory Facebook use” refers to the use of Facebook as a means of compensation for feelings of inadequacy and personal insecurities (Bodroža & Jovanović, 2016). Furthermore, despite requent Facebook use per se is considered normative and not problematic, some researchers (for example, Coco et al., 2018; Koban et al., 2018; Weiqin et al., 2016) have suggested that very high levels of Facebook use may become problematic (Montag & Hegelich, 2020). For this reason, the present study included daily or weekly counts of “time spent on Facebook” as a further main variable, along with problematic and compensatory Facebook use.

 Overall, it should be noted that none of these constructs have been recognized as official disorders by prominent diagnostic manuals yet (American Psychological Association, 2022; ICD11 WHO 2020). The lack of a shared definition and different positions regarding the potential diagnostic criteria have resulted in the development and use of various assessment tools (Griffiths et al., 2015), such as the Facebook Intrusion Questionnaire (Elphinston & Noller, 2011), the Problematic Facebook Use Scale (Assunção & Matos, 2017), and the Bergen Facebook Addiction Scale (Andreassen et al., 2012). Montag and Rumpf (2021) have also recommend novel assessment approaches to overcoming recall bias and other limitations of typical assessment approaches. Along with issues related to definition and assessment, the field of problematic Facebook use has suffered from the lack of a gold-standard theoretical model. The I-PACE model might be the most relevant, among the many attempts to provide a theoretical framework, for conceptualising problematic Facebook use (Brandter et al., 2021).

 Brand et al. (2016) integrated neurobiological and psychological factors to explain the development and maintenance of disorders related to internet use, highlighting that relevant personality characteristics and affective and cognitive mechanisms are implicated. Given the fact that Facebook has the highest number of users among various SNSs (2,375 million active users; Sindermann et al., 2020) and according to epidemiological research findings showing the prevalence of Facebook ‘addiction’ ranges from 4% to 8.6% (for example, Khumsri et al., 2015), examining the individual characteristics and differences affecting problematic use of Facebook is considered an important research area. Among the many psychological factors that may be involved in problems related to Facebook use, personality traits have attracted much attention (for example, Abbasi & Drouin, 2019; Garza et al., 2022; Lu et al., 2021; Marengo et al., 2020; Roma et al., 2019; and Sheldon et al., 2021) because they are known to constitute vulnerability factors for the engagement in problematic behaviors as they reflect individual differences associated with patterns of skills and behaviors (Marino et al., 2018). One of the most famous and widely used approaches in the field of personality is the Five-Factor or Big-five model (McCrae & John, 1992), which identifies five dimensions of human personality: extraversion (the quantity and intensity of relationships with one’s environment), agreeableness (the relational sphere and the tone of relationships with others), conscientiousness (orientation, persistency of behavior and control of impulses), neuroticism or emotional stability (inclination to perceive reality as difficult, problematic, or threatening and to feel negative emotions such as fear or anger), and openness (active search for and a love of new experiences). The association between the Big-five personality traits and problematic Facebook use, compensatory Facebook use, and time spent on Facebook is not yet clear.

 With regards to problematic Facebook use, a meta-analysis (Marino et al., 2018) showed that neuroticism (positively) and conscientiousness (negatively) were the clearest personality traits associated with problematic Facebook use. Even in the case of neuroticism, there are studies that show a relatively weak (positive) association (like Lee, 2015) or no association (Rajesh & Rangaiah, 2020) between this personality trait and problematic Facebook use. Except for these two personality traits, the other personality traits showed small or insignificant associations with problematic Facebook use. Marino et al. (2016) reported that only extraversion appears to be negatively associated with problematic Facebook use, whilst Błachnio and Przepiorka (2016) found that all of the five big personality traits are negatively associated with problematic Facebook use and only the associations between conscientiousness, emotional stability, and openness to experience to problematic Facebook use are statistically significant. Meanwhile, others reported that introversion is positively (though slightly) associated with problematic Facebook use (Bodroža & Jovanović, 2016; Wheeler, 2018).

 Concerning compensatory Facebook use, Bodroža and Jovanović (2016) found that it was positively associated with low conscientiousness and agreeableness and high neuroticism and introversion, while Jovanović et al. (2022) reported that low openness to experience was positively significantly associated with compensatory Facebook use.

 Finally, regarding the amount of time spent on Facebook, Abbasi and Drouin (2019) and Chow and Wan (2017) reported that individuals high in neuroticism may be particularly inclined towards spending more time on Facebook for emotion regulation purposes (as a means to improve their mood). Eşkisu et al. (2017) and Gazit (2021) found the highest positive association between openness to experience, and time spent on Facebook, as a means to maintain a wider social environment. Suresh (2013) reported that only low extraversion had a positive and significant association with the amount of time spent on Facebook and attributed this finding to the wider age groups in their study. Finally, Yao (2015) found positive association between conscientiousness and time spent on Facebook and explained the results based on the fact that Facebook has been redesigned and is now a safer and dependable platform.

**The rationale for the present study**

Some meta-analyses and systematic reviews have already been conducted to understand the magnitude of the associations between the Big-five personality traits and Facebook use. In their meta-analysis, Liu and Campbell (2017) found that extraversion and openness were the strongest predictors of SNS activities (including activities on Facebook), while conscientiousness, neuroticism, and agreeableness were only associated with a few of such activities. However, the authors did not exclusively focus on Facebook, problematic and compensatory use, or the amount of time spent on it. Marino et al. (2018), in their meta-analysis of 56 independent samples with a total of 27,867 participants, found that neuroticism and conscientiousness were the personality traits associated with problematic Facebook use. However, they did not distinguish between problematic and compensatory use.

 In Huang's (2019) meta-analysis, the results indicated positive and small associations between SNS (including Facebook) use and neuroticism and extraversion, while conscientiousness had a negative and small association with SNS (including Facebook) use. They also did not focus exclusively on Facebook and did not specifically focus on problematic Facebook use, compensatory Facebook use, and time spent on Facebook. Mancinelli et al. (2019) reported in their systematic review that extraversion, neuroticism, and openness to experience were all associated with SNS (including Facebook) use. They also did not limit their systematic review to Facebook and did not specifically refer to problematic Facebook use, compensatory Facebook use, and time spent on Facebook. Finally, Rajesh and Rangaiah (2022), in their meta-analysis of personality traits and problematic Facebook use, found that agreeableness, openness to experience, and conscientiousness were negatively associated with problematic Facebook use. However, they also did not distinguish between problematic Facebook use, compensatory Facebook use, and time spent on Facebook.

 Therefore, the present meta-analysis aims to provide a comprehensive review of the extant literature about the association between the Big-five personality traits and both problematic and compensatory Facebook use, as well as time spent on Facebook since many studies have been published on these topics but not included in the previous meta-analyses. Moreover, in none of the reviews mentioned above, the available data regarding the amount of time spent on Facebook has been analyzed based on self-reported daily hours, self-reported weekly hours, and time spent as measured by validated questionnaires.

 Thus, the current study is an updated meta-analysis which includes a large number of studies and employs a novel methodology (i.e., prediction interval calculation) to address heterogeneity (Borenstein, 2019), despite the previous studies that addressed heterogeneity but only with moderator analysis. In line with the earlier meta-analyses reviewed above, regarding the association between the Big-five personality traits and problematic and compensatory Facebook use, and the amount of time spent on Facebook, we have set out the following hypotheses.

H1 = Neuroticism will be positively associated with problematic Facebook use, compensatory Facebook use, and the amount of time spent on Facebook.

H2 = Extarversion will be negatively associated with problematic Facebook use, compensatory Facebook use, and the amount of time spent on Facebook..

H3 = Agreeableness will be negatively associated with problematic Facebook use, compensatory Facebook use, and the amount of time spent on Facebook.

H4 = Openness to experience will be negatively associated with problematic Facebook use, compensatory Facebook use, and the amount of time spent on Facebook.

H5 = Conscientiousnes will be negatively associated with problematic Facebook use, compensatory Facebook use, and the amount of time spent on Facebook.

**Method**

This is a systematic review and meta-analysis conducted and reported based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA; Page et al., 2021).

**Search strategy and study selection**

From commencement until November 19 2022, PsycINFO (using the Ovid platform), Google Scholar, ProQuest, ScienceDirect, PubMed, and OATD were carefully searched. A manual search for reference lists from all chosen papers, full-text reviews, and relevant reviews was conducted. The search was done using the following terms for the Big-five personality traits (Open OR openness OR conscientious OR conscientiousness OR extrovert OR extraversion OR introvert OR introversion OR agreeable OR agreeableness OR neurotic OR neuroticism OR emotionally stable OR emotional stability OR trait OR big five OR big 5 OR five factor OR NEO OR personality OR personality trait OR personality feature OR individual difference) AND (Facebook). Using search features specific to each database (e.g., asterisk, quotation mark) in conjunction with the Boolean ("AND" "OR") operators, the terms were independently and concurrently searched.

The scope of the literature review was restricted using the following criteria: (*a*) English-language articles published in peer-reviewed journals or unpublished studies i.e., theses/dissertations; (*b*) articles on the Big-Five personality traits; (*c*) articles on Facebook; (*d*) research conducted using a case-control design/prospective cohort studies/experimental research/large population-based cross-sectional studies; and (*e*) research that reports Pearson's *r* or Spearman's *r* correlation coefficients for the variables of interest, or any data that can be converted to *r*. Unless otherwise specified, each study's participants were presumed to be devoid of neurological or cognitively organic disability.

**Data collection process**

Two reviewers determined the research eligibility using the following criteria: title screening, abstract screening, and full article screening. Initially, titles and abstracts were evaluated. Then, each reviewer independently conducted a thorough review of the articles that appeared pertinent. The authors' disagreements on eligibility were resolved by consensus. Moreover, the reference lists for eligible publications were also checked for potential studies to include. When necessary, if data or findings were missing, we contacted the authors to obtain them. In this process, 20 corresponding authors were contacted, and 5 replied. The materials in Appendix A pertains to the extracted data prior to their combination.

**Data extraction and operational definition**

The following were extracted: titles, authors' names, effect size, number of participants, the proportion of females, year of publication, publication type (peer-reviewed vs. thesis/dissertation), mean age, sample type (students vs. general population), data collection method (online vs. in-person), Facebook use severity, and research design.

 The results were divided into three categories: (1) The quantity of time spent on Facebook, as measured by daily or weekly hours (self-reported duration), or as measured by validated questionnaires with focus on time spent (FIQ or Facebook Intrusion Questionnaire, Nolle & Elphinston, 2011; FBI or Facebook Intensity Scale, Ellison et al., 2007), labeled as time spent on Facebook; (2) Problematic Facebook use measured by these tools: Bergen Facebook Addiction Scale (BFA; Andreassen et al., 2012), addiction subscale of Psycho-Social Aspects of Facebook Use (PSAFU; Bodroza et al., 2009), Facebook Use Disorder scale (FUD-S) based on the short version of the smartphone addiction scale (Kwon et al., 2013), Facebook Questionnaire (FQ; Ross et al., 2009), Facebook Addiction Scale (FAS; Andreassen & Pallesen, 2013), Problematic Facebook Use Scale (PFUS; Caplan, 2010), Facebook engagement measures developed by Ross et al. (2009), Facebook Addiction Italian Questionnaire (FAIQ; Caci et al., 2017), questions adapted from FBI (Ellison et al., 2007), questions adapted from Bumgarner (2007) and Burke et al. (2010), authors’ created questions based on Moore and McElroy (2012), authors’ adapted the Facebook Use Disorder scale based on SAS-SV (Kwon et al., 2013), Young's Internet Addiction Test (IAT; Young & Rogers, 1998) tailored for Facebook; (3) The experiences of Facebook users who find it easier to express themselves and communicate on Facebook than offline, as indicated by the compensation subscale of PSAFU, are referred to as compensatory Facebook use (Bodroza et al., 2009).

**Data analysis**

Comprehensive Meta-Analysis Software (CMA-Version 3.3.070) was used to determine the overall pooled correlation; all analyses were performed using the random-effects model. Before the computation, several sensitivity studies utilizing the one-study removal approach and cumulative analysis were conducted to identify outliers. The given statistics strictly adhered to the Borenstein (2019) recommendations to prevent typical errors in conducting meta-analyses.

Although the *I*2 is commonly reported as an index of heterogeneity, it is a proportion and not an absolute value (Borenstein et al., 2017; Borenstein, 2019), so it only indicates that a percentage of heterogeneity in effect-sizes can be attributed to something other than sampling error and does not indicate the degree of heterogeneity. In addition to *I*2 and *Q*, we have presented a random-effects model-based estimate of between-study heterogeneity, tau (Johnson, 2021). In addition, using the method of Borenstein et al. (2017), we calculated the prediction interval (PI), which may account for genuine heterogeneity and indicate the expected true effect in 95% of future studies with a comparable design. Consequently, a PI range of -.20 to +.80 implies that the effect-sizes in certain populations (comparable to that of included studies) may be as low as -.20 and as high as +.80, which is more informative than *I*2.

The mixed-effects model (Borenstein et al., 2009) was utilized to compute the pooled effect-sizes for subgroups, pool the effect-sizes in each subgroup using the random-effect model, and evaluate the fixed-effect model to determine the differences across subgroups. We have provided *Q*, *DF*, and the corresponding *p*-value for pairwise omnibus tests and tests of the statistical significance of subgroup differences.

Using cumulative analysis, we analyzed the small-study effect (Borenstein, 2019). Using this methodology, if studies with a smaller sample size provide higher estimates, there is cause to suspect publication bias. In addition, Egger's regression tests were applied; however, these tests can only show the essence of publication bias. Consequently, Duval and Tweedie's trimmed technique was utilized to estimate how effect-sizes would alter when controlled publication bias. In addition, we did a continuous moderator analysis using meta-regression models according to Knapp–Hartung procedures and the maximum likelihood approach to determine if the moderators were statistically significant.

Evans (1996) has suggested cutoff points as follows: *r* < .2 very small, .2 < *r* < .4 small, .4 < *r* < .6 medium, .6 < *r* < .8 strong and *r* > .8 very strong. These thresholds were used to interpret the observed associations. However, to facilitate interpretation, it is common practice to transform effect-sizes into each other (Borenstein, 2009); hence effect-sizes were turned into odds ratios (ORs). An OR of 1 indicates no association, while values less than 1 and larger than 1 might be interpreted as protective and risk factors, respectively.

**Results**

**Selection and inclusion of studie*s***

Figure 1 presents the selection and inclusion of studies as a PRISMA chart. Two independent authors examined the titles and abstracts of the 9049 articles for a primary evaluation without aids of a software-browsing the papers in each database. This led to the retrieval of 690 studies for full-text screening. In the end, 78 studies satisfied the inclusion requirements and were included in the meta-analysis, providing us with 425 effect-sizes considering the association between the Big-five personality traits and time spent on Facebook, compensatory and problematic Facebook use (See Table 3).

**Sensitivity analysis**

Sensitivity analyses were undertaken for each subgroup (i.e., each Big-five personality trait) to see if the pooled effect-sizes were robust or affected by outliers. Using, one-study removed method and cumulative analysis method, there were no evidence of influential cases that could be responsible for the observed heterogeneity, thus, the analyses were conducted without omitting any study.

**Publication bias**

Concerning effect-sizes reported in Table 1 and Table 2, several publication bias analyses using Egger’s regression test were conducted. For daily time spent in Facebook, there was no evidence of publication bias. For weekly time spent in Facebook, except for agreeableness and openness to experience, there was no evidence of publication bias. After adjusting the effect-sizes for publication bias for agreeableness, two missing studies were imputed at the left of the mean and the adjusted effect-size become -.01 [-.08, .05], and it remained non-significant. For openness, after adjusting the effect-sizes and imputing two missing studies to the right of the mean, the adjusted effect-size become .10 [-.01, .20] and it remained non-significant. For daily time spent on Facebook as measured by FBI, except for conscientiousness, there was no evidence of publication bias. After adjusting the effect-sizes for publication bias for conscientiousness, four missing studies on the right side of the mean imputed and the effect-size become significant .06 [.01, .11]. However, for studies utilizing FIQ to assess daily time spent on Facebook, there was no evidence of publication bias. Finally, concerning studies on problematic and compensatory Facebook use, the Egger’s regression tests revealed no evidence of publication bias.

**Study characteristics**

Studies were published between 2010 to 2022, with the most published between 2015 to 2018. The total sample included in the meta-analysis was 39,930 participants, and the number of participants was as low as 39 and as high as 3,835. And the female proportion ranged between 30% and 89%. The mean age ranged between 17 and 48 years. Regarding the origin of the studies, the United States had the highest contribution (k = 28), followed by Italy (k = 9), Poland (k = 8), India (k = 6), Ireland (k = 5), Turkey (k = 4), the United Kingdom (k = 3), Germany (k = 3), Pakistan (K = 3), and Taiwan (k = 3). The remaining countries were represented by two studies (Israel, Pakistan, Malaysia, Serbia, Greece, Thailand, The Philippines), and one study (Austria, Australia, Canada, China, Croatia, Finland, France, Hong Kong, Hungary, Indonesia, Iran, Jordan, Norway, Romania, South Africa, South Korea, Ukrain, Vietnam). Overall, 395 effect-sizes were coming from peer-reviewed studies and 30 effect-sizes from theses/dissertations. Regarding data collection method, 282 effect-sizes were coming from studies with online data collection, 82 effect-sizes from in-person data collection, 10 effect sizes from mixed method of data collection, and for the rest it was not reported. Finally, the design of all studies was cross-sectional.

**Big-five personality traits and time spent on Facebook**

***Time spent on Facebook as measured by daily hours***

The association between agreeableness and openness with time spent on Facebook as measured by daily hours was not significant. However, the PI for agreeableness was as low as -.10 in some populations and as high as .11 among others or null in some populations. Moreover, the PI for openness was as low as -.19 in some populations and as high as .20 among others or null in some populations.

 Conscientiousness was negatively associated with daily hours spent on Facebook, but the PI suggested that it could be as low as -.25 and as high as .12 in some populations and null among others. However, according to ORs, conscientiousness on average is a protective factor against spending higher hours per day on Facebook.

 Extraversion and neuroticism were positively associated with higher daily hours spent on Facebook and according to the ORs, on average, they could be considered as a risk factor for spending higher hours per day on Facebook. Nonetheless, the PI for these personality traits contained negative, positive, and null effects in some populations but not in others.

***Time spent on Facebook as measured by the FBI***

When using the FBI as a means of assessing time spent on Facebook, the result was not significant for any personality traits with the exception of extraversion. The higher the extraversion, the higher the time spent on Facebook per day. This was consistent with measuring time spent by the amount of time (daily hours). According to ORs, extraversion could be considered as a risk factor for higher time spent on Facebook as measured by the FBI. Nonetheless, the PI suggested that the direction and the strength of the associations are not unform across all populations.

***Time spent on Facebook as measured by the FIQ***

Interestingly, the results based on the FIQ were totally reversed compared to those based on the FBI. All personality traits had significant associations with higher time spent on Facebook per day, except for extraversion. Higher neuroticism was associated with higher time spent on Facebook and it can be considered as a risk factor according to the ORs. Moreover, based on the PI, the association between neuroticism and time spent on Facebook as measured by FIQ was positive among all comparable populations included in the studies. According to ORs, the rest of the personality traits, on average, could play a protective role against higher time spent on Facebook, however, their PI suggests that the direction and strength of the associations is not uniform across all populations.

***Time spent on Facebook as measured by weekly hours***

When time spent on Facebook was measured by weekly hours, only extraversion and neuroticism demonstrated positive and significant associations, and according to ORs they could be considered as risk factors for spending more time on Facebook per week. However, based on PI, the association for extraversion was not positive among all populations and was negative or null in others. However, for neuroticism it was positive across all populations.

**Problematic Facebook use**

When pooling all measures, all personality traits (with the exception of extraversion) showed significant positive associations with problematic Facebook use. Except for neuroticism that was a risk factor for problematic Facebook use according to ORs, the rest of the significantly associated personality traits could be considered, on average, as protective factors. However, the PI suggests that the direction and strength of the associations was not uniform across all populations. In this part of the data analysis, we took into consideration the measures which had been used to assess problematic Facebook use. From among the various measures, almost all measures had been used in one or at most two studies except for BFAS and PSAFU. These two measures had been used in at least seven studies, so we took them as moderator in order to get a clear understanding of the association between the personality traits and problematic use of Facebook.

***Problematic Facebook use as measured by the BFAS***

Neuroticism was positively associated with problematic Facebook use as measured by the BFAS, however, except for extraversion which demonstrated non-significant associations, the remaining personality traits showed negative associations with problematic Facebook use and could be considered, on average, as protective factors. However, when PI was considered, only conscientiousness was a protective factor against problematic Facebook use in all populations. Furthermore, with regards to the other personality traits the direction and strength of the associations was not uniform across all populations.

***Problematic Facebook use as measured by the PSAFU-addiction subscale***

When problematic Facebook use was measured by the addiction subscale of PSAFU, again, neuroticism was identified as a risk factor, however, conversely to findings using the BFAS, it was a risk factor among all populations. In addition, agreeableness was protective factor among all, however, conscientiousness, extraversion and openness were not a protective factor against problematic Facebook use as they showed negative, positive, and null associations among some populations and not others when PI was considered.

**Moderator analysis**

For categorical moderator analysis, we checked whether there were differences in effect sizes across time spent (hours per day) and problematic use Facebook use in the association with the Big-five personality traits based on sample type (student vs. general sample), data collection (online vs. in-person), article type (peer-reviewed vs. thesis/dissertation), and the result was non- significant. Except for the association between agreeableness and problematic Facebook use data collection (online vs. in-person) was a significant moderator (*Q* = 4.96, *df* = 1, p = 0.026), studies collecting data in person demonstrated higher associations (*r* = -.11 [-.15, -.06]) than studies collecting data online (*r* = -.04 [-.08, .01]). Also, concerning problematic Facebook use studies which reported agreeableness, conscientiousness, and openness were all journal articles and it was not possible to test the moderating role of documentation type (peer-reviewed vs. thesis/dissertation) except for extraversion and neuroticism, which also was non-significant. It should be noted that we did not examine moderation analysis for outcomes with less than 10 studies (i.e., compensatory Facebook use and time spent on Facebook - weekly hours).

Also, for time spent on Facebook (daily hours) and problematic Facebook use, we checked the effect of gender proportion in the continuous moderator analysis, and the result for daily hours spent on Facebook was the same as the categorical moderator analysis. However, except for agreeableness, extraversion, neuroticism, and openness, the result was significant for the association between conscientiousness and problematic Facebook use (*b* = -0.31 [-0.60, -0.02], *T*-value = -2.18, *p* = 0.01), suggesting that the association between conscientiousness and problematic Facebook use was lower in studies with a higher female proportion of participants.

Finally, we also checked for the moderating role of age, and it was found to be non-significant for time spent (daily hours) on Facebook, however, it was only significant for the association between openness and problematic Facebook use (*b* = 0.015 [0.003, 0.009], *T*-value = 4.81, *p* = 0.01), suggesting that as age increases, the association between openness and problematic Facebook use becomes stronger. Finally, we checked for the moderating role of Facebook use severity, and it was non-significant for the association between the all Big-five personality traits and time spent (daily hours) and problematic Facebook use.

**Discussion**

The current study sought to explore and quantify the strength of the associations between the Big-five personality traits and Facebook use in terms of time spent and problematic and compensatory Facebook use. We included 78 studies providing us with 425 effect sizes. Despite we found publication bias for some personality traits, computing the adjusted effect-size for the missing studies did not change the results. Compared with the statistics reported by the Omnicore Agency (2022), in our study, the female proportion across studies was 30% to 89% while the female users on Facebook are 44%, suggesting that men are underrepresented in our meta-analysis. The mean age range was 17 to 48 years, which covers a wide age of Facebook users as reported ranges are typically between 18 to 35 years of age.

**Hypotheses**

We have offered five hypotheses on the associations between the Big-five personality traits and the relevant variables, all of which are supported by the literature. We were unable to accept all suggested hypotheses, nonetheless, because diverse associations were observed. The findings are discussed below.

**The Big-five personality traits and time spent on Facebook**

Considering time spent on Facebook by daily hours or weekly hours, only extraversion and neuroticism were found to be significant risk factors, however, according to the prediction intervals, not all people with high neuroticism or extraversion will spend more time on Facebook.

 In addition, when daily time was measured by the FBI, only extraversion remained a significant risk factor for higher daily time spent on Facebook, and when daily time spent was measured by the FIQ, only neuroticism remained a significant risk factor, while the rest of personality traits showed non-significant associations. Again, it should be considered that according to prediction intervals the significant association between extraversion and FBI is not the case for all people, as its direction is negative among some populations and also null among others. However, when considering daily time spent as measured by the FIQ, neuroticism was a risk factor among all populations. Different measures of time spent on Facebook led to different estimations of the association with the Big-five personality traits. Moreover, time spent on Facebook, as measured by daily hours or weekly hours, indicated that extraversion and neuroticism are significantly associated with spending a higher number of hours on Facebook.

People who report higher warmth, gregariousness, assertiveness, excitement seeking, and positive emotion (extraversion) would appear to be spending more time on Facebook. In addition, those reporting higher anxiety, depression, anger, impulsiveness, vulnerability to stress, and lower self-consciousness (neuroticism) would also appear to spend more time on Facebook. In light of the CIUT scores, these individuals may have in common the perception of Facebook as a platform that allows connection to others and the expression negative affective states as a form of distress relief.

**The Big-five personality traits and problematic Facebook use**

Except for extraversion, all personality traits were significantly associated with problematic Facebook use. Neuroticism was positively associated with problematic Facebook use; the odd ratios in Table 1 suggest people with higher neuroticism are at major risk of reporting problematic Facebook use, which appears reasonable as some people with difficulties in emotion regulation are likely to engage maladaptive coping strategies to achieve short-term relief (Avila, 2021).

 Interestingly, agreeableness, openness, and conscientiousness were negatively associated with problematic Facebook use. These personality traits, with the exception of conscientiousness, are associated with spending more time on Facebook; however, they also protective against problematic Facebook use. It seems that the only differentiating factor is neuroticism, suggesting that spending time on Facebook is not that crucial in understanding problematic use. A behavioral addiction, however, involves interactions of person-affect-cognition-execution, so according to the I-PACE model, it is not just a matter of motivations, and personality traits, which could predispose people tor problematic Facebook use, but a wider and more complex interaction which will include executive functions such as the ability for response inhibition. It is important to note, however, that the link between neuroticism and problematic Facebook use should is not set in stone. It is not the case for all people that high neuroticism will be associated with problematic Facebook use, in the same manner that not all people with higher scores on the rest of the personality traits are protected against it.

For problematic Facebook use and time spent on Facebook, when different measures were considered as a moderator (see Tables 1 and 2), different results were observed. Accordingly, when BFAS was the measure of problematic Facebook use, agreeableness (although it was significant when all measures were pooled) become non-significant and extraversion remained non-significant. Here, neuroticism was a risk factor for problematic Facebook use but not among all populations, however, only conscientiousness was a protective factor against problematic Facebook use among all populations. Although openness on average was a protective factor, it was not the case for all populations. Moreover, when the addiction subscale of the PSAFU was considered as the measure of problematic Facebook use, conscientiousness was no longer a protective factor among all populations, however, neuroticism was a risk factor among all populations. The results are consistent with Marino et al.’s (2018) meta-analysis which observed that neuroticism and conscientiousness were the personality traits most strongly associated with problematic Facebook use. Moreover, the eminent roles of neuroticism and conscientiousness were also was reported in a recent online gaming meta-analysis (Akbari et al., 2021), indicating that they are the two personality traits that merit further research.

**The Big-five personality traits and compensatory Facebook use**

As for the associations observed between the Big-five personality traits and compensatory Facebook use (as measured by the compensation subscale of the PSAFU) conscientiousness and extraversion were protective factors against compensatory Facebook use among all populations. Moreover, neuroticism demonstrated a positive association with compensatory Facebook use and it was a risk factor among all populations, suggesting that Facebook may provide a form of compensation for those who find it easier to express themselves and communicate on Facebook rather than offline. In light of the CIUT, it could be said that people who need social support or experience distress from in-person conversations may choose Facebook to meet their unfulfilled needs. However, considering the I-PACE model the personality traits are only predisposing factors and exhibiting problematic behaviors is influenced by the interactions of person-affect-cognition and executive functions; this model supports the notion of PI observed in this analysis as different samples may showcase differing patterns of associations.

**Implications**

The current meta-analysis sought to contribute to shed light on the associations between the Big-five personality traits and problematic Facebook use. However, we found that reaching a broad conclusion across the literature is arduous. Clearly, different conceptualizations will lead to different measurements of problematic Facebook use and consequently the outcomes will be inconsistent.

Even if we consider the BFAS as the golden standard for measuring problematic Facebook use, in view of the prediction intervals reported in Table 1, except for conscientiousness that is a protective factor among all populations, the remaining personality traits demonstrate differing patterns of association. This means than further investigations are needed to definitively conclude that, for example, among all Facebook users, neuroticism is always positively associated with problematic Facebook use.

In sum, it seems that we need more robust conceptualizations and assessment of problematic Facebook use. However, given the different prediction intervals observed, the individual differences need to be considered, for example, through a person-centered approach to determine how the effect-sizes vary in terms of direction and strength of associations across different populations.

**Limitations and future directions**

The strength of the current meta-analysis is that it was conducted in accordance with established standards (Borenstein, 2019); yet, a meta-analysis cannot include data that has not been published in the included studies; hence, it has the following limitations. The included studies did not report certain variables (such as anxiety and depression) that may have been utilized in a moderator analysis, resulting in the omission of full meta-regression. Most of the included studies were from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) nations (Henrich et al., 2010), limiting the generalizability to the global population. Another limitation is the lack of resources, as our effort was restricted to the Big-five personality traits and English-only publications. The observational and cross-sectional nature of the examined research calls for a cautionary approach in concluding for the presence of causality between personality traits and problematic Facebook use. However, there are some recommendations for more studies to fill the gaps in the literature.

 Future studies on problematic Facebook use should use stratification sampling methods to recruit more representative samples with demographics similar to that of Facebook statistics (Omnicore Agency, 2022), which will aid in obtaining better results and enhance the generalizability of findings. Moreover, when choosing a measure for time spent on Facebook or to assess problematic Facebook use, a cautionary approach might be considered as different measures may lead to different patterns of findings. Furthermore, future studies might want to develop a comprehensive measure of problematic Facebook use that could cover all aspects in each existing measure; this would help overcome the current problem of inconsistent directions being observed in associations.

 Finally, future studies may also examine the Big-five personality traits in terms of the underlying common variance encoded within the framework of two personality meta-traits: stability (conscientiousness, neuroticism, and agreeableness) and plasticity (extraversion and openness to experience). Plasticity is associated with an individual's urge to absorb novel environmental experiences (engagement). Stability is related to maintaining a consistent blend of behavioral and psychological activity (satiety and restraint of behavior). These characteristics are also associated with the activity of the serotonergic and dopaminergic neurotransmitter systems, respectively (DeYoung, Peterson, & Higgins, 2002). See Hirsh, DeYoung, and Peterson (2009) and DeYoung (2006) for further information on the big-two personality meta-traits. In addition, comparing individuals with high and low levels of each personality trait may highlight moderators and covariates that could underlie the observed differences.

**Conclusions**

Overall, regarding the association between the Big-five personality traits and problematic Facebook use it could be concluded that different samples and measures demonstrate different patterns of association in terms of strength and direction, thus, definitive conclusions cannot be reached. A more robust conceptualization and measurement of problematic Facebook use and time spent on Facebook are required to progress research in the area.

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Figure 1: Flow diagram of the search.

**Identification**

Title/abstracts from databases

 (*n* = 9046)

Title/abstracts

From manual search

(*n* = 3)

**Screening**

Studies included in

meta-analysis

(*n* = 78)

(425 effect-sizes)

Records excluded (*n* = 611)

-were not pertinent;

-not met the inclusion criteria.

- Information was not available to determine the effect size.

Records excluded based on title and abstract

(*n* = 8359)

-

Abstracts/articles screened

(*n* = 9049)

Full-text articles assessed for eligibility

(*n* = 690)

**Eligibility**

**Included**

Table1. *The Big-five personality traits and time spent on Facebook (mixed-effects analysis)*.

|  |
| --- |
| *Daily Hours as measured by hours/day* |
|  | **Effect-sizes and 95% interval** |  **Odds Ratio** |  **Heterogeneity** | **Prediction interval** | **Omnibus test** |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 11 | 4,194 | 0.006 | -0.03 | 0.04 | 1.02 [0.88, 1.19] | 17.4 (10) | 42.7 | 0.002 | -.10 | .11 | 27.1 (4) = 0.01 |
| C | 12 | 4,392 | -0.068 | -0.12 | -0.01 | 0.78 [0.63, 0.96] | 38.7 (11) | 71.5 | 0.007 | -.25 | .12 |
| E | 22 | 7,157 | 0.085 | 0.04 | 0.12 | 1.36 [1.16, 1.59] | 69.7 (21) | 69.9 | 0.007 | -.09 | .25 |
| N | 19 | 6,586 | 0.083 | 0.04 | 0.11 | 1.35 [1.19, 1.54] | 38.1 (18) | 52.8 | 0.003 | -.03 | .19 |
| O | 11 | 4,194 | 0.003 | -0.05 | 0.06 | 1.01 [0.82, 1.25] | 35.5 (10) | 71.8 | 0.007 | -.19 | .20 |
| *Weekly Hours as measured by hours/week* |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 5 | 1,749 | 0.02 | -0.07 | 0.11 | 1.09 [0.79, 1.50] | 11.1 (4) | 64.1 | 0.083 | -.72 | .73 | 16.9 (4) = 0.01 |
| C | 5 | 1,749 | -0.05 | -0.09 | 0.00 | 0.84 [0.71, 1.00] | 2.9 (4) | 0.0 | 0.000 | -.13 | .03 |
| E | 5 | 1,749 | 0.09 | 0.02 | 0.17 | 1.41 [1.06, 1.86] | 8.3 (4) | 51.9 | 0.051 | -.56 | .67 |
| N | 5 | 1,749 | 0.08 | 0.03 | 0.12 | 1.33 [1.12, 1.57] | 1.2 (4) | 0.0 | 0.000 | .01 | .14 |
| O | 5 | 1,749 | 0.05 | -0.09 | 0.18 | 1.18 [0.73, 1.91] | 24.7 (4) | 83.8 | 0.244 | -.91 | .92 |
| *Daily hours-as measured by FBI* |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 12 | 3,947 | 0.02 | -0.06 | 0.11 | 1.09 [0.79, 1.51] | 77.2 (11) | 85.8 | 0.020 | -.30 | .33 | 17.3 (4) = 0.01 |
| C | 13 | 4,070 | 0.03 | -0.02 | 0.08 | 1.12 [0.93, 1.34] | 26.2 (12) | 54.2 | 0.004 | -.11 | .17 |
| E | 16 | 5,774 | 0.14 | 0.09 | 0.20 | 1.70 [1.39, 2.08] | 57.6 (15) | 73.9 | 0.008 | -.06 | .33 |
| N | 13 | 4,114 | 0.03 | -0.04 | 0.10 | 1.11 [0.86, 1.43] | 54.5 (12) | 78.0 | 0.012 | -.22 | .27 |
| O | 11 | 3,559 | -0.03 | -0.09 | 0.04 | 0.91 [0.71, 1.17] | 36.0 (10) | 72.2 | 0.009 | -.25 | .19 |
| *Daily hours-as measured by FIQ* |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 8 | 2,628 | -0.10 | -0.17 | -0.04 | 0.69 [0.54, 0.87] | 19.8 (7) | 64.6 | 0.006 | -.29 | .10 | 146.9 (4) = 0.01 |
| C | 8 | 2,628 | -0.18 | -0.27 | -0.09 | 0.51 [0.36, 0.71] | 39.3 (7) | 82.2 | 0.014 | -.45 | .12 |
| E | 8 | 2,628 | -0.02 | -0.09 | 0.05 | 0.93 [0.73, 1.20] | 21.7 (7) | 67.8 | 0.007 | -.23 | .19 |
| N | 8 | 2,628 | 0.23 | 0.19 | 0.26 | 2.32 [2.01, 2.68] | 6.8 (7) | 0.0 | 0.000 | .19 | .26 |
| O | 8 | 2,628 | -0.12 | -0.21 | -0.02 | 0.65 [0.47, 0.91] | 40.7 (7) | 82.8 | 0.015 | -.41 | .20 |

Table 2. *The Big-five personality traits and problematic and compensatory Facebook use (mixed-effects analysis)*.

|  |
| --- |
| *Problematic Facebook Use---pooled measurement* |
|  | **Effect-sizes and 95% interval** |  **Odds Ratio** |  **Heterogeneity** | **Prediction interval** | **Omnibus test** |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 36 | 19,780 | -0.06 | -0.09 | -0.03 | 0.81 [0.73, 0.91] | 148.2 (35) | 76.4 | 0.006 | -.21 | .10 | 84.8 (4) = 0.01 |
| C | 36 | 19,780 | -0.15 | -0.19 | -0.12 | 0.57 [0.50, 0.65] | 220.8 (35) | 84.1 | 0.010 | -.34 | .05 |
| E | 39 | 21,185 | -0.05 | -0.09 | 0.00 | 0.85 [0.73, 0.99] | 424.1 (38) | 91.0 | 0.019 | -.32 | .22 |
| N | 41 | 22,142 | 0.17 | 0.11 | 0.23 | 1.89 [1.55, 2.32] | 731.1 (40) | 94.5 | 0.033 | -.19 | .49 |
| O | 33 | 19,175 | -0.06 | -0.09 | -0.02 | 0.82 [0.72, 0.93] | 182.8 (32) | 82.5 | 0.008 | -.24 | .12 |
| *Problematic Facebook Use as measured by BFAS* |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 19 | 8,074 | -0.04 | -0.09 | 0.01 | 0.88 [0.73, 1.05] | 81.9 (18) | 78.0 | 0.009 | -.24 | .16 | 57.6 (4) = 0.01 |
| C | 19 | 8,074 | -0.17 | -0.21 | -0.13 | 0.53 [0.45, 0.63] | 61.2 (18) | 70.6 | 0.006 | -.32 | -.01 |
| E | 21 | 8,385 | 0.01 | -0.04 | 0.04 | 0.99 [0.86, 1.14] | 54.4 (20) | 63.2 | 0.005 | -.14 | .16 |
| N | 22 | 8,600 | 0.18 | 0.08 | 0.28 | 1.99 [1.42, 2.78] | 440.3 (21) | 95.2 | 0.053 | -.30 | .58 |
| O | 17 | 7,712 | -0.08 | -0.11 | -0.04 | 0.76 [0.66, 0.87] | 36.4 (16) | 56.0 | 0.003 | -.20 | .04 |
| *Problematic Facebook Use as measured by PSAFU---Addiction subscale* |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 7 | 2,436 | -0.11 | -0.15 | -0.07 | 0.68 [0.58, 0.78] | 3.6 (6) | 0.0 | 0.000 | -.16 | -.05 | 186.1 (4) = 0.01 |
| C | 7 | 2,436 | -0.25 | -0.29 | -0.21 | 0.39 [0.34, 0.46] | 6.1 (6) | 1.2 | 0.100 | -.78 | .50 |
| E | 7 | 2,436 | -0.18 | -0.39 | 0.06 | 0.49 [0.24, 1.02] | 211.0 (6) | 97.2 | 0.002 | -.47 | .15 |
| N | 7 | 2,436 | 0.20 | 0.15 | 0.25 | 2.11 [1.73, 2.58] | 10.7 (6) | 44.1 | 0.005 | .01 | .37 |
| O | 7 | 2,436 | -0.03 | -0.09 | 0.04 | 0.91 [0.71, 1.17] | 16.8 (6) | 64.4 | 0.000 | -.12 | .06 |
| *Compensatory Facebook Use as measured by PSAFU---Compensation subscale* |
| **Domain** | *K* | *n* | *r* | Ll | Ul | *OR [LI, UI]* | *Q*-value (*df*) | *I2* | *T2* | Ll | Ul | *Q*(*df*) *P*-value |
| A | 7 | 2,436 | -0.14 | -0.20 | -0.07 | 0.61 [0.48, 0.77] | 15.6 (6) | 61.6 | 0.005 | -.33 | .06 | 246 (4) = 0.01 |
| C | 7 | 2,436 | -0.18 | -0.24 | -0.13 | 0.51 [0.42, 0.62] | 11.4 (6) | 47.3 | 0.003 | -.32 | -.02 |
| E | 7 | 2,436 | -0.29 | -0.35 | -0.24 | 0.33 [0.26, 0.42] | 14.4 (6) | 58.2 | 0.004 | -.44 | -.12 |
| N | 7 | 2,436 | 0.20 | 0.16 | 0.24 | 2.08 [1.80, 2.41] | 5.6 (6) | 0.0 | 0.000 | .14 | .25 |
| O | 7 | 2,436 | -0.08 | -0.14 | -0.02 | 0.75 [0.60, 0.94] | 14.6 (6) | 59.0 | 0.004 | -.25 | .10 |

Table 3. *The specificities of the studies/samples included in the current systematic review/meta-analysis.*

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Study** | **Sample size** | **Sample type** | **Female %** | **Mean age (sd)** | **Country** | **Document type** | **Outcome** |
| 01 | Abbasi & Drouin, 2019 | 742 | General population | 63.88% | 27 (10.49) | USA, India, Pakistan, UK, Canada, other | Journal article | PFU |
| 02 | Acopio & Bance, 2016 | 338 | Student | 34.32% | 17 | Philippines | Journal article | Time |
| 03 | Ahmad & Iqbal, 2021 | 86 | Student | 50.00% | 22 | Pakistan | Journal article | PFU |
| 04 | Andreassen et al., 2013 | 218 | Student | 78.44% | 21 (3) | Norway | Journal article | PFU |
| 05 | Atroszko et al., 2018 | 1157 | Student | 51.90% | 20 (1.68) | Poland | Journal article | PFU |
| 06 | Atroszko et al., 2021 | 327 | Student | 58.10% | 21 (1.66) | Poland | Journal article  | PFU |
| 07 | Balcerowska et al., 2020 | 1099 | General population | 71.90% | 21 (2.85) | Poland | Journal article  | PFU |
| 08 | Biolcati et al., 2018 | 755 | General population | 80.30% | 25 (4.18) | Italy | Journal article | PFU |
| 09\_1 | Błachnio & Przepiorka, 2016 – study 1 | 631 | General population & student | 64.00% | 22 (6.24) | Poland | Journal article | PFU |
| 09\_2 | Błachnio & Przepiorka, 2016 – study 2 | 452 | General population & student  | 67.00% | 21 (3.95) | Poland | Journal article | PFU |
| 10\_1 | Błachnio et al., 2016 | 388 | General population | 63.00% | 19 (1.34) | China  | Journal article | Time |
| 10\_2 | Błachnio et al., 2016 | 253 | General population | 40.00% | 27 (9.05) | Greece | Journal article | Time |
| 10\_3 | Błachnio et al., 2016 | 311 | General population | 81.00% | 32 (13.7) | Israel  | Journal article | Time |
| 10\_4 | Błachnio et al., 2016 | 317 | General population | 67.00% | 25 (6.52) | Italy | Journal article | Time |
| 10\_5 | Błachnio et al., 2016 | 453 | General population | 52.00% | 35 (13.74) | Poland  | Journal article | Time |
| 10\_6 | Błachnio et al., 2016 | 273 | General population | 46.00% | 20 (1.83) | Romania  | Journal article | Time |
| 10\_7 | Błachnio et al., 2016 | 395 | General population | 69.00% | 24 (5.99) | Turkey | Journal article | Time |
| 10\_8 | Błachnio et al., 2016 | 238 | General population | 72.00% | 24 (10.96) | USA | Journal article | Time |
| 11\_1 | Błachnio et al., 2017 | 350 |  | 67.00% | 21 (2.87) | Poland  | Journal article | PFU |
| 11\_2 | Błachnio et al., 2017 | 320 |  | 66.00% | 22 (3.63) | Turkey | Journal article | PFU |
| 11\_3 | Błachnio et al., 2017 | 341 |  | 66.00% | 22 (2.77) | Ukrain | Journal article | PFU |
|  | **Study** | **Sample Size** | **Sample Type** | **Female %** | **Mean Age (sd)** | **Country** | **Document Type** | **Outcome** |
| 12\_1 | Bodroža & Jovanović, 2016  | 445 | General population | 79.10% | 27 (6.35) | Serbia  | Journal article | Compensatory FU, PFU |
| 12\_2 | Bodroža & Jovanović, 2016  | 359 | Student | 79.40% | 21 (2.96) | Serbia  | Journal article | Compensatory FU, PFU |
| 13 | Boudreaux, 2022 | 71 | General population | 89.00% | 48 | USA | Thesis/dissertation | PFU |
| 14 | Brodbeck, 2018 | 198 | Student | 74.00% | 19 (1.32) | USA | Thesis/dissertation | Time |
| 15 | Caci, 2017 | 300 | General population | 49.00% | 46 (16.4) | Italy  | Journal article | PFU |
| 16 | Charzyńska et al., 2021 | 1157 | Student | 51.90% | 20 (1.68) | Poland  | Journal article | PFU |
| 17 | Chen et al., 2015 | 354 | General population | 48.90% | 27 | Indonesia, Thailand, Taiwan, Vietnam, the Philippines | Journal article | Time |
| 18 | Chen, 2014 | 209 | General population | 71.30% | 20 (3.72) | USA | Journal article | Time |
| 19 | Chow & Wan, 2017 | 282 | General population | 30.85% | 33 (10.1) | Hong Kong | Journal article | Time |
| 20 | Coco et al., 2018 | 811 | General population | 74.72% | 24 (5.96) | Italy  | Journal article | Time |
| 21 | El-Tah & Jaradat, 2018 | 243 | Student | 62.10% | 19 | Jordan | Journal article | Time |
| 22 | Eşkisu et al., 2017 | 492 | Student | 72.35% | 20 (2.7) | Turkey | Journal article | Time |
| 23 | Garcia & Sikström, 2014 | 304 | General population | 56.57% | 26 (7.52) | USA | Journal article | Time |
| 24 | Glynn et al., 2012 | 1050 | General population | 61.00% | 39 (14.8) | USA | Journal article | Time |
| 25 | Gosling et al., 2011 | 159 | Student | 68.00% |  | USA | Journal article | Time |
| 26\_1 | Hart et al., 2015 - study 1 | 267 | General population | 43.82% | 33 (10.94) | USA, India & other countries | Journal article | Time |
| 26\_1 | Hart et al., 2015 – study 2  | 316 | General population | 43.82% | 33 (11.62) | USA, India & other countries | Journal article | Time |
| 27 | Hatzithomas et al., 2019 | 367 | Student | 59.00% |  | Greece | Journal article | Time |
| 28 | Hong et al., 2014  | 215 | Student | 45.60% |  | Taiwan | Journal article | Time |
| 29 | Horzum et al., 2021 | 981 | Student | 73.10% | 21 (2.39) | Turkey | Journal article | PFU |
| 30 | Hussain et al., 2019 | 69 | General population | 68.10% | 23 (7.54) | UK | Journal article | PFU |
| 31 | Jenkins-Guarnieri et al., 2012 | 463 | Student | 75.00% | 18 | USA | Journal article | Time |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Study** | **Sample size** | **Sample type** | **Female %** | **Mean age (sd)** | **Country** | **Document type** | **Outcome** |
| 32\_1 | Jovanović et al., 2022 | 268 | Student  | 82.60% | 22 (2.18) | Croatia  | Journal article | Compensatory FU, PFU |
| 32\_2 | Jovanović et al., 2022 | 311 | General population | 41.50% | 30 (6.37) | Iran  | Journal article | Compensatory FU, PFU |
| 32\_3 | Jovanović et al., 2022 | 429 | Student  | 50.10% | 22 (3.05) | Italy  | Journal article | Compensatory FU, PFU |
| 32-4 | Jovanović et al., 2022 | 373 | Student  | 70.80% | 22 (2.39) | Serbia  | Journal article | Compensatory FU, PFU |
| 32\_5 | Jovanović et al., 2022 | 251 | Student | 82.90% | 24 (7.76) | UK | Journal article | Compensatory FU, PFU |
| 33 | Kessler, 2013 | 415 | Student | 58.79% | 20 | USA | Thesis/dissertation | Time |
| 34 | Koban et al., 2018 | 256 | General population | 74.21% | 24 (5.57) | Germany | Journal article | Time |
| 35 | Kotkavuori, 2015 | 487 | General population | 72.00% | 28 (6.98) | Finland  | Thesis/dissertation | Time |
| 36 | Lee et al., 2012 | 234 | Student  | 69.20% | 20 (1.14) | USA | Journal article | Time |
| 37 | Lee, 2015 | 276 | Student  | 56.00% | 22 (6.1) | USA | Journal article | PFU |
| 38 | Lee, 2019 | 204 | Student | 60.00% | 23 (3.43) | Malaysia | Journal article | PFU |
| 39 | Lee-Won et al., 2014 | 320 | Student | 64.95% | 21 (1.46) | USA, South Korea | Journal article | Time |
| 40 | Lee-Won et al., 2015 | 243 | Student | 71.60% | 20 (1.12) | USA | Journal article | PFU |
| 41 | Lin et al., 2012 | 195 | Student | 49.70%  | 26 | USA | Journal article | Time |
| 42 | Lin et al., 2017 | 940 | General population |  | 37 | USA | Journal article | Time |
| 43 | Mahmood & Farooq, 2014 | 150 | Student | 47.30% | 23 | Pakistan | Journal article | PFU |
| 44 | Mangalagiri & Kadiyala, 2019 | 131 | Student | 61.80% | 24 (3.35) | India  | Journal article | PFU |
| 45 | Marengo, Poletti et al., 2020 | 1094 | Student | 72.00% |  | Italy  | Journal article | PFU |
| 46 | Marino et al., 2016 (a) | 967 | Student  | 37.70% | 17 (1.48) | Italy  | Journal article | PFU |
| 47 | Marino et al., 2016 (b) | 815 | Student | 77.10% | 21 (2.15) | Italy  | Journal article | PFU |
| 48 | Marshall et al., 2015 | 555 | General population | 59.00% | 31 (9.19) | USA | Journal article |  |
| 49 | Miceli et al., 2021 | 248 | Student  | 66.00% | 22 (4.4) | Italy  | Journal article | PFU |
| 50 | Michikyan et al., 2014 | 261 | Student  | 74.71% | 22 (2.76) | USA | Journal article | Time |
|  | **Study** | **Sample size** | **Sample type** | **Female %** | **Mean age (sd)** | **Country** | **Document type** | **Outcome** |
| 51 | Mishra et al., 2014 | 105 | Student  | 48.60% |  | USA | Journal article | Time |
| 52 | Moore & McElroy, 2012 | 204 | Student  | 37.00% |  | USA | Journal article | Time |
| 53 | Murphy, 2013 | 167 | Student  | 56.88% |  | Irland  | Thesis/dissertation | Time |
| 54 | O'Hagan, 2013 | 156 | General population | 55.10% |  | Irland  | Thesis/dissertation | Time |
| 55 | O'Hanlon, 2014 | 70 | Student | 52.50% | 26 (4.28) | Irland  | Thesis/dissertation | Time |
| 56 | Orosz et al., 2016 - study 3 | 531 |  | 74.00% | 24 (7.29) | Hungary | Journal article | PFU |
| 57 | Pal et al., 2018 | 359 | Student | 56.20% |  | India  | Journal article | Time |
| 58 | Petrocchi et al., 2015 | 96 | Student | 76.00% |  | USA | Journal article | Time |
| 59 | Pornsakulvanich, 2017 | 460 | General population | 66.00% |  | Thailand  | Journal article | Time |
| 60 | Rajesh & Rangaiah, 2020 | 114 | General population | 31.60% |  | India  | Journal article | PFU |
| 61 | Scherr & Brunet, 2017 | 510 | General population | 74.00% | 29 (10) | Germany | Journal article | Time |
| 62 | Seidman, 2013 | 184 | Student | 72.28% | 20 (1.56) | USA | Journal article | Time |
| 63 | Seidman, 2019 | 257 | General population | 58.50% | 33 (9.18) | USA | Journal article | Time |
| 64 | Sheldon et al., 2021 | 337 | Student | 57.27% | 23 (8.08) | USA | Journal article | PFU |
| 65 | Simoncic et al., 2014 | 237 | Student | 47.25% | 19 (0.98) | USA | Journal article | Time |
| 66 | Sindermann et al., 2020 (a) | 3835 | General population | 38.30% | 32 (11.82) | Germany | Journal article | PFU |
| 67 | Sindermann et al., 2020 (b) | 355 | General population | 30.42% | 25 (8.08) | France, Poland, Austria | Journal article | PFU |
| 68 | Smith-Duff, 2012 | 188 | Student | 57.97% | 24 | Irland  | Thesis/dissertation | Time |
| 69 | Steers et al., 2016 | 280 | Student | 70.00% | 23 (5.88) | USA | Journal article | Time |
| 70 | Sulaiman et al., 2018 | 994 | Student | 62.20% |  | Malaysia | Journal article | Time |
| 71 | Suresh, 2013 | 97 | General population | 55.00% | 26 | India  | Journal article | Time |
| 72 | Tang et al., 2016 | 894 | Student | 65.00% |  | Taiwan | Journal article | PFU |
| 73 | Turel et al., 2018 | 215 | Student  | 73.84% | 27 | Israel  | Journal article | PFU |
|  | **Study** | **Sample size** | **Sample type** | **Female %** | **Mean age (sd)** | **Country** | **Document type** | **Outcome** |
| 74 | Van der Schyff et al., 2020 | 567 | General population | 51.40% |  | USA | Journal article | Time |
| 75 | Weiqin et al., 2016 | 281 | Student | 72.60% | 20 (2.15) | Autralia  | Journal article | Time |
| 76 | Wheeler, 2018 | 240 | Student | 55.90% |  | South Africa  | Thesis/dissertation | PFU |
| 77 | Yao, 2015 | 39 | Student | 66.66% |  | USA | Journal article | Time |
| 78 | Zabawska, 2013 | 123 | General population | 56.90% | 34 (10.4) | Irland  | Thesis/dissertation | Time |

Time = Time Spent on Facebook; PFU = Problematic Facebook Use; Compensatory FU = Compensatory Facebook Use