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Personality does not Determine Internet Addiction: A Meta-Analysis

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Abstract

Internet addiction (IA) is the disruption of a person's life because of the excessive use of the Internet. Severe IA can contribute to relationship conflicts, poor well-being, and low productivity. Research has found that IA can be attributed to maladaptive thinking and specific personality traits and with the Big Five in particular. However, the results of previous studies have been somewhat inconsistent, with previous meta-analytical research showing insignificant correlations. This study was a replication of a previous meta-analytic study and sought to improve the accuracy and the reliability of previous findings using different and larger samples. A total of 11 studies with 16 correlations and 8,481 participants were examined for this study. It was found that the Big Five had insignificant correlations ($r = -0.233$–0.061) with medium to high heterogeneity (I^2 = 70.7% to 96.8%) and no publication bias (E = 0.725), which was consistent with previous meta-analytical studies and implied that personality gave only a small contribution to IA behavior. Instrumental differences in the measurement of IA and personality (Big Five) and the participant sample characteristics were the main weaknesses in this meta-analysis.

Perilaku Internet Addiction Tidak Dibentuk oleh Tipe Kepribadian: Meta-analisis

Abstrak

Internet addiction (IA) adalah penggunaan Internet berlebihan yang mengganggu kehidupan pribadi seseorang. Dalam tingkat yang parah, IA menimbulkan konflik dalam relasi, menurunkan kesejahteraan hidup serta produktivitas kinerja. Penelitian sebelumnya menemukan bahwa IA disebabkan oleh proses kognisi maladaptif yang dikaitkan dengan ciri-ciri kepribadian tertentu, terutama dengan kepribadian *Big Five*. Namun, hasil penelitian sebelumnya ditemukan tidak konsisten. Penelitian meta-analitik terdahulu bahkan menunjukkan korelasi yang tidak signifikan. Meta-analisis ini merupakan replikasi penelitian sebelumnya yang bertujuan untuk meningkatkan akurasi dan reliabilitas menggunakan sampel yang berbeda dan lebih besar. Penelitian melibatkan 11 studi dengan 16 nilai korelasi dengan total 8.481 peserta. Hasil penelitian konsisten dengan penelitian sebelumnya yang menunjukkan bahwa Big Five memiliki korelasi yang tidak signifikan (r = -0,233 - 0,061), dengan heterogenitas sedang hingga tinggi (I^2 = 70.7% - 96.8%), tanpa bias publikasi (E = 0,725) dan menyiratkan bahwa kepribadian memiliki kontribusi yang relatif kecil dalam membentuk perilaku IA. Perbedaan alat ukur IA dan kepribadian (*Big five*), serta variasi karakteristik sampel partisipan menjadi kelemahan utama dalam analisis meta-analisis ini.

Keywords: big five, internet addiction, meta-analysis, personality

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1. Introduction

Internet addiction (IA) is a dependency on the Internet that can disturb normal life. IA has been observed to have similar characteristics and symptoms to other addictive pathological addictions such as gambling and alcoholism (Young, 1996): (1) a preoccupation with the use of Internet; (2) a loss of self-control and unsuccessful restrictions on Internet use; (3) mood changes when disengaged; (4) withdrawal symptoms when not connected; (5) increased tolerance and needing more time to feel satisfied; and (6) a need to continue using the Internet despite negative consequences (Cash, Rae, Steel, & Winkler, 2012).

Internet addicts also often experience relationship problems with their family members (Xin et al., 2018; Young, 1999; Zhou et al., 2017), students with IA often have negative relationships with their teachers and have poor academic achievements (Cash et al., 2012; Xin et al., 2018), and adults with IA may have reduced productivity because of their excessive Internet use for non-work-related activities. Other research has found that higher IA was also related to lower well-being (Çikrıkci, 2016; Stead & Bibby, 2017).

IA studies have been conducted in many countries around the world, which implies that IA is ubiquitous wherever the Internet is available. The global IA prevalence rate has been estimated at around 6%, with the overall global range being between 2.6% and 26.5% (Cheng & Li, 2014; Xin et al., 2018). A study of IA in five Asian countries (China, Hong Kong, India, South Korea, and Taiwan) reported a 7.1% prevalence rate, which was slightly higher than the worldwide average (Cheng & Li, 2014). The Indonesian prevalence rate has also been reported as being between mild and medium; however, no specific percentages have been reported (Sari, Ilyas, & Ifdil, 2018).

Cognitive–behavioral models could be used to explain IA, as it is surmised to be related to a combination of identified individual psychopathologies (such as depression, social anxiety, or substance dependence) and the experience of interacting with new Internet technology. Because these etiologies respond positively to behavior reinforcement, people seek the same response they received from the initial event. However, once reinforcement has been established, maladaptive cognition can develop, with people who have self-doubt, low self-efficacy, and a negative self-image thinking that they can only be the best version of themselves on the Internet. The lack of social support from family or friends can also exacerbate IA symptoms, which means that addicts often waste a lot of time on the Internet for no specific reason. Addicts, however, often feel guilty about the time they spend on the Internet, but when they try to unsuccessfully stop, they suffer a decreased sense of self-worth and increased IA symptoms (Davis, 2001).

Biological research has found that people with addictive behaviors generally have insufficient dopamine receptors or a lack of serotonin or dopamine, which are the substances in our brains that trigger pleasure (Cash et al., 2012), which may explain why IA has been associated with certain personality traits: high sensation-seeking tendencies, some psychotic behaviors, low self-directedness, and increased interpersonal conflicts (Grant et al., 2010).

One of the most frequently used personality assessment theories has been the Big Five, which is also referred to as the Five Factor Model (FFM). This theory was developed by McCrae and Costa Jr. (2008) and classifies personality traits into five dimensions: (1) conscientiousness (being organized and prompt); (2) neuroticism (being nervous and anxiety prone); (3) openness (being imaginative and intellectually oriented); (4) extroversion (being talkative and outgoing); and (5) agreeableness (being sympathetic and warm) (Andreassen et al., 2013).

However, the contribution of personality to IA has been the subject of considerable debate, with some research finding that personality had a meaningful relationship with IA and should be used in initial IA prevention screening (Celik, Atak, & BaŞAl, 2012; Sahraian, Hedayati, Mani, & Hedayati, 2016) and others finding the opposite. Buckner et al. (2012) assessed 170 employees and found that the FFM did not predict pathological Internet use; therefore, the role of personality as an IA predictive factor remains unclear.

Literature reviews have also found an inconsistent relationship between the Big Five and IA. Previous meta-analytic studies found that conscientiousness, extroversion, openness, and agreeableness were negatively correlated with IA and that neuroticism was positively correlated. In general, although all Big Five dimensions have been found to have significant relationships with IA, they had only small correlations (Kayiş et al., 2016).

On the basis of these previous findings, therefore, a meta-analysis replication was conducted to improve the results accuracy and reliability of previous research and to determine the extent to which the Big Five had meaningful correlations with IA in larger samples outside those from previous meta-analyses.

2. Methods

Literature Review. A comprehensive literature review was conducted to extract the relevant data from August to September 2018 using the "Science-Direct" and "Google Scholar" journal databases. Journal articles focused on the Big Five personality and IA were sought using the keywords "Big five," "personality," "internet addiction," "internet," "internet dependency," and "compulsive internet use," which were used independently and in combination to maximize the literature search range.

The literature screening was conducted in three steps: (1) the research title was evaluated to determine whether or not it contained two research variables; (2) duplicate titles were removed; and (3) research abstracts were examined. The papers that had suitable abstracts were collected for further screening based on the inclusion and exclusion criteria.

Inclusion and Exclusion. The extracted journal articles were assessed on the basis of the following inclusion criteria: (1) had gone through a peer-review process; (2) were published between 2008 and 2018; (3) were written in English; (4) reported the correlation coefficients (r) between each Big Five dimension and IA; and (5) reported the number of samples (n) and the participant characteristics. Incomplete data were excluded from the data analysis.

Data Processing. A meta-analysis is a statistical method that combines the results of other independent empirical research studies (Hedges, 1992). Most recent meta-analyses have employed the Hedges–Olkin method as it allows for pooled correlation values and identifies inconsistencies (I^2) and publication biases. The extracted relevant studies were summarized according to the author's name (including publication year), the country, the number of samples, the samples' mean age, the Big Five scale used, the IA scale used, and the Big Five correlation coefficient (r) with IA, all of which are summarized in Table 1.

The data (author names, year of publication, correlation coefficient (r) between Big Five and IA, and number of samples involved) were processed using the free trial version of the Stats Direct 3.0 statistical software, and statistical counting was individually carried out on each Big Five dimension. As the effect sizes varied across the studies, a random effects model was employed with a 95% confidence interval (CI), with the effect size correlations being revealed from the Hedges–Olkin random effects pooled correlation, which was considered low if it was <0.3, moderate if it was $0.3 \leq r < 0.49$ and high if $r \geq 0.5$.

The research heterogeneity was evaluated using Cochran's Q coefficient, which was calculated as the weighted sum of the squared differences between the individual study effects and the pooled effect across the studies. As the Cochran Q tends to have low power when determining heterogeneity and especially in small samples, I^2 statistics were used to describe the variation percentages due to heterogeneity rather than chance across the studies, with the greater the percentage, the greater the study heterogeneity. Unlike the Cochran Q, I^2 statistics are not determined by the number of samples. Publication bias can occur because of study quality, the hypotheses being tested, and the significance and direction of the detected effect and was assessed using a non-significant Egger bias value.

3. Results

From the literature review, 92 relevant studies were initially found; however, 56 were subsequently eliminated because of title duplication, 13 were eliminated because of irrelevant abstracts and research variables, 5 were eliminated because they did not include Big Five and IA correlation values (r), and 2 were eliminated as they did not measure IA variables. Therefore, after the exclusion process, there were 16 eligible studies. The study selection process is illustrated in Figure 1.

The current study involved 11 studies, which together had 16 eligible correlation coefficients (r) and 8,481 participants. The studies were from various countries in Asia and Europe and had been published between 2012 and 2018. The individual sample sizes ranged from 140 to 1,189, the Big Five statistical measures used were TIPI, Neo FFI, and BFI (both short and full versions), and the IA statistical measures employed were IAT, YDQ, IADQ, PIU, s-IAT, Bergen's, and IAS. Pearson's correlation coefficients (r) for each study are given in Table 1.

The data were processed using the free trial version of the Stats Direct 3.0 statistical software. The obtained data processing results were the pooled correlation coefficients using a random effect size model with a 95% CI, inconsistency (I^2), heterogeneity (Cochran Q), and the Egger publication bias. The statistical meta-analysis calculation results are presented in Table 2.

Effect size correlation and CI. In general, all Big Five dimensions were found to have significant effect size correlations for IA behavior, with openness, conscientiousness, extraversion, and agreeableness having negative relationships and neuroticism having a positive relationship with IA.

Openness and IA had the lowest effect size correlations of the Big Five dimensions (r=−0.056) with a 95% CI from −0.097 to −0.015 (figure 2). Although conscientiousness and IA had the greatest effect size correlations, it was still relatively low (r = −0.233) with a CI from −0.283 to −0.183 (figure 3). Extroversion and IA had a significant but relatively low correlation (r = −0.081) with a CI from −0.129 to −0.034 (figure 4), agreeableness and IA also had a relatively low effect size correlation (r = −0.171) with a CI from −0.233 to −0.107 (figure 5), and neuroticism had a weak effect size correlation (r = 0.061) with a CI from −0.060 to 0.182 (figure 6).

Data consistency, heterogeneity, and publication bias. The I^2 statistical test showed moderate inconsistencies for openness (70.7%) and high inconsistencies for the other four dimensions, with neuroticism being the least consistent (I^2 = 96.8%). These results were somewhat different from previous studies, in which moderate inconsistencies were found for openness and conscientiousness, and high inconsistencies were found for extraversion, agreeableness, and neuroticism (Kayiş et al., 2016). These variations in the results could be explained because of the differences in the numbers and characteristics in the obtained research data.

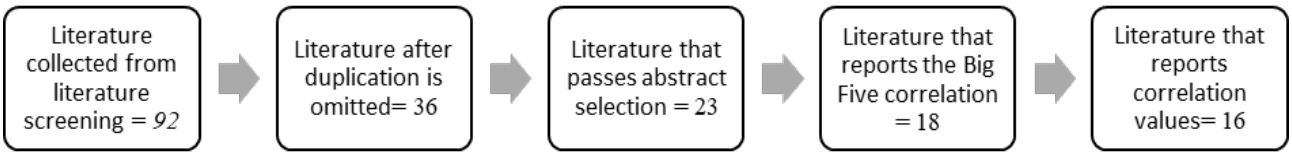

Figure 1. Journal article selection for the meta-analysis

Table 1. Summary of Literature Data

No	Study Name	Country	N	Mean Age	IA Scale	Big Five Scale	r				
							O	C	E	A	N
1	Celik et al., 2012	Turkey	210	N/A	IAT	TIPI	0.14	−0.2	−0.16	0.18	−0.17
2	Celik et al., 2012	German	411	20.7	s-IAT	Short BFI	−0.012	−0.192	−0.242	−0.03	0.219
3	Samarein, 2013	Poland	1,157	20.33	Bergen's	TIPI	−0.07	−0.07	0.04	−0.05	−0.15
4	Samarein, 2013	Iran	400	N/A	YDQ	Neo FFI	−0.01	−0.3	−0.19	−0.23	0.11
5	Błachnio & Przepiórka, 2016	Poland	452	21.04	IAT	TIPI	−0.19	−0.23	−0.08	−0.17	−0.12
6	Sahraian et al., 2016	Iran	278	N/A	IAT	Neo FFI	0.043	−0.21	−0.118	−0.379	0.2
7	Saini et al., 2016	India	140	30.56	IAT	Short BFI	0.08	−0.2	0.01	−0.08	−0.02
8	Zhou et al., 2016	China	998	15.15	IADQ	BFI	−0.07	−0.35	−0.07	−0.22	0.33
9	Blachnio et al., 2017	Turkey	320	21.94	IAT	TIPI	−0.15	−0.3	−0.18	−0.08	−0.19
10	Blachnio et al., 2017	Ukraine	341	21.7	IAT	TIPI	−0.05	−0.31	0.14	−0.04	−0.24
11	Blachnio et al., 2017	Poland	350	20.87	IAT	TIPI	−0.2	−0.22	−0.08	−0.12	−0.2
12	Olowodunoye et al., 2017	Nigeria	300	N/A	IAT	BFI	−0.2	−0.38	−0.03	−0.4	0.44
13	Stead & Bibby, 2017	NA	495	20.62	PIU	TIPI	−0.07	−0.11	−0.15	−0.1	−0.3
14	Zhou et al., 2017	China	1,189	14.43	IADQ	BFI	−0.01	−0.21	0.01	−0.15	0.23
15	Kircaburun & Griffiths, 2018	Turkey	752	20.3	IAS	Short BFI	0.02	−0.11	−0.01	−0.19	0.11
16	Stodt et al., 2018	China	410	20.72	s-IAT	Neo FFI	−0.16	−0.365	−0.186	−0.386	0.502

Note. IA = Internet Addiction, N/A= not applicable (mean age was not stated), IAT = Internet Addiction Test, YDQ = Diagnostic Questionnaire for Internet Addiction (adapted in Chinese), IAS = Instagram Addiction Scale, IADQ = Internet Addiction Diagnostic Questionnaire, PIU = Problematic Internet Use, TIPI = Ten Item Personality Inventory, BFI = Big Five Inventory, FFI = Five Factor Inventory, N = sample size, *r* = correlation, O = *openness*, C = *conscientiousness*, E = *extroversion*, A = *agreeableness*, N = *neuroticism/emotional stability.*

Table 2. Big Five and Internet Addiction Meta-Analysis Statistical Results

Big Five	r	95% CI	I^2 (%)	Q	Egger
O	−0.056**	−0.097; −0.015	70.7	54.56***	-
C	−0.233***	−0.283; −0.183	82.6	91.82***	-
E	−0.081***	−0.129; −0.034	78.6	74.89***	-
A	−0.171***	−0.233; −0.107	87.7	138.82***	-
N	0.061*	−0.060; 0.182	96.8	506.67***	0.752

Note. O = *openness*, C = *conscientiousness*, E = *extroversion*, A = *agreeableness*, N = *neuroticism*/*emotional stability*, r = correlation, Q = Cochran, I^2 = Inconsistency, *p < 0.5, **p < 0.1,***p < 0.001.

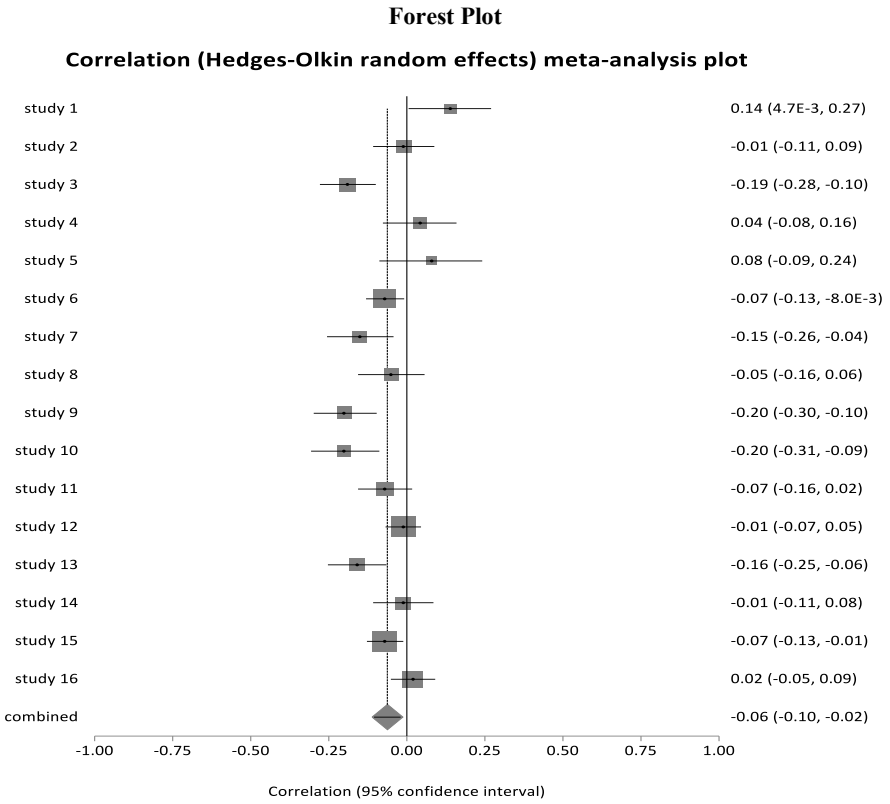

Figure 2. *Openness* forest plot

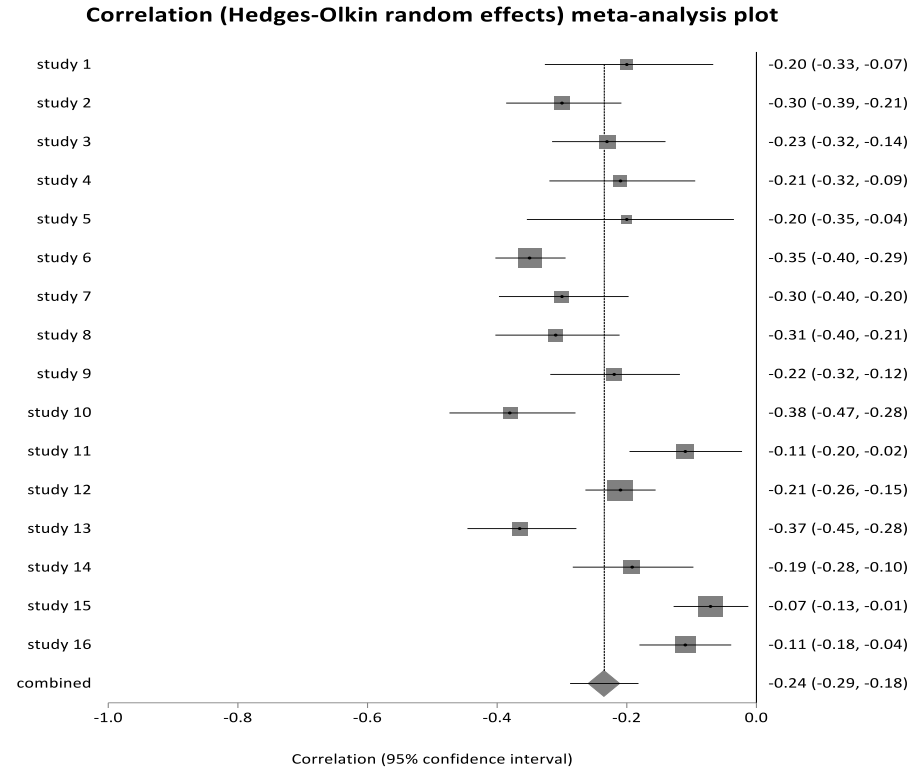

Figure 3. *Conscientiousness* forest plot

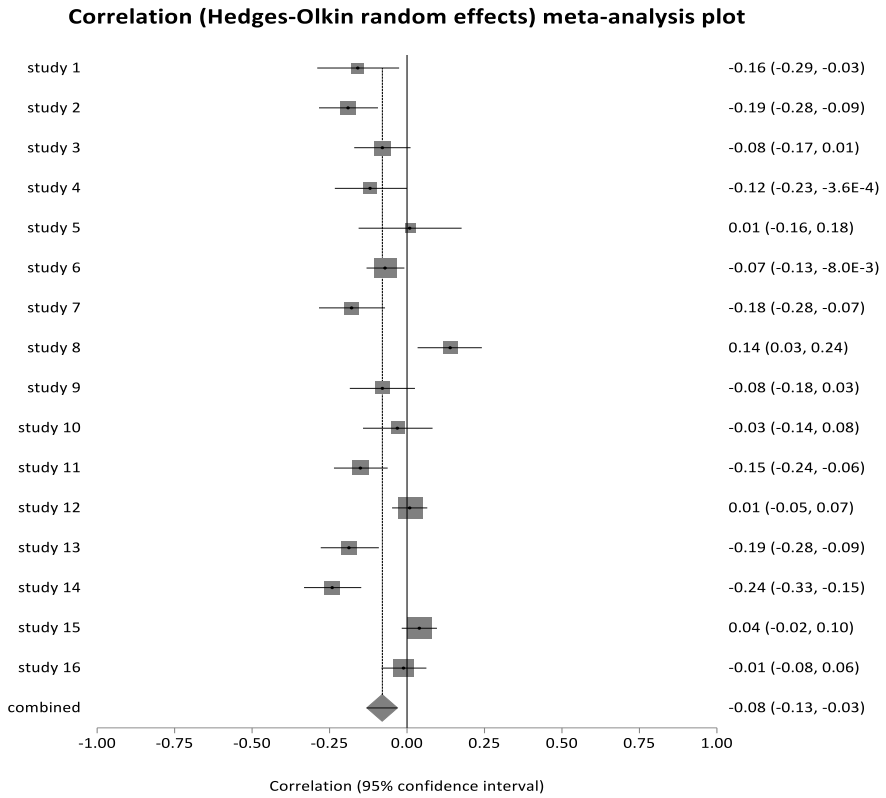

Figure 4. *Extroversion* forest plot

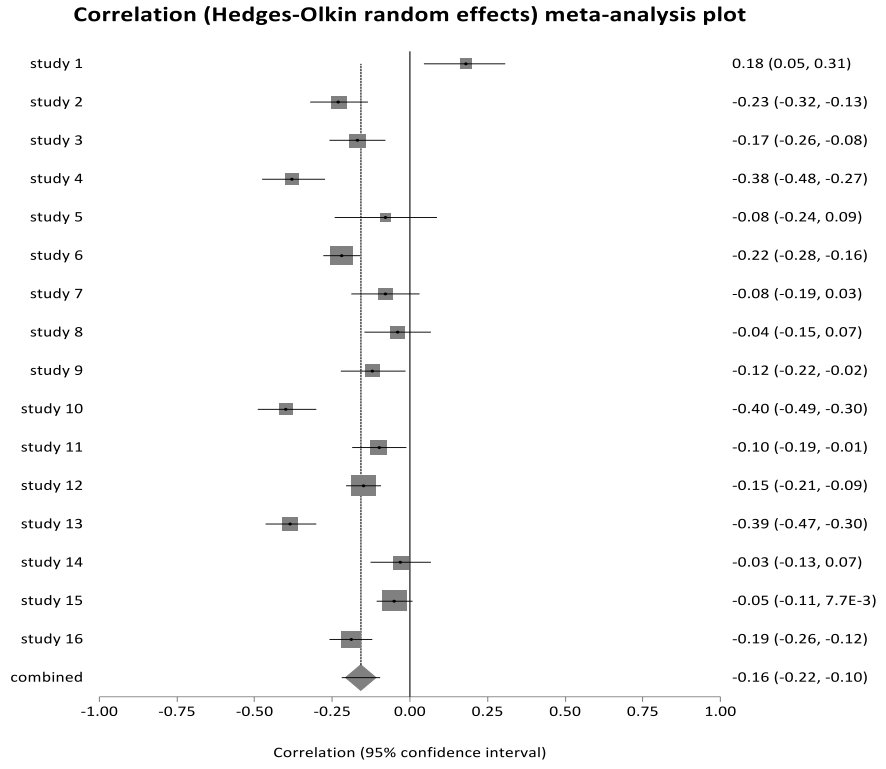

Figure 5. *Agreeableness* forest plot

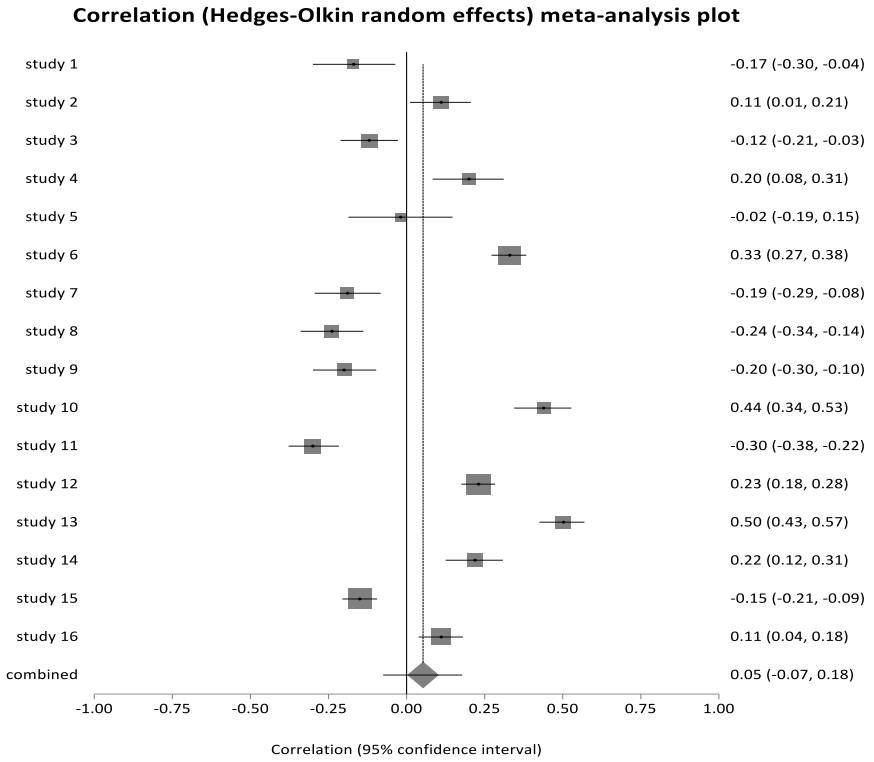

Figure 6. ***Neuroticism*** **forest plot**

The Cochran Q value also showed similar results to the I^2 value. Neuroticism had the highest Q value (Q = 506.67) indicating high heterogeneity, with the lowest Q value (Q = 54.56) being openness. Conscientiousness (Q = 91.82), extroversion (Q = 74.89), and agreeableness (Q = 138.82) were also found to show heterogeneity but were somewhat lower than that for neuroticism. The non-significant Egger's results for indicator bias indicated no bias, which meant that the publications did not depend on certain hypotheses, significances, or detected correlation effect directions.

4. Discussion

The present study sought to improve the statistical reliability of the correlations between the Big Five and IA because of the previous inconsistent findings; therefore, it was decided that a pooled effect size correlation from different independent empirical studies could better measure the combined correlations.

The literature review found that conscientiousness had the strongest correlation coefficient on IA behavior (Celik et al., 2012; Kircaburun & Griffiths, 2018; Saini, Baniya, Verma, Soni, & Kesharwani, 2016; Samarein et al., 2013; Zhou, Li, Li, Wang, & Zhao, 2016). Conscientiousness is associated with dutiful, responsible, reliable, and well-organized people (McCrae & John, 1992). People with a high degree of conscientiousness are generally able to maintain healthy behavior by being highly organized. However, a low degree of conscientiousness has been found to lead to excessive use tendencies such as addiction (Hussain & Pontes, 2018).

Neuroticism was another personality dimension that has been found to be strongly related to addictive behavior. Neurotic people are characterized by wide mood swings and feeling of anxiousness, instability, and self-pity (McCrae & John, 1992). Neuroticism was found to have small to medium significant correlation with IA, although some other studies reported insignificant results (Błachnio & Przepiórka, 2016; Błachnio, Przepiórka, Senol-Durak, Durak, & Sherstyuk, 2017; Stodt et al., 2018). The correlation direction itself, however, is still debatable; that is, although a majority of the studies reported a positive correlation (Błachnio & Przepiórka, 2016; Błachnio et al., 2017; Kircaburun & Griffiths, 2018; Olowodunoye, Olusa, & Adesina, 2017; Samarein et al., 2013; Stodt et al., 2018; Zhou et al., 2017), some others reported a negative correlation.

Openness is characterized as being artistic, imaginative, curious, and open-minded (Hussain & Pontes, 2018). Openness was found to have a significant meaningful negative correlation with IA in most studies (Atroszko et al., 2018; Celik et al., 2012; Saini et al., 2016; Zhou et al., 2016), but the correlation value was small;

however, a few studies reported a positive correlation (Celik et al., 2012; Kircaburun & Griffiths, 2018; Saini et al., 2016).

Agreeableness is characterized as being kind, sympathetic, generous, and forgiving. Agreeableness and IA were negatively correlated, with only one study showing a positive correlation (Celik et al., 2012). However, the relationship between agreeableness and IA was not significant, even though some studies indicated that they believed the relationship to be quite significant (Olowodunoye et al., 2017; Sahraian et al., 2016; Saini et al., 2016; Stead & Bibby, 2017; Stodt et al., 2018; Zhou et al., 2017, 2016).

Extraversion is related to how people interact with others, with high extraversion being characterized by a friendly, energetic, and optimistic attitude (Hussain & Pontes, 2018). This trait was reported to be significantly negatively correlated with IA in most studies with a relatively weak correlation coefficient. However, several studies found that there was no significant correlation between extraversion and IA (Atroszko et al., 2018; Olowodunoye et al., 2017; Samarein et al., 2013; Zhou et al., 2017), and others found that there was a positive correlation (Atroszko et al., 2018; Saini et al., 2016; Zhou et al., 2017).

These mixed results indicate that there may be invisible barriers to IA diagnoses using personality types. The meta-analysis statistical analysis showed that in reality, personality had only a minimal influence on IA, which supported a previous meta-analytical study (Kayiş et al., 2016) that found low effect size correlations between personality types and IA. Although the correlations did not show a cause or a causal relationship, the findings indicated that IA did not have distinctive personality predisposing factors. The hierarchical multiple regression analysis conducted by Andreassen et al. (2013) found that personality explained only 17.2% of IA variance. As the theoretical implications from this study were that personality had low predisposing factors for the development of IA, it is recommended that personality not be used as a means for screening for IA, as had been suggested in a previous study (Celik et al., 2012; Sahraian et al., 2016).

There are three main explanations for the low effect size correlations between personality types and IA. First, the sample mean age ranged from adolescence to adulthood (Table 1), with the mean being 20.70 years (SD = 3.935), which is early adulthood. Theoretically, age determines the IA symptoms related to mood, depression, and anxiety and the production of serotonin or neurotransmitters in the nervous system, which regulate anxiety and mood (Beard, 2005). However, the older the participants, the less the serotonin and the less people experience IA symptoms.

Second, personality types refer to specific cognitive patterns and behaviors in individuals and therefore are less related to IA mental processes, as IA is related more to non-personality mental processes. From a psychological viewpoint, IA mental processes can be explained as the emergence of cognitive distortions or irrational beliefs, which is similar to the behavior of other types of addicts. IA could also be seen as being related to a type of conditioning mechanism that offers rewards; another possible explanation is comorbidity with other clinical disorders. Research has found that IA in adolescents was comorbid with depression and insomnia, suicidal ideation, ADHD, schizophrenia, and other disorders (Kuss, Van Rooij, Shorter, Griffiths, & Van De Mheen, 2013).

Third, this meta-analysis study found many variations in the research instruments used. The Big Five was measured using three different scales: the TIPI, the Neo FFI, and the BFI (both short and full versions), and IA was measured on seven different scales: IAT, YDQ, IADQ, PIU, s-IAT, Bergen's, and IAS; all of which indicated that there was significant heterogeneity in the personality and IA measurements and scales assessed in this study, which could have influenced the veracity of the meta-analysis results (Table 1).

The findings of the present study supported the previous research findings that personality had no meaningful relationship with IA because the small effect size correlations clearly indicated that personality had a low association with IA. Therefore, the use of personality measurements for IA screening (Celik et al., 2012; Sahraian et al., 2016) needs to be further reviewed. Previous studies reported that conscientiousness and extraversion were protective factors for IA, especially in online gaming addicts (Kuss et al., 2013). These results also contradicted the idea that personality attributes were protective factors for IA as there was a chance of comorbidity between personality and other clinical disorders.

The main study limitations were the measurement variations and the sample characteristics in the meta-analysis as these could have adversely affected the results. However, to validate the findings in this study, three recommendations are given for further research. First, it is suggested to measure personality using other instruments outside the Big Five or FFM typology. Studies using other personality types and those especially focused on addictive personalities could give some insights into the role personality plays in triggering IA. Second, IA and personality relationship research could examine the extent to which IA may influence a participant's personality because pathological IA can cause a change in cognitive behavior and a commensurate change in personality patterns or types. Third, research needs to be conducted with a

focus on the participant's age and biological state. Younger participants, those born after the Internet, and adolescents have been found to be more prone to IA than adults. The research on personality type and the relationship with IA needs to be replicated and further developed to reveal the predisposing and protective factors for IA.

5. Conclusion

The results of the statistical tests found that the Big Five personality traits and IA had insignificant correlations, which was in agreement with similar previous meta-analytical research. These results implied that IA was not predicted by personality and that there were other non-personality factors that affected IA or its comorbidity with other clinical personality disorders. However, the differences in the measuring instruments for assessing the correlations between IA and personality (Big Five), the characteristics of the sample participants, and the high data heterogeneity were major weaknesses in this meta-analysis, even though the examined papers had no publication bias.

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