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Review article

The Association between Internet Addiction and Emotional Intelligence: A Meta-Analysis Study

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SUMMARY

Recently, internet addiction has turned into a major concern all over the world. According to scientific evidences, people with higher emotional intelligence are less addicted to the Internet; however, the type and strength of this relation is still a matter of debate. Due to a lack of information in this regard, the present study has been conducted as a meta-analysis method to this end.

A comprehensive search in Scopus, Web of Knowledge, ScienceDirect, Medline, Springer, Google Scholar, Magiran and Scientific Information Database (SID) with no restrictions of time and language was done with the following keywords: 'Internet'/'Internet users', 'Internet addiction', and 'emotional intelligence'. Pooled correlation of the present study was -0.393; [95%CI, -0.564-0.190]. The results of the Cochran Q (Q = 623:192, p = 0.000) and I2=97.75% index showed a high heterogeneity between studies included in the meta-analysis. No publication bias was observed.

In general, there was a moderate and inverse relation between Internet addiction and emotional intelligence; however, it seems that there is a relation between some of different personal, social, and cultural traits. Therefore, further studies are needed for the confirmation of the claim put forth.

Key words: **Internet addiction, emotional intelligence, Internet users, Internet**

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INTRODUCTION

In recent years, Internet usage has grown significantly throughout the world. Apart from the various benefits provided by this communicative device in the improvement of human life, the inappropriate usage of this device could result in undesirable consequences, including Internet addiction (1).

Nowadays, the phenomenon of Internet addiction has turned into an emerging, noteworthy concern for mental health in a number of countries (2-8).

Internet addiction was first put forth in 1996 when people were seen using the Internet inappropriately. This condition could disrupt the life of its addicted users in the way that drugs and alcohol could do to their users (9). It could go as far as driving them to lose control of normal Internet usage, subsequently making them face difficulties in their family and social interactions, as well as their educational or job-related performance (10).

Based on the available evidence, people who spend an extremely long time, i.e. 20-80 hours a week or more than 15 hours in a working session, on the Internet may suffer from pathological disorders such as despair, social isolation, anxiety and depression (11). Moreover, poor sleeping habits, smoking, poor nutrition, low physical activity (12), as well as low emotional intelligence are assumed to be other difficulties commonly observed in people addicted to the Internet (13).

As scholars believe, people with high emotional intelligence may have less tendency to Internet addiction (14-16), because these people, due to their emotional intelligence, may be able to control their own or emotions and excitements of other people, and to make distinctions between them; plus, they may also be able to take advantage of their information in order to implement their own thoughts and actions as well (17).

Regarding the remarks outlined above, a number of studies have investigated the relation between emotional intelligence and Internet addiction in Internet users, and as a result contradictory results were obtained (16, 18-21), so the type (negative or positive) and strength of the relation between these concepts is still a matter of debate. To cover this informational gap, the present study was performed via a meta-analysis method to more precisely evaluate the observational studies on the relation between Internet addiction and emotional intelligence.

METHODS

Search strategy

Scopus, Web of Knowledge, Science Direct, Medline, Springer, Google Scholar, and Persian databases such as Magiran and Scientific Information Databases (SID) – published before the August 10, 2016 – were searched using the following key words: 'internet', 'internet users', 'internet addiction', and 'emotional intelligence'. No restrictions of time and language were imposed on the search strategy. The search process was done by two of the researchers separately. For statistical pooling, the random effect model was used. In order to access studies more relevant to the given subject, the reference lists of the papers in the meta-analysis were reviewed profoundly. Any disagreements in results were resolved by the consensus of the study group members.

All descriptive studies reporting the correlation between Internet addiction and emotional intelligence were considered in this research. Inclusion criteria for the studies were as follows: 1) the study type has to be observational (correlational); 2) the study is required to investigate the relation between Internet addiction and emotional intelligence; and 3) the correlation level (r) between Internet addiction and emotional intelligence has to be presented or information based on which the correlation could be computed is required to be presented. The exclusion criteria consisted of all the studies that had merely presented the correlation of Internet addiction under the emotional intelligence subscales or had failed to present an overall score for the respective scale, or the concepts of Internet addiction and emotional intelligence had been separately investigated in the systematic reviews and descriptive studies (studies with inadequate results for the meta-analysis).

Data extraction

For studies included in the meta-analysis, the name of the author, the year of publication, country, sample size, gender and age range of the participants, the field of study, measurement tool of emotional intelligence and that of Internet addiction were separately extracted by two of the researchers. The disagreement among the results was resolved by consensus of the

peers. Quality assessment of the papers included in meta-analysis was performed using the qualitative measurement tool related to observational studies (22). During the evaluation process, papers having less than 50% of the inclusion criteria were removed from the study.

Statistical analysis

The statistical analysis of the study was carried out by taking into account the differences existing among the studies included in the meta-analysis, via the random effects model. The aforementioned model allows the researcher to determine the extent of real effects of the variables which most likely vary in the papers included in the meta-analysis (23).

The Cochrane Q test and I2 index were used to respectively measure the heterogeneity, and to quantify the heterogeneity ratio of the studies included in the meta-analysis. The I2 index represents the ratio of true variance observed in the selected studies.

Meta-regression and subgroup analyses were used to describe the true heterogeneity in the studies and its possible relation with covariates (sex, age range, the year of publication, country, sample size, kind of measurement tool for emotional intelligence and Internet addiction, the field of study and the study populations), and also to evaluate the qualitative state of the included studies.

Furthermore, for measuring publication bias, Funnel plotting, the Egger's regression intercept (24) and Begg and Mazumdar method (25) were used. Funnel plot is a plot in which the standard errors of the studies included in meta-analysis and their impacts are placed on the Y- and the X-axis, respectively. Asymmetry of these plots may be due to the publication bias of the studies included in the meta-analysis (23). Finally, the data analysis in this research was executed by utilizing a Comprehensive Meta-Analysis (CMA) software version 3 (Biostat, Englewood, NJ, USA).

RESULTS

Figure 1 illustrates the flowchart of search strategy for the studies included in the meta-analysis.

In the searching phase, a comprehensive search in the previously-mentioned databases was begun, where in 1,482 studies appeared to be possibly appropriate. Then, 1,421 papers were removed due to their irrelevant titles or abstracts.

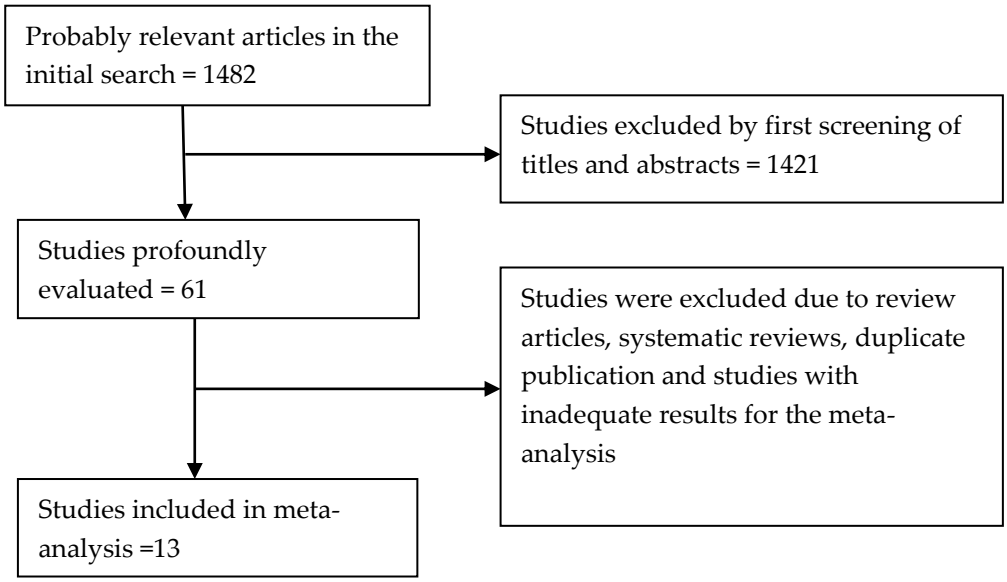


Figure 1. The process of study inclusion in meta-analysis

Afterwards, the full text of 61 remaining articles were profoundly evaluated and finally 48 studies were excluded due to being review articles, duplicate publication or even descriptive studies which had investigated the concepts of Internet addiction and/or emotional intelligence separately in their sample populations. Therefore, 13 articles, constituting a total of 3,625 participants, in which the correlation between Internet addiction and

emotional intelligence was studied, were included for meta-analysis (14-16, 18-21, 26-31).

Among the included studies, 2 articles – each containing 2 separate subgroups for gender and age were assumed as separate studies (16, 20). Finally, the meta-analysis was carried out on a total of 15 papers. The features of the included studies are presented in Table 1.

Table 1: Characteristics of studies included in the meta-analysis

First author	Year	Country	Sample size	Gender	Age
Khoshakhlagh H	2012	Iran	200	male/female	NA
Sanghvi H	2015	India	30	male/female	16-22
Hamissi J	2013	Iran	201	male/female	18-40
Mesgarani M	2013	Iran	129	NA	NA
Smaeeli Far, N	2014	Iran	400	male/female	18-24
Juneja MR	2015	India	250	male	18-24
Juneja MR	2015	India	250	female	18-24
Jafari N	2011	Iran	71	male/female	NA
Ibrahim AF	2016	Egypt	80	male/female	20-30
ANÇEL G	2015	Turkey	432	male/female	NA
Parker JD	2008	Canada	209	male/female	13–15
Parker JD	2008	Canada	458	male/female	16–18
Maddi SR	2013	USA	425	male/female	NA
Valihorová M	2015	Slovak	105	male/female	18-22
Waldo AD et al	2013	USA	385	male/female	NA

First author	‡IAQ	†EIQ	Participants	Setting
Khoshakhlagh H	Young	Carson et al	students	university
Sanghvi H	Young	NA	students	university
Hamissi J	Young	Schutte	students	university
Mesgarani M	Young	Shoot	NA	internet cafes
Smaeeli Far, N	Young	Schutte	students	university
Juneja MR	Young	Schutte	students	NA
Juneja MR	Young	Schutte	students	NA
Jafari N	Young	Petrides&Furnham	students	university
Ibrahim AF	PIUQ	Petrides&Furnham	students	university
ANÇEL G	Online Cognition Scale	NA	students	university
Parker JD	Young	Bar-On & Parker	students	public schools
Parker JD	Young	Bar-On & Parker	students	public schools
Maddi SR	Problematic Internet Use Questionnaire	Tapia	students	university
Valihorová M	Young	Petrides&Furnham	students	university
Waldo AD et al	Young	Weisinger	students	university

†EIQ = Emotional Intelligence Questionnaire ‡IAQ= Internet Addiction Questionnaire

Figure 2 demonstrates the Forest Plot of the correlation between Internet addiction and emotional intelligence in the included studies. Among all the included studies (n = 15), in two studies a positive and poor relation between Internet addiction and emotional intelligence was reported (18, 19); in four studies, an inverse and poor relation (15, 21, 29, 30) was found; in three studies, an inverse and moderate (14, 26, 28) relation; in three other studies, an inverse and strong (16, 20, 27) relation; and in one study, no relation was reported (31).

Pooled results of the present study revealed a moderate and inverse relation between Internet addiction and emotional intelligence (Pooled Correlation = -0.393; [95% CI, -0.564 - 0.190]) (Figure 2).

Study name (Publication year)	Statistics for each study				
	Correlation	Lower limit	Upper limit	Z-Value	p-Value
AN?EL et al, (2015)	-0.248	-0.335	-0.157	-5.246	0.000
Hamissi et al, (2013)	-0.303	-0.424	-0.172	-4.402	0.000
Ibrahim et al, (2016)	-0.316	-0.501	-0.103	-2.871	0.004
Jafari & Fatehizade, (2011)	-0.540	-0.687	-0.351	-4.982	0.000
Juneja & Sethi, Female (2015)	-0.791	-0.833	-0.740	-16.881	0.000
Juneja & Sethi, Male (2015)	-0.875	-0.901	-0.842	-21.280	0.000
Khoshakhlagh & Faramarzi, (2012)	0.240	0.105	0.367	3.436	0.001
Maddi et al, (2013)	-0.210	-0.299	-0.117	-4.379	0.000
Mesgarani et al, (2013)	-0.280	-0.432	-0.113	-3.229	0.001
Parker et al, old adolescents, (2008)	-0.560	-0.620	-0.494	-13.499	0.000
Parker et al, yong adolescents, (2008)	-0.760	-0.812	-0.696	-14.298	0.000
Sanghvi & Rai, (2015)	0.133	-0.239	0.471	0.695	0.487
Smaeeli Far et al, (2014)	-0.310	-0.396	-0.219	-6.387	0.000
Valihorov? et al, (2015)	-0.154	-0.336	0.039	-1.568	0.117
Waldo et al, (2013)	0.007	-0.093	0.107	0.137	0.891
	-0.393	-0.564	-0.190	-3.646	0.000

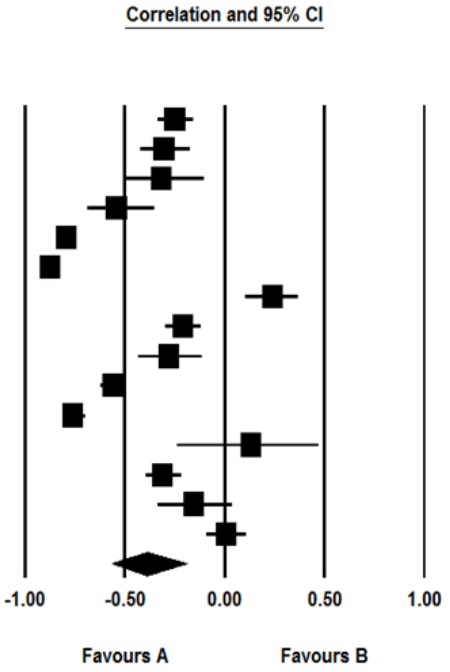


Figure 2. Forest plot of the correlation between Internet addiction and emotional intelligence based on the random effects model

Cochran Q index was representative of the heterogeneity (Q = 623:192, df: 14, p = 0.000) in the included studies. I2 index (97.75%) also indicated a high ratio of true heterogeneity in the studies included in the meta-analysis. To describe the actual heterogeneity between the studies, meta-regression indicated a significant the studies, meta-regression indicated a significant relation with the covariates of publication year of studies (Intercept = -0.813, p = 0.007), country in which the studies were done (Intercept = -0.811, p = 0.0001), age range of the participants (Intercept = -0.996, p = 0.006), and emotional intelligence measurement tool (Intercept = -0.813, p = 0.01). However, the mentioned heterogeneity had no significant relation (p > 0.05) with the covariates of sample size, setting and the measurement tool of Internet addiction.

To investigate the relation between the pooled results and the papers publication years in subgroup analysis, the studies were classified into two groups of after and before 2013. The pooled correlation in subgroup analysis pertaining to publication year (when limited to: after 2013 and before 2013) were -0.454; [95% CI, -0.703 - 0.107] and -0.334; [95% CI, -0.547 - 0.081], respectively (Figure 3).

Group by Publication year		Statistics for each study				
		Correlation	Lower limit	Upper limit	Z-Value	p-Value
After 2013	Ibrahim et al, (2016)	-0.316	-0.501	-0.103	-2.871	0.004
After 2013	AN?EL et al, (2015)	-0.248	-0.335	-0.157	-5.246	0.000
After 2013	Juneja & Sethi, Female (2015)	-0.791	-0.833	-0.740	-16.881	0.000
After 2013	Juneja & Sethi, Male (2015)	-0.875	-0.901	-0.842	-21.280	0.000
After 2013	Sanghvi & Rai, (2015)	0.133	-0.239	0.471	0.695	0.487
After 2013	Valihorov? et al, (2015)	-0.154	-0.336	0.039	-1.568	0.117
After 2013	Smaeeli Far et al, (2014)	-0.310	-0.396	-0.219	-6.387	0.000
After 2013		-0.454	-0.703	-0.107	-2.507	0.012
Before 2013	Hamissi et al, (2013)	-0.303	-0.424	-0.172	-4.402	0.000
Before 2013	Maddi et al, (2013)	-0.210	-0.299	-0.117	-4.379	0.000
Before 2013	Mesgarani et al, (2013)	-0.280	-0.432	-0.113	-3.229	0.001
Before 2013	Waldo et al, (2013)	0.007	-0.093	0.107	0.137	0.891
Before 2013	Khoshakhlagh & Faramarzi, (2012)	0.240	0.105	0.367	3.436	0.001
Before 2013	Jafari & Fatehizade, (2011)	-0.540	-0.687	-0.351	-4.982	0.000
Before 2013	Parker et al, old adolescents, (2008)	-0.560	-0.620	-0.494	-13.499	0.000
Before 2013	Parker et al, yong adolescents, (2008)	-0.760	-0.812	-0.696	-14.298	0.000
Before 2013		-0.334	-0.547	-0.081	-2.555	0.011
Overall		-0.375	-0.546	-0.173	-3.529	0.000

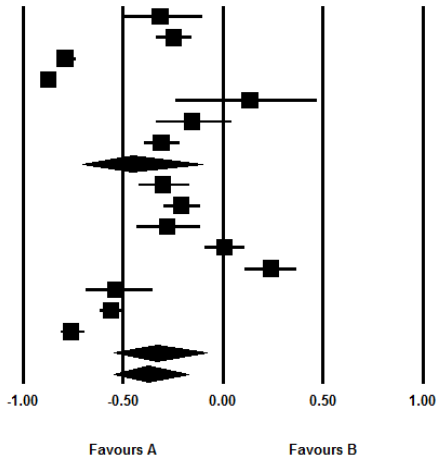


Figure 3: Forest plot of the correlation between Internet addiction and emotional intelligence based on publication year of the included studies

In subgroup analysis associated with 'the gender of participants', the pooled correlation obtained for female, male, and male/female groups were, -0.692; 95% [CI, -0.857-0.396], -0.826; [95% CI, -0.910-0.678], respectively, and -0.331;[95% CI, -0.431-0.223] (Figure 4).

Group by Gender	Study name (Publication year)	Statistics for each study				
		Correlation	Lower limit	Upper limit	Z-Value	p-Value
Female	Juneja & Sethi, Female (2015)	-0.791	-0.833	-0.740	-16.881	0.000
Female	Parker et al, old adolescents, (2008)	-0.560	-0.620	-0.494	-13.499	0.000
Female		-0.692	-0.857	-0.396	-3.859	0.000
Male	Juneja & Sethi, Male (2015)	-0.875	-0.901	-0.842	-21.280	0.000
Male	Parker et al, yong adolescents, (2008)	-0.760	-0.812	-0.696	-14.298	0.000
Male		-0.826	-0.910	-0.678	-6.575	0.000
Male/female	AN?EL et al, (2015)	-0.248	-0.335	-0.157	-5.246	0.000
Male/female	Hamissi et al, (2013)	-0.303	-0.424	-0.172	-4.402	0.000
Male/female	Ibrahim et al, (2016)	-0.316	-0.501	-0.103	-2.871	0.004
Male/female	Jafari & Fatehizade, (2011)	-0.540	-0.687	-0.351	-4.982	0.000
Male/female	Khoshakhlagh & Faramarzi, (2012)	0.240	0.105	0.367	3.436	0.001
Male/female	Maddi et al, (2013)	-0.210	-0.299	-0.117	-4.379	0.000
Male/female	Sanghvi & Rai, (2015)	0.133	-0.239	0.471	0.695	0.487
Male/female	Smaeeli Far et al, (2014)	-0.310	-0.396	-0.219	-6.387	0.000
Male/female	Valihorov? et al, (2015)	-0.154	-0.336	0.039	-1.568	0.117
Male/female	Waldo et al, (2013)	0.007	-0.093	0.107	0.137	0.891
Male/female		-0.182	-0.304	-0.055	-2.789	0.005
Overall		-0.331	-0.431	-0.223	-5.757	0.000

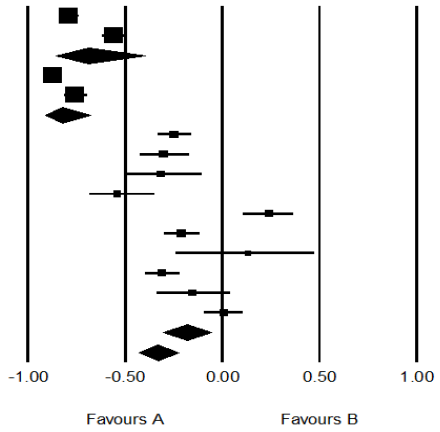


Figure 4: Forest plot of the correlation between Internet addiction and emotional intelligence based on the age group of the Internet users

In subgroup analysis associated with 'age group of the Internet users', the pooled correlation varied depending on the age group -0.508; [95% CI, -0.551-0.462]. According to the results obtained, there was a strong relation between Internet addiction and emotional intelligence in the 13-15 age group -0.760; [95% CI, -0.812-0.696] compared to other age groups, while in the 20-30 age group, such a relation was weaker -0.316; [95% CI, -0.501-0.103] (Figure 5).

Group by Range age	Study name (Publication year)	Correlation	Lower limit	Upper limit	Z-Value	p-Value
13-15	Parker et al, yong adolescents, (2008)	-0.760	-0.812	-0.696	-14.298	0.000
13-15		-0.760	-0.812	-0.696	-14.298	0.000
16-18	Parker et al, old adolescents, (2008)	-0.560	-0.620	-0.494	-13.499	0.000
16-18		-0.560	-0.620	-0.494	-13.499	0.000
16-22	Sanghvi & Rai, (2015)	0.133	-0.239	0.471	0.695	0.487
16-22		0.133	-0.239	0.471	0.695	0.487
18-22	Valihorov? et al, (2015)	-0.154	-0.336	0.039	-1.568	0.117
18-22		-0.154	-0.336	0.039	-1.568	0.117
18-24	Juneja & Sethi, Female (2015)	-0.791	-0.833	-0.740	-16.881	0.000
18-24	Juneja & Sethi, Male (2015)	-0.875	-0.901	-0.842	-21.280	0.000
18-24	Smaeeli Far et al, (2014)	-0.310	-0.396	-0.219	-6.387	0.000
18-24		-0.724	-0.915	-0.267	-2.797	0.005
18-40	Hamissi et al, (2013)	-0.303	-0.424	-0.172	-4.402	0.000
18-40		-0.303	-0.424	-0.172	-4.402	0.000
20-30	Ibrahim et al, (2016)	-0.316	-0.501	-0.103	-2.871	0.004
20-30		-0.316	-0.501	-0.103	-2.871	0.004
Overall		-0.508	-0.551	-0.462	-18.338	0.000

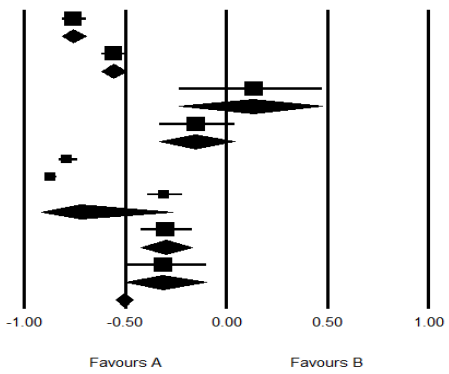
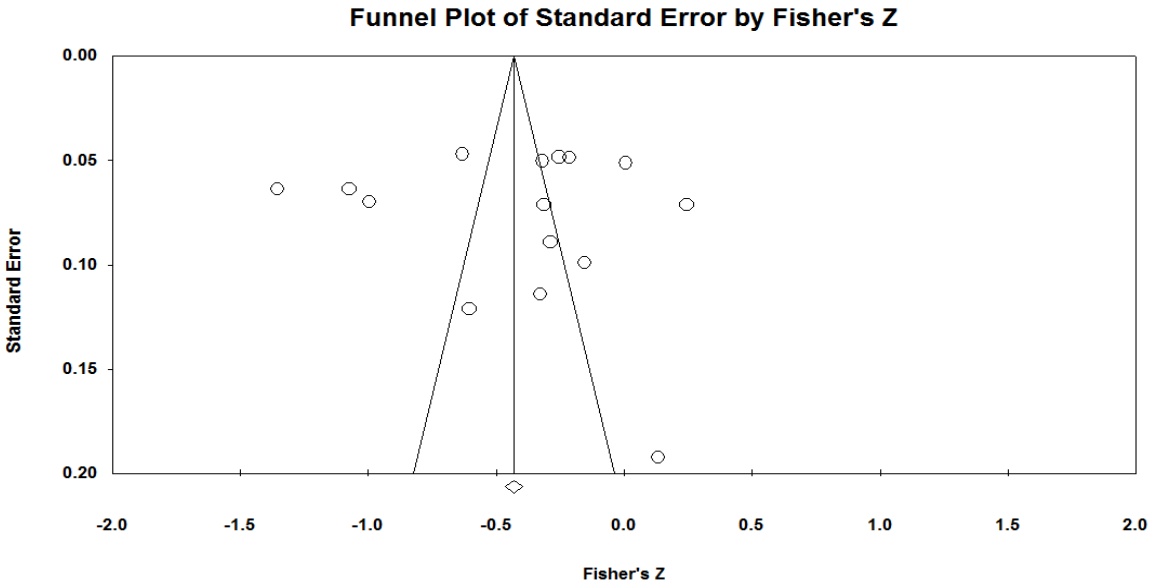


Figure 5: Forest plot of the correlation between Internet addiction and emotional intelligence based on the age range of the Internet users

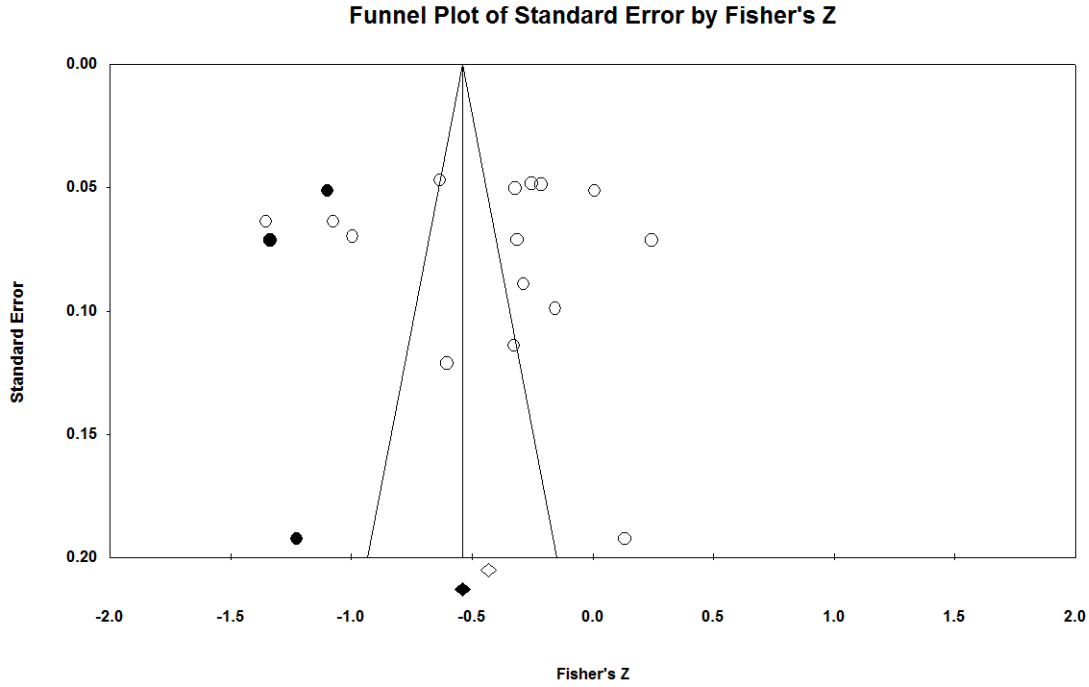
Funnel plot, Egger's regression intercept (24), the Begg and Mazumdar rank correlation test, Classic fail-safe N, and Duval and Tweedie's Trim and Fill were used to measure publication bias. Figure 5 shows the funnel plot of the publication bias with regards to the correlation between Internet addiction and emotional intelligence.

Egger's regression intercept (Intercept = -0.037, p = 0.994) and Begg and Mazumdar rank correlation (Tau = 0.000, p = 0.5) were representative of a relatively symmetrical funnel plot; however, no evidence of publication bias between Internet addiction and emotional intelligence was observed.

Classic fail-safe N test also presented 2,323 studies required to be added to the meta-analysis to increase p-value up to more than Alpha value, representing the lack of publication bias in the present study as well as the fairly symmetrical funnel plot.



Furthermore, following the further exploration by Duval and Tweedie's Trim and Fill method, the observed and modified value (after adding 3 studies along with their modification) were reported, -0.392; [95% CI, -0.563-0.189] = and 0.497; [95% CI, -0.515-0.469], respectively. These findings indicate that the best unbiased estimation of the effect size is 10% more than the observed and computed correlation coefficient.



DISCUSSION

The present study is an in-depth quantitative review about the relation between Internet addiction and emotional intelligence. The pooled results were representative of a moderate as well as inverse relation between Internet addiction and emotional intelligence (Pooled Correlation = -0.393;[95% CI, -0.564 - 0.190]. In spite of the fact that to date there has been no study on the relation between Internet addiction and emotional intelligence via the meta-analysis method, the results presented by Bai et al. (2015) show that internet addicts have low emotional intelligence. They also concluded that emotional intelligence is often considered a mediator affecting the level of Internet addiction of users (13). In a systematic review, Kuss et al. (2014) indicated that Internet addiction may provide obligatory use of Internet and adverse consequences for the people addicted to it (1). These symptoms are extremely similar to the consequences resulted from drug addiction, e.g. mood swings, intolerance, isolation, conflict, and relapse (32). However, these symptoms may vary from person to person (16).

Regarding the findings, studies included in meta-analysis were heterogeneous, that is to say there was a high level of heterogeneity (I2 = 97.75%) among the included studies. A part of the difference existing in the effect size of the included studies may have resulted from the age difference of the participants, the country where the study was carried out, and/or the year of publication of the respective study. The general effect size associated with the studies performed before and after-2013 were -0.334; [95% CI, -0.547 - 0.081] and -0.454; [95% CI, -0.703 - 0.107], respectively. This finding is in line with the results presented by Kuss et al. (2014). The present researchers found that Internet addiction is related to personal and social traits as well as the social-mental factors of the people addicted to the Internet (1).

Moreover, it was found that the heterogeneity in the present study fails to be related to the measurement tools of Internet addiction. This heterogeneity may be due to the limited numbers of Internet addiction measurement tools in the included studies. Kuss et al. (2014) also dealt with the various tools used to investigate the Internet addiction in the studies done in this area; they consequently concluded that this condition could be the result of a lack of specific standard for the classification of Internet addiction (1).

In subgroup analysis, from the perspective of gender, the pooled results associated with the male group were more than both female and female/male group. The difference may be due to the prevalence of Internet addiction phenomenon among men rather than women. There is ample support for this claim by the researches reporting the prevalence of Internet addiction in males rather than females (33-39). Albeit, in some

cases such a phenomenon was mostly observed in female rather than in the opposite sex (40), and as there is an inconclusive debate in this regard, more studies are hence required.

In the subgroup analysis, when the analysis is merely limited to age group, there is a stronger correlation between Internet addiction and emotional intelligence in the 13-15 age group compared to other age groups -0.760; [95% CI, -0.812-0.696], whereas this relation is at the moderate level in the 20-30 age group -0.316;[95% CI, -0.501-0.103]. This finding is consistent with the results presented by Kuss et al (41); nevertheless, more evidence is required in this regard.

In spite of the fact that this study is the first to have addressed the relation between Internet addiction and Emotional Intelligence and has presented the intensity and direction of such concepts, in practice it faced several limitations such as a lack of access to more scientific databases, and inadequate similar studies for the sake of results comparison.

CONCLUSION

Totally, there was a moderate and inverse relation between Internet addiction and emotional intelligence. However, it seems that the given concepts are related to personal, social and cultural traits, hence more evidence is required to confirm the presented claim.

CONFLICT OF INTEREST

The authors declared no potential conflicts of interest with respect to the study.

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Povezanost između zavisnosti od interneta i emocionalne inteligencije: meta-analiza

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SAŽETAK

Odnedavno je zavisnost od interneta postala značajan problem širom sveta. Prema naučnim podacima, ljudi sa većom emocionalnom inteligencijom su manje zavisni od interneta; međutim, tip i jačina ove povezanosti je još uvek predmet rasprava. Usled nedostatka informacija o ovoj temi, ova studija je izvedena kao meta-analiza.

U opsežnoj studiji, u kojoj su za pretragu korišćene baze Scopus, Web of Knowledge, Science direct, Medline, Springer, Google Scholar, Magiran i Scientific Information Database (SID), bez ograničenja u vremenu i jeziku, tražene su sledeće ključne reči: "internet/korisnici interneta", "zavisnost od interneta" i "emocionalna inteligencija". Korelacija je iznosila -0,393; [95%CI,-0,564-0,190]. Rezultati Cochran Q testa, kao i I2=97,75% indeksa, su pokazali visok stepen heterogenosti između studija koje su uključene u ovu meta-analizu. Pristrasnost pri objavljivanju nije uočena.

Generalno, zabeležena je umerena i inverzna relacija između zavisnosti od interneta i emocionalne inteligencije. Međutim, smatra se da postoji određena veza između različitih ličnih, društvenih i kulturoloških osobina. Stoga, potrebno je nastaviti sa istraživanjima u ovom pravcu kako bi se proverila ova tvrdnja.

Ključne reči: **zavisnost od interneta, emocionalna inteligencija, korisnici interneta, internet**