A Meta-analysis of the Reliabilty of Young's Internet Addiction Test

Constantinos C. Frangos, Christos C. Frangos, and Ioannis Sotiropoulos

***Abstract*—AIM: Currently there are at least 5 scales being used most frequently in studies for diagnosing Internet addiction or problematic Internet use. Moreover there are various studies using each scale mentioning differing reliability coefficients. The most frequently used questionnaire until now is Young's Internet addiction test (YIAT20). The aim of this study is to produce an overall value for the reliability YIAT20, drawing from a large sample of studies. METHODS: A systematic search of the databases PsycINFO, Medline, EMBASE, Pubmed/Medline, and Google Scholar revealed 20 studies using out of which 11 gave reliability measures. We performed a meta-analysis of the values of Cronbach's α values mentioned in each study, noted various moderates including sample subgroup (college or pre-college students), sample mean age, sample male percentage, online or offline answering of the questionnaire, and continent of the author's study. Difference were sought between reliability in various categories while we performed a weighted least squares general linear model to find predictive factors of the variance in YIAT20's reliability. All analyses were done in PASW 18.0. RESULTS: Eleven studies comprising of a total of 6821 participants were included in the final analysis. The overall Cronbach's alpha computed from the studies was 0.889 (95% CI 0.884-0.895). The standard deviation of α was low: 0.049. Cronbach's α was significantly lower in pre-college students [Mean Difference: -0.045 (95% CI -0.057, -0.032)], while Asian studies produced a higher value of Cronbach's α not reaching significance [Mean Difference: -0.015 (95% CI -0.032, 0.002)]. The weighted least squares general linear model was adequate with R-Squared = 0.504 (Adjusted R-Squared = 0.292). The variable continent proved out to be a significant predictor of the value of reliablity. CONCLUSION: YIAT20 is a frequently used scale to measure Internet addiction. Mean differences showed that it is more reliable in college students and probably in Asia. A general linear model showed that the continent of the study affects significantly the outcome of reliability of the study with reliability decreasing when the continent is Europe. More studies are required to examine which scale is more reliable in pre-college students and in other continents.**

***Index Terms*—applied statistics, weighted least squares GLM, meta-analysis, Internet addiction.**

I. Introduction

Internet addiction is new disorder first described by Kimberly Young in 1996 [1]. Since then, there have been many studies examining the multiple facets of this disorder [2], [3]. Currently there are at least 5 scales which are being used most frequently in studies for diagnosing Internet addiction or problematic Internet use [2]–[5]. The most frequently cited are:

- Chen Internet Addiction Scale [6]
- Young's Internet Addiction Questionnaires (8 items and 20 items) [1], [7]
- Ko's Internet Addiction Scale [8]

Moreover for each scale there are various studies mentioning differing reliability coefficients. Several factors affect the reliability of these studies, which is mainly depicted with Cronbach's α coefficient. The most frequently used questionnaire until now is Young's Internet addiction test (YIAT20), which is consists of twenty 5-point Liekert type questions (Table I).

The psychometric properties of Young's Internet Addiction Scale include the following characteristics:

TABLE I
Young's Internet Addiction Test (YIAT20)

Answer the following questions on the Likert scale: 1=rarely, 2=occasionally, 3=frequently, 4=often, 5=always	
1	How often do you find that you stay on-line longer than you intended?
2	How often do you neglect household chores to spend more time on-line?
3	How often do you prefer the excitement of the Internet to intimacy with your partner?
4	How often do you form new relationships with fellow on-line users?
5	How often do others in your life complain to you about the amount of time you spend on-line?
6	How often do your grades or school work suffers because of the amount of time you spend on-line?
7	How often do you check your email before something else that you need to do?
8	How often does your job performance or productivity suffer because of the Internet?
9	How often do you become defensive or secretive when anyone asks you what you do on-line?
10	How often do you block out disturbing thoughts about your life with soothing thoughts of the Internet?
11	How often do you find yourself anticipating when you will go on-line again?
12	How often do you fear that life without the Internet would be boring, empty, and joyless?
13	How often do you snap, yell, or act annoyed if someone bothers you while you are on-line?
14	How often do you lose sleep due to late-night log-ins?
15	How often do you feel preoccupied with the Internet when off-line, or fantasize about being on-line?
16	How often do you find yourself saying"just a few more minutes"when online?
17	How often do you try to cut down the amount of time you spend on-line and fail?
18	How often do you try to hide how long youve been on-line?
19	How often do you choose to spend more time on-line over going out with others?
20	How often do you feel depressed, moody or nervous when you are off-line, which goes away once you are back on-line?

Manuscript received March 9, 2012; revised April 5, 2012.

Constantinos C. Frangos is with the Division of Medicine, University College London, London, UK (corresponding author phone: 00447960340489; e-mail: constantinos.frangos.09@ucl.ac.uk).

Christos C. Frangos is with the Department of Business Administration, Technological Educational Institute (TEI) of Athens, Athens, Greece (e-mail: cfragos@teiath.gr.)

Ioannis Sotiropoulos is with the Department of Finance and Auditing, TEI of Epirus, Preveza, Greece (e-mail: sotiropoulosioan@yahoo.gr).

- It is a 20-item questionnaire, answered in a five-point Likert scale.
- It covers the degree to which their Internet use affects their daily routine, social life, productivity, sleeping pattern, and feelings.
- The minimum score is 20, and the maximum is 100; the higher the score, the greater the problems Internet use causes.
- Young [7] suggests that a score of 20-39 points is an average online user who has complete control over his/her usage, A score of 40-69 signifies frequent problems due to Internet usage, and a score of 70-100 means that the Internet is causing significant problems

Widyanto and Mcmurran [9] performed the most comprehensive study on the psychometric properties of YIAT20, where a factor analysis of the YIAT20 revealed six factors (explaining 68% of variance): 1. salience, 2. excessive use, 3. neglecting work, 4. anticipation, 5. lack of control, and 6. neglecting social life. These factors showed good internal consistency and concurrent validity, with salience being the most reliable ($\alpha = 0.82$). The six factors were all significantly correlated (Pearson's r) with each other, with correlations ranging from $r = 0.62$ to $r = 0.226$. Younger and more recent users reported more problems, mainly concerning the neglect of work and social life.

Despite this study though, empirical research on Internet addiction provides confilicting results on the psychometric properties of YIAT20. This is due to the fact that man studies have used this scale in various settings. A method to synthesize psychometric properties of a scale is called Reliability Generalization. Vacha-Haase [10] proposed meta-analytic reliability generalization for the purpose of gaining better understanding about what the typical score reliability is for an instrument, what the salient factors are that contribute to the variability of reliability estimates across studies, and what the typical measurement conditions are under which the application of an instrument tends to exhibit higher (or lower) score reliability. It is often unclear why considerable variability exists among the reliability estimates across studies, so meta-analysis has often led to better understanding about a body of seemingly inconsistent literature. Thus, a meta-analytic approach appears natural for summarizing score reliability of a measurement instrument across studies with different study characteristics.

Hence, the aim of this study is to produce an overall value for the reliability of YIAT20, drawing from a large sample of studies.

II. Methodology

A systematic search of the databases PsycINFO, Medline, EMBASE, Pubmed/Medline, and Google Scholar revealed 20 studies using out of which 11 gave reliability measures. We did a meta-analysis of the Cronbach's α values mentioned in each study, noted various moderates including sample subgroup (college or pre-college students), sample mean age, sample male percentage, online or offline answering of the questionnaire, and continent of the author's study. Difference were sought between reliability in various categories while we performed a weighted least squares general linear model to find predictive factors of the variance in YIAT20's reliability.

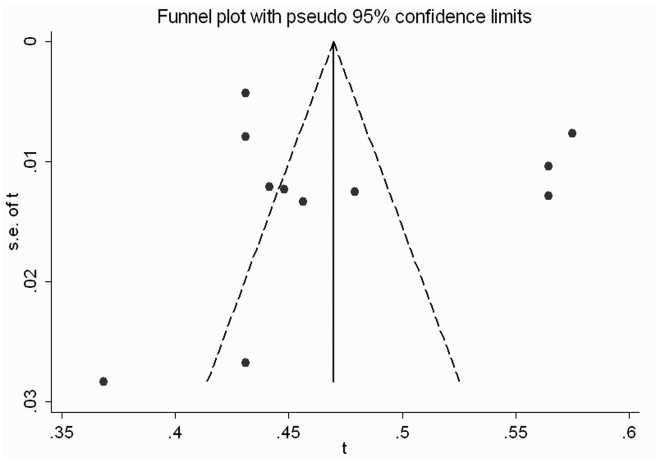

Fig. 2. Funnel plot for assessment of publication bias

A. Statistical Techniques

In order to synthesize Cronbach's α, we followed the Rodriguez-Maeda [11] method. By this method, Cronbach's α is transformed to Hakstian-Whalen $T = (1 - \alpha)^{1/3}$, which is a variable with standard normal distribution. Estimates were computed with the fixed and random effects models, there was an assessment of publication bias with funnel plots and finally we performed meta-regression using a univariate ANOVA model.

III. Results

Eleven studies comprising of a total of 6821 participants were included in the final analysis. Mean age range was from 9.3 to 22.9 years old, while females and males were generally equal in all studies except for one study which had 83.9% males. The overall Cronbach's α computed from the studies was 0.889 (95% CI 0.884-0.895) (Figure 1). The standard deviation of alpha was low: 0.049. There were some signs of publication bias because of asymmetry in the forest plot (Figure 2). Because of the presence of heterogeneity in the results, we performed a subgroup analysis in college and pre-college students (Figure 3), but heterogeneity remained.

We examined the mean difference of Cronbach's α between college and pre-college students as well as between European and Asian studies. Cronbach's α was significantly lower in pre-college students [Mean Difference: -0.045 (95% CI -0.057, -0.032)], while Asian studies produced a higher value of Cronbach's alpha not reaching significance [Mean Difference: -0.015 (95% CI -0.032, 0.002)]. The weighted least squares general linear model performs a regression between the transformed sample coefficient alpha to Hakstian-Whalen $T = (1 - \alpha)^{1/3}$ and the variables we choose. This variable has better statistical properties in a General Linear Model. The overall model was satisfactory with R-Squared = 0.504 (Adjusted R-Squared = 0.292). The coefficients of this general model are shown in Table II. The variable continent (Europe =1, Asia=2) proved out to be a significant predictor of the value of T.

IV. Conclusion

YIAT20 is a frequently used scale to measure Internet Addiction. Mean differences showed that it is more reliable

ISBN: 978-988-19251-3-8
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

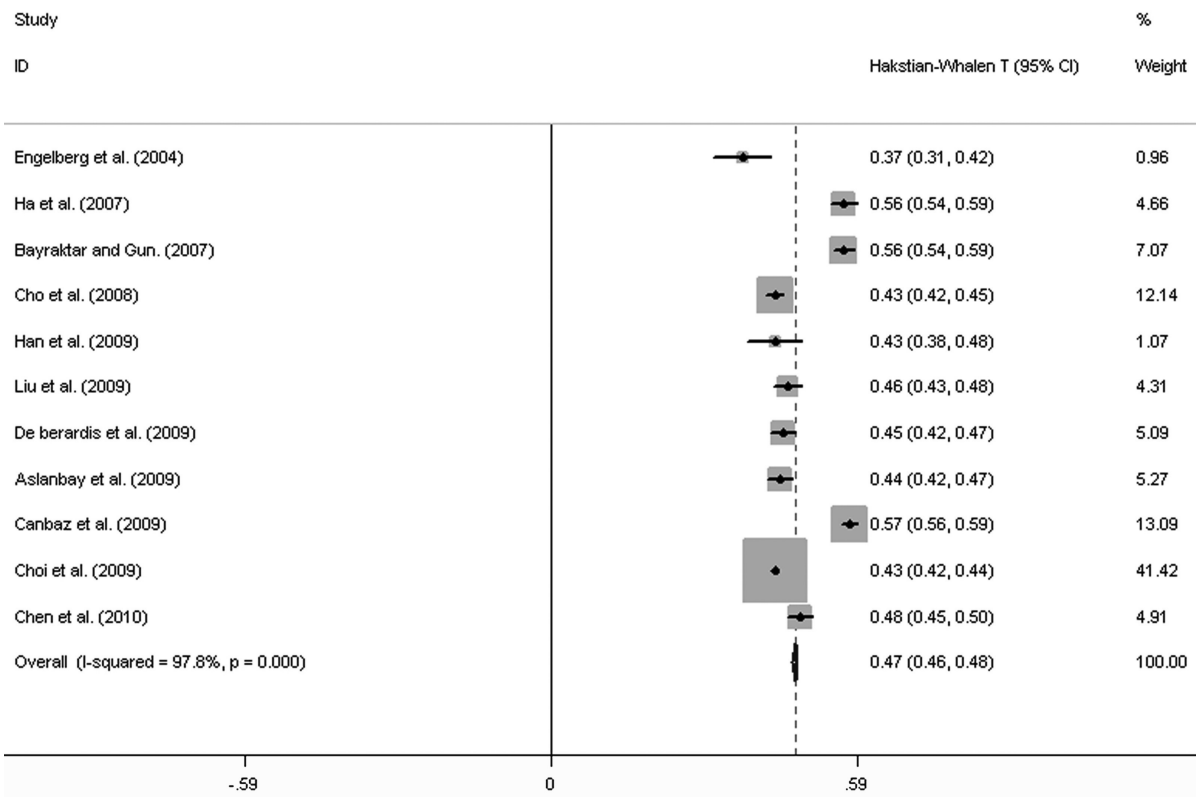

Fig. 1. Forest plot. Heterogeneity $\chi^2 = 454.88$ ($df = 10$), $p < 0.0001$, I^2 (variation in effect size attributable to heterogeneity) = 97.8%, Test of effect size= 0: $z = 169.22$, $p < 0.0001$.

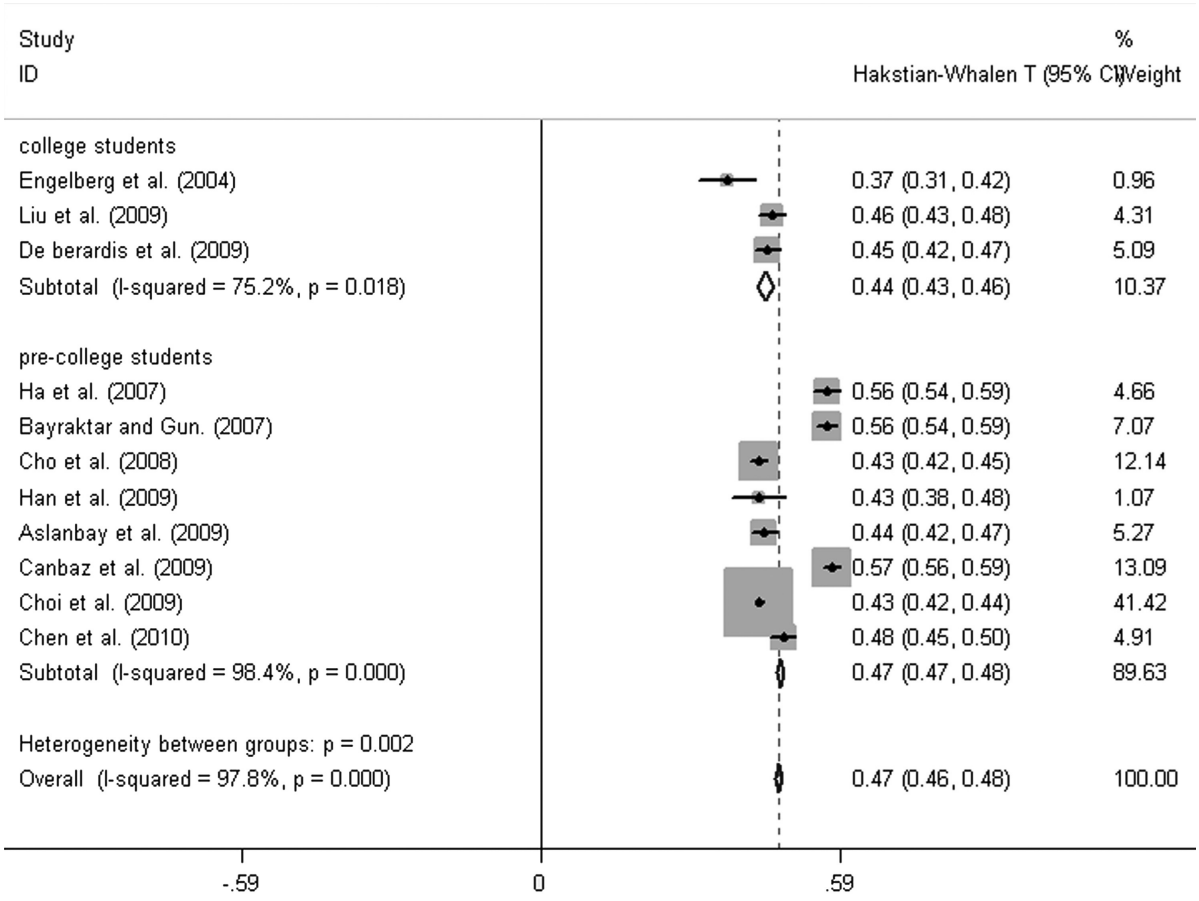

Fig. 3. Subgroup analysis in college students and pre-college students.

ISBN: 978-988-19251-3-8
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)

TABLE II
RESULTS OF THE GLM MODEL WITH DEPENDENT VARIABLE $T = (1-\alpha)^{1/3}$

Parameter	B	S.E.	t	Sig.	95% CI
Intercept	0.500	0.224	2.235	0.061	(-0.029, 1.029)
subgroup	-0.033	0.058	-0.571	0.586	(-0.171, 0.104)
continent	-0.101	0.039	-2.576	0.037	(-0.194, -0.008)
males	0.003	0.004	0.849	0.424	(-0.006, 0.012)

in college students and probably in Asia. GLM showed that the continent of the study affects significantly the outcome of reliability of the study with the reliability decreasing when the continent is in Europe. More studies are required to examine which scale is more reliable in pre-college students and in other continents.

REFERENCES

[1] K.S. Young, "Internet addiction: The emergence of a new clinical disorder," *CyberPsychology & Behavior*, vol. 1, no. 3, pp. 237-244, 1998.

[2] M.A. Moreno, L. Jelenchick, E. Cox, H. Young and D.A. Christakis, "Problematic Internet Use Among US Youth: A Systematic Review," *Archives of Pediatrics and Adolescent Medicine*, vol. 165, no. 9, pp. 797-805, 2011.

[3] L. Widyanto and M. Griffiths, "'Internet Addiction': A Critical Review", *International Journal of Mental Health and Addiction*, vo. 4, no. 1, pp. 31-51, 2006.

[4] C.C. Frangos, C.C. Frangos, and A. Kiohos, "Internet Addiction among Greek University Students: Demographic Associations with the Phenomenon, using the Greek version of Young's Internet Addiction Test," *International Journal of Economic Sciences and Applied Research*, vol.3, no. 1, pp. 49-74, 2010.

[5] C.C. Frangos, C.C. Frangos, and I. Sotiropoulos, "Problematic internet use among Greek university students: an ordinal logistic regression with risk factors of negative psychological beliefs, pornographic sites, and online games," *CyberPsychology, Behavior, and Social Networking*, vol. 14, no. 1-2, pp. 51-58, 2011.

[6] S. Chen, L. Weng, Y. Su, H. Wu, and P. Yang, "Development of a Chinese Internet addiction scale and its psychometric study," *Chinese Journal of Psychology*, vol. 45, no. 3, pp. 279-294, 2003.

[7] K.S Young, *Caught in the Net: How to Recognize the Signs of Internet Addiction - and A Winning Strategy For Recovery*, New York, Wiley, 1998.

[8] C.H Ko, J.Y. Yen, C.C. Chen, S.H. Chen, C.F. Yen CF, "Proposed diagnostic criteria of Internet addiction for adolescents," *Journal of Nervous and Mental Disease*, vol. 193, no. 11, pp. 728-733, 2005.

[9] L. Widyanto and M. Mcmurran, "The psychometric properties of the internet addiction test," *CyberPsychology & Behavior*, vol. 7, no. 4, pp. 443-450, 2004.

[10] T. Vacha-Haase, "Reliability Generalization: Exploring Variance in Measurement Error Affecting Score Reliability Across Studies," *Educational and Psychological Measurement*, vol. 58, no. 1, pp. 6-20, 1998.

[11] M.C. Rodriguez and Y. Maeda, "Meta-analysis of coefficient alpha," *Psychological Methods*, vol. 11, no. 3, 306-322, 2006.

ISBN: 978-988-19251-3-8
ISSN: 2078-0958 (Print); ISSN: 2078-0966 (Online)