CYBERPSYCHOLOGY, BEHAVIOR, AND SOCIAL NETWORKING
Volume 17, Number 12, 2014

DOI: 10.1089/cyber.2014.0317

Internet Addiction Prevalence and Quality of (Real) Life: A Meta-Analysis of 31 Nations Across Seven World Regions

Cecilia Cheng, PhD and Angel Yee-lam Li, BA

Abstract

Internet addiction (IA) has emerged as a universal issue, but its international estimates vary vastly. This multinational meta-analysis fills this gap by providing estimates of its global prevalence. Two hypotheses were formulated to explain the cross-national variations. The accessibility hypothesis predicts that IA prevalence is positively related to Internet penetration rate and GDP per capita, whereas the quality of (real) life hypothesis predicts that IA prevalence is inversely related to a global national index of life satisfaction and specific national indices of environmental quality. Multiple search strategies were used in an attempt to retrieve all empirical reports from 1996 to 2012 that adopted the Young Diagnostic Questionnaire or Internet Addiction Test for assessing generalized IA. The data set comprised 164 prevalence figures derived from 80 reports, including 89,281 participants from 31 nations across seven world regions. A random effects meta-analysis showed a global prevalence estimate of 6.0% [95% CI 5.1–6.9], with moderate heterogeneity ($I^2 = 44\%$, $p < 0.0001$). The highest prevalence was in the Middle East with 10.9% [95% CI 5.4–16.3], and the lowest was in Northern and Western Europe with 2.6% [95% CI 1.0–4.1]. Moreover, IA prevalence was higher for nations with greater traffic time consumption, pollution, and dissatisfaction with life in general. The prevalence rate of IA varies across world regions. IA prevalence is inversely associated with the quality of life, as reflected by both subjective (life satisfaction) and objective (quality of environmental conditions) indicators.

Introduction

IN THE PRESENT CYBER AGE, the Internet has become a necessity in people's daily lives. Societies worldwide are facing new challenges that the convenience and excitement gained through Internet use can result in individuals hooked on online activities to gratify needs. An extreme form of this phenomenon is known as Internet addiction (IA), an impulse control problem characterized by an inability to inhibit Internet use that exerts an adverse impact on major life domains (e.g., interpersonal relations, physical health).[1] Although IA is currently not included in the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5), it is generally regarded as a disorder of concern because the neural abnormalities (e.g., atrophies in dorsolateral prefrontal cortex) and cognitive dysfunctions (e.g., impaired working memory) associated with IA mimic those related to substance and behavioral addiction.[2,3] Moreover, IA is often comorbid with mental disorders, such as attention deficit hyperactivity disorder and depression.[4,5]

Although the consequences of IA have been widely researched in recent years, it is unclear how prevalent IA is around the globe. As international estimates of the problem have varied vastly,[6] whether a universality or cross-national variation exists for the IA prevalence remains unknown. The present study addressed this timely issue through a meta-analysis, which amalgamates data to give more conclusive evidence for a global estimate. More importantly, this statistical technique allows for the testing of moderating effects. Two overarching hypotheses—accessibility and quality of (real) life—were proposed to guide the formulation of the specific predictions to be tested in our meta-analysis.

Accessibility hypothesis

Drawing on Mann's notion of ''availability as a law of addiction,''[7] the accessibility hypothesis puts forward that greater Internet availability may foster a greater engagement in online activities, in turn increasing one's susceptibility to IA. Consistent with this notion, previous studies have revealed a positive link between time spent on the Internet and IA.[8,9] Applying this hypothesis to cross-national analyses, accessibility may be related to two socioeconomic factors: Internet penetration rate and GDP per capita.

As of December 2013, approximately 39% of the world's 7 billion people use the Internet.[10] Internet penetration rate,

Department of Psychology, The University of Hong Kong, Hong Kong.

which refers to the proportion of Internet users in the population, varies across world regions. North America had the highest penetration rate (85%) on average.[10] Although Asia had the greatest number of Internet users at around 1.3 billion, its average penetration rate was low (32%).[10] Bakken et al. compared their epidemiological work with another large-scale survey and found a higher prevalence of IA in their study.[11,12] They also observed a parallel difference in the proportion of Internet users between the studies. Hence, a positive link may exist between Internet penetration rates and IA.

According to the global digital divide observed by economists and sociologists, disparities exist among nations in terms of the resources that facilitate the use of information technology, and national income differentials may also play a role.[13] In this light, a positive link may exist between GDP per capita and IA. Nations with higher GDP per capita are characterized by more advanced information technology and infrastructure that fosters a proliferation of the Internet.[14] Hence, individuals from these nations have more opportunities to access and use the Internet, and may be more susceptible to IA than those from nations with lower GDP per capita.

Quality of (real) life hypothesis

Providing a distinct perspective, the quality of (real) life hypothesis predicts that IA prevalence is related to a poor quality of real life. In the present cyber age, people may immerse themselves into the virtual world of the Internet to escape from stress they experience in the real world.[15,16] As the boundaries of the virtual and the real worlds become blurred, individuals who encounter more frequent real life problems have a greater motivation to use the Internet as a coping mechanism.[17,18] It is thus reasonable to infer an inverse link between IA and the quality of (real) life.

Quality of life can be evaluated according to both subjective and objective indicators. Psychologists define this construct as a subjective appraisal of a good life,[19] and thus widely assessed by the self-report method.[20] The Life Satisfaction Index was formulated to rank nations in terms of their residents' perceptions of their quality of life in general,[20] and has been adopted for multinational comparisons.[21] In light of the quality of (real) life hypothesis, an inverse link may exist between IA prevalence and the Life Satisfaction Index.

Economists posit that quality of life reflects the standard of living conditions that influence socioeconomic development.[22] A country's quality of life can be quantified in terms of national indices. The national quality of life index comprises multiple components spanning three broad domains of life: (a) environmental (pollution, safety, traffic time consumption); (b) economic (consumer price, property price to income ratios, purchasing power); and (c) health (healthcare).[23] IA prevalence may be related to the quality of environmental conditions rather than that of other life domains. This is because environmental conditions, such as noise pollution and traffic congestion, can elicit stress.[24,25] When under stress, people seek relief, but they are less likely to find it through engaging in outdoors activities when the physical environment is deemed hassling or hazardous.[26] The more pent-up stress people experience, the more likely they are to turn to the Internet to escape from stressors.[27,28] Their susceptibility to IA may be heightened with prolonged use.[29,30]

Overview of the meta-analysis

To address the empirical inconsistencies in the cross-national prevalence of IA, the present meta-analysis aimed to (a) establish more precise estimates of the overall prevalence, and (b) identify national indices that explain the heterogeneous prevalence rates across nations.

Among the various screening measures of IA, the Young Diagnostic Questionnaire (YDQ) and Internet Addiction Test (IAT) have been the most widely used. Both measures have been translated into multiple languages,[31,32] and thus are ideal instruments for making multinational comparisons in this study.

Materials and Methods

Conceptualization and operationalization of Internet addiction

Young's conceptualization of IA was adopted because the two target measures of YDQ and IAT were constructed based on it.[1] According to this conceptualization, IA refers to a generalized impulse control disorder involving the problems one experiences in regulating the desire to engage in online activities. Young likened its symptoms to those of pathological gambling as defined in the DSM-IV.[33]

The YDQ is a brief self-report checklist comprising eight yes/no screening criteria (e.g., a loss of control over Internet use, withdrawal symptoms resulting from restricted Internet use). Young proposed a cutoff point of 5 to distinguish normal Internet users from problematic Internet users. The YDQ diagnostic criteria and cutoff point were highly similar to the recently proposed DSM-5 criteria for Internet gaming disorder.[34]

The 20-item IAT is an expanded version of the YDQ. Respondents rate each item on a 5-point Likert scale, and the IAT scores range from 20 to 100. They are distinguished according to Young's scoring scheme: 20–39 = average Internet users, 40–69 = potentially problematic Internet users, and 70–100 = problematic Internet users. Following the typical practice in the literature, IA was defined as problematic Internet use in this study.

Eligibility criteria

IA first emerged as a medical dictionary term in 1996.[35] Multiple search strategies were used as an attempt to locate every available empirical report from 1996 to 2012 that adopted the YDQ, IAT, or both for measuring generalized IA.

Reports were excluded if they (a) did not contain any quantitative data (e.g., qualitative studies, reviews); (b) investigated a specific subtype of IA only (e.g., cybersexual addiction, online gambling compulsion); (c) adopted the investigators' own diagnostic scheme (e.g., cutoffs of 3 for the YDQ, 50 for the IAT); (d) did not adopt any diagnostic schemes (e.g., using the YDQ as a dimensional measure, examining the factorial structure of the IAT only); and (e) failed to provide sufficient data for coding (e.g., abstracts of conference papers or unpublished theses).

Search strategies

Computerized searches were first performed via ProQuest for 11 online databases, including (a) Applied Social

Sciences Index and Abstracts (1987–current), (b) British Nursing Index (1994–current), (c) ComDisDome (1950–current), (d) COS Conference Papers Index (1982–current), (e) ERIC (1966–current), (f) MEDLINE (1960–current), (g) ProQuest Dissertations & Theses A&I: Health & Medicine (1960–current), (h) ProQuest Dissertations & Theses A&I: Social Sciences (1960–current), (i) PsycINFO (1960–current), (j) Social Services Abstracts (1979–current), and (k) Sociological Abstracts (1952–current).

In the literature on IA, scholars have used a range of terms interchangeably to refer to the same condition. Keyword searches were thus performed using a range of synonyms or alternative terms of IA: compulsive-Internet-us* OR computer-addict* OR cyber-addict* OR cyberspace-addict* OR excessive-Internet-us* OR Internet-addict* OR Internet-dependen* OR Internet-disorder OR Internet-overus* OR Net-addict* OR online-addict* OR pathological-Internet-us* OR problematic-Internet-us* OR Young-diagnos*. Wildcards were used as an attempt to maximize the number of studies included in the present meta-analysis. The searches were carried out to locate relevant reports completed between January 1, 1996, and December 31, 2012.

Additional searches were conducted by (a) going through the reference lists of the reviews and reports identified in the database searches, and (b) using the Web of Science databases to look for other articles that cited the selected reports. In addition, the author contacted the researchers who published extensively on the topic over the past decade, and also those whose reports or abstracts contained incomplete information. Decisions to include all the additional relevant reports were made before conducting the various analyses.

Coding procedures

A coding scheme was developed before the potentially relevant abstracts and articles were screened. After receiving training, two research assistants initially coded 10% of the selected reports on their own. Any discrepancies in their pilot work were discussed and resolved in ad hoc meetings before coding the entire data set independently.

All of the coding was checked by a third research assistant who was not involved in the coding tasks. All three of the research assistants were blind to the research aims and hypotheses before the completion of the coding procedures. The interrater reliabilities for the final coding were generally high (94–100%), indicating considerable accuracy and consistency between the coders.

Data coding

Both sample and national characteristics were coded in the meta-analysis. For each independent sample, the coders extracted the IA prevalence rate, sample size, sex composition (i.e., proportion of male participants), age composition (i.e., average age or age range), nation in which the sample was recruited, and survey mode (i.e., online sample or not) from the selected articles.

For each nation, both coders recorded its GDP per capita, Internet penetration rate, Life Satisfaction Index, and Quality-of-Life Indices based on the information provided by the relevant databases.[10,21,23,36]

Confound checks

The array of selected studies varied vastly in methodological rigor, and thus the possible effects of study quality were assessed using established coding schemes.[37,38] Four indicators were used: (a) bias reduction (1 = effort made to decrease the common method bias, 0 = no effort made); (b) measurement validity[39] (1 = well-established measure, 0.67 = approaching well-established measure, 0.33 = promising measure, 0 = nonpromising measure); (c) statistical power[40] (1 = adequate power, 0 = inadequate power); and (d) sampling strategy (1 = probability sampling, 0 = nonprobability sampling). These four indicators of study quality were aggregated to yield a composite score, which ranged from 0 to 4.

Apart from study quality, the presence of self-selection bias was also detected. Participants drawn from online sources (e.g., social networking sites, online forums) may have had access to and used the Internet more frequently, and thus their IA prevalence may be higher than that of the participants recruited through offline sources (e.g., news advertisement, community centers). A score of 1 was assigned to a study that recruited an online sample only, and a score of 0 was assigned otherwise.

Meta-analytic procedures

A random effects meta-analysis was performed to obtain a pooled prevalence estimate of IA. The random effects model rather than the fixed effects model was chosen due to the expected heterogeneity in the pool of selected studies. The prevalence figures were weighted by the inverse of the sampling variance of each independent sample, which was determined by the sample size. As the samples were recruited from an array of nations worldwide, a stratified meta-analysis was also performed to yield a prevalence estimate for each world region.

The I^2 index, which estimated the percentage of variations due to differences among the selected studies rather than sampling errors, was examined. Homogeneity tests were also

Table 1. List of National Indices Included as Moderators

World region	*GDP pc (US$)*	*IPR*	*LSI*	*PI*	*TCTI*	*SI*
All 31 countries	32,363	68%	6.87	55.42	34.12	65.22
North America[a]	49,965	78%	7.70	32.53	39.54	46.56
Oceania[b]	67,036	89%	7.60	20.89	39.09	55.56
N + W Europe[c]	60,733	86%	7.57	26.78	28.50	70.90
S + E Europe[d]	21,647	58%	6.66	56.88	34.88	55.95
Middle East[e]	14,376	55%	6.25	79.47	52.43	53.68
Asia[f]	17,869	63%	6.38	78.53	31.18	78.93
South America[g]	7,752	60%	8.40	68.26	43.57	45.84

[a]United States. [b]Australia. [c]Austria, Estonia, France, Germany, Ireland, Norway, Sweden, United Kingdom. [d]Bulgaria, Cyprus, Czech Republic, Greece, Hungary, Italy, Poland, Romania, Serbia, Slovenia, Spain. [e]Iran, Isarel, Lebanon, Turkey. [f]China, Hong Kong, India, South Korea, Taiwan. [g]Columbia.

GDP pc, gross domestic product per capita[36]; IPR, Internet penetration rate[10]; LSI, Life Satisfaction Index[21]; N + W, northern and western; PI, Pollution Index[23]; S + E, southern and eastern; SI, Safety Index[23]; TCTI, Traffic Commute Time Index.[23]

Table 2. Prevalence of Internet Addiction by World Region

World region	*Prevalence rate*	*95% CI*	k	N	Q	df	p
All 31 countries	6.0%	5.1–6.9	164	89,281	291.88	163	< 0.0001
North America[a]	8.0%	3.2–12.9	15	4,117	25.43	14	0.0306
Oceania[b]	4.3%	0.5–8.1	10	2,716	0.83	9	0.9997
N + W Europe[c]	2.6%	1.0–4.1	29	16,086	4.84	28	0.9999
S + E Europe[d]	6.1%	4.4–7.7	46	27,699	75.33	45	0.0031
Middle East[e]	10.9%	5.4–16.3	9	3,979	20.73	8	0.0079
Asia[f]	7.1%	5.3–8.9	54	34,604	135.96	53	< 0.0001
South America[g]	0.0%	n/a	1	80	n/a	n/a	n/a

[a]United States. [b]Australia. [c]Austria, Estonia, France, Germany, Ireland, Norway, Sweden, United Kingdom. [d]Bulgaria, Cyprus, Czech Republic, Greece, Hungary, Italy, Poland, Romania, Serbia, Slovenia, Spain. [e]Iran, Isarel, Lebanon, Turkey. [f]China, Hong Kong, India, South Korea, Taiwan. [g]Columbia.

conducted to scrutinize the variability across studies, and a significant *Q* statistic indicated that the prevalence estimates were dissimilar. Meta-regression analyses were then carried out to identify moderators that explained the heterogeneity of prevalence.

Results

Characteristics of the present data set

In this study, 80 reports met the eligibility criteria. The final data set consisted of 164 independent samples (*k*; $N = 89{,}281$). There was an average of 544 participants per independent sample ($SD = 440.76$; range 26–2,533). About half (49%) of the participants were men, and the average age was 18.42 years ($SD = 5.02$; range 12–41). The participants came from 31 nations across seven world regions, and their national characteristics are shown in Table 1.

Random effects meta-analyses and heterogeneous tests

Before conducting the random effects meta-analyses, possible outliers were identified using boxplot. The results revealed six extreme outliers in the data set. To avoid data loss, winsorizing procedures were used to replace these outliers with the nearest value.

Table 2 summarizes the overall estimated prevalence of IA and the estimated prevalence stratified by world region. The prevalence rates were relatively low for the nations in Oceania and those in Northern and Western Europe, but relatively high for the nations in the Middle East. The results also revealed moderate heterogeneity in the prevalence estimates ($I^2 = 44\%$, $p < 0.0001$).

Meta-regression analyses

The upper panel of Table 3 presents the meta-regression results of the cross-national comparisons. Several of the national indices could explain the heterogeneity in the present findings. Specifically, a higher prevalence of IA was more likely to be found in nations with a lower Life Satisfaction Index, higher Pollution Index, higher Traffic Commute Time Index, and lower GDP per capita, and vice versa. These results provided some support for the quality of (real) life hypothesis, which proposed an inverse link between quality of life and IA prevalence.

Confound checks

As shown in the lower panel of Table 3, the possible confounding effects of study quality and self-selection were not significant. Also, there were only 18% online samples in the data set, suggesting that the self-selection bias was not pervasive in this pool of studies.

Discussion

The present meta-analysis examined the prevalence of IA in 31 nations across seven world regions. The findings yielded an overall prevalence estimate of 6.0%. The IA prevalence rate was more than threefold higher than that of pathological gambling (0.2% to 2.1%), another impulse control disorder.[41] More importantly, there were considerable differences in the prevalence figures across world regions. The countries with the following characteristics tended to have a higher prevalence of IA: perception of less life satisfaction in general, greater overall pollution (primarily air pollution), greater traffic commute time consumption, and lower national income. Taken together, these results provided tentative support for the quality of (real) life hypothesis, which proposed an inverse link between IA prevalence and quality of (real) life.

Table 3. Summary Results of Meta-Regression Analyses

Moderator	β	SE	p
Testing accessibility hypothesis			
Internet penetration rate[10]	−0.1333	0.0277	0.1181
Gross domestic product per capita[36]	−0.2146	0.0000	0.0108
Testing quality of (real) life hypothesis			
Life Satisfaction Index[21]	−0.1939	0.0076	0.0218
Quality of environmental conditions:[23]			
1. Pollution Index	0.1960	0.0002	0.0207
2. Traffic Commute Time Index	0.3249	0.0006	0.0001
3. Safety Index	0.0254	0.0004	0.7671
Confound checks			
Study quality	−0.0277	0.0065	0.7463
Self-selection (online sample)	−0.0556	0.0153	0.5156

These results may have implications for policymakers. Specifically, the IA prevalence is positively linked with traffic commute time consumption and pollution. By increasing the efficiency of transportation networks and installing stricter pollution controls, the environmental stress that people suffer from may be alleviated. When less stressed, people may be less likely to escape into the virtual world of the Internet to search for emotional comfort,[27,28] and hence the likelihood of developing IA may be reduced. Furthermore, from a social engineering perspective,[42] improving the quality of environmental conditions may encourage residents to engage more in outdoor activities rather than relying solely on browsing the Internet at home for stress relief. Such measures provide an alternative avenue for reducing susceptibility to IA.

The findings failed to support the accessibility hypothesis, which speculates that Internet accessibility promotes IA. Interestingly, our findings documented high Internet penetration rates for Northern and Western Europe. Yet, the IA prevalence in this world region was very low. Network readiness, which refers to a nation's capability of advancing information technology infrastructure to secure greater national growth and socioeconomic rewards, may account for such results.[43] The nations in this world region have consistently been ranked at the top in terms of their network readiness,[44] and this may partly explain why both national income and national well-being are inversely related to IA prevalence.

Some cautionary issues warrant mentioning. While the present data set included nations from seven world regions, the absence of African data is noteworthy. Our literature searches could not locate any studies conducted in this world region. Hence, the present findings may not necessarily be applicable to African nations, which have a far lower Internet penetration rate (16%) than the rest of the world.[10] Although the African region is still at an early stage of Internet development, it is the fastest growing in the world.[45] More research effort should be expended to explore whether the accessibility or quality of (real) life hypotheses hold for African samples.

Although the meta-analyses revealed cross-national differences in IA prevalence rates, the incidence and remission rates of IA are also of interest to practitioners and policy makers. Such data could not be obtained because most of the selected reports adopted a cross-sectional design. More longitudinal studies are required to determine the incidence and remission rates of IA, a topic that has been underexplored in the literature.

Acknowledgments

Preparation of this article was supported by the Hong Kong Research Grants Council's General Research Fund (17400714) and Seed Funding Programme for Basic Research (201211159079).

Author Disclosure Statement

No competing financial interests exist.

References

1. Young KS. Internet addiction: the emergence of a new clinical disorder. CyberPsychology & Behavior 1998; 1:237–244.
2. Brand M, Young KS, Laier C. Prefrontal control and Internet addiction: a theoretical model and review of neuropsychological and neuroimaging findings. Frontiers in Human Neuroscience 2014; 8:375.
3. Yuan K, Qin W, Liu Y, et al. Internet addiction: neuroimaging findings. Communicative & Integrative Biology 2011; 4:637–639.
4. Ho R, Zhang M, Tsang T, et al. The association between Internet addiction and psychiatric co-morbidity: a meta-analysis. BMC Psychiatry 2014; 14:183.
5. Yen J, Ko C, Yen C, et al. The comorbid psychiatric symptoms of Internet addiction: attention deficit and hyperactivity disorder (ADHD), depression, social phobia, and hostility. Journal of Adolescent Health 2007; 41:93–98.
6. Shaw M, Black DW. Internet addiction: definition, assessment, epidemiology and clinical management. CNS Drugs 2008; 22:353–365.
7. Mann RE. Availability as a law of addiction. Addiction 2005; 100:924–925.
8. Cao F, Su L. Internet addiction among Chinese adolescents: prevalence and psychological features. Child Care, Health & Development 2007; 33:275–281.
9. Odacı H, Kalkan M. Problematic Internet use, loneliness and dating anxiety among young adult university students. Computers & Education 2010; 55:1091–1097.
10. Internet World Statistics. World Internet Usage and Population Statistics (December 31, 2013) 2014. www.internetworldstats.com/stats.htm (accessed April 17, 2014).
11. Bakken IJ, Wenzel HG, Götestam KG, et al. Internet addiction among Norwegian adults: a stratified probability sample study. Scandinavian Journal of Psychology 2009; 50:121–127.
12. Aboujaoude E, Koran LM, Gamel N, et al. Potential markers for problematic Internet use: a telephone survey of 2,513 adults. CNS Spectrums 2006; 11:750–755.
13. Norris P. (2001) *Digital divide: civic engagement, information poverty, and the Internet worldwide*. New York: Cambridge University Press.
14. Avgerou C, Madon S. (2005) Information society and the digital divide problem in developing countries. In Berleur J, Avgerou C, eds. *Perspectives and policies on ICT in society*. New York: Springer, pp. 205–218.
15. Griffiths M. Sex on the Internet: observations and implications for Internet sex addiction. Journal of Sex Research 2001; 38:333–342.
16. Griffiths M. Internet gambling: issues, concerns, and recommendations. CyberPsychology & Behavior 2003; 6:557–568.
17. Meerkerk GJ, van den Eijnden RJJM, Franken IHA, et al. Is compulsive Internet use related to sensitivity to reward and punishment, and impulsivity? Computers in Human Behavior 2010; 26:729–735.
18. Tang Z, Zhou S. Psychological risk factors of the youth with Internet addiction. Chinese Journal of Clinical Psychology 2009; 17:51–54.
19. Veenhoven R. The cross-national pattern of happiness: test of predictions implied in three theories of happiness. Social Indicators Research 1995; 34:33–68.
20. Diener E. Subjective well-being: the science of happiness and a proposal for a national index. American Psychologist 2000; 55:34–43.
21. World Values Survey Association. World Values Survey 1981–2008 Official Aggregate V.200909012009. www.worldvaluessurvey.org (accessed March 31, 2014).
22. Sen A, Hawthorn G. (1987) *The standard of living*. New York: Cambridge University Press.

23. Numbeo. Quality of Life Index for 2013. www.numbeo.com/quality-of-life/ (accessed April 17, 2014).
24. Evans GW, Bullinger M, Hygge S. Chronic noise exposure and physiological response: a prospective study of children living under environmental stress. Psychological Science 1998; 9:75–77.
25. Stokols D, Novaco RW, Stokols J, et al. Traffic congestion, Type A behavior, and stress. Journal of Applied Psychology 1978; 63:467–480.
26. King AC, Stokols D, Talen E, et al. Theoretical approaches to the promotion of physical activity: forging a transdisciplinary paradigm. American Journal of Preventive Medicine 2002; 23:15–25.
27. Lam LT, Peng Z, Mai J, et al. Factors associated with Internet addiction among adolescents. CyberPsychology & Behavior 2009; 12:551–555.
28. Whang LS-M, Lee S, Chang G. Internet over-users' psychological profiles: a behavior sampling analysis on Internet addiction. CyberPsychology & Behavior 2003; 6:143–150.
29. Bayraktar F, Gün Z. Incidence and correlates of Internet usage among adolescents in North Cyprus. CyberPsychology & Behavior 2007; 10:191–197.
30. Mottram AJ, Fleming MJ. Extraversion, impulsivity, and online group membership as predictors of problematic Internet use. CyberPsychology & Behavior 2009; 12:319–321.
31. Khazaal Y, Billieux J, Thorens G, et al. French validation of the Internet addiction test. CyberPsychology & Behavior 2008; 11:703–706.
32. Lai C, Mak K, Watanabe H, et al. Psychometric properties of the Internet Addiction Test in Chinese adolescents. Journal of Pediatric Psychology 2013; 38:794–807.
33. American Psychiatric Association. (1994) *Diagnostic and statistical manual of mental disorders*. 4th ed. Washington, DC: American Psychiatric Association.
34. American Psychiatric Association. (2013) *Diagnostic and statistical manual of mental disorders.* 5th ed. Washington, DC: American Psychiatric Association.
35. Young KS. Psychology of computer use: XL. Addictive use of the Internet: a case that breaks the stereotype. Psychological Reports 1996; 79:899–902.
36. World Bank Group. (2013) *World Development Indicators database*. Washington, DC: Author.
37. Anderson CA, Shibuya A, Ihori N, et al. Violent video game effects on aggression, empathy, and prosocial behavior in Eastern and Western countries: a meta-analytic review. Psychological Bulletin 2010; 136:151–173.
38. Cheng C, Cheung S, Chio JH, et al. Cultural meaning of perceived control: a meta-analysis of locus of control and psychological symptoms across 18 cultural regions. Psychological Bulletin 2013; 139:152–188.
39. Holmbeck GN, Thill AW, Bachanas P, et al. Evidence-based assessment in pediatric psychology: measures of psychosocial adjustment and psychopathology. Journal of Pediatric Psychology 2008; 33:958–980.
40. Cohen J. (1988) *Statistical power analysis for the behavioral sciences.* 2nd ed. Hillsdale, NJ: Lawrence Erlbaum.
41. Shaffer HJ, LaBrie RA, LaPlante DA, et al. The road less travelled: moving from distribution to determinants in the study of gambling epidemiology. Canadian Journal of Psychiatry 2004; 49:504–516.
42. Podgurecki A, Alexander J, Shields R. (1996) *Social engineering*. Ottawa, Canada: Carleton University Press.
43. Peña-López I. Networked readiness index vs. human development index. ICTlogy 2006; 30.
44. Dutta S, Bilbao-Osorio B, Geiger T. (2012) The global information technology report 2011–2012. Geneva, Switzerland: World Economic Forum.
45. International Telecommunications Union (ITU). (2007) Telecommunications/ICT Markets and Trends in Africa. Geneva, Switzerland: ITU.

Address correspondence to:
Dr. Cecilia Cheng
Department of Psychology
The University of Hong Kong
Pokfulam Road
Hong Kong

E-mail: ceci-cheng@hku.hk