

Rapid Communication

Internet Addiction: Metasynthesis of 1996–2006 Quantitative Research

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Abstract

This study reports the results of a meta-analysis of empirical studies on Internet addiction published in academic journals for the period 1996–2006. The analysis showed that previous studies have utilized inconsistent criteria to define Internet addicts, applied recruiting methods that may cause serious sampling bias, and examined data using primarily exploratory rather than confirmatory data analysis techniques to investigate the degree of association rather than causal relationships among variables. Recommendations are provided on how researchers can strengthen this growing field of research.

Introduction

THE INTERNET HAS EMERGED as an essential media channel for personal communications, academic research, information exchange, and entertainment.¹ While the positive aspects are renowned, concerns continue to mount regarding problematic Internet usage behaviors.² It is currently estimated that approximately 9 million Americans could be labeled as pathological computer users addicted to the Internet to the detriment of work, study, and social life.^{3,4} Among all behavioral addictive traits, the Internet stands out for its relevance to the future and its promise of potentially delivering harmful results to millions as access to the Internet rises globally.

To better understand Internet addicted behaviors, researchers have explored its symptoms, attempted to concretize the characteristics of addicts, conceptualized its antecedents and consequences, and developed corresponding measurement items. This study provides directions for future research through reflections on empirical research on Internet addiction over the 10-year period 1996–2006. Specifically, this study addresses the following questions: How has Internet addiction been measured? What aspects of the In-

ternet addiction phenomenon have been investigated by academic researchers? Given the sensitive nature of the topic, how have survey respondents been selected? and What are the predominant methods of data analysis in Internet addiction studies? In exploring these questions, various challenges to academic researchers are also presented.

Defining Internet Addiction

The capacity of the Internet for socialization is a primary reason for the excessive amount of time people spend having real-time interactions using e-mail, discussion forums, chat rooms, and online games.⁵ User participation at sites such as Blogger.com, MySpace.com, and Wikipedia.org increased by 525%, 318%, and 275% respectively.⁶ However, the networking capabilities of the Internet can cause social isolation and functional impairment of daily activities.⁷ In the workplace, Internet addictive behavior symptoms include a decline in work performance and a withdrawal from coworkers, leading to reduced job satisfaction and decreased efficiency.⁸

Broadly speaking, addiction is defined as a “compulsive, uncontrollable dependence on a substance, habit, or practice

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to such a degree that cessation causes severe emotional, mental, or physiological reactions.⁹ A perusal of the literature revealed various names for Internet addiction, including cyberspace addiction, Internet addiction disorder, online addiction, Net addiction, Internet addicted disorder, pathological Internet use, high Internet dependency, and others.^{1,10} Among these terms, *Internet addiction* is most popular.^{4,11} However, while Internet addiction has received attention from studies in various fields,¹² no clear definition currently exists. Some researchers have adapted *substance use disorder*, while others reference *pathological gambling*,¹³ resulting in an inconsistent definition of Internet addiction.^{7,14,15} Many researchers, due to the complex nature of the topic, do not provide a clear definition of Internet addiction.^{2,16,17}

For the purposes of this study, we define Internet addiction following Beard's holistic approach wherein "an individual is addicted when an individual's psychological state, which includes both mental and emotional states, as well as their scholastic, occupational and social interactions, is impaired by the overuse of the medium."¹⁸ While this definition is used as a guide, it must be noted that it does not totally encompass the underlying structure of the term. A standardized definition will become increasingly important as fascination with the topic grows. As such, we propose *Challenge 1 to researchers*: Develop a complete definition of Internet addiction that is not only conclusive but decisive, covering all ages, gender, and educational levels.

Methodology

We employed a meta-analysis approach¹⁹ to appraise the cumulative outcome of empirical research on Internet addiction. A study was considered empirical if it used human participants and a quantitative instrument to measure Internet addiction. To ensure quality and completeness, only full-length articles in peer-reviewed journals or conference proceedings were considered. Searches of academic databases and of Google and Yahoo! using keywords *Internet addiction*, *Internet addicted*, *problematic Internet usage*, and *computer addiction* resulted in 120 articles spanning the period 1996–2006 (see www.netaddict.org/IA120.xls). A total of 61 articles were found to have implemented quantitative analysis approaches using empirically based surveys and human participants. Further, 22 articles were excluded because they focused more on the social and economic costs of Internet addiction, treatment problems, or employee termination due to excessive Internet use. A list of the final 39 articles is available at www.netaddict.org/IA39.xls.

Results

Reflection 1: How has Internet addiction been measured over the period 1996–2006?

Most of the studies on Internet addiction adapted their criteria for analysis from the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) handbook,²⁰ the most frequently used manual for the diagnosis of mental disorders. While Internet addiction is not currently recognized in the DSM, it does describe the criteria for diagnosing pathological gambling (DSM-IV 312.31), a type of behavioral impulse-control disorder.¹⁶ Goldberg,²¹ a pioneer in the field, developed the Internet Addictive Disorder (IAD) scale by adapting the

DSM-IV and providing several diagnostic criteria, including two commonly used statements often seen in Internet addiction research: "hoping to increase time on the network" and "dreaming about the network." Brenner²² developed the Internet-Related Addictive Behavior Inventory (IRABI) with 32 true-or-false questions, and Morahan-Martin and Schumacher²³ constructed the Pathological Internet Use (PIU) scale with 13 yes/no questions by adapting the DSM-IV. In a bid to simplify the measurement process, Young²⁴ developed the 8-question Internet addiction Diagnostic Questionnaire (DQ) based on the DSM-IV. Young claimed that excessive use of the Internet is another type of behavioral impulse-control disorder, and as such, if a respondent answered yes to more than 5 of the 8 questions, the respondent could be defined as an Internet dependent user.²⁴ The cut-off score of 5 was consistent with that of the criteria for pathological gambling. While Young's instrument has the advantage of simplicity and ease of use,¹² it in no way covers all the antecedents of Internet addictive behavior, nor does it provide a clearer understanding of the topic.

Realizing the need for a stricter and more conservative judgment, Chou and Hsiao¹² utilized both the IRABI and the DQ and defined Internet addicts only when respondents meet both criteria simultaneously. They found 50% fewer Internet addicts than when the other methods alone were used. This lack of consensus has motivated other researchers to develop new measures of Internet addiction rather than rely heavily on the DSM-IV criteria (e.g., Widyanto and McMurrans² Internet Addicted test [IAT] and Shapira et al.²⁶ Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders-IV [SCID-IV]). Attempts have also been made to define Internet addicts by a single question,^{e.g.,^{11,27}} primarily the amount of time spent online. While the length of time is the most frequently reported predictor,⁴ it has severe limitations in that it is only one symptom of Internet addicted behavior rather than a parsimonious item of diagnosis.

The challenge of measurement is also compounded by researchers' reworking scales to suit their specific circumstances. For example, Chou and Hsiao¹² categorized 5.9% of their college student sample in Taiwan as Internet addicts by utilizing the Chinese Internet-Related Addictive Behavior Inventory version II (C-IRABI-II)^{22,28} and Young's²⁴ criteria. While such changes are important from a cultural perspective, these scales have not been standardized for efficient cross-study comparisons. Thus we propose *Challenge 2 to researchers*: Previous studies on Internet addiction have used inconsistent criteria, making any comparison across study findings meaningless.^{13,16} Future researchers should consider using prior works to develop a major study leading to a standardized instrument for measuring Internet addiction across cultural perspectives.

Reflection 2: What aspects of Internet addiction phenomenon have been investigated?

Primary antecedents of Internet addiction explored by researchers were based on participants' personality, low interpersonal skills, and high levels of intelligence. Ko et al.²⁹ assess Internet addiction through five dimensions: compulsive use, withdrawal, tolerance, interpersonal and health problems, and time management problems. Hur¹⁰ measured

the degree of self-control, Internet dependency, psychological distress, and abnormal behavior in which the four constructs are viewed as the actual causes of Internet addiction disorder rather than its underlying dimensions. In addition, Caplan³⁰⁻³² developed a theory-based measure of problematic Internet use and assessed its association with such psychological variables as depression, self-esteem, loneliness, and shyness. Research focused on predicting Internet addiction also included sensation seeking and poor self-esteem as predictors of excessive Internet use;³³ shyness, locus of control, and online experience as predictors of Internet addiction;³⁴ and attitudes toward computer networks and Internet addiction.³⁵ Most researchers focused on the associations among constructs, such as the relationship between Internet usage and interpersonal skills, personality, and intelligence;³⁶ between attention-deficit/hyperactivity/impulsivity symptoms and Internet addiction;³⁷ and between Internet addiction and depression and suicidal ideation.³⁸ Few studies questioned the existence of Internet addiction as a separate form of addiction and investigated whether or not the condition should be placed under other, previously identified disorders.³⁹⁻⁴⁴ These studies did not find significantly different overarching theories concluding that in general, Internet addicts tend to be lonely, have deviant values, and to some extent lack emotional and social skills.³⁶ A number of studies^{10,11,23,34,45-49} profiled Internet addicts using demographic characteristics and examined features common to participants that made them more vulnerable to developing an addiction, including psychiatric symptomatology and personality characteristics among excessive Internet users.⁴⁵

While the number of studies are increasing, work is needed to provide more stable evidence to support the findings of prior research. In sum, these authors found that while use of the Internet was associated with loneliness, no linkage was found between personality and Internet use. Most concluded that more work is needed to distinguish between predisposition to excessive Internet usage and its actual consequences. *Challenge 3 to researchers:* Develop a seminal text in the field that encompasses the cyberpsychological aspects, provide concrete signs of identification, and identify proven short- and long-term treatment strategies for Internet addicts.

Reflection 3: Given the sensitive nature of the topic, how have survey respondents been selected?

Studies on Internet addiction most often appropriately employ Internet survey methods. In an analysis of the challenges associated with Internet surveying, Couper⁵⁰ concludes that if a survey targets Internet users only, it is a good decision to employ the Internet survey mode. With a few exceptions,^{e.g.,13,29} most of the studies used Internet-based survey formats as well as used high school and university student samples.^{10,17,25,51} Our meta-analysis revealed that the different sample selection criteria across the studies have brought varying conclusions on the prevalence of Internet addiction. When more representative samples were selected, the percentage of Internet addicts tend to be lower than in studies with on-campus college student samples^{e.g.,10,13,16,34,39} It is understood that adolescents are at a point in their life cycle where they are very vulnerable to harmful addictive agents¹³ and can be easily persuaded to change their behaviors as they

are more accepting of technology tools. While this might be one explanation of why previous studies mainly examined Internet addiction focusing on the younger generation, it is important to note that very rarely do these studies raise red flags on Internet addiction levels among teenage and college populations that are purportedly prone to Internet addictive behavior. We are left to ponder: Have we targeted the wrong population for analysis? Have mainstream stereotypes affected research in the area where we have become shortsighted to the perils of the real populations that suffer from Internet addiction, such as online gamblers?

Recognizing this deficiency, several researchers have attempted to recruit samples outside of schools; however, most of these sample recruitment methods suffer from sampling bias.^{2,33} For example, participants in Armstrong et al.'s³³ study were recruited by using a convenience sampling method: (a) survey invitation message posted on an Internet addiction forum Web site and (b) survey e-mails sent to acquaintances asking them to forward the e-mail to others. These recruiting methods seem to bring significantly biased respondents because the surveys were completed by self-selected Internet users. Such errors are also noted when researchers utilized additional media to recruit samples, such as through nationally and internationally dispersed newspaper advertisements.^{11,24} While this extends the diversity of media in recruiting, the sample selection criteria are still far from the randomization principle and raise questions regarding sample coverage errors. For example, the characteristics of people who are aware of and visit a related forum Web site may differ from those who are Internet addicts but do not visit any of these sites. Thus, *Challenge 4 to researchers:* Begin to examine sample selection and its effect on study outcomes. Use sound sampling techniques that result in fewer problems in generalizing the findings of the study to its population. Use samples that are not convenient or "safe-haven" student samples and that are more reflective of the entire population of Internet users. Current statistics reveal that the over-50 age group is a growing population of Internet users; researchers should begin to examine these populations and their development of Internet addictive behaviors.

Reflection 4: What are the predominant methods of data analyses in Internet addiction studies?

Our meta-analysis found that prior studies on Internet addiction have focused on "proving" the existence of Internet addiction or identify the characteristics of Internet addicts. The analysis methods employed were thus exploratory rather than confirmatory. Ko et al.²⁹ and Soule et al.¹¹ tested the personal characteristics of Internet addicts using ANOVA. Through *t* tests between Internet addicts and non-addicts, Chou and Hsiao¹² found that addicts spent significantly more hours online and perceive the Internet as more entertaining, interactive, and satisfactory than do nonaddicts. Regression is the most common form of inferential statistics used in Internet addiction studies.^{12,33} Using stepwise regression analysis, Chou and Hsiao¹² found that self-reported communication pleasure experience, hours spent on bulletin board services (BBS), gender, satisfaction score, and hourly e-mail usage are the best predictors of Internet addiction.

Few studies have applied cause-and-effect techniques, such as structural equation modeling, to test Internet addiction models. However, several limitations have emerged in the data analyses and interpretation stages of these projects. For example, Davis et al.¹ developed the Online Cognition Scale (OCS) from the literature on problematic Internet use and tested its dimensionality using AMOS, a tool for structural equation modeling (SEM). While their approach was confirmatory, more respondents were needed when the number of items in the model was considered;⁴ as such, the study did not conform to the standard sampling guidelines of SEM. Similarly, Widyanto and McMurrans² and Davis et al.¹ also suffered from too-small sample sizes.⁵² In addition, Pratarelli and Browne,¹⁷ acknowledging the lack of robustness, still interpreted their research models in spite of the bad model fit indices (chi-square value over 2,880 with 524 degrees of freedom and RMSEA over 0.9). In addition, some factor loading values were over 1.0, showing problems with the measurement items within the model. Thus, we propose *Challenge 5 to researchers*: While the findings of studies that utilized first-generation analysis are still valuable and have advanced our knowledge on Internet addiction so far, researchers are encouraged to develop confirmatory research models by utilizing the findings of preceding exploratory studies and theories in the psychology discipline.

Conclusion

In general, Internet addiction has commonly been viewed as an extremely broad topic with few common definitions and little guidance. Researchers should work to develop a standardized definition of Internet addiction with supporting justification. We found that previous studies on Internet addiction were primarily concerned with the antecedents of Internet addiction and with identifying features in participants that made an individual more susceptible to becoming an Internet addict. However, the development of the concept, due to its complex nature, requires more systematic empirical and theory-based academic research¹⁰ to arrive at a more standardized approach to measurement. The use of representative samples and data collection methods that minimize sampling bias is highly recommended. Further, implementation of analyses methods that can test causal relationships, rather than merely examining the degree of associations, are recommended so that antecedents and consequences of Internet addiction can be clearly differentiated. The outcomes of this quantitative meta-analysis serves as a basis for those looking forward to expanding this field of study not simply as an accumulation of relevant knowledge but more as a basis of formulating a more sustainable foundation for the development of treatment approaches.

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