

A Factor Analytic Study of the Internet Usage Scale

David M. Monetti
Mark A. Whatley
Kerry T. Hinkle
Teddi Cunningham
Jennifer E. Breneiser
Rhea Kisling
Valdosta State University

Abstract

This study developed an Internet Usage Scale (IUS) for use with adolescent populations. The IUS is a 26-item scale that measures participants' beliefs about how their Internet usage impacts their behavior. The sample for this study consisted of 947 middle school students. An exploratory factor analysis with varimax rotation was conducted on the data that yielded an initial three-factor solution. However, after eliminating items that provided redundant variance, the three-factor solution was unacceptable. A two-factor solution was investigated and found to be acceptable. The first factor was termed "SELF-DETACHMENT" and accounted for 19.16% of the variance. The second factor was termed "USAGE" and accounted for 9.10% of the variance. These psychometric properties show promise for further exploration of Internet usage among adolescents.

In May 2010, the Associated Press reported that a South Korean court convicted a couple in the negligent death of their infant resulting from excessive video gaming. The video game they were obsessed with and played an average of 10 hours a day involved raising a virtual child (Yoon, 2010). Between 2000 and 2002, conservative estimates indicate that the number of U.S. online households and Internet users is projected to jump from 32 million to 44 million households, and from 62 million users to 85 million users (Murray, 2000). Since 2000, the U.S. experienced a growth rate of 151.6% in internet usage (IWS, 2010). More recent sources estimate that from 176 million to 239 million individuals in the United States have access (e.g., cable modem, wireless laptop, cell phone, etc.) to the Internet (IWS, 2010; Stellin, 2001) and almost 2 billion individuals worldwide (IWS, 2010). Given that approximately 75.9% of the population of the United States is using the Internet (World Bank, 2010), research concerning its benefits and burdens seems warranted. While the popular culture and mass media have lauded the positive effects of the Internet (e.g., Clark & Everhart, 2007), educational researchers are still examining its impact on students and their behavior.

Although there is little doubt that the Internet has initiated a revolution in the enhancement of personal and business communications, for some individuals who may be psychologically vulnerable, Internet usage may have significant emotional and behavioral consequences (e.g., Young & Rodgers, 1998). For example, Greenfield (1999) conducted a web-based study with 17,251 participants that found that about 6% of the sample suffered from some form of Internet addiction (see also Greenfield & Davis,

2002). However, a subsequent review of research on the topic of Internet dependency conducted by Walther and Reid (2000) cautioned researchers against the labels “dependency” and “addiction” when examining Internet usage (see Oblinger, 2003). As indicated by Scealy, Phillips, and Stevenson (2002) Internet usage can drive feelings of isolation or create social bonds.

Research to date on Internet usage and dependency has focused primarily on adult populations with limited emphasis on youth. One of the few articles concerning the impact of the Internet on students, Suler (1998) indicated that teens are now socializing in Internet spaces, such as chat rooms, instead of more traditional hangouts. Not surprisingly, we know very little about the benefits or burdens that may accompany this new realm. Thus, the Internet enables children and adolescents the option of turning to “cyber-friends” instead of satisfying their need for social contact through more traditional, real-world interactions.

Along with many other challenges facing today’s youth and those who provide behavioral health care services for them, the potential impact of the Internet can not be ignored. In 1999, an estimated 11 million teenagers were online (Leland, 1999). Since then, the number of 12-17 year olds in the United States has continually increased from 34.7 million users in 2007 to 37.9 million in 2010 (eMarketer, 2010) with estimates as high as 93% of youth being online (Macgill, 2007). This trend is expected to increase with projections of 38.8 million users in 2011 and 39.7 million users in 2012 (eMarketer, 2010). Investigating the consequences of Internet usage and exploring possible interventions is imperative.

Often, the Internet can be used by students for educationally relevant purposes, such as conducting cross-cultural interviews, research, and sharing information. However, for some individuals, Internet usage may represent a means by which they become socially isolated, thus endangering the quality and quantity of their interpersonal relationships. For example, Reisberg (2000) reported that at least 10% of college students frequently using the Internet experienced a negative impact on their grades, health, and social lives. Because of the paucity of research, a question remains as to the magnitude of impact of Internet usage on America’s youth.

In contrast, what we clearly know are some of the personal and interpersonal features of adolescence. We know that teens are in the process of identity development and exploration (Erikson, 1963). Adolescence is a time of independence and separation from parents and adults, which makes Internet usage a natural source of impersonal answers and information. Further, we understand that personal relationships are especially important at this time of life. On the Internet, youth can interact with a variety of people and groups offering them varying degrees of social and emotional support—some good, some not so good. Adolescence is also a time of stress and frustration.

This research was conducted for three main reasons. First, the nature of the impact of Internet usage on student behavior has yet to be concretely established, although we suspect that it impacts individuals differentially based on their psychological

predispositions. For example, pressures of school, family, and friends might make cyberspace the perfect place to vent and thus serve as a productive means to gain needed information and beneficial social contacts. In contrast, other youth may find the Internet only enhances their stress and consequentially may negatively impact their social and emotional well-being. Second, much of the current research in this area involves small sample sizes. For example, the issue of inadequate sample size used in similar research was expressed by Gross, Juvonen, and Gable (2002). Third, and perhaps most germane to the current study is that valid and reliable instrumentation needed to be developed to examine this phenomena. Thus, given the seriousness of these concerns, the purpose of this study was to develop a questionnaire that would measure how adolescents are using the Internet and the degree to which it impacts their social and emotional development.

Method

Participants

Middle school students ($n = 947$) from a rural part of the southeastern United States participated in the study. The gender composition was 492 female and 452 male with three of the students choosing not to report gender. The grade distribution consisted of 6th graders ($n = 329$), 7th graders ($n = 308$), and 8th graders ($n = 310$). The typical ages for 6th through 8th grades are 11 to 14 years. The sample consisted of 287 (30.3%) African American, 498 (52.6%) Caucasian, 44 (4.6%) Hispanic, 106 (11.2%) Other, and 12 (1.3%) who opted not to respond to this item. In the sample, 400 participants received free or reduced lunch, while 476 of the participants did not receive free or reduced lunch, and 71 of the students opted not to answer this item.

Materials

The Internet Usage Scale (IUS) began with a 26 item pool, four of which were demographic in nature and 22 of which operationalized the participants' attitudes regarding how Internet usage affects their behavior. Participants selected one of four possible choices from (A) *Not at All* to (D) *A Lot* where the response indicates the magnitude of the attitude. The last question, "What do you do most frequently on the Internet," is answered from (A) *using web sites*, (B) *using chat rooms*, (C) *using e-mail*, and (D) *I use web sites, chat rooms, and e-mail the same amount of time*.

Procedure

Parental permission was obtained through the school administration for the administration of the Internet Usage Scale. Participation in the study was voluntary and students could elect not to participate in the study independent of parental consent. Students' anonymity was carefully guarded through the use of coded data throughout data collection, entry, and analysis stages. Standardized instructions were given to all study participants by the classroom teachers. The instructions were: "The following questions are related to your Internet use. For these questions the term Internet includes online use of web sites, chat rooms, and e-mail. Please read each question carefully and bubble in your answer on the separate answer sheet. You are not asked to give your names so

please be honest in answering.” Students were given the opportunity to ask questions related to the administration of the instrument both before and after administration of the scale.

Results

Factor Analysis Overview

Factor analysis is a method for analyzing data that allows research to identify the main factors or clusters that explain the relationship among the observed variables (Pedhazur & Schmelkin, 1991; Tabachnick & Fidell, 1989, 2001). The observed variables, for example participants' responses to a particular measure, are believed to suggest the unobservable or latent construct of interest (i.e., the factor). When applied to scale development, factor analysis is useful, in that it selects a subset of items that are seen as representing the underlying construct the researcher is trying to assess (e.g., Glick & Fiske, 1996). The objective of factor analysis is to detect or differentiate the fewest possible factors that are compatible with and/or explain the data.

The factor analysis used the maximum likelihood method of extraction and varimax rotation. The maximum likelihood method of extraction (Joreskog & Lawley, 1968; Lawley & Maxwell, 1963) generated the parameter estimates. Maximum likelihood estimates the population values for the determinants that maximize the probability of sampling the observed correlation matrix from a population (Tabachnick & Fidell, 1989). In more simple terms, maximum likelihood minimizes the discrepancy between the population and sample covariance matrix, thereby maximizing the fitting function. Varimax rotation maximizes the factor loading variance and is the most commonly used method (e.g., Tabachnick & Fidell, 1989).

The data were analyzed using The Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity to determine if a factor analysis of the data would be appropriate. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy was .842. This analysis indicated that the distribution exceeded the standard .7 requirement. Bartlett's Test of Sphericity revealed that there was a connection between the variables, thus permitting the factor analysis [$\chi^2(231) = 3034.60, p < .001$]. Therefore, the data were analyzed utilizing an exploratory factor analysis using the varimax rotation method. Factor analysis was used to reveal which items tended to cluster together. These clusters are referred to as factors (Aron & Aron, 1999).

One method to determine the number of factors to retain is the eigenvalue > 1.0 method. An eigenvalue is a measure of the variance accounted for by a given factor. The factor analysis revealed 6 factors with eigenvalues greater than 1.0. An additional or complementary method for retaining a factor is the scree-test (Cattell, 1966). This method is advocated by Cattell and entails focusing the researcher's attention to a visual display of the eigenvalues. The scree-test "rule" is that a researcher should stop extracting factors when the eigenvalues begin to level off and form a comparatively straight line.

An examination of the scree plot suggested the presence of a three-factor solution. Upon further investigation, a three-factor solution was unacceptable due to items cross-loading on the factors. Cross-loading is when an item loads above .30 on more than one factor; thereby, the item(s) share redundant variance with one or more factors. As such, we investigated a two-factor solution.

The two-factor solution was much more satisfactory retaining only items that contributed unique variance to a specific factor. Reliability (internal consistency) of the two-factor solution was .74. The coefficient of variation for the two-factor solution was .27. The coefficient of variation allows a comparison and assessment of the amount of variation that exists in a measure (Howell, 1992). The higher the value the more variation exists, and the greater the variation the greater the ability of a measure to discriminate between groups. The items and factor loadings are presented in Table 1.

Factor I

The first factor, consisting of six items (i.e., 5, 9, 12, 14, 18, 24), was termed “SELF-DETACHMENT” and accounted for 19.16% of the variance. The standardized alpha coefficient of the items composing this factor was .70. This factor was conceptualized as a social/affective orientation toward Internet usage resulting choices that create a preference for the use of technology as opposed to more traditional face-to-face contact (e.g., family, friends, and activities). Globus (2002) reviewed the possible effects of Internet use on activities such as sports and other leisure activities. The factor label “SELF-DETACHMENT” was selected based on terminology utilized in the literature (Weiser, 2001). The coefficient of variation for Factor 1 was .37.

Gender differences. A one-way analysis of variance (ANOVA) was calculated to determine whether males and females differed on self-detachment. The analysis was significant, $F(1, 942) = 4.33, p = .038 (r = .07)$. In general, males reported that internet usage led to greater social and affective detachment from others, as well as activities ($M = 9.77, SD = 3.67$), than did females ($M = 9.29, SD = 3.41$).

Factor II

The second factor, consisting of six items (i.e., 8, 10, 19, 20, 22, 25), was termed “USAGE” and accounted for 9.10% of the variance. This factor was conceived as an indication of the preference of adolescents toward how and when they are likely to use the Internet, a discussion by Jenkins (2001) highlighted possible ways in which adolescents may prefer to use the Internet. The standardized alpha coefficient of the items composing this factor was .67. The coefficient of variation for Factor 1 was .31.

Gender differences. A one-way analysis of variance (ANOVA) was calculated to determine whether males and females differed on usage. The analysis was significant, $F(1, 942) = 15.83, p < .001 (r = .13)$. In general, females reported that they prefer internet usage more ($M = 13.25, SD = 4.05$) than did males ($M = 12.19, SD = 4.12$).

Discussion

The motivation for the development of the IUS rests on the scarcity of data reported in the literature. The lack of data concerned: (a) how much time adolescents spend on the Internet, (b) how they specifically use the Internet, and (c) the potential effect Internet usage has on their behavior. Of these three areas of concern, the most salient gap seems to be an exploration of the possible connection between Internet usage, socio-emotional development, and problematic behavior in adolescents (i.e., aggression, depression, social isolation, persecution, and rejection). Exploring these concerns necessitated the development of a scale examining the impact of Internet usage on adolescent populations. The first developmental step was to examine the adequacy of the psychometric characteristics of the Internet Usage Scale. The reliability analysis of the scale yielded a standardized alpha coefficient of .74. The second step involved conducting an exploratory factor analysis to examine the underlying structure of the data. The analysis suggested a two-factor solution. We labeled these factors self-detachment and usage. One puzzling aspect of the findings was the presence of behavioral differences between male and female adolescents.

There are several possible explanations why males would score significantly higher on detachment and females would score significantly higher on usage. For example, Vandello and Cohen (1999) found that the South is more dominated by collectivism (e.g., interdependence) than by individualism (e.g., independence). Additionally, even within a predominantly individualistic culture, such as in the U.S., males tend to be more individualistic than females; whereas, females tend to be more collectivistic than males (Cross & Madson, 1997; Madson & Trafimow, 2001; Verkuyten & Masson, 1996; Winstead & Griffin, 2002). Any of the various explanations of the observed sex differences hold merit, however, a more parsimonious explanation is that the observed differences are artifacts of the large sample size.

Although the results of the study suggest promise for incorporating the IUS into research investigating this topic, we acknowledge that the sample may present issues surrounding generalizability. Therefore, we want to caution researchers from over interpreting these results. Specifically, there are two plausible concerns worth mentioning: the geographical location of the sample (Southeast U.S. region) and the presence of gender differences in Factor I and Factor II mentioned above. The sample used to develop the IUS was from the Southeast. Research demonstrates that individuals in the South possess more traditional attitudes and values. For example, Secret (1987) showed that individuals in the Southeast tend to be more religious and conservative compared to individuals in other parts of the country (e.g., Madson & Trafimow, 2001). In addition, there is a body of research demonstrating a relatively strong attitude-behavior correspondence (e.g., Kraus, 1995). The extent to which such attitudinal differences impacted the manner participants responded to the survey items is unknown and beyond the scope of the current project.

If a causal link between Internet usage and detrimental behaviors can be established, information concerning Internet usage among teens could be considered in directing

intervention strategies toward the most vulnerable subgroups. Further inquiries should be designed to analyze the impact of the Internet usage on various cultural, socioeconomic, and gender subgroups. The information gained from this research could be used to alert educators, parents, and counselors to possible difficulties associated with Internet usage amongst adolescents.

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Table 1

Internet Usage Scale Items and Factor Loadings

Items	Factor Loadings	
	I	II
1. To what extent do you believe your time spent with friends is affected by the amount of time you spend on the Internet?	.395	.083
2. To what extent do you prefer to interact with your online-friends and contacts as opposed to your face-to-face friends?	.293	.347
3. To what extent do you believe your extra-curricular activities (sports, band, clubs) are affected by the amount of time you spend on the Internet?	.487	-.011
4. How often do you rely on Internet contacts to get advice?	.193	.361
5. To what extent are your responsibilities at home (chores, homework, pets) affected by the amount of time you spend on the Internet?	.477	.141
6. To what extent do you believe your time spent with community activities (church, scouts, sports, clubs) is affected because of the time you spend on the Internet?	.611	.022
7. To what extent do you believe your time spend with family is affected because of the time you spend on the Internet?	.618	.140
8. To what extent have you found yourself using the Internet more now than you used to?	.232	.580
9. To what extent do you find yourself looking forward to the time when you will be able to go on the Internet?	.258	.355
10. How often do you use the Internet?	.020	.740
11. How often do you feel lonely or sad when you are not on-line?	.444	.212
12. What do you do most frequently on the Internet?	.017	.472