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**Problematic Internet Use among College Students:**

**An Exploratory Survey Research Study**

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**Problematic Internet Use among College Students:**

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**Problematic Internet Use among College Students:  
An Exploratory Survey Research Study**

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The Internet has become an important part of many people's lives across the world since its first launching in 1960s. In spite of its many beneficial roles for various new applications and services, the emergence of the Internet also has created a new problem called "problematic Internet use" or "Internet addiction," in which individuals experience interpersonal, school, or work-related problems due to excessive use of the Internet. However, since problematic Internet use is a relatively new phenomenon, research in this field has produced as yet a limited number of research studies.

This study reviews available research related to defining, assessing, and measuring the problematic Internet use of college students, and examines characteristics related to Internet use for this population. This study utilizes a web-based survey with a randomly selected sample of registered undergraduate and graduate students of the University of Texas at Austin in 2006.

The Internet Addiction Test (IAT) (Young, 1998) and the Online Cognition Scale (OCS) (Davis, 2002) were employed to measure aspects of problematic Internet use.

Result scores of the Internet Addiction Test (IAT) showed that only 0.8 percent of the respondents were diagnosed as Internet users with significant problems, whereas 28.0 percent were classified with frequent problems. Consolidation of the percentage of respondents with the frequent problems and the significant problems resulted in a total of 28.8 percent presenting with problematic Internet use. A gender difference with regard to problematic Internet use was evident, with male students scoring higher on both the Internet Addiction Test and the Online Cognition Scale. Time spent online for non-academic purpose was positively correlated with problematic Internet use, whereas both age and GPA were negatively correlated with problematic Internet use. The hard science students were more likely to be problematic Internet users than soft science and fine arts students while freshmen students were more vulnerable to problematic Internet use than graduate students.

Overall, the findings of this study support previous research except for Internet applications and services used by college students. The percentage of online chatting users has dramatically jumped from mere 9.1% (Scherer, 1997) to 56.4%. In contrast to this jump, the percentage of Usenet service use has decreased from 36.9% (Scherer, 1997) to 11.7%. Relatively new services such as blog/social networking and file sharing, which were not reported in earlier studies conducted by Scherer (1997) and Young (1996, 1998), have become increasingly popular. It seems that, as network technology is evolving and more services have become available, the trend of Internet use is also changing.

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# CHAPTER 1

## INTRODUCTION

### Statement of the Problem

Since the launching of the Internet in 1960s, the continued growth of Internet technology and applications has become an important part of the reality of many people's lives globally. Thanks to the Internet, people can communicate and interact with others in numerous new ways through text, photos, and even audio/visual means. Individuals and groups can communicate using chatting, instant messaging, e-mail, news groups, and discussion groups, all of which can be used for social, informational, educational, and even self-help purposes. At the same time, numerous informational and educational opportunities are readily available online, including e-books and libraries, encyclopedias, newspapers, and such. Recreational activities such as online gaming, downloading music/video files, gambling, and dating services are also easily accessible via the Internet. The Internet has is now the back bone of those so-called "e" phenomena such as e-commercial, e-business, e-medical, e-telephone, and so forth. The possibilities of Internet-related services and applications seem to be limitless, as the Internet increasingly becomes an inseparable part of individuals' daily lives, knowingly or unknowingly.

In spite of its many beneficial roles, the Internet also has created a new problem for some people, an issue most commonly known as "Internet addiction," in which individuals experience family, school, or work related problems due to excessive use of

the Internet. Since the Internet has become a significant part of individuals' lives throughout the world, problems associated with Internet overuse have been a concern in many countries. According to Holden (2001), Internet abuse is the country's fastest growing addiction among various types of chemical and non-chemical addictions. Moreover, an ABC News survey of more than 17,000 participants in 1999 estimated that approximately six million American may be addicted to the Internet (Yang, 2000).

However, since problematic Internet use is a relatively new phenomenon, research in this field has produced as yet a limited number of research studies. Many published studies do not use a consistent definition of "Internet addiction" or employ tested measurement tools often utilizing instead their own measures of problematic Internet use with unknown reliability and validity. In addition, these studies often use smaller-sized convenience samples rather than larger randomly selected samples. With the use of inconsistent definitions, untested measures, and smaller-sized samples, difficulties generalizing the research findings of this field are apparent.

### Purpose of Study

The purpose of this study is to review available research related to defining, assessing, and measuring the problematic Internet use of college students, and to examine characteristics related to Internet use for this population. In addition, a brief review of research related to problematic Internet use of adolescents and general sample of Internet users in order to identify common characteristics will be included. Using a large randomly-selected sample of university students, this study examines selected research

questions regarding aspects identified as important based upon a literature review regarding problematic Internet use among college students. This study employs demographic information and data from two selected measures of problematic Internet use with the best demonstrated reliability and validity.

Specific aims of this study are: (1) to identify and examine the current prevalence rate of Internet abuse among students at a large public university, (2) to find the average time spent using online services, (3) to identify online services that the students are using, (4) to test the relationship of grade point average (GPA) and Internet abuse, (5) to investigate other selected aspects of Internet dependence, and (6) to compare two scales measuring aspects of Internet use (the Internet Addiction Test and the Online Cognition Scale). As noted earlier, there are a number of different terms used to describe the same construct associated with problematic Internet use such as “Internet addiction,” “pathological Internet use,” and “problematic Internet use.” In this study, rather than choosing a specific term related to addiction or dependence, the more generic term “problematic Internet use” will be used to describe the symptoms in which individuals experiencing frequent or severe problems related to Internet use.

### Brief History of the Internet

The Internet is a network system in which computers around the world can be connected together. According to Krol’s (1995) *The Whole Internet Users Guide and Catalogue*, the Internet is “(1) a network of networks based on the standard sets of

protocols, (2) a community of people who use and develop those networks, and (3) a collection of resources that can be reached from those networks.”

The birth of the Internet dates to the late 1960s when the U.S. Department of Defense began to develop a telecommunication network system that could survive a nuclear strike. In 1969, they launched a study of ARPANET (Advanced Research Projects Agency Network) to build a decentralized computer network for national security. A decentralized network is less vulnerable to disruption than a centralized network in which information is concentrated in one place. Unlike a centralized network, a decentralized network does not have a central point governing the flow of all information. Thus, even when one part of the network is damaged, the network can still function by bypassing and rerouting the damaged network. ARPANET is the predecessor of the Internet (Congressional Digest, 2007).

Initially, ARPANET was designed for military and research purposes only. However, restrictions for commercial or public use of the Internet were lifted in 1991, and a graphically oriented web-browser, which makes it much easier to access to the Internet, was introduced in 1993 by the National Center for Super Computing Application (NCSA). In addition, the ownership of affordable personal computers has been continuously increasing since the first personal computers were introduced to the mass market in early 1980s. Due to the combination of these events, the Internet became widely accessible to the general public (Huang & Alessi, 1996).

In the late 1990s, Internet experts predicted that Internet usage among the general population would rapidly increase over the next few years along with the advent of



affordable broadband connections such as cable-modem and Digital Subscriber Lines (DSL) (Griffiths, 2000). By 2007, 71% of American households had an Internet connection, which is an increase from 50% in 2001 (Time, 2007). With this increasing popularity, the Internet, which was initially developed as a communication tool, has grown to provide a variety of services for entertainment (e. g., online TV, video, music, and gaming), education (e. g., e-libraries and online classes), and business (e. g., online banking and shopping) as well as communication (e. g., e-mail and online chatting).

### Impact of the Internet on Daily Life

The use of Internet has both positive and negative impacts on a person's daily life. People can enjoy benefits of the Internet for daily routine use (e-mails and newspapers) and recreational use (online games and chatting) as well as specific services such as its use as an educational tool (Barrie & Presti, 1996), social networking tool ("facebook" or "myspace") (Ellison, Steinfield, & Lampe, 2007), a vehicle for electronic commerce (Lynch, & Lundquist, 1996; Kiang, Raghu, & Shang, 2000; Poon, Murdoch, & Joseph, 2001), or a tool for accessing health related services (Bloom, & Iannacone, 1999; Rice & Katz, 2001; Kalichman, Weinhardt, Benotsch, DiFonzo, Luke, & Austin, 2002). Despite these widespread positive uses of the Internet, numerous researchers have pointed to social and psychological concerns associated with problematic Internet use. Problems associated with the excessive use of the Internet began to be reported in the mass media in mid 1990s. *The New York Times* (1996), for example, reported the case of a woman whose husband divorced her because she spent too much time online instead of

taking care of her children. *The Washington Post* (1996) reported that some college students obsessively used the Internet in order to establish new relationships with others. Researchers also began to publish their empirical studies on Internet related problems in mid 1990s. A survey conducted by Young (1996) revealed that Internet use could result in severe academic, relationship, financial, and occupational problems, and another study of Scherer (1997) found that college students diagnosed as “Internet dependent” had difficulties in fulfilling major responsibilities at work, school. The rate of Internet users and the services that the Internet provides are increasing. Thus, the problems associated with Internet use are also expected to increase.

## CHAPTER 2

### LITERATURE REVIEW:

#### DEFINING AND MEASURING PROBLEMATIC INTERNET USE

In this chapter, the definitions and the models of problematic Internet use will be presented, and related assessment tools will be reviewed.

#### Defining Problematic Internet Use

The term “Internet addiction” has been one of the most widely used terms describing problematic Internet use. The term “Internet addiction” is commonly used in mass media such as newspapers, magazines and TV. In addition, “Internet addiction” has become one of the most frequently used terms by researchers and clinicians including Young (1996, 1998), Griffith (1997, 1998), Petrie and Gunn (1998), Pratarelli, Browne and Johnson (1999, 2002), Chou and Hsiao (2000), Tsai and Lin (2001), Simkova and Cincera (2004), Song, Larose, Eastin, and Lin (2004), and Nichols and Nicki (2004). However, it has been argued whether the term “Internet addiction” is an accurate or precise term describing the characteristics of people who have personal, family, or school/work related problems associated with the use of the Internet. Although, for mass media and the general public, the term “addiction” is used to the extent of describing any phenomena in which individuals are irresistibly or obsessively drawn to certain objects or behaviors as well as chemicals or substances, the concept of addiction in the clinical field

has usually been associated with ingestion of chemicals or substances such as alcohol and other drugs (Griffiths, 1998). Also, the *DSM-IV*, in which the term “addiction” is replaced with “dependence,” limits the use of “dependence” (addiction) to involvement of substances only. Erickson (2008) even argued that the term “addiction” is so often misused and so unscientific that it should be replaced with “dependence” as shown in *the DSM-IV*. Judging from this strict clinical perspective on addiction, it is not appropriate to use the term “Internet addiction” because the Internet addiction has nothing to do with chemical or substance ingestion.

However, there is a group of researchers who have been trying to expand the strict clinical concept of addiction by embracing “behaviors” as a source of addiction. Griffith (1997) defined “Internet addiction” as a type of technological addiction involving non-chemical (behavioral) addiction to a human-machine relationship. Also, Holden (2001) classified Internet addiction as a behavioral addiction. He represented a functional Magnetic Resonance Imaging (fMRI) picture of a gambler’s brain taken by a researcher at Massachusetts General Hospital in Boston, and argued that “brain activity and biochemistry are affected the same way in behavioral addictions as they are by substance abuse” (p. Holden 2001). Behaviors like gambling can be addictive without ingestion of any chemicals, and these behaviors can trigger certain neural activities in the brain just like chemicals do. Although this expanded concept of addiction is overlapping with impulse control disorders, it certainly provides a fresh perspective in defining problematic Internet use as a behavioral addiction.

Adopting either the strict clinical perspective on addiction or the newly expanded concept of addiction, scholars and researchers put forward other terms of Internet addiction. Other terms appearing in the professional literature include “excessive Internet use” (Beard, 2002), “problematic Internet use” (Caplan, 2002; Davis, Flett, & Besser, 2002), “maladaptive Internet use” (David, Flett, & Besser, 2002; Kubey, Lavin, & Barrows, 2001), “Internet dependence” (Young, 1996; Scherer, 1997), “Internet over-use” (Whang, Lee., & Chang, 2003), “Internet related disorder” (Pratarelli & Browne, 2002), “ Internet Behavior Dependence” (Hall & Parsons, 2001) “misuse of Internet” (Greenfield & David, 2002), and “pathological Internet use” (Young, 1998; Sharpira, Goldsmith, Keck, Jr., Khosla, & McElroy, 2000; Davis, 2001). It should be noted that researchers such as Young and Davis even employed different terms across their own studies (Young 1996, 1998; Davis 2001; Davis, Flett, & Besser 2002). Since research on Internet use only began in the mid 1990s, it is not surprising to find that there is currently no one accepted term to define or diagnose problematic Internet use.

### Models of Problematic Internet Use

The use of multiple terms may reflect several different perspectives on problematic Internet use. There have been several attempts to conceptualize the symptoms associated with problematic Internet use within the last 10 years. The results can be roughly categorized into two major models (Yellowlees & Marks, 2007; Hall & Parsons, 2001). These models include (1) the impulse control disorder model and (2) the cognitive-behavioral model.

## **Impulse Control Disorder Model**

The impulse control disorder model was proposed by Young (1996). She reported that individuals who suffer from problematic Internet use show similar symptoms to those among individuals who suffer from pathological gambling as well as dependency on alcohol and drugs. Since pathological gambling is classified as one of impulse control disorders in the *DSM-IV*, Young (1996) conceptualized “Internet addiction” as a type of impulse-control disorder, and developed the Diagnostic Questionnaire for Internet addiction based on the criteria of pathological gambling in the *DSM-IV*. Researchers who support this impulse control disorder model often employ the term “pathological Internet use” indicating to some extent that their perspective on problematic Internet use is based on pathological gambling.

Shapira, Goldsmith, Keck Jr., Khosla and McElroy (2000) also support the impulse control model. However, they initially hypothesized that problematic Internet use is another form of an obsessive compulsive disorder (OCD), and viewed it as a pathological repetitive behavior. They defined the problematic internet use as (1) uncontrollable, (2) markedly distressing, time-consuming or resulting in social, occupational or financial difficulties, and (3) not solely present during hypomania or manic symptoms. They studied 20 adults (11 males and 9 females) with a mean age of 36.0, who responded to newspaper advertisements, or who were clinically referred due to problematic Internet use. Assessment tools included the Structured Clinical Interview for *DSM-IV*, family psychiatric history, and a semi-structured interview asking for

demographic information, the nature of Internet use, and response of problematic Internet use to previous mental health treatment. They found that only three of the 20 participants (15%) met *DSM-IV* criteria for OCD whereas all participants met *DSM-IV* criteria for an Impulse Control Disorder (ICD) Not Otherwise Specified (NOS). According to this result, problematic Internet use can be characterized more as an unspecified impulse control disorder rather than as an obsessive compulsive disorder. Treuer, Fabian, and Furedi (2001) conducted a web-based survey, and found that the participants (n=86) showed some characteristics of impulse control disorder such as (1) great urge to be online if the Internet is not available (82%), (2) thought that the world is an empty and dull space without Internet (92%), (3) daytime fantasies about Internet use (77%), (4) nervousness if the Internet connection is slow (81%), (5) depressive mood and guilty feeling after a longer use of the Internet (43%), and (6) aggressive behavior if their use of Internet is interrupted (71%). Based on the findings of the study, Treuer et. al. (2001) argued that problematic Internet use is a new subtype of impulse control disorder.

A few years later, Shapira, Lessig, Goldsmith, Szabo, Lazoritz, Gold, and Stein (2003) proposed diagnostic criteria based on the impulse control model for problematic Internet use following the previous study results of Shapira, Goldsmith, Keck Jr., Khosla and McElroy (2000). The diagnostic criteria include (1) maladaptive preoccupation with Internet use, and (2) clinically significant distress or impairment in social, occupational, or other important areas of functioning. They also examined three clinical cases of college students and concluded that problematic Internet use should be classified as an

impulse control disorder. Although one of three participants had an obsessive compulsive disorder, all three participants were successfully diagnosed with problematic Internet.

### **Cognitive-Behavioral Model**

In addition to various models attempting to conceptualize the symptoms of problematic Internet use, other researchers have contributed additional concepts to clarify this phenomenon. The cognition-Behavioral model for problematic Internet use was initially proposed by Davis (2001, 2002). Davis categorized problematic Internet users into two groups. One includes those who are attracted by the specific services (or contents) of the Internet (specified problematic Internet users), and the other includes those who are attracted by the Internet itself (generalized problematic Internet users). Davis argued that generalized problematic Internet users are more vulnerable to Internet-related problems because specified problematic Internet users are able to stop using the Internet once they find alternative sources for the contents, whereas generalized problematic Internet users continue to use the Internet regardless of the services or contents.

Holden (2001) shares Davis's theory that Internet services such as gambling, pornography, and shopping are the same services to which people become addicted offline. He regards the Internet as a vehicle for the contents to which people get addicted. Also, agreeing with Davis's view, earlier work by Holmes (1997) supports the notion that heavy Internet use is a behavioral reflection of unaddressed or underlying psychological



characteristics, and these people will find alternative means to satisfy their addictions if Internet access becomes unavailable.

Davis (2001) theorized that the Internet functions as a vehicle for its contents, and he extended the concept of problematic Internet use by proposing a “cognitive-behavioral model of pathological Internet use” (Davis 2001, p. 190). He argued that pathological Internet use (PIU) occurs when pre-existing psychological problems such as depression, social anxiety, and maladaptive cognitions to the self and the world such as “I am worthless offline” or “people treat me badly offline” are coupled with behaviors that intensify or maintain the maladaptive response. Davis (2001), consistent with a cognitive-behavioral model, views the individual’s cognition as the main source of abnormal behavior. In his model of pathological Internet use, there are two type of pathological use: (1) Specific Pathological Internet Use (SPIU), and (2) Generalized Pathological Internet Use (GPIU). The specific type of problematic use (SPIU) is characterized by the overuse of specific contents of the Internet such as online gambling or pornography. From this perspective, the Internet is viewed as a vehicle for specific services. Thus when the vehicle becomes unavailable, people will presumably find another means for accessing the services. In contrast, the generalized pathological Internet use (GPIU) involves overuse of the Internet itself, in which individuals simply waste their time on the Internet without purpose. It is related to the “social context of the individual” such as lack of social support or social isolation (Davis 2001, p. 192). Thus, Davis hypothesized that individuals with a high level of shyness and loneliness have a tendency to overuse the Internet, and consequently develop problems associated with Internet use, such as poor

work performance. His assumption is also in accordance with the findings of Petrie and Gunn (1998), who surveyed a convenient sample of 445 Internet users in the United Kingdom. Petrie and Gunn (1998) found that Internet addiction was negatively related with extraversion and positively related with depression, and concluded that intensive Internet users are more likely to be introverted and to be suffering from depression. Davis (2001) also argued that pre-existing psychosocial problems cause Internet-related problems rather than problematic Internet use producing psychosocial problems. Thus, when coupled with the experience of the Internet, psychological problems such as depression, obsessive compulsive disorder, and social anxiety may be causes of generalized problematic Internet use. It is interesting to note that Song, Larose, Eastin, and Lin (2004) hypothesized that “process gratification” is positively related to “Internet Addiction Tendency” whereas “content gratification” is not. Content gratification means that an individual is gratified by consuming the contents of media while process gratification means gratification by using the media itself. This is similar to concepts of “specified” and “generalized” problematic Internet use proposed by Davis (2001).

### **Summary of the Two Models**

Problematic Internet use has been conceptualized using a cognitive behavioral model and an alternative impulse control disorder model. As the name suggested, the impulse control disorder model is heavily based on the diagnostic criteria for impulse control disorder from *DSM-IV*, and this model has been supported by a number of clinical cases and reports. Since the diagnostic criteria of this model are already listed in the

*DSM-IV*, clinicians can easily adopt and apply this model to their clients. The cognitive-behavioral model provides an alternative perspective on problematic Internet use by focusing on maladaptive cognitions to the self and the world as well as underlying psychological characteristics. Since these models have been presented relatively recently, they have not been adequately tested. Thus, there are still rooms for further refinement in these existing models or even additional conceptualization of models.

### Assessment and Measurement of Problematic Internet Use

Criteria and tools for the identification and measurement of problematic Internet use are required for proper diagnosis supporting effective treatment method. Since the mid-1990s, there have been a number of attempts to develop and test instruments related to measuring problematic Internet use. I will first review two instruments selected for this research study including the Internet Addiction Test (IAT) (Young 1998) and the Online Cognition Scale (OCS) (Davis 2001) along with the Diagnostic Questionnaire (Young 1996). Seven other instruments for problematic Internet use will also be reviewed.

#### **The Internet Addiction Test (IAT)**

One of the first attempts to define and diagnose symptoms or characteristics associated with problematic Internet use was completed by Young (1996). Young defined Internet addiction as “an impulse-control disorder which does not involve an intoxicant” (Young 1996, p.238) and developed an eight-item Diagnostic Questionnaire (DQ) based on modified Pathological Gambling criteria in the *Diagnostic and Statistical Manual of*

*Mental Disorders – Fourth Edition (DSM-IV; American Psychiatric Association, 1994)*

(Table 1). Seven items of the DQ were certainly borrowed from the Pathological Gambling criteria (item number 1, 2, 3, 4, 6, 7, and 8), and only one new item was added to the DQ (item number 5).

Table 1. Diagnostic Criteria for Pathological Gambling in *DSM-IV*

Persistent and recurrent maladaptive gambling behavior as indicated by five (or more) of the following:

- (1) is preoccupied with gambling (e.g., preoccupied with reliving past gambling experiences, handicapping or planning the next venture, or thinking of ways to get money with which to gamble)
- (2) needs to gamble with increasing amounts of money in order to achieve the desired excitement
- (3) has repeated unsuccessful efforts to control, cut back, or stop gambling
- (4) is restless or irritable when attempting to cut down or stop gambling
- (5) gambles as a way of escaping from problems or of relieving a dysphoric mood (e.g., feelings of helplessness, guilt, anxiety, depression)
- (6) after losing money gambling, often returns another day to get even ("chasing" one's losses)
- (7) lies to family members, therapist, or others to conceal the extent of involvement with gambling
- (8) has committed illegal acts such as forgery, fraud, theft, or embezzlement to finance gambling
- (9) has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling
- (10) relies on others to provide money to relieve a desperate financial situation caused by gambling

Diagnostic Questionnaire (DQ) by Young (1996)

- (1) Do you feel preoccupied with the Internet (think about previous online activity or anticipate next online session)?
- (2) Do you feel the need to use the Internet with increasing amounts of time in order to achieve satisfaction?
- (3) Have you repeatedly made unsuccessful efforts to control cut back, or stop Internet use?
- (4) Do you feel restless, moody, depressed, or irritable when attempting to cut down or stop Internet use?
- (5) Do you stay online longer than originally intended?
- (6) Have you jeopardized or risked the loss of significant relationship, job, educational or career opportunity because of the Internet?
- (7) Have you lied to family members, therapist, or others to conceal the extent of involvement with the Internet?
- (8) Do you use the Internet as a way of escaping from problems or of relieving a dysphoric mood (e.g., feelings of helplessness, guilt anxiety, depression)?

After developing the items for the Diagnostic Questionnaire (DQ), Young recruited 605 participants through newspaper advertisements, flyers, postings on electronic support groups for Internet addiction, and results for individuals searching for “Internet addiction” using Web-based search engines. She used the Diagnostic Questionnaire (DQ), basic demographic information, and additional questions such as the length of time of the Internet use, hours of use per week, applications used most frequently, the reasons applications were found attractive, problems caused by Internet

use, and rating of identified the problems in terms of the level of consequent impairment (mild, moderate, or severe). Participants who answered “yes” to five or more items on the DQ were classified as “addicted Internet users.” Results of the survey revealed that that 396 out of 496 (79.84 %) valid respondents were classified as “Internet dependents” (157 males, 239 females), and 100 were non dependent (64 males, 36 females). Seventy-one percent of the non dependent and 81% of the Internet dependents had been using the Internet for less than one year. Dependents spent an average of 38.5 hours for pleasure or personal use, while non dependents spent an average of 4.9 hours. It is notable, however, that 54% of dependent users had no desire to reduce the amount of time they spent online. Internet dependents also had a tendency to use more interactive applications of the Internet such as chat rooms, MUD (Multiple User Dungeon) games, and news groups, while non-dependents used information gathering applications such as e-mail, WWW (World Wide Web), and Information Protocols. The Internet dependents reported that Internet use resulted in severe academic (58%), relationship (53%), financial (52%), and occupational (51%) problems. However, while no severe physical problems were reported, twenty-five percent of the dependent users reported mild to moderate physical problems. The result of Young’s study and stories about Internet addiction were covered by *The New York Times*, *The Wall Street Journal*, *USA Today*, *The New York Post*, and *London Times* (Young, 1998). However, researchers criticized the study for the sample selection bias (Kubey, Lavin, & Barrow 2001). Young’s participants did not represent the general population well because of the methods she employed to recruit her sample. Young’s measuring tool was also questioned on the grounds that the slightly modified

criteria based on pathological gambling in the *DSM-IV* (American Psychiatric Association, 1994) may not provide appropriate diagnostic criteria to identify Internet addiction. For example, Beard and Wolf (2001) argued that pathological gambling is classified as an impulse control disorder, thus the term “addiction” is not appropriate to describe symptoms related to Internet use. Although having been criticized by other researchers, the importance of the Young’s Diagnostic Questionnaire is that it was an initial attempt develop a measure of “Internet addiction,” and this measure was employed in one of the first published studies in this area of research.

Young later revised her questionnaire into a twenty-item instrument called the Internet Addiction Test (IAT), which was introduced in her book *Caught in the Net* (1998). According to Young (2008), the IAT was developed based upon behavioral indicators that distinguish dependent from non-dependent Internet users. The IAT employs a five-point Likert scale with scores ranging from 20 to 100. Individuals who score 20 to 39 are classified as “an average online user,” and 40 to 100 as “experiencing frequent” or “significant problems suffering because of the Internet use.” She identified scores of 40 to 69 as indicating frequent problems and 70 to 100 as significant problems. The IAT is the one of the first measuring tools for assessing Internet problems, and, consequently, it has been one of the most frequently used instruments. However, a major weakness of the IAT was the lack of validity and reliability data related to the instrument. Young did not include any statistically tested results of the instrument in her book. This omission might be mainly due to the fact that the Young’s book was targeted to general public rather than researchers.

A few years following Young's introduction of the IAT, Windyanto and MacMurran (2004) statistically tested the instrument. They conducted a survey of 92 Internet users recruited through the Internet postings employing the IAT and a 35-item questionnaire including demographic information and 11 questions concerning the respondent's Internet use. Factor analysis identified five factors of the IAT including (1) salience, (2) excessive use, (3) neglecting work, (4) anticipation, and (5) lack of control. Of these factors, salience explained most of the variance (35.8%) and was found to be the most reliable with a Cronbach's alpha of .82. Salience consists of 5 of the 20 items: (1) spending more time online instead of going out, (2) acting annoyed if someone bothers you when online, (3) feeling that life would be boring without the Internet, (4) preoccupation with the Internet when off-line, and (5) use of Internet for blocking disturbing thought about life. The IAT demonstrated moderate to high internal consistency with Cronbach's alphas ranging from .54 to .82. Windyanto and MacMurran (2004) also compared the score of the IAT with age and duration of use. Scores on the IAT was negatively and weakly correlated with age ( $r=-.192$ ) and duration of use ( $r=-.18$ ), indicating that younger and newer Internet users have a tendency score higher on the IAT. Meanwhile, average use ( $r=.217$ ) and personal use ( $r=.299$ ) are positively correlated with the IAT. Due to the effort of Windyanto and MacMurran (2004), Young's IAT received its initial statistical verification.



## **The Online Cognition Scale (OCS)**

Another early attempt to develop a theoretically driven and statistically tested instrument was conducted by Davis, Flett, and Besser (2002). They introduced a scale to measure aspects of problematic Internet use called the Online Cognition Scale (OCS). Unlike Young's IAT, which was primarily based on the symptoms of the pathological gambling in the *DSM-IV* (American Psychiatric Association, 1994), the OCS was based on the cognition model of generalized Internet use developed by Davis (2001), described in an earlier part of this chapter. Each item of the OCS was drawn from Davis's study as well as from a review of other studies related to problematic Internet use, procrastination, depression, impulsivity as well as pathological gambling. Davis and colleagues (2002) conducted a survey of 211 undergraduate psychology students in Canada employing the OCS along with demographic information and several selected psychometric measures including the Barratt Impulsiveness Scale 11 (BIS-11), the Center for Epidemiological Studies Depression Scale (CES-D), the UCLA Loneliness Scale, the Procrastinatory Cognition Inventory (PCI), the Rejection Sensitivity Questionnaire (RSQ), and the Internet Behavior and Attitude Scale (IBAS), which was developed by Morahan-Martin and Schumacher (2000) to measure social aspects of Internet use and feelings of competency online. Their Confirmatory Factor Analysis of items of the OCS identified four factors including: (1) social comfort, (2) loneliness/depression, (3) diminished impulse control, and (4) distraction. The OCS has a good construct validity in that 15% variance of loneliness, 26% of distraction, 10% of depression, 10% of impulsivity, 18% of social comfort were explained by the four sub-scales. The OCS has good internal

consistency with Cronbach's alpha ranging from .49 to .81 of item-total correlations. However, two factors of the OCS had weak correlations with the scores of the other scales used. The correlations of the OCS Loneliness/Depression factor with the Center for Epidemiological Studies Depression Scale (CES-D) and the UCLA Loneliness Scale were .15 and .31, respectively, and the correlation between the OCS Impulsivity factor and the Barrett Impulsivity Scale 11 (BIS-11) revealed only .22. Given that the two factors of the OCS correlated weakly with an established scale, it is plausible that these two factors, Loneliness/Depression and Impulsivity, might not measure the constructs that they are intended to measure, or they may measure different constructs that are only partially related to loneliness, depression, or impulsivity. The correlation between the Social Comfort factor and the Rejection Sensitivity Questionnaire was moderate ( $r=.41$ ). There was no relevant scale included that was comparable with the OCS Distraction, but among scores on other scales, the Internet Behavior and Attitude Scale (IBAS) obtained the highest correlation with the OCS Distraction ( $r=.55$ ). The IBAS also correlated moderately with the remaining OCS sub factors: OCS Loneliness ( $r=.51$ ), OCS Impulsivity (.54), and OCS Social Comfort ( $r=.62$ ). The importance of the OCS is that; (1) it is based on a cognition model of the Internet use, (2) has been statistically tested from inception, and (3) is easily accessible due to publication of all items of the scale.

Most other scales for measuring problematic Internet use have been poorly developed, providing no reliability or validity test results and even lack of publication of the actual test items. For this reason, although more than a dozen of instruments have been introduced during the last 10 years, only a few instruments are readily accessible for

research purposes. This study will employ the aforementioned the OCS along with Young's IAT because those two scales are easily available, statistically tested, and have been used by other researchers. Moreover, the two scales complement each other in that the OCS focuses on cognition aspects whereas the IAT focuses on behavioral aspects of problematic Internet use.

### **Other Measures of Problematic Internet Use**

In addition to the IAT and the OCS, there are several instruments for measuring problematic Internet use. Currently, there are two scales developed to assess Internet addiction based on the Substance Abuse criteria in the *DSM-IV* including (1) the Internet Related Addictive Behavior Inventory by Brenner (1997), and (2) the Internet Addiction Scale (IAS) by Nichols and Nicki (2004). These two fully developed scales will now be discussed.

### **Internet Related Addictive Behavior Inventory (IRABI)**

Brenner (1997) developed the Internet Related Addictive Behavior Inventory (IRABI) based on the Substance Abuse criteria in the *DSM-IV* (American Psychiatric Association, 1994). Brenner further expanded those criteria into 32 true-false items with a score ranging from 0 to 32. Brenner (1997) conducted a preliminary online survey in a university research web-site employing the IRABI, along with a set of questions asking for demographic information and time spent online. 1885 individuals from more than 25 countries visited his web-site through hypertext link or Internet search engines during a

90-day period. 654 individuals took the survey and 563 responses (411 males and 152 females) were found to be complete. The average age of the participants was 34. On average, they spent 19 hours online per week, had used the Internet for 2 years, and had 15 years of education. Older users scored lower on the IRABI than younger users ( $p < .001$ ). No gender difference was found. Reliability tests for the IRABI showed good internal consistency with an alpha of .87, and each item correlated moderately with the total score ranging from .22 to .55 (item-total correlation). Unfortunately, the prevalence rate of Internet dependence was not presented in this research. Brenner's IRABI is the first fully developed instrument based on the Substance Abuse Criteria from *DSM-IV*.

### **Internet Addiction Scale (IAS)**

Nichols and Nicki (2004) developed the "Internet Addiction Scale" (IAS), which originally consisted of 36 items based on the substance dependence criteria from the *DSM-IV* (American Psychiatric Association, 1994) along with salience and mood modification criteria recommended by Griffiths (1998). They conducted a survey of 207 volunteered students at a Canada University employing the IAS, the Social and Emotional Loneliness Scale (SELSA), and the Boredoms Proneness Scale (BPS). After examining the result of the survey, the authors dropped five of the 36 original IAS items because mean scores of the five items either were distant from the center of the range or their correlations were very low. Thus, with a final total of 31 items, test scores on the IAS ranged from 31 to 155, with the cut-off point at 93. Principal-components analyses on the IAS revealed the existence of only one factor. Correlation of the IAS with the

Boredom Proneness Scale (.14) and the two sub-scales of the Social and Emotional Loneliness Scale, Family Loneliness (.30) and Social Loneliness (.31), were found to be weak to moderate. They also found that “less than 1%” of the students was classifiable as the Internet addicts, and concluded that there is no evidence of widespread Internet addiction among their sample. Their findings varied significantly from Young’s study (with 79 % of the sample Internet dependent). These studies are difficult to compare because they used different data gathering methods and different instruments. It is not surprising that the outcomes of these studies on the same topic are notably different. Also, although Nichols and Nicki’s scale and Scherer’s diagnostic tool are based on the same substance dependence criteria from the *DSM-IV*, the result of the studies is different in that Nichols and Nicki (2004) found less than 1% Internet dependents whereas Scherer (1997) found 13%. Given that Nichols and Nicki’s scale was statistically tested and that they revised the items after the first test, while Scherer (1997) simply modified the substance dependence criteria from the *DSM-IV*, the survey result of the Nichols and Nicki (2004) seems to be more valid.

### **Pathological Use Scale (PIU) and Internet Behaviors and Attitudes Scale (IBAS)**

Morahan-Martin and Schumacher (2000) developed two Internet-related instruments, the Pathological Use Scale (PUS) and the Internet Behaviors and Attitude Scale (IBAS), in order to carry out their research. They employed the term “Pathological Internet Use (PIU)” instead of Internet addiction, and defined the PIU as “Internet use which causes a specified number of symptoms, including mood-altering use of the

Internet, failure to fulfill major role obligations, guilt, and craving” (Morahan-Martin and Schumacher 2000, p.14). They hypothesized that pathological Internet users are (1) more likely to use games and chatting services, (2) more likely to use technologically sophisticated sites, and (3) more likely to use the Internet recreationally, socially, and for emotional support. They also hypothesized that pathological Internet users would (1) feel competent and comfortable online, (2) enjoy the anonymity available online, and (3) be lonelier than others. In addition, to test their research hypothesis, they used data from the subjects to conduct preliminary tests on the instruments. The first instrument that Morahan-Martin and Schumacher (2000) developed is the Pathological Use Scale (PUS), which consists of 13 questions examining whether Internet use causes academic, work, or interpersonal problems, personal distress, withdrawal symptoms, or mood alteration. Individuals who reported four or more symptoms are considered pathological Internet users (PIU), while those with one to three symptoms are Limited Symptoms (LS) users, and those with no symptoms are No Symptoms (NO) users. The second instrument developed by the researchers is the Internet Behaviors and Attitude Scale (IBAS), which consists of 25 questions related to social aspects of Internet use and feelings of competency online. However, detailed information on development of both scales was not presented.

Morahan-Martin and Schumacher (2000) conducted an in-class survey of 283 undergraduate students attending college in Rhode Island employing these two scales, the UCLA Loneliness Scale, and other questions asking for demographics, Internet experience, Internet sites used, and reasons for Internet use. Out of 277 valid responses,

they found, according to scores on the PUS, that 22 (8.1%) students were categorized as Pathological Internet Users (PIU), whereas 117 (64.7%) students were categorized as Limited Symptoms (LS) users, and 74 (27.2%) students as No Symptoms (NO) users. Post analysis of the PUS revealed that it has high internal reliability with an alpha of .8761. Factor Analysis on the IBAS revealed that it has six sub-factors on online behavior including: (1) Social Confidence, (2) Socially Liberating, (3) Competency, (4) Ease of Communication, (5) Disadvantages of Internet Use, and (6) Lurking. These six factors explained 59.29% of the variance. However, no test data on reliability of the IBAS was presented. Morahan-Martin and Schumacher (2000) compared the three groups of Internet users (PIU, LS, and NO) with the six factors of the IBA. MANOVA test results revealed that pathological users were more likely to have higher scores on social confidence and social liberation factors of the IBAS. This indicates that pathological users are more likely to prefer socializing online and to feel competent online. Comparing those three groups and other variables also revealed that pathological Internet users are more likely to be lonely males who are interested in technology, and to use the internet for meeting new people, emotional support, adult-only resources, gambling, relaxing, socializing, and playing highly interactive online games.

### **Generalized Problematic Internet Use Scale (GPIUS)**

Caplan (2002) developed the “Generalized Problematic Internet Use Scale” (GPIUS), which is based on Davis’s (2001) aforementioned theory concerning problematic Internet Use. The GPIUS contains 29 items drawn from Davis’ (2001)

description of generalized Internet use, and other relevant studies on problematic Internet use. Caplan (2002) tested the GPIUS on 386 undergraduate students from general psychology classes in a university in Delaware along with four psychometric measures including the Beck Depression Inventory-II, the Rosenberg Self-Esteem Scale, the UCLA Loneliness Scale, and the Social Reticence Scale. Factor Analysis of the GPIUS resulted in seven factors: (1) Mood Alteration, (2) Social Benefits, (3) Negative Outcomes, (4) Compulsive Use, (5) Excessive Time Online, (6) Withdrawal, and (7) Social Control. Correlation between these seven sub-factors and the four psychometric measures were weak to moderate, ranging from 1.0 to .44. The Social Benefits factor of the GPIUS and the Social Reticence Scale showed the highest correlation ( $r=.44$ ), suggesting that shy people have a tendency to use the Internet for socializing. It is interesting to note that, while GPIUS is based on the same theoretical constructs as the OSC, the two scales are different in terms of the number and the type of sub-factors. As noted earlier, the OSC has four factors (social comfort, loneliness/depression, diminished impulse control, and distraction). These differences might stem from the use of different statistical methods. Caplan employed Exploratory Factor analysis whereas Davis used Confirmatory Factor analysis. Both methods can be employed for testing a newly developed scale, and Caplan's study has its own merit in that he found seven factors with eigenvalues of larger than 1.0. However, given that the GPIUS was already based on a theoretically-driven model, confirmatory factor analysis would have been a more appropriate method for testing the GPIUS.



## **Internet Effect Scale (IES)**

The “Internet Effect Scale” (IES), developed by Suhail and Bargees (2006), is one of the most recent. The IES consists of demographic items, the time spent on the Internet, and seven sub-scales measuring: (1) interpersonal problems, (2) physical problems, (3) psychological problems, (4) behavioral problems, (5) educational problems, (6) Internet abuse, and (7) positive effects of Internet use. The seven sub-scales have a total of 28 items designed to be answered using a yes/no format, and one sub-scale measures positive effects of Internet use while the remaining sub-scales measure negative effects. The IES is thus different from all other Internet use scales since it attempts to measure the positive as well as the negative effects of Internet use. Using peer group process, the IES was reported to have good face validity. However, no psychometric test data on the IES is presented by the authors with the exception of correlations between sub-scales. Suhail and Bargees (2006) used their IES in a survey of 210 university students in Pakistan. They found that each of the six sub-factors measuring negative aspects of the Internet were weak to moderately correlated, with absolute values ranging from .03 to .50. All of the correlations were in the positive direction with the exception of abuse and psychological problems. The correlations between the one positive factor and the six negative factors were weak (.02 to .28) with half of the correlation in the positive direction (Behavioral, Interpersonal, and Psychological) and half in the negative direction (Abuse, Physical, and Educational). However, except for the correlation between positive and the abuse factor, other correlations between the positive factor and the negative factors failed to achieve statistical significance. Suhail and Bargees’ (2006) results

suggest that the positive effect of Internet use is relatively independent of the negative effects. However, given the results of significance tests, it is premature to confirm the relationship between the positive effect and other negative effects. Suhail and Bargees (2006) also compared scores of all seven sub-scales with time spent online. Each of the six sub-scales measuring negative effects of Internet use showed weak correlation with time spent online (.14-.28,  $p < .05$ ), and the sub scale measuring the positive effect of Internet use correlated very weakly with time spent online (.05,  $p < .05$ ), and was the only scale that did not achieve significance. This suggests that, although weakly correlated, a student who spends more time online is more likely to experience the negative effects of Internet use. One weakness of the IES is that the scores of the each sub-scale have very narrow variability. For example, the Educational Problems Scale and the Internet Abuse Scale, which consist of only two items, have a possible total score range of 0 to 2 (0, 1, or 2). With these small score ranges, it would be hard to detect significant differences between variables. The weak correlations between each sub-scale and time spent online might be partially affected by the narrow variability of each sub scale.

### **Internet Addiction Tendency Scale**

Song, Larose, Eastin, and Lin (2004) hypothesized that “process gratification” is positively related to “Internet Addiction Tendency” whereas “content gratification” is not. Content gratification means that an individual is gratified by consuming the contents of media while process gratification means gratification by using the media itself. Song, Larose, and Lin (2004) conducted an in-class survey (introductory communication class)

with 498 college students (304 males and 194 females) from a university in Michigan and one in Ohio. The survey included two scales developed by the authors, Gratifications of the Internet and the Internet Addiction Tendency. Exploratory factor analyses identified seven factors from the items of Gratifications of the Internet scale with eigenvalues above 1.0 accounting for 67.4% of total variance. These factors were: (1) Virtual Community (developing new relationship with others), (2) Information Seeking (getting information from online), (3) Aesthetic Experience (finding good web sites), (4) Monetary Compensation (finding bargains/freebies/financial resources), (5) Diversion (having fun and finding relaxation online), (6) Personal Status (finding information improving their life), and (7) Relationship Maintenance (getting in touch with others). The authors defined Information Seeking and Monetary Compensation factors as content gratifications and Aesthetic Experience and Diversion factors as process gratifications. The remaining factors had characteristics of both process and content gratifications. The authors developed the Internet Addiction Tendency Scale based on items from a variety of previously published reports. The items were rated according to a seven-point Likert scale ranging from 1 (very unlikely) to 7 (very likely). The total number of items was reduced to six through factor analysis. Authors ran a correlation test to examine the relationship of scores on the seven factors of the Gratifications of Internet scale with scores on the Internet Addiction Tendency scale. Results revealed that The Virtual Community ( $p < .001$ ), Diversion ( $p < .001$ ), Monetary Compensation ( $p < .001$ ), Personal Status ( $p < .001$ ) and Relationship Maintenance ( $p < .001$ ) factors were positively related to the Internet Addiction Tendency scale, but the Information Seeking

and Aesthetic Experience factors failed to achieve a significant relationship with the Internet Addiction Tendency scale. Their hypotheses, therefore, were only partially supported in that only one of the factors they defined as content gratification was significantly related to scores on the Internet Addiction Tendency scale. Also the Diversion factor, which was predicted to be unrelated to the Internet Addiction Tendency scale, was found to be significantly related.

### **Problematic Internet Use Diagnostic Interview**

Beard (2005) developed a pool of structured questions for a diagnostic interview to assess problematic Internet use. He argued that current standardized instruments, including Young's IAT and Davis's OCS, use a self-report method, in which the participants may not answer honestly or may not understand the questions correctly. Due to the limitations of self-report instruments, he argued that the clinical interview should be the primary method of assessment for problematic Internet use. Thus, Beard developed diagnostic criteria for Internet addiction based on his own biopsychosocial model of addiction that integrates biochemical, genetic, psychological, familial, environmental, and cultural dynamics. Beard (2005) attempted to develop a unique assessment tool by addressing a broad range of issues interacting with and influencing Internet addiction. Beard's diagnostic criteria consist of 72 interview questions concerning five specific areas of functioning, including: (1) biological area (17 items), (2) psychological area (12 items), (3) social area (16 items), (4) presenting problems (21 items), and (5) relapse prevention (6 items). Along with these standard questions, interviewers are allowed to

provide additional questions and include other instruments to examine selected aspects of Internet addiction such as risk taking, motivation level, anxiety, or depression. However, the usefulness of the Beard's structured interview questions for assessing problematic Internet has not been tested. Given that this interview approach was developed as an alternative to other self-report instruments, it offers an ideal opportunity if used with other self-report instruments.

### **Instrument Summary**

The instruments discussed in this chapter are listed in table 2. It is interesting to note that most researchers developed their own instruments for their own studies of Internet use rather than employing existing instruments. This is mainly due to the fact that a standardized instrument has not been readily available. So far, only Young's (1997) IAT, Brenner's (1997) IRABI, and Davis, Flett, and Besser's (2001) OCS have been used or tested by other researchers. The original IAT or modified IAT was employed in studies by Ferraro, Caci, D'Amico, and Blasi (2007), Engelberg and Sjoberg (2004), and Hur (2006). Brenner's IRABI (1997) was used by Chou and Hsiao (2000), and Davis, Flett, and Besser's (2001) the OCS by Nalwa and Anand (2003). In terms of the frequency of use, Young's IAT is the most popular instrument for measuring problematic Internet use. Davis, Flett, and Besser's OCS is the most unique instrument in that it is derived from a newly developed cognition model for problematic Internet use rather than based on the pathological gambling or substance dependence criteria from the *DSM-IV*.

Table 2. Instruments for Problematic Internet Use

	Author	Year	Type
Diagnostic Questionnaire	Young	1996	Instrument
Internet-Related Addictive Behavior Inventory	Brenner	1997	Instrument
Internet Addiction Test	Young	1998	Instrument
Pathological Internet Use Scale	Morahan-Martin & Schumacher	2000	Instrument
Internet Behavior and Attitude Scale	Morahan-Martin & Schumacher	2000	Instrument
Generalized Problematic Internet Use Scale	Caplan	2002	Instrument
Online Cognitions Scale	Davis, Fett & Besser	2002	Instrument
Internet Addiction Scale	Nichols & Nicki	2004	Instrument
Internet Addiction Tendency Scale	Song, Larose, Eastin, & Lin	2004	Instrument
Diagnostic Interview	Beard	2005	Structured Interview questions
Internet Effect Scale	Suhail & Bargess	2006	Instrument

## CHAPTER 3

### COLLEGE STUDENTS AND INTERNET USE

This section will review and summarize research findings related to college students with problematic Internet use. This literature is diverse and includes data from the United States, China, the United Kingdom, and Sweden. The section will review a range of definitions of Internet overuse, the size and characteristics of college students samples, and different measures and methods.

#### College Students and Internet Use

Scherer (1997) designed a measure of Internet dependency called the “symptom checklist” for use in her research. It includes ten items based on the symptoms of substance abuse and dependency in the *DSM-IV* (American Psychiatric Association, 1994). Participants who agree positively with three or more items are regarded as “Internet dependent.” Using a mail survey to 1005 students at a large university in Texas employing her symptom checklist and a set of questions asking for demographic information, grade point average (GPA), hours of the Internet use, reasons for using the Internet, and type of Internet services. Among 531 out of 1005 students who returned the survey, 385 students reported that they use the Internet at least once a week. Out of these 385 students, 49 (13%) were classified as the Internet dependent based on scores of her checklist. Among those 49 dependent users, 71.4% are male and 28.6% are female while,

among 336 (87%) non-dependent users, 50.3% are male and 49.7% are female. Other than observing a larger percentage of male students identified as dependent, there were no significant differences on other demographics variables. There also was no significant difference on the amount of time online for work or school between dependent and non-dependent users. However, dependent users were likely to (1) have a larger proportion of relationships online and (2) to spend at least twice as much time online for leisure activities such as online games, chatting, and newsgroups.

Morahan-Martin and Schumacher (2000), previously discussed, conducted a study of 283 undergraduate college students in Rhode Island employing the Pathological Use Scale (PUS), the Internet Behaviors and Attitude (IBA), the UCLA Loneliness Scale and other questions asking for demographics, Internet experience, Internet sites used, and reasons for Internet use. They found that 8.1% of students were categorized as pathological Internet users based on scores on the Pathological Use Scale (PUS). In addition, 64.7% of students were categorized as Limited Symptoms (LS) users, while 27.2% of students were categorized as No Symptoms (NO) users according to the scores on the PUS. Morahan-Martin and Schumacher found that pathological Internet users are more likely to be lonely males who are interested in technology, who used the internet for meeting new people, emotional support, adult-only resources, gambling, relaxing, socializing, and playing highly interactive online games.

Chou (2001) interviewed 83 college students (49 males and 34 females) living on campuses in Taiwan. Seventy-one students were full-time (freshmen to doctoral students) and 12 students were part-time. Some of the participants were previously diagnosed as



“Internet addicts” in an earlier study by the author while the remainder were those who responded to the campus Bulletin Board Systems (BBSs) and were diagnosed as Internet addicts based on scores from Young’s DQ scale, reporting that they spent more than 30 hours per week on the Internet, or diagnosing themselves as “Internet addicts.” The interviews were conducted using online chatrooms. The researcher developed a questionnaire with six parts: (1) Internet use and reasons for use, (2) Internet features and services used, (3) Internet as replacement for other media, (4) impact of Internet overuse, (5) attempt of controlling Internet use, and (6) coping with Internet withdrawal. On average, participants spent four to five hours per week day, and five to eight hours per day during weekends and school break. Students used the Bulletin Board Systems (BBSs), e-mail, and the World Wide Web (WWW) for interacting with other users, developing a sense of companionship (belonging), monitoring environments, searching useful information to improve living, killing time, and for fun and personal gratification. Participants used the Internet to replace traditional broadcast media such as TV and radio. As a result of Internet usage, one-third of students reduced time using the telephone, and more than half reduced handwriting letters. Students appreciate the Internet for its interactivity, ease of use, availability, and the range of information assessed online. They thought that the Internet significantly enhanced their self-identification, fostered closer relationships with friends, and allowed them to connect with the world. However, eye-sight deterioration and sleeping deprivation were major physical problems reported related to the Internet use.

Niemz, Griffiths, and Banyard (2005) distributed an Internet survey to 371 college students in the United Kingdom (200 males and 171 females) using the Pathological Internet Use Scale (PIUS), the General Health Questionnaire (GHQ), the Rosenberg Self-Esteem Scale, and the Social Confidence and Socially Liberating Scales, along with a set of questions asking for demographic information, years of Internet use, and weekly Internet use. Students were categorized into hard sciences (computing, chemistry, physics, and engineering), soft sciences (psychology and social sciences, law, and business studies), and liberal arts (media studies, English, and journalism). The result of this study revealed that 18% of participants were diagnosed as “pathological Internet users” based on scores of the PIUS. Males and those who spent more time online scored higher on the PIUS ( $p < .01$ ,  $p < .01$ ). There was not a statistically significant difference in the GHQ score between pathological Internet users and non-pathological users based on the PIUS score ( $p = .118$ ). Also, no significant difference was found between users in age ( $p = .45$ ). Pathological Internet users obtained lower scores in the Rosenberg Self Esteem Scale ( $p < .01$ ), but scored higher in the Social Confidence ( $p < .001$ ) and Socially Liberating Scales ( $p < .01$ ). Due to the small number of liberal Arts students, only the hard and soft science groups were compared, and results revealed that the hard science group scored significantly higher on the PIU ( $p < .01$ ) and spent more time online ( $p < .01$ ) than the soft science students.

Joiner, Gavin, Duffield, Brosnan, Crook, Durndell, Maras, Miller, Scott, and Lovatt (2005) conducted a survey of 608 first-year psychology undergraduate students (118 males and 490 females) from universities in the United Kingdom to examine gender

differences in Internet service use, Internet Identification, and Internet Anxiety. They employed the 20-item Internet Anxiety Scale and the 12-item Internet Identification Scale developed by the authors. They also included a set of questions concerning demographic information, ownership of the computer, website, or email account, general use of the Internet service (email, chat newsgroups, web games, shopping, downloading files or listening to music and accessing other specialist sites), and the number of times they used these services per week. They found no statistically significant differences between male and female students in terms of Internet anxiety and Internet identification. However, overall males' total use of the Internet (16.02 hours) was higher than females' (14.08 hours). Male students are more likely to have their own web page, and more likely to use the Internet for gaming, downloading files, and using other specialty sites such as sports web or TV webs. No other results were reported.

Kubey, Lavin, and Barrows (2001) conducted an in-class survey with 576 undergraduate students at a university in New Jersey to examine the relationship between Internet use and academic performance. Ninety percent of students were in their first three years of college, and 97% of student were declared or planned to declare liberal arts or social science majors. The survey included questions about Internet usage, study habits, academic performance, and personality measures. Among the 572 completed responses from 576 students (191 males and 381 females), 53 students (9.26%) reported that "they might have become a little psychologically dependent on the Internet" (Kubey, Lain, & Barrows 2001, p. 372). Subjects who self-reported that they were Internet dependent spent nearly three times as much recreational time online per week (11.18 hours) than did

students who did not consider themselves Internet dependent (3.84 hours). Thirty out of the 53 dependent users reported Internet-related academic impairment. Self-reported Internet dependency and impaired academic performance were associated with the use of Internet applications such as chat rooms and multiple user dungeons (MUDs).

Yuen and Lavin (2004) surveyed 283 students (79 males and 204 females) in a private university in western New York. They recruited participants through the school's email notice board, and an online survey method was used to examine the relationship between Internet dependency and shyness. A questionnaire was developed by the authors that included two shyness scales (face-to-face situations and online situations), Internet dependency questions, and a set of questions concerning demographics, time spent online, and Internet applications used. Using their own Internet dependency questions based on the *DSM-IV* criteria for substance dependence, 43 out of 283 students (15.2%) who answered "agree" or "strongly agree" to three out of the seven questions were classified as "Internet dependent." The Internet dependent subjects spent more time online than non-dependents ( $p = .01$ ). The researcher found that among non-dependent users, there were no significant differences between the level of shyness for face-to-face and online situations. However, dependent users were significantly less shy in online compared to face-to-face situations.

Chou and Hsiao (2000) distributed 1209 survey questionnaires to a stratified sample of students at twelve universities and colleges in Taiwan. They received 910 completed responses (546 males and 364 females). The instrument included the Chinese version of Brenner's (1997) Internet-Related Addictive Behavior Inventory (IRABI) and

Young's (1996) Diagnostic Questionnaire (DQ). In addition, the researchers developed twelve items assessing participants' rating of motivation for and gratification from Internet use, as well as a scale developed by the researchers, the Pleasure Experience from Internet Usage II (PEIU-II). Chou and Hsiao (2000) also included a set of questions concerning demographics and network usage data including time spent online and applications used. Factor analysis of the IRABI (Chinese version) revealed six factors accounting for a total of 52.14% of the variance. These factors were summarized as: (1) problems related to Internet addiction, (2) compulsive Internet use and withdrawal from Internet addiction, (3) Internet hours, (4) Internet as a social medium, (5) Internet interpersonal relationship dependence, and (6) the Internet as replacement for daily activity. Factor analysis of PIEU-II also revealed six factors accounting for a total of 56.01% of the variance: (1) Entertainment, (2) Escape, (3) Anonymity, (4) Alternative identification, (5) Interpersonal communication, and (6) Use behavior/Intertext (pleasure from using the Internet and interacting with the text/information). Based on the score results of both the IRABI and DQ, 54 out of 910 participants (5.9%) were identified as "Internet addicts." These Internet addicts spent 20-25 hours per week online while non-addicts spent 5-10 hours online. Also, Internet addicts spent significantly more hours on Internet applications such as Bulletin Board Systems (BBSs) ( $p=.00$ ), the World Wide Web (WWW) ( $p=.025$ ), e-mail ( $p=.006$ ), and games ( $p=.013$ ) than the non-addicts. The authors also ran a multiple regression analysis on C-IRABI-II scores as dependent variables with the PIEU-II scores, Motivation and Satisfaction ratings, BBS use hours, WWW use hours, email use hours, game use hours, and gender as independent variables.

Results revealed that among the independent variables PIEU-II, BBS use hours, gender, Motivation/Satisfaction ratings, and email use hours were significant predictors of the IRABI scores, accounting for 46.9% of variance of the IRABI.

Engelberg and Sjoberg (2004) surveyed 41 undergraduate students (21 males and 20 females) at the Stockholm School of Economics in Sweden. They hypothesized that use of the Internet would be negatively related to interpersonal skills. They developed two measures for identifying emotions using (1) facial expression and (2) dyadic interactions related to social problems. They also included the UCLA Loneliness Scale, Work/Leisure Balance Scale, Young's Internet Addiction Test (IAT), Schwartz's value deviance scale, and the Big Five inventory (five personality dimension), as well as a set of questions concerning demographic information. Correlation test results revealed that the IAT score was positively related to the UCLA Loneliness Scale scores and to scores on Schwartz's value deviance scale. The IAT scores were negatively related to the scores for identifying emotions in both the (1) facial expression exercise and dyadic interactions related to social problems, and (2) scores on the Work/Leisure Balance scale. The IAT score was not related to any of five dimensions of the Big Five Inventory (Conscientiousness, Agreeableness, Emotional Stability, Extroversion, and Intellectual Openness). Data from this study indicate that an individual with higher scores on IAT has a tendency to be lonely, to have deviant values, to have difficulties in balancing work/leisure and in identifying emotions.

Pratarelli, Browne and Johnson (1999) developed a questionnaire measuring computer/Internet addiction for their research. The questionnaire consists of nineteen

items related to demographics and time spent on computer/Internet usage, and 74 items for computer/Internet experiences. The items were drawn from the existing literature and surveys on computer or Internet use and addictions. Authors surveyed 350 students from sociology, psychology, math, and computer science courses at a university in Oklahoma. Three hundred and forty-one students (163 males and 178 females) completed the survey. A principal components factor analysis revealed four factors accounting for a total of 31% of the variance: (1) Internet addiction factor (problematic computer-related behaviors) (2) Internet use factor (use of computers and the Internet for general purpose) (3) Sex factor (Internet use for sexual gratification and shyness/introversion), and (4) absence of problems related to Internet use factor. Using the questionnaire they developed, Pratarelli and Browne (2002) surveyed 524 students (265 males and 259 females) from psychology computer/math sciences courses at two mid-western universities to test the relationship between the Internet addiction factor, the sex factor, and the Internet use factor found in their previous research. They did not use the fourth factor (Absence of problems related to Internet use) identified in their earlier research because it was not related to problematic use of the Internet and explained only 3.4% of the variance. They hypothesized that the addiction factor would be causally related to either the sex factor or the Internet use factor. Path analysis was used to test this causal relationship and found that the paths from the addiction factor to the Internet use factor and Sex factor were both statistically significant. This suggests that problematic computer use leads to use for sexual gratification and also to use for general contents of the Internet. Caplan (2002) surveyed 386 undergraduate students from general psychology classes in a

university in Delaware to test the Generalized Problematic Internet Use Scale (GPIUS) which was developed by the author. He found that the GPIUS consisted of seven factors: (1) Mood Alteration, (2) Social Benefits, (3) Negative Outcomes, (4) Compulsive Use, (5) Excessive Time Online, (6) Withdrawal, and (7) Social Control. Since this study was conducted with the intention purpose of testing the newly developed GPIUS, the prevalence of the Internet abuse among college student was not presented. Caplan (2007) also surveyed 343 undergraduate student (104 males and 239 females) at a University in Delaware employing UCLA Loneliness Scale, the Social Avoidance and Distress (SAD) scale as well as two scales developed by the author (Preference for Online Social Interaction (POSI) and Negative Outcomes of Internet Use). Path analysis revealed that relationship between loneliness and POSI was spurious, and social anxiety (SAD) was a significant positive predictor of POSI. Structural Equation Modeling revealed that gender was a significant direct predictor of social anxiety (SAD) and online gambling and games were significant positive predictors of negative outcome of Internet use. However, the sexual material was not a significant predictor of negative outcomes of the Internet use. Social anxiety (SAD) was a significant direct predictor of POSI, and POSI was a direct predictor of the negative outcomes of the Internet use.

Simkova and Cincera (2004) surveyed online chatting users in Czech Republic using Young's Diagnostic Questionnaire (DQ) and a questionnaire they developed asking for demographic information, Internet applications used, and time spent online. They recruited 357 participants with (245 males and 112 female) who were listed as "top users" at the four online chatting service sites in Czech Republic. At least 700 cumulative



hours of chatting were required to be listed as the top users. The survey results showed that 56 of 357 participants (16%) were diagnosed as Internet dependents based on the score results of the Young's DQ. The authors also administered the same questionnaires to 342 university students in Czech Republic, and found that 20 of 342 students (6%) were categorized as Internet dependents. The sample of the Internet chatting service users were more likely to be diagnosed as having "Internet addiction disorder (IAD)" than the sample of the university students.

#### Summary of College Students and Problematic Internet Use

Prevalence rate of problematic Internet use among college students ranged from 1% to 13% according to the researchers using a variety of definition and assessment tools. Scherer (1997) found that 49 (13%) out of 385 college students were classified as the Internet dependent using her diagnostic tool based on *DSM-IV*. Chou and Hsiao (2000) reported that 54 out of 910 students (5.9%) were Internet addicts using both the Young's Diagnostic Questionnaire (DQ) and the Brenner's Internet Related Addiction Behavior Inventory (IRABI), and Morahan-Martin and Schumacher (2000) found that 22 (8.1%) out of 277 college students were categorized as the pathological Internet users according to the result scores on the Problematic Use Scale (PUS). Nichols and Nicki (2004) also reported that less than 1% of the college students were classifiable as the Internet addicts according to results of their Internet Addiction Scale (IAS). Judging from the results of these studies, it is hard to tell the exact prevalence rate of the Internet addiction among college students. The prevalence rate might be actually different due to distinct

characteristics of each sample. However, it also should be noted that those researchers all employed different measures for Internet addiction.

In addition to the prevalence rate, college students who were identified as problematic Internet users were reported to share notable characteristics. They showed a tendency to be lonely (Engelberg and Sjoberg, 2004), to use more interactive applications of the Internet such as chat rooms, MUD (Multiple User Dungeons) games, and news groups (Morahan-Martin and Schumacher, 2000), and to spend more recreational time online per week (Scherer, 1997; Kubey, Lavin and Barrows, 2001). Male students have been reported to be more vulnerable to problematic Internet use than females (Morahan-Martin and Schumacher, 2000). Problematic users also were reported to have impaired academic performance (Kubey, Lavin and Barrows, 2001).

Table 3. Summary of College Students and Problematic Internet Use

<b>Author</b>	<b>Definition</b>	<b>Sample Size and Characteristics</b>
Scherer, K (1997)	Internet Dependence	531undergrad and grad students 51.5% Men, 48.5% Women Mean age = 24.02
Morahan-Martin & Schumacher (2000)	Pathological Internet use	283 Undergraduate Students
Chou, C. (2001)	Internet heavy use or overuse	83 College students in Taiwan (freshmen to doctoral students). 49 male, 34 female
Niemz, Griffiths, & Banyard (2005)	Pathological Internet use	371 College Students in U.K. 200 male 171 female
Joiner, Gavin, Duffield, Brosnan, Crook, Durndell, Maras, Miller, Scott, & Lovatt (2005)	Internet use	608 First year psychology undergraduate students in U.K. 118 male and 490 female
Kubey, Lavin, & Barrows (2001)	Psychology dependent on the Internet	572 Undergraduate students

<b>Author</b>	<b>Measure</b>	<b>Prevalence rate</b>
Scherer, K (1997)	Checklist of Internet dependency based on the symptoms of substance abuse and dependency in <i>DSM-IV</i> and questionnaires	13%
Morahan-Martin & Schumacher (2000)	Pathological use scale (PUS) Internet Behaviors and Attitudes Scale (IBAS) UCLA Loneliness Scale	8.1%
Chou, C. (2001)	Online interview (The author built his own online chatroom for interview)	5.9%
Niemz, Griffiths, & Banyard (2005)	Pathological Internet Use Scale (PIUS) General Health Quest (GHQ) Rosenberg Self Esteem Social Confidence and Socially Liberating Scales	18% Problematic Internet Uses Scale
Joiner et. al. (2005)	20-item Internet Anxiety Scale and the 12-item Internet Identification Scale developed for study	n/a
Kubey, Lavin, & Barrows (2001)	Self-report of Internet addiction Recreation time online Academic Performance	9.26% (self-report)

<b>Author</b>	<b>Results</b>
Scherer, K (1997)	Internet dependents are more likely to be male, to spend at least twice as much time online for leisure activities, and to have more proportion of relationships online.
Morahan-Martin & Schumacher (2000)	Internet dependents are more likely to be male, to feel lonely, to use Internet for meeting new people/emotional support, and to use more interactive applications of the Internet such as chat rooms, MUD games, and news groups
Chou, C. (2001)	<p>The Internet enhanced self-identification, closer relationships with friends, and bonding with the world. However, eyesight deterioration, sleep deprivation, poor grades, and job performance were the major negative impacts of Internet use.</p> <p>Students did not look for professional help from psychologists or counselors because they thought that Internet overuse was a personal or minor problem.</p>
Niemz, Griffiths, & Banyard (2005)	<p>Male students, and students who spent more time online scored higher on PIUS</p> <p>Hard science group scored higher on the PIU spent more time online (<math>p &lt; .01</math>) than the soft science students.</p> <p>No significant relationship between PIU and GHQ</p> <p>Pathological users scored lower on self esteem but higher on Social Confidence and Socially Liberating Scales.</p>
Joiner et. al. (2005)	<p>No statistically significant differences between male and female students on Internet anxiety and Internet identification.</p> <p>Male spent more time online (16 hours /week) than females (14 hours/ week) and more likely to use specific sites and gaming.</p>
Kubey, Lavin, & Barrows (2001)	<p>Internet dependents spent three times as much recreational time online per week (11.18 hours) than non-dependent (3.84 hours).</p> <p>30 out of the 53 dependent users reported Internet-related academic impairment. Internet dependency and impaired academic performance were associated with the use of Internet applications such as chat rooms and multiple user dungeons (MUDs).</p>

<b>Author</b>	<b>Definition</b>	<b>Sample Size and Characteristics</b>
Yuen, C, & Lavin, M. J. (2004)	Internet dependence	283 University students 79 male 204 female
Chou & Hsiao (2000)	Internet addiction	910 College students in Taiwan 546 males 364 females
Engelberg, & Sjoberg. (2004)	Internet addiction	41 Students at the Stockholm School of Economics. 21 male, 20 female
Pratarelli & Browne (2002)	A putative computer/Internet-related disorder	524 students at 2 regional mid-western universities 265 males 259 females
Caplan, S. E. (2007)	Problematic Internet use (PIU).	343 undergraduate student 104 males and 239 females
Simkova, Cincera (2004)	Internet addiction	342 university students in Czech Republic 357 participants with listed as 'top users' at the online chatting sites.

<b>Author</b>	<b>Measure</b>	<b>Prevalence Rate</b>
Yuen, C, & Lavin, M. J. (2004)	2 shyness scales developed by authors for this study Internet dependency questionnaire	15.2% Internet Dependence Questions developed by researchers
Chou, & Hsiao (2000)	Internet-Related Addictive Behavior Inventory (IRABI) Diagnostic Questionnaire (DQ). 12 items assessing motivation for and gratification from Internet use Pleasure Experience from Internet Usage II	5.9% based on both Diagnostic Questionnaire and Internet Related Addiction Behavior Internet
Engelberg & Sjoberg. (2004)	Internet Addiction Scale by UCLA Loneliness Scale Work/Leisure Balance Scale Schwartz' value scale Big Five inventory Emotional Intelligence Young's Internet Addiction Test (IAT)	n/a
Pratarelli & Browne (2002)	A questionnaire measuring computer/internet addiction developed by Paratarelli	n/a
Caplan, S. E. (2007)	UCLA Loneliness Scale Social Avoidance and Distress scale Preference for Online Social Interaction Negative Outcomes of Internet Use	Not presented
Simkova, & Cincera (2004)	Young's Diagnostic Questionnaire (DQ)	6% Young's Diagnostic Questionnaire

<b>Author</b>	<b>Results</b>
Yuen, C, & Lavin, M. J. (2004)	<p>The Internet dependents spent more time online than non dependents.</p> <p>Non-dependent users showed no significant differences between the level of shyness for face-to-face and online situations.</p> <p>Dependent users were significantly less shy online compared to face-to-face situations.</p>
Chou & Hsiao (2000)	<p>Internet addicts spent 20-25 hours per week online while non-addicts spent 5-10 hours online.</p> <p>Internet addicts spent significantly more hours on Internet applications such as Bulletin Board Systems (BBSs), the Word Wide Web (WWW), e-mail, and games than the non-addicts.</p> <p>PIEU-II, BBS use hours, gender(male), motivation/satisfaction, and email use hours were significant predictors of the IRABI scores, accounting for 46.9% of variance of the IRABI.</p>
Engelberg & Sjoberg. (2004)	<p>High frequency users of the Internet were lonelier, and expressed more deviant values.</p> <p>They adhere to idiosyncratic values and have difficulties in balancing work/leisure and in identifying emotions</p>
Pratarelli & Browne (2002)	<p>The problematic computer use leads to the use of sexual contents, management of shyness as well as the use of general contents of the Internet</p>
Caplan, S. E. (2007)	<p>Gender was a significant predictor of social anxiety (SAD) and online gambling and games were significant positive predictors of negative outcome of Internet use. However, the sexual material was not a significant predictor of negative outcomes of the Internet use. Social anxiety (SAD) was a significant direct predictor of POSI, and POSI was a direct predictor of the negative outcomes of the Internet use.</p>
Simkova, & Cincera (2004)	<p>20 of 342 students (6%) were categorized as Internet dependents.</p> <p>The sample of the Internet chatting service users were more likely to be diagnosed as “Internet addiction disorder (IAD)” than the sample of the university students.</p>



### Brief summary of Internet Abuse of other populations

In addition to reviewing research findings related to problematic Internet use among college students, I will also briefly review studies that have been conducted using samples of middle and high school students as well as research using samples of individuals representing a mixture of ages from the general population. As in studies with college students, this research includes samples of the Internet users in the U.S., India, China, and South Korea.

Gross, Juvonen, and Gable (2002) studied 7<sup>th</sup> graders to examine the effects of Internet use on the well-being of young adolescents ages 11 to 13. The sample included 49 male and 81 female students from a public school in southern California. The researchers developed a self-report form surveying time spent on daily after-school activities, number of close friends, and characteristics of participants' online communications/relationships. Students were asked to complete the self report form in class and then complete a daily activity report at home before going to bed for three days. Out of the initial 130 students, 17 students failed to complete the reports. The researchers also asked participants to complete the UCLA loneliness scale, the Social Anxiety Scale for Adolescents, the Child Depression Inventory, and the Student's Life Satisfaction Scale. The researchers found that the average daily time spent on various activities by students was divided into six areas: online activities (46 mins.), clubs/lessons (62 mins.), watching television (62 mins.), doing homework (129 mins.), talking on the phone (64 mins.), and hanging out with friends (70 mins.). Time spent online did not correlate with scores on any of the psychological measures including the UCLA loneliness scale, the

Social Anxiety Scale for Adolescents, the Child Depression Inventory, and the Student's Life Satisfaction Scale. However, they found that students who scored higher on either the loneliness or the social anxiety scale were more likely to communicate with others through the "Instant Message" function on the Internet. The researcher assumed that students used the Internet to deal with being lonely and anxious. However, they concluded that, overall, there are no main effects of the time spent online and measures of the well-being of the participants.

Tsai and Lin (2001) conducted an exploratory survey of 753 high school students in Taiwan to examine students' attitude toward computer networks and Internet addiction. They employed Young's Diagnostic Questionnaire, the Computer Network Attitude Inventory (CNAI), and the Internet Addiction Scale for High Schoolers in Taiwan (IAST). The CNAI consists of four sub-scales including; (1) Affective (feeling toward the Internet), (2) Perceived usefulness, (3) Perceived control, and (4) Behavior (behavioral intentions and actions to computer network). The IAST, which was developed by the authors for the study, consists of four sub-scales; (1) Compulsive use and withdrawal, (2) Tolerance, (3) Internet related problems (family, school, and health), and (4) Internet related problems (peer interaction and finance). Based on criteria of the Young's Diagnostic Questionnaire (DQ), 90 (75 males and 15 females) out of 753 students (12%) were diagnosed as "Internet addicts." Regression analysis for test scores revealed that students who scored highly on the Behavior scale of the CNAI are likely to (1) display more compulsive behavior using the Internet, (2) feel more depressed if their Internet use is restricted, and (3) experience more family, school, and health problems.

Tsai and Lin (2003) conducted a follow-up study in Taiwan to their aforementioned research. They used scores on both Young's Diagnostic Questionnaire and the IAST to differentiate Internet addicts from non-addicts. Combining criteria from the two scales, only 60 of 753 students were categorized as "Internet addicts". Tsai and Lin selected 10 students (convenience sample of 8 males and 2 females) for in-depth interviews from the sample. These students did not report that they suffered from any serious problems related to their peer interactions in school. However, they indicated that they spent at least 20 hours per week online mostly gathering information, communicating (online talk, and bulletin board) and playing interactive online games. Although, those 10 students were diagnosed as "Internet addicts" based on the score results of both the DQ and the ISAT measures, eight out of the 10 students categorized themselves as Internet addicts. Tsai and Lin also employed the theoretical framework of pathological Internet use developed by Davis (2001), which defines two types of Internet use: (1) specific pathological Internet use and (2) generalized pathological Internet use. Using these Davis' criteria, two out of 10 students were categorized as generalized pathological Internet use type, and six out of 10 as specific pathological Internet use type. However, the remaining two students were not clearly categorized by Davis' framework.

Nalwa and Anand (2003) studied 100 randomly selected 16-18 year-old students from a public school in India employing the Online Cognition Scale (OCS), and the UCLA Loneliness Scale. A semi-structured questionnaire was also developed by the authors for this study. This questionnaire consists of questions asking for length of time since first use of the Internet, time spent online, applications used, work or sleep

problems, feeling that life without the Internet would be boring, responses when Internet become unavailable, and control of the time spent online. Out of the initial 100 students included in the sample, Nalwa and Anand selected 18 Internet dependents and 21 non-dependent based on their scores on the OCS. Comparison of scores on the UCLA Loneliness Scale and items from the semi structured questionnaire found significant differences between dependent and non-dependent students on (1) delaying work to spend time online , (2) loosing sleep due to late night use, (3) feeling that life without the Internet would be boring, (4) feeling upset when failing to log on at a predetermined time, (5) loneliness, (6) length of time of Internet use, and (7) length of time since first Internet use. However, there were no statistically significant differences on their ability to control time spent online or applications used (e-mail, chat rooms, search engines, games, gambling, e-cards/jokes, and auction or shopping).

In the workplace, inappropriate use of Internet has become an issue with both employer and employee because an increasing number of companies incorporate the Internet with business and offer Internet access to their employees. Greenfield and Davis (2002) conducted a telephone survey with 224 human resource directors and also interviewed 300 employees. They found that 47% of employees in the workplaces use the Internet for non-work related purpose such as shopping, chatting, gambling, pornography, and games with an average of 3.24 hours per week. Only 38% of employees interviewed understood possible consequences of the inappropriate Internet use at work. 64% of the companies included in the study have disciplined their employees for inappropriate Internet use, and 30% of them have terminated employees for inappropriate use. However,

49.6% of the companies did not express concern about the inappropriate use of the Internet. Companies who addressed the issue used self or managerial oversight or filtering software, and preferred less unobtrusive ways of monitoring Internet use.

Ferraro, Caci, D'Amico, Blasi completed an initial study related to the time online and the six sub-factors of Young's IAT, however, this study is available only in Italian. The researchers later completed a follow-up study published in English in 2007. In the follow-up study, they surveyed 236 Internet chatroom users (139 males and 97 females) using an Italian translation of the Young's IAT and a set of questions asking for demographic information and time spent online per week. The participants were recruited in chat rooms provided by Italian chatting service companies. There were 130 subjects with age range of 13 to 50. Authors ran Analysis of Variance (ANOVA) and multivariate Analysis of Variance (MANOVA) to test difference of gender, age, occupation, time spent online and the six sub-factors of the IAT, which they had identified in their preliminary study. Those six factors were: (1) compromised social quality of life, (2) compromised individual quality of life, (3) compensatory usage of the Internet, (4) compromised academic/working careers, (5) compromised time control, and (6) excitatory usage of the Internet. The result of this study showed that there were no gender, age, and occupation differences in overall IAT scores. However, younger user group (13 to 24-year old) scored significantly higher in compromised social quality of life ( $p < .05$ ), compromised individual quality of life and compensatory usage of the Internet ( $p = .05$ ). Employed users scored statistically higher in compromised social quality of life ( $p < .01$ ), and compromised individual quality of life ( $p < .05$ ). Also, participants who spent more

time online (11 to 100 hours per week) obtained significantly higher IAT scores ( $p < .01$ ) than others (2 to 10 hours per week) on all the IAT sub-scales.

## CHAPTER 4

### METHODOLOGY

This chapter consists of three sections: (1) study design, (2) research questions, and (3) data analysis. In the first section, the survey method, the sampling method, and the data collection method are described. In the second section, research questions, and research variables are described. In the third section, methods for data analysis are explained.

#### Study Design

This study utilizes a non-experimental research design employing quantitative research methodology. Data for this study are collected through a web-based survey. A unique feature of this web-based survey is that, by incorporating an interactive web form and the Common Gateway Interface (CGI), the result score of the Internet Addiction Test (IAT) is presented to each participant. Immediately after participants click the submit button of the web-based questionnaire, the test score and its diagnosis (the normal, the frequent problem, and the significant problem) are programmed to be displayed to the participant. Another feature of this web-based survey is that it employs the “zero missing value” survey design. If participants skip any question or do not answer any survey questions, the web-page prompts the participants to go back to the unanswered items.

### Sample and Data Collection

The sample for this study includes registered undergraduate and graduate students of the University of Texas at Austin in 2006. The web pages for the survey were designed by the researcher using Adobe's Dreamweaver, and were securely stored in a computer lab server at School of Social Work, at the University of Texas at Austin. The server was only accessible to a computer lab administrator.

The e-mail list of students was obtained from the Information Technology Services (ITS) department at the University of Texas at Austin through formal process. Twenty-five percent of the students were randomly selected from the student e-mail list using SPSS 13, and the total number of the selected students was 12,533. However, the University of Texas at Austin prohibited sending this high number of e-mails (n=12,533) through the university's e-mailing system except for the use of official announcements or class notifications. Thus, the bulk e-mailing service of the Survey Monkey ([www.surveymonkey.com](http://www.surveymonkey.com)) was used to send a participation e-mail to the selected students. The participation e-mails were sent to the randomly selected students during the 2006 Fall semester, and two reminder e-mails was also sent to them to increase the response rate. The total number of responses turned out to be 1,578 with a return rate of approximately twelve percent (12.6%). The data from each participant are stored in the Microsoft Access format in the web-server, and then converted into a SPSS file for statistical analysis after the survey was completed.



## Research Questions

The main purpose of this study is to examine the problematic Internet use among college students. Research Questions in this study are selected following a review of existing studies related to problematic Internet use and college students. The results of this study will be discussed in relation to the findings of previous studies.

### **Research Question 1**

What are the demographic characteristics of the study participants, and how well does the sample of participants represent the target population from which the sample was drawn?

Descriptive statistics of school year (freshmen, sophomore, junior, senior, or graduate), age, gender, department/school, ethnic background will be presented. Due to the fact that the participants of this study are university students, variability of age is expected to be relatively narrow.

### **Research Question 2**

What percent of the participants are diagnosed as having frequent or significant problems related to Internet use?

The prevalence rate of individuals diagnosed as Internet addicts varies greatly dependent on the instruments selected, the characteristic of the population studied, and the research method. Young's (1996) Diagnostic Questionnaire (DQ) revealed that 396 (79%) out of 496 general population participants were found to be Internet addicts

(Young, 1996). Scherer (1997) found that 49 (13%) out of 385 college students were classified as the Internet dependent using her diagnostic tool based on *DSM-IV*, and Morahan-Martin and Schumacher (2000) found that 22 (8.1%) out of 277 college students were categorized as the pathological Internet users according to the result scores on the Problematic Use Scale (PUS). Using Young's DQ, Simkova and Cincera (2004) found that 56 of 357 general population participants (16%) were diagnosed as Internet dependents, whereas 20 of 342 college students (6%) were categorized as Internet dependents.

In this study, the prevalence rate of the problematic Internet use will be diagnosed by the result scores of the Internet Addiction Test (IAT), and the prevalence rate of both frequent and significant problem of the Internet use will be calculated accordingly.

### **Research Question 3**

Are there demographic differences between problematic Internet users and normal users including gender, age, college year and majors (e.g. natural science/engineering, social science/information science, liberal arts, and fine art)?

According to previous studies, males have been reported to be more vulnerable to Internet addiction than females (Young, 1996; Scherer, 1997; Morahan-Martin and Schumacher, 2000), and spent more time online (Joiner et al., 2005). Brenner (1997) found that, in general population, younger users scored higher on the Internet-Related Addictive Behavior Inventory (IRABI) than older users, while, no gender difference was

found. Niemi, Griffiths, and Banyard (2005) reported that the hard science group scored significantly higher on the PIU ( $p < .01$ ) and spent more time online ( $p < .01$ ) than the soft science students.

Descriptive statistics from demographic information of both problematic and non-problematic group will be presented, and gender, age, college year and major variables will be tested.

#### **Research Question 4**

Is the GPA of college students diagnosed as problematic users significantly different from non-problematic college students?

Problematic Internet use has been reported to be negatively associated with academic performance in college (Scherer, 1997; Kubey, Lavin, and Barrows, 2001). Thirty out of the 53 problematic users reported Internet-related academic impairment. Self-reported problematic Internet use and impaired academic performance were associated with the use of Internet applications such as chat rooms and multiple user dungeons (MUDs) (Kubey, Lavin, and Barrows 2001).

The relationship between the GPA and the scores of both IAT and the OCS will be analyzed. Then, the GPA of the problematic group and the non-problematic group will be compared.

### **Research Question 5**

How many hours per week do the participants spend on the Internet, and what is the relationship of time spent online and the overall scores of the Internet Addiction Test (IAT) and the Online Cognition Scale (OCS)?

Researchers have reported that time spent online is the significant factor of Internet use. Young (1996) found that problematic users spent an average of 38.5 hours on pleasure or personal use of the Internet while non-problematic users spent an average of 4.9 hours. Scherer (1997) found that problematic college users were likely to spend at least twice as much time online for leisure activities such as online gaming, chatting, and reading newsgroups, and concluded that excessive Internet use is the most obvious warning sign of Internet dependency. Kubey, Lavin and Barrows (2001) also found that college students classified as Internet dependent spent nearly three times as much recreational time online per week. Average time spent on the Internet for pleasure and for work will be presented.

### **Research Question 6**

What types of Internet services do the participants use, and are there differences between problematic and non-problematic users?

The Internet provides a variety of services including e-mail, news, games, chatting, dating, social networking, gambling, and such. Previous research revealed that, in general, individuals identified as problematic users had a tendency to use more interactive applications of the Internet such as chat rooms, MUD (Multiple User

Dungeons) games, and news groups (Young, 1996; Morahan-Martin and Schumacher, 2000).

This study will identify Internet services used by college students, and examine whether there is a difference between problematic and non-problematic users related to the use of Internet services. Frequency tables for the Internet services listed by participants will be presented.

### **Research Question 7**

Is there any relationship between the overall scores of the Online Cognition Scale (OCS) and the Internet Addiction Test (IAT)?

Currently, no research using these two scales together has been presented. The Online Cognition Scale (OCS) focuses on cognitive aspects of the Internet abuse whereas the Internet Addiction Test (IAT) reflects behavioral aspects of the Internet abuse. The relationship of the overall scores of the Online Cognition Scale (OCS) and the Internet Addiction Test (IAT) will be analyzed. The relationship between sub-scales of these instruments will also be analyzed.

### **Research Question 8**

How are the four factors of the Online Cognition Scale (social comfort, loneliness/depression, diminished impulse control, distraction) related to the Internet Addiction Test (IAT)?

The relationship of the four factors of the OCS and other variables including demographic characteristics, GPA, and time spent online will be analyzed. However, it should be noted that, according to the research of Davis, Flett, and Besser's (2002) study, two factors of the OCS (Loneliness/Depression and Impulsivity) are weakly correlated with the scores of the other relevant scales. The correlations of the OCS Loneliness/Depression factor with the Center for Epidemiological Studies Depression Scale (CES-D) and the UCLA Loneliness Scale .15 and .31, respectively, and the correlation between the OCS Impulsivity factor and the Barrett Impulsivity Scale 11 (BIS-11) revealed only .22. Given that the two factors of the OCS correlated weakly with an established scale, it is plausible that these two factors, Loneliness/Depression and Impulsivity, might not measure the constructs that they are intended to measure, or they may measure different constructs that are only partially related to loneliness, depression, or impulsivity.

### Research Variables and Coding

Based on the literature review, a total of ten research variables will be examined in this study including two scales.

#### **1. Gender**

Gender is coded as a nominal variable. Female is coded as '0', and male as '1'.

#### **2. Age**

Age is coded as continuous variable.

### **3. Ethnicity**

Ethnicity is coded as a nominal variable. There are six sub-categories in this variable. European American is coded as '1', African American as '2', Hispanic as '3', Asian American as '4', Native American as '5', and Other as '6'.

### **4. College Year**

College Year is coded as a nominal variable. Freshmen are coded as '1', sophomores as '2', juniors as '3', seniors as '4', and graduate students as '5'.

### **5. Duration of Internet use**

Duration of Internet use is the length of time since participants started to use the Internet.

### **6. Time Spent on Internet service**

Time spent online is an amount of hours spent by participants using Internet services or application per week.

### **7. Department/Major**

Department/Major is coded as a nominal variable. There is a total of fourteen departments/majors presented in the survey questionnaire, and these departments/majors are coded '1' through '14.' However, in order to make this study to be comparable to the previous study of Niemz, Griffiths, and Banyard (2005), and to ensure the assumption of similar or equal size cells in ANOVA, each department/major is categorized into one of four groups (natural science/engineering, social science, liberal arts, and fine arts).

In the study of Niemz, Griffiths, and Banyard (2005), authors employed three-group classification categorizing computing, chemistry, physics, and engineering into

hard sciences, psychology, social sciences, law, and business studies into soft sciences, and media studies, English, and journalism into liberal arts. However, this classification leaves fine arts students unclassified, and the term “hard/soft science” is sometimes misleading. Thus, this study added an additional group representing fine arts, and accordingly, participants were categorized into four groups. Also, the term “hard science” is changed to “natural science/engineering” and “soft science” to “social science/information science” in order to describe these two groups more precisely. Classification and coding of department/major is shown in the table 4.

<u>Table 4. Department/Major Classification</u>		
Group	Department/Major	code
Natural science/ Engineering	Architecture Engineering Natural Science Nursing Pharmacy	1
Social science/ Information science	Business Education Information Science Law LBJ Social Work	2
Liberal Arts	Communication Liberal Arts	3
Fine Arts	Fine Arts	4



## **8. Internet service used**

Internet service used is the types of Internet services or applications used by participants. These Internet services or applications include (1) email, (2) chatting, (3) forum, (4) blog/social networking, (5) online games, (6) adult services, (7) file sharing (p2p), (8) dating services, (9) gambling, (10) shopping, (11) school related, (12) news, and (13) Usenet.

## **9. Score of the Internet Addiction Test (IAT)**

The Internet Addiction Test (IAT) was developed by Young (1998), and has been one of the most frequently used instruments for measuring problematic Internet use. Windyanto and MacMurran (2004) statistically tested the IAT and identified five factors including (1) salience, (2) excessive use, (3) neglecting work, (4) anticipation, and (5) lack of control.

The IAT consists of twenty items using a five-point Likert scale with a possible score ranging from 20 to 100, and those who score 20 to 39 are classified as “an average online user,” 40-69 as “experiencing frequent problems,” and 70-100 as suffering “significant problems because of the Internet use” (Young, 1998). The prevalence rate of problematic Internet use will be determined using these criteria.

## **10. Score of the Online Cognition Scale (OCS)**

The OCS consists of thirty-six items using a seven-point Likert scale with a possible score ranging from 36 to 252. The OCS is based on a cognitive-behavioral

model of pathological Internet use presented by Davis (2001), and was co-developed by Davis, Flett, and Besser (2002). The OCS consists of four factors including (1) social comfort, (2) loneliness/depression, (3) diminished impulse control, and (4) distraction. The OCS has good internal consistency with Cronbach's alphas ranging from .49 to .81 of item-total correlations. Unlike the IAT, the OCS does not offer a cut-off score.

### Data Analysis

#### **1. Descriptive Statistics**

Descriptive Statistics will be employed to examine research questions one, two, and six.

#### **2. Correlation Analysis**

Correlation Analysis will be employed to examine research questions five, seven, and eight.

#### **3. Analysis of Variance (ANOVA)**

ANOVA will be employed to examine research questions three, four, five, and six comparing the mean difference of the Internet Addiction Test (IAT) score, the Online Cognition Scale (OCS) score, and the grade point average (GPA) among (1) gender, (2) time spent on Internet services, (3) college year, and (4) department/major.

#### 4. Multiple Regression (Stepwise)

Multiple regression analysis will be employed to test research question six. This analysis examines the independent variables in the order of statistical importance. Thus, researchers can identify independent variables mostly associated with a dependent in a set of independent variables (Table 5).

Statistical Method		Target Research Questions
Descriptive Statistics	Mean, median, mode, and frequency	1, 2, and 6
Correlation Analysis	Two tails Pearson's correlation	5, 7, and 8
ANOVA	One-way ANOVA	3, 4, 5, and 6
Multiple Regression	Step-wise	6

## CHAPTER 5

### RESULTS

This chapter presents the results of the data analysis. It introduces the demographic characteristics of the sample and the descriptive statistics of the independent and dependent variables. Results of the correlation test, ANOVA, and multiple regression are presented to investigate the research questions of the study.

#### Data Cleaning

Out of randomly selected twelve thousand five hundreds thirty three students, one thousand five hundreds seventy-eight completed the survey. However, there are sixty seven participants whose answers to the survey questions are invalid. Characteristics of invalid cases include: (1) responding to the GPA question with a score higher than 4.0, which is beyond the range of an obtainable GPA, (2) responding to the questions asking for time spent online per week with a value higher than 168 hours, which also exceeds the highest number of hours per week, and (3) responding to the question on time spent on email use with a value of '0,' which is an improbable answer because this study employed an email and web-based survey method. These cases may be the result of a simple keystroke mistake and may contain meaningful information on other variables. However, they are excluded from the data set because of the total number of these invalid cases (n=67) is quite low when compared with the total number of collected cases

(n=1578). Thus, the total number of valid cases used in this study becomes one thousand five hundred eleven (n=1511).

### Characteristics of the Samples

Data analysis is conducted on a total of 1511 participants after screening out the invalid cases from the initial 1578 responses. It should be noted that the response rate of this study is 12.06%.

Female students represent 57.9% of the whole students whereas male students represent 42.1%. Regarding ethnicity composition, European Americans (61.4%) are the largest group in the sample, followed by Asian Americans (13.7%), Hispanics (12.9%), African Americans (2.6%) and Native Americans (0.1%). Single students (84.1%) present the majority of the marital status, and Texas resident students (78.4%) are the largest group in residential status (Table 6).

Table 6. Demographic Characteristics of the Sample (n=1511)

		Frequency	Percent
Gender	Female	875	57.9
	Male	636	42.1
Ethnicity	European American	927	61.4
	Asian American	207	13.7
	Hispanic	195	12.9
	African American	40	2.6
	Native American	2	0.1
	Other	140	9.3
Marital Status	Single	1270	84.1
	Married	214	14.2
	Divorced	23	1.5
	Separated	4	0.3
Residential Status	Resident	1184	78.4
	Out of state	188	12.4
	International	139	9.2

Table 7 shows that graduate students (35.2%) make up the largest group, followed by seniors (18.9%), freshmen (18.2%), juniors (13.6%), and sophomores (13.6%). Also, Liberal Arts students (25.1%) present approximately a quarter of the sample, followed by Natural Science students (18.2%), Engineering students (13.4%), and others.

		Frequency	Percent
School year	freshman	275	18.2
	sophomore	206	13.6
	junior	212	14.0
	senior	286	18.9
	graduate	532	35.2
Department	Architecture	16	1.1
	Liberal Arts	380	25.1
	Natural Science	272	18.2
	Nursing	26	1.6
	Pharmacy	18	1.2
	Social Work	38	2.5
	Business	157	10.4
	Communication	148	9.5
	Education	107	7.0
	Engineering	203	13.4
	Fine Arts	61	4.0
	Information Science	23	1.5
	Law	41	3.0
	LBJ	21	1.4

## **Comparison of the sample and the population**

Comparison of the demographic information between the sample and the population is presented in Table 8. The data of the population were obtained from the statistical handbook of the University of Texas at Austin (<http://www.utexas.edu/academic/oir/>). Comparison results revealed that females are more represented in the sample (57.9%) than in the population (51.1%). The one sample proportion test (one sample z-test) on female proportion confirmed that there is statistically significant difference between the sample and the population ( $p < .001$ ). The proportion of graduate students in the sample (35.7%) is also higher than that in the population (25.4%). In addition, the undergraduate Grade Point Average (GPA) of the sample ( $m=3.34$ ) is slightly higher than that of the population ( $m=3.21$ ). Since the graduate GPA of the population is not available from the statistical handbook of the University of Texas at Austin, it is not possible to determine how well the graduate GPA of the sample represents the population. Given that the proportion of the graduate students is inflated by a relatively large margin (10.3%) and the graduate GPA of the sample is higher than the undergraduate GPA of the sample, the total GPA of this sample will be much higher than the total GPA of the population.



Table 8. Comparison of the population and the sample

		Population	Sample
Gender	Male	48.9%	42.1%
	Female	51.1%	57.9%
Ethnicity	European American	56.6%	61.4%
	Hispanic	15.0%	12.9%
	Asian American	14.4%	13.7%
	African American	3.9%	2.6%
	Foreign	8.9%	n/a
	Native American	0.5%	0.1%
	Unknown (other)	0.7%	9.3%
Academic Year	Freshman	14.7%	18.2%
	Sophomore	15.9%	13.6%
	Junior	17.4%	14.0%
	Senior	26.5%	18.9%
	Graduate/Law	25.4%	35.2%
Residency	Texas	80.8%	78.4%
	Out of State	10.3%	12.4%
	Foreign	8.9%	9.2%
GPA (undergraduate)	Male	3.15	3.33
	Female	3.26	3.34
	Total	3.21	3.34
GPA (graduate)	Male	n/a	3.70
	Female	n/a	3.73
	Total	n/a	3.72

### Prevalence Rate of Problematic Internet Use

Young's Internet Addiction Test (IAT) was used to find the prevalence rate of problematic Internet use. The IAT employs a five-point Likert scale with score ranging from 20 to 100, and those who score 20 to 39 are classified as "an average online user," 40 to 69 as "experiencing frequent problems," and 70 to 100 as suffering "significant problems because of the Internet use." Table 9 presents the result of Young's Internet Addiction Test (IAT). Seventy-one and two percent of the respondents are diagnosed as the normal average online users, whereas twenty-eight percent of respondents shows frequent problems and 0.8 percent of the respondents are diagnosed as Internet users with significant problems.

	Frequency	Percent (%)
Normal	1074	71.1
Frequent Problems	425	28.1
Significant Problems	12	.8
Total	1511	100.0

However, the number of students in the "significant problems" group is very low (.8%) and almost negligible when compared with the number of students in other two groups. This discrepancy in size violates an assumption of the ANOVA, which requires the same or similar size across all groups. Thus, when ANOVA is employed for data

analysis of IAT groups, the significant problems group and the frequent problems group will be combined together into a new group titled “problem group” to minimize the difference in the number of students in each group. Characteristics of the “significant problems” group are briefly examined before it is combined with the “frequent problems” group.

### **Characteristics of the significant problems group**

Table 10, 11, and 12 show the characteristics of the significant problem group. Out of 12 students diagnosed as belonging to the “significant problems” group, seven are male and five are female and their mean age is 24.50, ranging from 18 to 48. On average, they spent time online for 33.17 hours per week and had used the Internet for over 9 years. The majority of students in this group study natural science/engineering, and their mean GPA is 3.11, ranging from 2.0 to 3.90. Although their mean GPA is above 3.0, it should be noted that the mean GPA of the whole sample is 3.47. Although the sample number for the significant problem group is small, students in this group might be roughly characterized as “24-year-old male graduate students majoring natural science/engineering with a GPA of 3.11.”

This result supports the general characteristics of problematic Internet users of previous studies except that the mean age of this group ( $m=24.50$ ) is slightly higher than that of whole sample ( $m=23.49$ ). This is mainly due to the two outliers (40 and 48), which increase the mean age of the significant problem group. Without these two outliers, the mean age of the significant problem group becomes 20.60, which is lower than mean

age of the whole sample (m=23.49). Also, GPAs of these two outliers (3.70 and 3.90) are higher than the average GPA of the problematic group (3.11), and their IAT scores (70 and 72) are lower than the average (75.83).

One of the interesting participants in this group is a female graduate student (ID number 4) who reported spending time online for only five hours per week. Since time spent online is found to be positively correlated with problematic Internet use, it is a very unusual case. Meanwhile, a male freshman student (ID number 10) exemplified an instance of problematic Internet use. He had the highest IAT score, the largest amount of time spent online, and the lowest GPA of the significant problem group (Table 12).

	Minimum	Maximum	Mean
Age	18	48	24.50
GPA	2.00	3.90	3.11
Months used	60	245	111.25 (9 years and 3.25 months)
Hours/week	5.000	70.000	33.17
IAT Score	70	100	75.83

Table 11. Significant Problems Group 2

		frequent	percentage
Gender	Male	7	58.3
	Female	5	41.7
Major	Natural science/engineering	8	66.7
	Social science/information science	1	8.3
	Liberal arts	3	25.0
School Year	Freshman	2	16.7
	Sophomore	1	8.3
	Junior	2	16.7
	Senior	3	25.0
	Graduate	4	33.3
Ethnicity	European American	6	50.0
	African American	1	8.3
	Hispanic	1	8.3
	Asian American	2	16.7
	Other	2	16.7

<u>Table 12. Significant Problem Group 3</u>							
<u>Id #</u>	<u>Age</u>	<u>Gender</u>	<u>School Year</u>	<u>College</u>	<u>GPA</u>	<u>IAT Score</u>	<u>Time Spent Online</u>
1	21	Male	Senior	Natural Science	2.80	80	16
2	18	Male	Freshman	Natural Science	2.00	72	45
3	20	Male	Junior	Natural Science	2.90	74	38
4	22	Female	Graduate	Natural Science	3.20	70	5
5	25	Female	Graduate	Pharmacy	3.20	70	30
6	48	Male	Graduate	Engineering	3.90	72	35
7	19	Male	Sophomore	Natural Science	3.80	73	50
8	20	Female	Junior	Communication	3.00	80	25
9	22	Female	Senior	Communication	3.14	78	30
10	18	Male	Freshman	Engineering	2.00	100	70
11	40	Male	Graduate	Education	3.70	70	24
12	21	Female	Senior	Liberal Arts	3.70	71	30

### **Problematic Internet Use and the Overall Time Spent online**

The overall time spent online is positively correlated with the IAT ( $r=.253$ ,  $p<.001$ ) (Table 13). Although the correlation of problematic Internet use and the overall time spent online is found to be weak, this indicates that students who spend more time online are more likely to score highly on the IAT.

Table 13. Correlations between Time spent online and IAT

		hour/week	IAT
hour/week	Pearson Correlation	1	.253(**)
	Sig. (2-tailed)		.000
	N	1511	1511
IAT	Pearson Correlation	.253(**)	1
	Sig. (2-tailed)	.000	
	N	1511	1511

\*\* Correlation is significant at the 0.01 level (2-tailed).

However, it should be noted that the time spent on school-related use of the Internet is not correlated with the IAT ( $r=.008$ ,  $p=.766$ ) (Table 14). This indicates that these two variables are independent of each other. Although the overall amount of time spent on the Internet is positively related with the IAT, the time spent on school-related Internet use is not related with the IAT. These results imply that students who spend more time on the Internet for pleasure are more likely to score higher on the IAT.

Table 14. Correlation between School Related Use and IAT

		School related use (hour/week)	IAT
School related use (hour/week)	Correlation	1	.008
	Sig. (2-tailed)		.766
	N	1511	1529
IAT	Correlation	.008	1
	Sig. (2-tailed)	.766	
	N	1511	1511

Table 15 shows that on average, normal users spent 21 hours per week, whereas problematic users (frequent and significant problem) spent 28 to 33 hours per week.

<u>Table 15. Time Spent Online (hours per week)</u>		
average normal	Mean	21.01
	Median	16.00
	Std. Deviation	24.826
	Minimum	0
	Maximum	600
frequent problem	Mean	28.43
	Median	25.00
	Std. Deviation	22.280
	Minimum	3
	Maximum	280
significant problem	Mean	33.17
	Median	30.00
	Std. Deviation	16.721
	Minimum	5
	Maximum	70



## Gender Difference in the IAT

Descriptive statistics on Table 16 shows that mean score of the IAT in male students ( $m=37.06$ ) is higher than female students ( $m=34.73$ ). ANOVA test confirms that there is statistically significant mean difference between male and female groups ( $p=.000$ ).

<u>Table 16. Descriptive Statistics (Gender)</u>						
	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
male	636	37.0629	11.27114	.44693	20.00	100.00
female	875	34.8320	9.88251	.33409	20.00	80.00
Total	1511	35.7710	10.54353	.27124	20.00	100.00

<u>ANOVA (Gender)</u>						
	Sum of Squares	df	Mean Square	F	Sig.	
Between Groups	1832.982	1	1832.982	16.660	.000	
Within Groups	166027.788	1509	110.025			
Total	167860.770	1510				

In addition, according to the classification of the IAT, 32.86% of male participants belonged to the frequent or the significant problems group, whereas 26.06% of female participants belonged to the frequent or the significant problem group. This indicates that male participants have a higher chance to suffer from problematic Internet use than female participants (Table 17).

Table 17. Gender Difference

	Male		Female	
	frequency	Percent	Frequency	Percent
Normal	427	67.14%	647	73.94%
Frequent Problems	202	31.76%	223	25.49%
Significant Problems	7	1.10%	5	.57%
Total	636		875	

### **Ethnicity and the IAT**

Among ethnic groups, Asian Americans have the highest mean score of the IAT ( $m=40.72$ ), followed by unspecified “other” ethnicities ( $m=39.29$ ), African Americans ( $m=36.00$ ), Hispanics ( $m=34.88$ ), European Americans ( $m=34.33$ ), and Native Americans ( $m=27.50$ ) (Table 18). Due to group size discrepancy, direct comparison between groups might not yield a meaningful result. Thus, minority groups were combined into one group, and then, compared with the European American group. On average, the combined minority group scored higher than the European American group on the IAT (Table 19). ANOVA test results showed that there is a statistically significant difference between the European American group and the combined minority group ( $p<.001$ ) (Table 20).

Table 16.1. Ethnicity and the IAT (n=1511)

Ethnicity	N	Mean	Std. Deviation	Minimum	Maximum
European American	927	34.33	9.60870	20.00	80.00
African American	40	36.00	11.26829	23.00	71.00
Hispanic	195	34.88	10.09447	21.00	70.00
Asian American	207	40.72	11.57201	21.00	80.00
Native American	2	27.50	4.94975	24.00	31.00
Other	140	39.29	12.29686	21.00	100.00

Table 17. European American and Minority on IAT

	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
European American	927	34.3301	9.60870	.31559	20.00	80.00
Minority	584	38.0582	11.52118	.47675	21.00	100.00
Total	1511	35.7710	10.54353	.27124	20.00	100.00

Table 18. European American and Minority on IAT (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4979.760	1	4979.760	46.135	.000
Within Groups	162881.011	1509	107.940		
Total	167860.770	1510			

### School Year and the IAT

Table 21 shows that prevalence rates of problematic Internet use are ranging from 23.6% (Graduate) to 33.3% (Freshman). A Post Hoc test of ANOVA for each group difference revealed that there was statistically significant difference between freshman and graduate students ( $p = .005$ ). However, no statistically significant difference was found between other groups. This indicates that freshman students are more vulnerable to problematic Internet use than graduate students (Table 22).

	Freshman	Sophomore	Junior	Senior	Graduate
IAT score	37.13	36.55	35.99	36.22	34.44
n	275	206	212	286	532

Table 22. ANOVA (School Year)

			Mean Difference (I-J)	Std. Error	Sig.
Tukey HSD	freshman	sophomore	.57873	.96806	.975
		junior	1.13671	.96019	.761
		senior	.90699	.88728	.845
		graduate	2.68742(*)	.78027	.005
	sophomore	freshman	-.57873	.96806	.975
		junior	.55798	1.02782	.983
		senior	.32826	.96005	.997
		graduate	2.10869	.86212	.104
	junior	freshman	-1.13671	.96019	.761
		sophomore	-.55798	1.02782	.983
		senior	-.22971	.95212	.999
		graduate	1.55072	.85328	.364
	senior	freshman	-.90699	.88728	.845
		sophomore	-.32826	.96005	.997
		junior	.22971	.95212	.999
		graduate	1.78043	.77031	.142
	graduate	freshman	-2.68742(*)	.78027	.005
		sophomore	-2.10869	.86212	.104
		junior	-1.55072	.85328	.364
		senior	-1.78043	.77031	.142

\* The mean difference is significant at the .05 level.

### Distribution Characteristics of the GPA, the IAT, and the OCS

With the valid 1511 cases, the mean of the GPA was 3.4728 (Table 23) with its minimum of 1.20 and maximum of 4.00. As mentioned earlier, thirty-two cases were excluded from the analysis because GPA of those cases was either 0 or more than 4.0, which was beyond the range of possible GPA. However, the figure1 visually shows that most students scored between 3.0 to 4.0. Also, the Kolmogorov-Smimov statistic, a test for normality, confirms that the GPA is not normally distributed (Kolmogorov-Smimov statistic = .139,  $p < .001$ ).

The IAT score is not normally distributed (Kolmogorov-Smimov statistic = .109,  $p < .001$ ), whereas the OCS score, slightly skewed (Figure 3), is closer to the normal distribution (Kolmogorov-Smimov statistic = .020,  $p = .141$ ). Figure 2 (the IAT), visually confirms that the majority of participants fall into the normal group range of 20 to 39. Since the distribution curves of the GPA and the IAT violates the normality assumptions, it should be cautious to run regression analysis on these variables.

Table 23. The GPA, the IAT, and the OCS (n=1511)

	Minimum	Maximum	Mean	Std. Deviation	Kolmogorov-Smirnov Statistic	df	Sig.
GPA	1.20	4.00	3.4728	.48550	.139	1511	.000
IAT	20.00	100.00	35.7710	10.54353	.109	1511	.000
OCS	36.00	239.00	108.3508	30.44187	.020	1511	.141

Figure 1. Distribution of the GPA

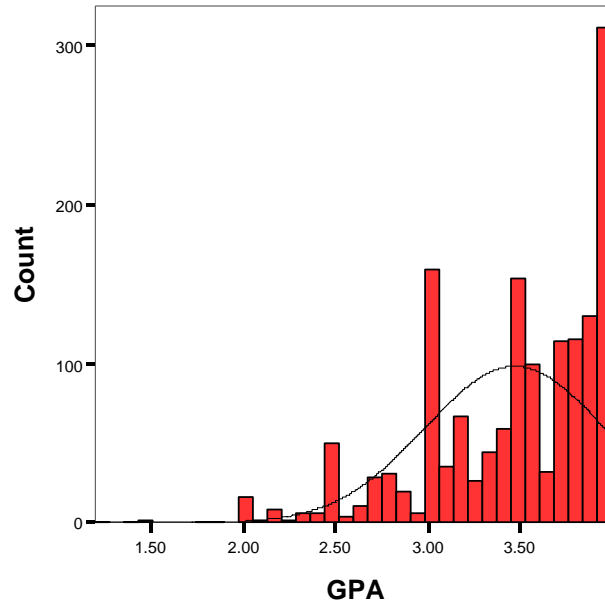


Figure 2. Distribution of the IAT score

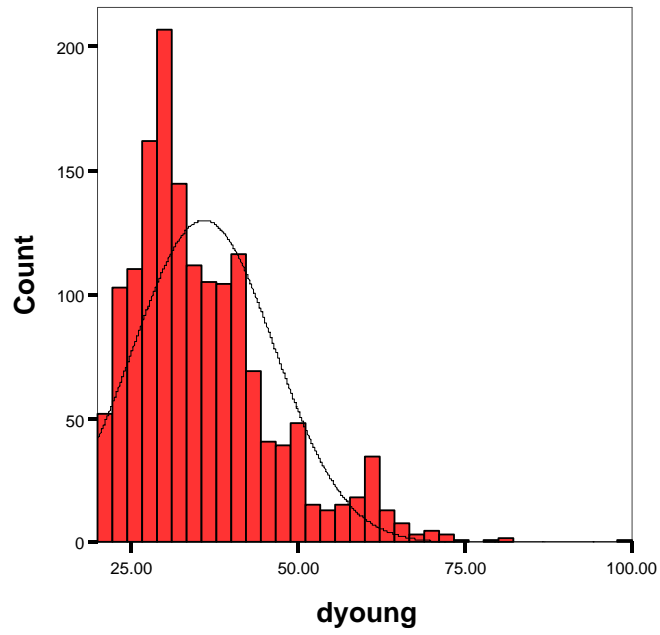
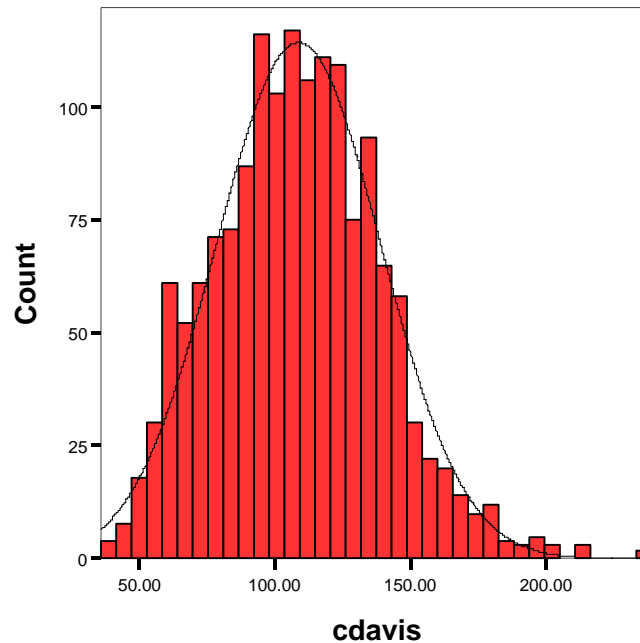


Figure 3. Distribution of the OCS score



### **GPA and Problematic Internet Use (the OCS and the IAT)**

Bivariate correlation analysis was conducted to examine directions and magnitudes of relationships between three variables. Table 24 shows that each pair of the three variables showed statistically significant relationships. The IAT and OSC are supposed to measure the same construct, problematic Internet use. Thus, as expected, the IAT and the OCS are highly and positively correlated ( $r=.688$ ). Although statistically significant in a negative direction, however, the correlation between the GPA and the IAT ( $r=-.101$ ), and the correlation between the GPA and the OCS ( $r=-.093$ ) are very low. Judging from the values of the correlation coefficient, association between the GPA and problematic Internet use is very weak. However, it is also noted that the GPA and two



scales are negatively related, which implies that the students who have higher GPA show a tendency to receive low scores on IAT and OCS.

<u>Table 24. Relationships among GPA, IAT, and OCS</u>			
	GPA	Young IAT	Davis OCS
GPA			
Young IAT	-.101**		
Davis OCS	-.093**	.688**	
** correlation is significant at the 0.01 level (2-tailed)			
N= 1511			

Initially, the participants were categorized, based on the result scores of the Internet Addiction Test, into three groups including (1) normal group, (2) frequent problem group, and (3) significant problem group. However, because the number of cases in the significant problems group was negligibly small (12 out of 1511), the significant problems group was combined with the frequent problems group. The newly combined group was named “problematic group.” The mean of GPA in normal group was 3.4898, and the mean of GPA in problematic group was 3.4309 (Table 25).

Table 25. GPA of Normal and Problematic groups

		Statistic	
GPA	normal	Mean	3.4898
		Median	3.6000
		Variance	.224
		Std. Deviation	.47324
		Minimum	1.20
		Maximum	4.00
	problematic	Mean	3.4309
		Median	3.5000
		Variance	.263
		Std. Deviation	.51256
		Minimum	1.40
		Maximum	4.00

One-way ANOVA was conducted to test the difference between the GPA of normal group and that of the problematic group. The result revealed that there was a statistically significant difference between those two groups ( $p=.033$ ) (Table 26), and it can be concluded that the normal group scored higher on GPA than the problematic group.

Table 26. ANOVA (GPA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.077	1	1.077	4.578	.033
Within Groups	354.849	1509	.235		
Total	355.926	1510			

### **Departments/Majors and the IAT**

Roughly based on the classification of Niemz, Griffiths, and Banyard (2005), each departments and majors were categorized into four groups including (1) natural science/engineering, (2) social science/information science, (3) liberal arts, and (4) fine arts. The mean scores of the IAT in these four groups were compared. Descriptive statistics in Table 27 showed that natural science/engineering group scored highest (m=36.88) followed by liberal arts (m=35.85), social science/information science (m=34.56), and fine arts (m=32.98).

	N	Mean
Natural science/ engineering	535	36.88
Social science/ Information science	387	34.56
Liberal Arts	528	35.85
Fine Arts	61	32.98

ANOVA test showed that there were statistically significant mean differences among the four groups (Table 28). A post hoc test revealed that there was a mean score difference between natural science/engineering and social science/information science ( $p=.005$ ), and between natural science/engineering and fine arts ( $p=.031$ ), but none of the other group comparisons was found to be statistically significant (Table 29). This indicated that natural science/engineering students scored higher on the IAT than social science/information science and fine arts students, and it can be concluded that the natural science/engineering students are more likely to be problematic Internet users than social science/information science and fine arts students. This finding confirmed the study of Niemz et. al. (2005), in that natural science/engineering students were more vulnerable to problematic Internet use than social science/information science students.

Table 28. ANOVA (Departments and the IAT)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1707.172	3	569.057	5.161	.001
Within Groups	166153.599	1507	110.255		
Total	167860.770	1510			

Table 29. Post Hoc Test (Departments and IAT, Tukey HSD)

		Mean Difference		
(I) college4groups	(J) college4groups	(I-J)	Std. Error	Sig.
natural science/ engineering	social science/ information science	2.32339(*)	.70070	.005
	liberal arts	1.03184	.64413	.378
	fine arts	3.90051(*)	1.41899	.031
social science/ information science	natural science/ engineering	-2.32339(*)	.70070	.005
	liberal arts	-1.29155	.70265	.256
	fine arts	1.57712	1.44649	.696
liberal arts	natural science/ engineering	-1.03184	.64413	.378
	social science/ information science	1.29155	.70265	.256
	fine arts	2.86867	1.41995	.181
fine arts	natural science/ engineering	-3.90051(*)	1.41899	.031
	social science/ information science	-1.57712	1.44649	.696
	liberal arts	-2.86867	1.41995	.181

\* The mean difference is significant at the .05 level.

### Age and Problematic Internet Use

Mean age of the participants was 23.49 year old on average ranging from 15 to 63 (sd=6.264). Age was negatively correlated with both the IAT ( $r=-.116$ ,  $p<.001$ ) and the OCS scores ( $r=-.130$ ,  $p<.001$ ). Although weakly correlated, the result indicates that younger students are more likely to score higher on both the IAT and the OCS than older students (Table 30).

		IAT	OCS
age	Pearson Correlation	-.116(**)	-.130(**)
	Sig. (2-tailed)	.000	.000
	N	1511	1511

\*\* Correlation is significant at the 0.01 level (2-tailed).

### Duration of Internet Use and Problematic Internet Use

Participants of this study had used the Internet for 12.25 years on average. Duration of Internet use was found to be negatively correlated with the IAT ( $r=-.069$ ,  $p=.007$ ). This indicates that, although the relationship is very weak, newer Internet users have a tendency to score higher on the IAT. The result supports the study of Windyanto and MacMurrans (2004), who reported that the IAT was negatively correlated with duration of use ( $r=-.18$ ). However, duration of Internet use was not correlated with the OCS ( $r=.22$ ,  $p=.386$ ) (Table 31)

Table 31. Correlation of Duration and The IAT Score

		IAT	OCS
duration	Pearson Correlation	-.069(**)	.022
	Sig. (2-tailed)	.007	.386
	N	1505	1505

\*\* Correlation is significant at the 0.01 level (2-tailed).

### **Internet Services Used by Participants**

Study results on Internet services used by participants are shown in Table 32.

The participants used the Internet for email (100%), school related used (90.9%), reading news (68.4%), chatting (56.4%), and shopping (55.3%), blog/social networking (49.2%), forum (37.0%), games (23.8%), file sharing (20.8%), adult contents (15.8%), Usenet (11.7%), gambling (2.9%), and dating service (2.8%). It should be noted that the rate of email use (100%) may inflate the true rate of the email use. Since this study employed an email service for sending a participation mail, students who do not use email were not able to participate in this survey.

Services	Percentage	Average time spent/week (hour)
Email	100.0%	4.80
School Related (Library)	90.9%	4.43
News	68.4%	2.62
Chatting	56.4%	3.75
Shopping	55.3%	1.15
Blog/Social Networking	49.2%	2.22
Forum	37.0%	1.66
Online gaming	23.8%	1.36
File sharing (p2p)	20.8%	1.50
Adult Contents	15.8%	.56
Usenet/Newsgroups	11.7%	.31
Gambling	2.9%	.15
Dating Service	2.8%	.08

Multiple regression analysis was employed to examine relationships between the IAT score and the time spent on each Internet service (13 variables). The stepwise method was selected to extract the best set of predictor variables into the regression equation. The result of the stepwise multiple regression revealed that, out of 13 Internet services, (1) chatting, (2) online gaming, (3) blog/social networking, (4) adult services, and (5) forum are a set of statistically significant predictors of the IAT ( $p < .001$ ), and those five variables explain 12.5% of the variance in the IAT (Table 33, 34 and 35).



When controlling the effect of the gender variable, the directions of each five predictors remained the same (Table 36). However, the Beta of chatting and blog slightly increased while the Beta of online gaming, adult services, and forum slightly decreased.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.256(a)	.066	.065	10.19443
2	.295(b)	.087	.086	10.08171
3	.330(c)	.109	.107	9.96114
4	.343(d)	.118	.115	9.91674
5	.354(e)	.125	.122	9.87903

<u>Table 34. Regression (ANOVA)</u>						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11035.928	1	11035.928	106.190	.000(a)
	Residual	156824.842	1509	103.926		
	Total	167860.770	1510			
2	Regression	14586.259	2	7293.130	71.754	.000(b)
	Residual	153274.511	1508	101.641		
	Total	167860.770	1510			
3	Regression	18329.727	3	6109.909	61.577	.000(c)
	Residual	149531.044	1507	99.224		
	Total	167860.770	1510			
4	Regression	19758.031	4	4939.508	50.228	.000(d)
	Residual	148102.739	1506	98.342		
	Total	167860.770	1510			
5	Regression	20979.990	5	4195.998	42.994	.000(e)
	Residual	146880.780	1505	97.595		
	Total	167860.770	1510			

a Predictors: (Constant), chatting

b Predictors: (Constant), chatting, online games

c Predictors: (Constant), chatting, online games, blog

d Predictors: (Constant), chatting, online games, blog, adult services

e Predictors: (Constant), chatting, online games, blog, adult services, forum

<u>Table 35. Regression Coefficients</u>						
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	34.480	.291		118.627	.000
	chatting	.344	.033	.256	10.305	.000
2	(Constant)	34.230	.291		117.818	.000
	chatting	.297	.034	.221	8.718	.000
	online games	.314	.053	.150	5.910	.000
3	(Constant)	33.676	.301		111.930	.000
	chatting	.242	.035	.180	6.942	.000
	online games	.341	.053	.162	6.464	.000
	blog	.326	.053	.155	6.142	.000
4	(Constant)	33.659	.300		112.361	.000
	chatting	.230	.035	.172	6.627	.000
	online games	.325	.053	.155	6.160	.000
	blog	.299	.053	.142	5.604	.000
	adult services	.251	.066	.094	3.811	.000
5	(Constant)	33.459	.304		110.149	.000
	chatting	.207	.035	.154	5.867	.000
	online games	.303	.053	.144	5.725	.000
	blog	.282	.053	.134	5.299	.000
	adult services	.256	.066	.096	3.894	.000
	forum	.212	.060	.089	3.538	.000

Table 36. Regression Coefficients after Controlling for Gender

Model	B	Std. Error	Beta	t	Sig.
(Constant)	32.754	.374		87.649	.000
chatting	.212	.035	.158	6.034	.000
online games	.279	.053	.133	5.252	.000
blog	.305	.054	.144	5.684	.000
gender	1.709	.531	.080	3.218	.001
adult services	.227	.066	.085	3.440	.001
forum	.190	.060	.080	3.160	.002

Dependent Variable: IAT

### **Gender Difference and Internet Service Used**

As seen in the Table 37 and 38, there are gender differences with respect to Internet service used. Female students tend to spend more time on email ( $p < .001$ ), school-related ( $p = .015$ ), blog/social networking ( $p < .001$ ), and shopping ( $p = .001$ ) services, while male students spend more time on news ( $p < .001$ ), online games ( $p < .001$ ), file sharing (p2p) ( $p < .001$ ), Usenet/newsgroup ( $p = .001$ ), forum ( $p < .001$ ), gambling ( $p = .002$ ), and adult services ( $p < .001$ ). No gender differences were found on chatting ( $p = .895$ ) and dating service ( $p = .495$ ). It is interesting to note that male students have a tendency to spend more time on Internet services such as online games, news and forum, which were found to be statistically significant predictors of problematic Internet use (the IAT) in the previous regression analysis. This finding partially explains why male students are more

vulnerable to problematic Internet use. Namely, male students spend more time on Internet services associated with problematic Internet use.

Table 37. Time spent online services per week (hours)

	Male (n=636)	Female (n=875)
Email	3.98	5.39
School Related	3.99	4.74
News	3.48	1.99
Chatting	3.72	3.77
Shopping	.92	1.32
Blog/Social Networking	1.58	2.69
Forum	2.24	1.24
Online Games	2.31	.68
File sharing (p2p)	2.58	.70
Adult Contents	1.14	.15
Usenet/Newsgroups	.44	.21
Gambling	.08	.03
Dating Service	.09	.07
Total	28.05	24.27

Table 38. Gender Difference and Internet Service (ANOVA)

		Sum of Squares	df	Mean Square	F	Sig.
email	Between Groups	738.117	1	738.117	14.062	.000
	Within Groups	79205.783	1509	52.489		
	Total	79943.900	1510			
school related	Between Groups	211.042	1	211.042	5.886	.015
	Within Groups	54107.604	1509	35.857		
	Total	54318.646	1510			
news	Between Groups	815.440	1	815.440	41.051	.000
	Within Groups	29974.692	1509	19.864		
	Total	30790.133	1510			
chatting	Between Groups	1.068	1	1.068	.017	.895
	Within Groups	93013.107	1509	61.639		
	Total	93014.175	1510			
shopping	Between Groups	57.436	1	57.436	10.332	.001
	Within Groups	8388.719	1509	5.559		
	Total	8446.154	1510			
blog	Between Groups	458.350	1	458.350	18.535	.000
	Within Groups	37314.879	1509	24.728		
	Total	37773.228	1510			
forum	Between Groups	372.909	1	372.909	19.376	.000
	Within Groups	29042.257	1509	19.246		
	Total	29415.166	1510			

online games	Between Groups	982.441	1	982.441	40.004	.000
	Within Groups	37058.836	1509	24.559		
	Total	38041.277	1510			
p2p	Between Groups	1297.976	1	1297.976	17.005	.000
	Within Groups	115179.707	1509	76.329		
	Total	116477.683	1510			
adult services	Between Groups	361.931	1	361.931	23.438	.000
	Within Groups	23301.564	1509	15.442		
	Total	23663.495	1510			
usenet	Between Groups	20.109	1	20.109	11.357	.001
	Within Groups	2671.890	1509	1.771		
	Total	2691.999	1510			
gambling	Between Groups	20.585	1	20.585	9.826	.002
	Within Groups	3161.095	1509	2.095		
	Total	3181.679	1510			
dating service	Between Groups	.268	1	.268	.465	.495
	Within Groups	870.368	1509	.577		
	Total	870.636	1510			

### **Correlation between the IAT and Sub-Scales of the OCS**

The Online Cognition Scale (OCS) consists of four sub-scales including (1) Social Comfort, (2) Loneliness/Depression, (3) Diminished Impulse Control, and (4) Distraction. These four sub scales were moderately correlated with the Internet Addiction

Test (IAT) (Table 39). Among the sub scales, Diminished Impulse Control had the highest correlation with the IAT ( $r=.685$ ) followed by Loneliness/Depression ( $r=.556$ ), Distraction ( $r=.553$ ), and Social Comfort ( $r=.488$ ).

		IAT	Social comfort	Loneliness depression	Diminished impulse ctrl	distract ion
IAT	Pearson Correlation	1	.491(*)	.556(*)	.686(*)	.552(*)
	Sig. (2-tailed)		.000	.000	.000	.000
	N	1511	1511	1511	1511	1511
Social comfort	Pearson Correlation	.491(*)	1	.606(*)	.644(*)	.444(*)
	Sig. (2-tailed)	.000		.000	.000	.000
	N	1511	1511	1511	1511	1511
Loneliness depression	Pearson Correlation	.556(*)	.606(*)	1	.660(*)	.525(*)
	Sig. (2-tailed)	.000	.000		.000	.000
	N	1511	1511	1511	1511	1511
Diminished Impulse ctrl	Pearson Correlation	.686(*)	.644(*)	.660(*)	1	.540(*)
	Sig. (2-tailed)	.000	.000	.000		.000
	N	1511	1511	1511	1511	1511
distract ion	Pearson Correlation	.552(*)	.444(*)	.525(*)	.540(*)	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	1511	1511	1511	1511	1511

\* Correlation is significant at the 0.01 level (2-tailed).



## CHAPTER 6

### DISCUSSION AND LIMINATION

#### Discussion

This study examines variables associated with problematic Internet use among college students. Researching this area is made difficult by the fact that numerous definitions of problematic Internet use exist. Also, there are at least ten different instruments that have been independently developed and utilized for research in this area. Several types of samples of college students have been studied from a range of college level. Therefore, the results of published studies and this research are only somewhat comparable. Some findings of this study contradict the results of other studies while other findings of this study support and comply with the results of other studies. First of all, based on the result scores of the Internet Addiction Test (IAT), only 0.8 percent of the respondents are diagnosed as Internet users with significant problems, and 28.0 percent with frequent problems. When compared to the previous results of Young (1996) (79% general population), Scherer (1997) (13% college students), Morahan-Martin and Schumacher (2000) (8.1% college students), Simkova and Cincera (2004) (16% for general population, 6% for college students), the prevalence rate of the students with significant problems (0.8 %) is very low. The prevalence rate of this study is similar only to the finding of Nichols and Nicki (2004), which revealed that less than one percent of college students were classifiable as problematic Internet users. However, it also should

be noted that combining both the significant and the frequent problem group, the prevalence rate increases to 28.8 percent, and that the aforementioned studies employed different measures for problematic Internet use. Judging from the prevalence rate of this study, it can be concluded that, although the number of students with significant problems of Internet use is almost negligible (0.8%), more than one quarter of all students (28.0%) are experiencing some sorts of problems of Internet use.

One of the findings of this study is that some applications and services related to Internet use by college students have changed within last ten years. Comparing the results of Scherer's study (1997), the majority of college students still use the Internet for email (100%) and academic purpose (90.9%). However, the percentage of online chatting users dramatically has jumped from mere 9.1% (Scherer, 1997) to 56.4%, and blog/social networking (49.2%) and file sharing (20.8%), which were not reported in earlier studies conducted by Scherer (1997) and Young (1996, 1998), have become increasingly popular. As Ellison, Steinfield, and Lampe (2007) noted, online social networking services have become widely used among college students. On the contrary, however, the percentage of Usenet service use has decreased from 36.9% (Scherer, 1997) to 11.7%. This decrease might be due to the fact that America Online, one of the largest online service providers, stopped providing direct access to Usenet newsgroups in 2005. It seems that, as network technology is evolving and more services have become available, the trend of Internet use is also changing accordingly.

This study also supports the findings of Niemi et. al (2005) in that natural science/engineering students are more vulnerable to problematic Internet use than social

science/information science and liberal arts students. This might be partly due to the fact that natural science/engineering students were found to be spend more time online (23.62 hours/week) than social science/information science (22.72 hours/week) or liberal arts students (21.12 hours/week), and the time spent online was found to be positively related to the Internet Addiction Test (IAT).

Previous studies also have found that the time spent online is positively related with problematic Internet use. The result of this study also revealed that frequent and significant problem group students spent more time online (28.43 hours/week and 33.17 hours/week) than normal group students (21.01 hours/week), and time spent online is positively correlated with the Internet Addiction Test (IAT) ( $r=.260$ ,  $p=.001$ ). However, it should be noted that although the overall amount of time spent online is positively correlated with problematic Internet use, time spent online for academic purposes is not correlated with problematic Internet use. Moreover, five out of 13 Internet applications and services, chatting, online gaming, blog/social networking, adult services, and forum were found to be a set of statistically significant predictors of problematic Internet use. This indicates that students who spent more time online for pleasure are more vulnerable to problematic Internet use.

Age is negatively correlated with the Internet Addiction Test (IAT) ( $r=-.117$ ,  $p=.01$ ), indicating that younger college students are more vulnerable to problematic Internet use. Although the target population of this study is limited to college students, if the relationship between age and problematic Internet use is linear to some extent, it

could be hypothesized that an adolescent population would be more vulnerable to problematic Internet use than an adult population.

It is interesting to note that in this study, as other studies corroborate, male students were found to score higher on the Internet Addiction Test than female students. There might be various reasons why male students are more vulnerable to problematic Internet use. Based on some of the findings in this study, it would be mainly due to the fact that (1) male students spent more time online, (2) their time spent online is more for pleasure purposes such as online games, peer to peer (P2P) file sharing, and accessing adult contents, and (3) time spent online for non-academic purposes is positively correlated with problematic Internet use. Meanwhile, female students were found to use the Internet more for communication (e-mail and blog), shopping, and academic purposes. Because in-depth discussion concerning why male students spend more time-online is beyond the purpose of this study, future studies will be required to examine this issue.

This study found that GPA and the Internet Addiction Test (IAT) is negatively correlated ( $r=-.110$ ,  $p<.001$ ), and, indeed, the mean GPA of the combined problematic group is found to be lower than that of normal group. However, degree of the relationship between GPA and IAT is very weak, and the mean GPA of the students who belong to problematic group is fairly high at 3.43 when compared to that of normal group at 3.49. Negatively skewed distribution of GPA with less variability makes it harder to examine differences in academic performance among college students.

#### Limitation of this Study

This study shares the same limitations that other studies on problematic Internet use have. First of all, this study used a data set from a less diverse sample frame. The participants of this study were limited to the registered students at the University of Texas at Austin. It is plausible that other populations such as adolescent and adults or even students from different colleges might have different characteristics related to Internet use. Thus, it would not be desirable to compare the results of this study with those of others'. In addition, this study employed e-mail and a web-based survey with a relatively low response rate of 12.06%. In many cases, the response rate of an e-mail survey is known to be lower than that of traditional mail survey (Sheehan, & McMillan, 1999). The average response rate to paper surveys was reported to be 55.6% (Baruch, 1999), whereas average response rate of web-based surveys with no missing data was 34.6% (Cook, Heath, & Thompson, 2000). By comparison with the result of those studies, the response rate of this study (12.06 %) is low. Cook and colleagues (2000) suggested that the number of contacts, personalized letters, and precontacts are the factors increasing response rates in the web-based studies. However, none of these suggestions were taken into consideration at the time of designing this study and during the gathering of data because of the large amount of study sample and anonymity issue of participants. As described in Chapter 4, the sample of this study over-represents graduate students (population: 25.4% and sample: 35.7%) and female (population: 51.1% and sample: 57.9%). A low response rate might result in these disparities of the population and the sample. Due to the lower response rate and the limited sample frame generalizability of this study is restricted.

This study found 12 individuals diagnosed as “significantly problematic users.” However, due to the nature of quantitative methodology employed in this study, in-depth analysis on these 12 individuals was not possible. Although characteristics of the significantly problematic users in terms of gender, age, GPA, major, and time spent online were described and compared in this study, future studies employing both qualitative and quantitative methodology will be needed for further understanding of problematic Internet users.

Finally, it also should be noted that the characteristics of Internet use are rapidly changing as new network technology is becoming widely available. At the time this study was conducted, use of the Internet for social networking (“facebook” and “myspace”) and multimedia contents created by end users (“youtube”) were not as popular as they are these days. Thus, the result of this study might not reflect current characteristics of Internet use among college students. Future study is required to examine more up-to-date trends of Internet use among college students as well as other populations.

**Appendix A:**

**Cover Letter**

Hi,

My name is Sokho Lee, doctoral student at UT School of Social Work.

I am currently doing a research on “Internet use among college student”, and you are randomly selected from a UT student email list.

If you are willing to participate in an online survey, please continue to read. Otherwise, disregard this email.

Thanks.

Sokho Lee

-----

Thank you for your interest in participating in this research study.

This study is designed to examine the factors affecting your Internet use. You will be asked to respond to several survey questions on your demographic background and time spent on certain activities. The average time needed to complete the survey is approximately 20-30 minutes, and you may leave any question unanswered if you feel uncomfortable for any reason. Your responses will remain confidential, and no data that could be personally identifiable will be recorded. Furthermore, your decision to participate will in no way affect your status as a student at The University of Texas, and your personal rights and welfare will not be affected in any way.

To participate in this study, you must be

- 18 years of age or older
- A registered student at The University of Texas at Austin

By clicking "SURVEY" below, you state that you meet the requirements and agree to participate in this research study.

[SURVEY]

If you have any questions regarding your participation in this study, please contact any of the following individuals:

Principal Investigator:

Sokho Lee

School of Social Work

[leesokho@mail.utexas.edu](mailto:leesokho@mail.utexas.edu)

512-231-1512

Faculty Supervisors:

Clayton Shorkey, PhD

Professor of School of Social Work



**Appendix B:**  
**Survey Questionnaire**

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Please take a few moments to answer the following questions.

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**I. Demographic Information**

1. What is your age?

] years

2. What is your gender?

] Male

] Female

3. Marital Status

] Single

] Married

] Separated

] Divorced

4. Residency

] Resident

] Out of state

] International

5. To which ethnicity/race do you most identify yourself?

- European/Anglo American
- African-American
- Mexican-American/Hispanic/Latino
- Asian-American
- Native-American
- Other (Please specify): \_\_\_\_\_

6. What is your classification by semesters enrolled at The University of Texas?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate

7. Which college are you primarily enrolled in? Select from list

- Architecture
- Business
- Communication
- Education
- Engineering
- Fine Arts
- Information science
- Law
- LBJ
- Liberal Arts
- Natural Science

- Nursing
- Pharmacy
- Social Work

8. What is your overall, cumulative Grade Point Average (GPA)?

\_\_\_\_\_

## II. Questions on Internet Use

1. How long have you been using the Internet?

\_\_\_\_\_ year(s) \_\_\_\_\_ month(s)

2. Within the past 12 months, how much time do you spend using the Internet, on average, per week?

\_\_\_\_\_ hour(s)

3. Within the past 12 months, how much time do you usually spend each week on each of the following activities?

- |                    |                                  |
|--------------------|----------------------------------|
| Personal Email     | <input type="checkbox"/> hour(s) |
| Online chatting    | <input type="checkbox"/> hour(s) |
| Peer to Peer (P2P) | <input type="checkbox"/> hour(s) |
| Online games       | <input type="checkbox"/> hour(s) |
| Dating service     | <input type="checkbox"/> hour(s) |
| Online gambling    | <input type="checkbox"/> hour(s) |
| Shopping           | <input type="checkbox"/> hour(s) |
| Usenet newsgroup   | <input type="checkbox"/> hour(s) |

- Internet forum (e.g. hobby, culture) [ ] hour(s)  
Adult services (e.g. Pornography) [ ] hour(s)  
Personal site (e.g. Blog) [ ] hour(s)  
News/Radios [ ] hour(s)  
School related site (e.g. Library, Online Journal) [ ] hour(s)  
Other (please specify) [ ] hour(s)

4. How many friends have you made online?

\_\_\_\_\_

5. Has your use of the internet ever significantly interfered with your work or studies?

- [ ] Yes  
[ ] No

6. Have you ever attempted to cut down on your time using the internet?

- [ ] Yes  
[ ] No

7. If you have attempted to cut down on your time, overall, have these attempts been successful?

- [ ] Yes  
[ ] No  
[ ] Not attempted

8. If you thought you had a problem with excessive Internet use would you pursue counseling?

- [ ] Yes  
[ ] No

9. Do you want the University of Texas to offer counseling services for excessive Internet use?

Yes

No

## Appendix C

### Internet Addiction Test (IAT)

#### III. Question Set 1

		not at all	rarely	occasionally	often	always
1	How often do you find you stay online longer than you intended?					
2	How often do you neglect household chores to spend more time online?					
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 online users?					
5	How often do others in your life complain to you about the amount of time you spend online?					
6	How often do your grades or school work suffer because of the amount of time you spend online?					
7	How often do you check your e-mail 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 online?					
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 online 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 online?					

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 online?					
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 online and fail?					
18	How often do you try to hide how long you've been online?					
19	How often do you choose to spend more time online 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 online?					

## Appendix D

### Online Cognition Scale

#### IV. Question Set 2

		Strongly Disagree	Moderately Disagree	Slightly Disagree	Neutral	Slightly Agree	Moderately Agree	Strongly Agree
1.	I am most comfortable online.							
2.	I feel safest when I am on the Internet.							
3.	You can get to know a person better on the Internet than in person.							
4.	I often find it peaceful to be online.							
5.	I can be myself online.							
6.	I get more respect online than in real life.							
7.	People accept me for who I am online.							
8.	Online relationships can be more fulfilling than offline ones.							
9.	I am at my best when I am online.							
10.	I wish my friends and family knew how people regard me online.							
11.	The Internet is more real than real life.							
12.	I say or do things on the Internet that I could never do offline.							
13.	When I online, I can be carefree.							



14.	Few people love me other than those I know online.							
15.	I am less only when I am online.							
16.	I cannot see myself ever without the Internet for too long.							
17.	The Internet is an important part of my life.							
18.	I feel helpless when I don't have access to the Internet.							
19.	I am bothered by my inability to stop using the Internet so much.							
20.	I often keep thinking about something I experienced online well after I have logged off.							
21.	When I am on the Internet, I often feel a kind of rush or emotional high.							
22.	I use the Internet more than I ought to.							
23.	People complain that I use the Internet too much.							
24.	I never stay on longer than I had planned.							
25.	When I am not online, I often think about the Internet.							
26.	The offline world is less exciting than what you can do online.							
27.	I can't stop thinking about the Internet.							
28.	Even though there are times when I would like to, I can't cut down on							

	my use of the Internet.							
29.	My use of the Internet sometimes seems beyond my control.							
30.	When I am online I don't think about my responsibilities.							
31.	When I have nothing better to do, I go online.							
32.	I find that I go online more when I have something else I am supposed to do.							
33.	When I am online, I don't need to think about offline problems.							
34.	I sometimes use the Internet to procrastinate.							
35.	I often use the Internet to avoid doing unpleasant things.							
36.	Using the Internet is a way to forget about the things I must do but don't really want to do.							

Thank you for participating in this survey. Please click on the submit button below.

[Summit Survey]

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