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Comparison of Internet addicts and non-addicts in Taiwanese high school

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Abstract

This study investigated the difference between Internet addicts and non-addicts in Taiwanese high schools, and focused specifically on their Internet usage patterns, and gratification and communication pleasures. A total of 1708 valid data samples of high school adolescents were collected. Among this sample, 236 subjects (13.8%) were identified as addicts using the eight-item Internet addiction Diagnostic Questionnaire designed by Young [Internet addiction survey [Online]. Available: http://www.pitt.edu/_ksy/survey.htm]. The analytical results revealed that Internet addicts spent almost twice as many hours on line on average than the non-addicts. Notably, surfing with a social/entertainment motivation and gratification was positively correlated with Internet addiction. Furthermore, Internet addicts obtained markedly higher overall PIUST scores and scored higher than non-addicts on four subscales (tolerance; compulsive use and withdrawal; related problems, including family, school, health, and other problems; interpersonal and financial problems). While Internet addicts perceived the Internet to have significantly more negative influences on daily routines, school performance, teacher and parental relation than non-addicts, both Internet addicts and non-addicts viewed Internet use as enhancing peer relations. Moreover, students with personalities characterized by dependence, shyness, depression and low self-esteem had a high tendency to become addicted.
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Keywords: Internet addicts; Internet addiction; Internet usage patterns; Adolescents; Gratification and communication pleasures

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1. Introduction

Controversy regarding the positive and negative impacts of Internet and computer use has received considerable attention recently. The Internet provides a new communication medium that enables access to vast amounts of information across a wide variety of topics. However, the remarkable growth of the Internet has not been uncontroversial. Anecdotal and empirical evidence shows growing problems of Internet related harassment, stalking, and pornography. Brenner (1996) contended that since the Internet provides a user-friendly interface, and a convenient medium for checking information and communicating with others, a more diverse group of users than previously have become cybernetically involved with the Internet, altering the profile of the computer addict. Besides these and other related problems, recent research has begun to explore the physical, psychological and other problems resulting from excessive Internet use (Brenner, 1996, 1997; Egger & Rauterberg, 1996; Greenfield, 1999, 2000; Griffiths, 1999, 2000; Kraut, Lundmark, Kiesler, Mukhopadhyay, & Scherlis, 1997, 1998; LaRose, Mastro, & Eastin, 2001; Morahan-Martin, 1999; Pratarelli, Browne, & Johnson, 1999; Pratarelli & Browne, 2002; Shapira, Goldsmith, Keck, Khosla, & McElroy, 2000; Young, 1996a, 1996b, 1996c; Young & Rogers, 1998).

Given the widespread growth of the Internet, differences in various aspects of Internet use across demographic groups have become an interesting research area. Notably, the college student population is especially susceptible to Internet use related problems, and more specifically – excessive Internet use. According to Kandell, various factors influence the tendency for college students to become dependent on or overuse the Internet: examples include (1) having free and easily accessible connections, (2) a strong drive to develop a firm sense of identity, (3) desire develop meaningful and intimate relationships, and (4) Internet use being implicitly if not explicitly encouraged. Accessibility of the Internet is clearly factors in its overuse by college students (Anderson, 2001; Davis, Smith, Rodrigue, & Pulvers, 1999; Lin & Tsai, 2001; Morahan-Martin & Schumacher, 2000; Wang, 2001). A high percentage of colleges and universities have an Internet presence by offering Internet connections, e-mail accounts etc; these institutions enable students to access the World Wide Web, as well as providing e-mail and related Internet services.

To cultivate information literacy and improve global competitiveness among primary and secondary high school teachers and students, the Taiwanese government has been promoting the establishment of networks to connect high school campuses since 1996. The Taiwanese government has strongly promoted Internet use island-wide for commercial and educational purposes. Internet use in Taiwan has exploded in terms of number of subscribers to Internet Service Providers (ISPs) since popular consumption began in 1995. According to the computer center of the Taiwanese Department of Education, around 3.14 million students and academics in Taiwan have used the Internet, and all students above primary school level enjoy full accessibility to the Internet. This accessibility means that high school students, like college students, could also be vulnerable to Internet overuse or Internet dependence.

Although Internet addiction is receiving considerable attention among researchers and counselors, with a recent accumulation of anecdotal data and empirical studies, the conceptualization of Internet addiction remains in its infancy. Various researchers have coined terms such as Internet addiction, Internet dependence, technology addiction, Problematic Internet Use (PIU), Pathological Computer Use (PCU) and Internet Addiction

Disorder (IAD), and have conducted studies on related issues. Systematic exploration and validation is required of issues related to Internet addiction, such as a more precise, holistic, concept definition, accurate diagnosis and measurement, demographic and important variables influencing Internet addiction, for example physical, psychological and social variables, and so on. Additionally, a comprehensive and humanistic theoretical framework and methodology (a combination of discourse analytic and ethnomethodological techniques) must be embraced that complements our understanding of Internet addiction. Research in this area is just beginning, and further research is required to understand the full scope of Internet addiction and the most effective treatment modes.

Given the above background, this study examined the differences between Internet addicts and non-addicts in Taiwanese high schools, with specific focus on Internet usage patterns, and gratification and communication pleasures. Hopefully, this study can contribute to understanding of Internet addiction among Taiwanese adolescents and help in designing educational policy to prevent excessive non-productive Internet use.

2. Literature review

Goldberg defined Internet Addiction Disorder (IAD) as a behavioral addiction that acts as a coping mechanism and borrows from substance-dependence criteria from the DSM-IV (Garrison & Long, 1995, p. 20; Goldberg, 1996). Young presented a second definition for Internet related disorders, Problematic Internet Use (PIU), namely another diagnostic term based on DSMIV criteria associated with pathological gambling (Young, 1996a, 1998b; Young & Rogers, 1998). Young (1998a) designed an eight-item "yes/no" Internet addiction Diagnostic Questionnaire (DQ) based on the definition of Pathological Gambling from the American Psychiatric Association (1995). Young considered individuals who met five of eight criteria for Internet addiction to qualify as addicts. Criteria for problematic Internet use include (Young, 1999):

1. preoccupation with the Internet,
2. need to spend increasingly long periods online,
3. repeated attempts to reduce Internet use,
4. suffering withdrawal symptoms when reducing Internet use,
5. time management problems,
6. environmental distress (family, school, work, friends),
7. deception regarding time spent online,
8. mood modification through Internet use.

Additionally, Griffiths (1998) considered Internet addiction to be a form of technological addiction (such as computer addiction), and one of a subset of behavioral addictions (such as compulsive gambling). Any behavior that meets the following six "core components" of Internet addiction (salience, mood modification, tolerance, withdrawal symptoms, conflict, and relapse) is operationally defined as functionally addictive.

1. *salience*: when a particular activity, such as Internet use, becomes the most important activity in the subject's life and dominates his or her thinking;
2. *mood modification*: when individuals report subjective experiences from engaging in the activity in question;

3. *tolerance*: the process whereby increasing time spent on the particular activity or time are required to achieve the desired effects;
4. *withdrawal symptoms*: unpleasant feelings, state, or physical effects when the particular activity is stopped or curtailed;
5. *conflicts*: conflicts between addicts and those around them, including conflicts with other activities, or within the individuals themselves; and
6. *relapse*: the tendency for repeated reversions to earlier patterns of the addictive activity to recur.

Griffiths (1998) hypothesized that Internet addiction could originate from various aspects of Internet use, such as the process of typing, the medium of communication, the lack of face-to-face contact, Internet content (such as, pornography), or online social activities (chat rooms, MUDs, bulletin boards, computer games). Responding to Young, Griffiths (1999) argued that many of these excessive Internet users are not "Internet addicts", but merely use the Internet excessively as a medium to fuel other addictions. Contrasting the definition of Griffiths, Kandell (1998) defined Internet addiction as "a psychological dependence on the Internet, regardless of the type of activity once logged on" (p. 12). Extending Young's definition, Davis (1999) proposed a cognitive-behavioral model for PIU. Davis proposed that problematic Internet use be classified as Specific Pathological Internet Use (SPIU) and Generalized Pathological Internet Use (GPIU).

Chou, Chou, and Tyan (1999) conducted the first study on Internet addiction among Taiwanese students. Chou et al. (1999) examined Internet addiction among Taiwanese students based on Stephenson's play theory of mass communication. Among 104 valid, self-selected samples collected on-line, 68 (66.7%) were male. The analytical results indicated that the addict group (52 respondents) spent significantly more hours on BBSs and IRCs than the non-addict group (47 respondents), and also achieved significantly higher communication pleasure scores than the non-addict group.

Applying the uses and gratifications theory and the play theory in mass communication, Chou and Hsiao (2000) investigated Internet addiction among 910 Taiwanese college students from 12 universities and colleges around Taiwan. The results indicated that Internet addiction exists among Taiwanese college students. Specifically, 54 students were identified as Internet addicts. Internet addicts spent roughly triple the number of hours on-line as did non-addicts, with this additional on-line time being spent mainly on BBSs, the WWW, e-mail and games. The addict group found the Internet entertaining, interesting, interactive, and satisfactory. Furthermore, the addict group rated the impact of the Internet on their studies and daily life routines significantly more negatively than did the non-addict group. This study also found that the most powerful predictor of Internet addiction was communication pleasure score, followed by BBS use hours, sex, satisfaction score, and hours spent using e-mail.

Several Taiwanese researchers found that Taiwanese college students displayed excessive Internet use (around 20 h per week), very similar to findings for the USA and Europe (e.g. Chen, 1998; Chou et al., 1999). Previous studies on Internet addiction focused primarily on undergraduate students, adults, or general users who voluntarily responded to Internet surveys (Greenfield, 2000; Griffiths, 1998). Examples of such previous studies were the investigations of excessive Internet use among Taiwanese high school students conducted by Lin and Tsai (1999a, 1999b, 2001, 2002) as well as Tsai and Lin (1999, 2000, 2001).

Tsai and Lin (2001) explored the interplay between the attitudes of young people towards computer networks and Internet addiction. Ninety individuals identified by instruments as possible Internet addicts were selected for examination out of 753 Taiwanese high school adolescents. The examination revealed that the attitudes of these subjects toward computer networks could explain numerous aspects of Internet addiction. However, actual Internet usage behavior and perceptions of the usefulness of the Internet were more important than affective responses towards computer networks (e.g., the comfort of using the Internet) in predicting Internet addiction among adolescents. Another study by Lin and Tsai (1999a, 1999b) identified 10% of high school students (61 of 615 subjects) as problematic Internet users. These dependent users used the Internet excessively, totaling around 20 h weekly. The most frequently used Internet applications for young Internet dependents were listed in a descending sequence, WWW (5.79 h/pw), BBS (3.85 h/pw), chat rooms/IRC (3.61 h/pw), FTP (2.73 h/pw), Internet games/MUD (2.04 h/pw), and e-mail (1.77 h/pw). The average time addictive high-school students spent on-line resembles the findings of Brenner (1997) for American adults (21 h/pw), and the findings of Chen (1998), Chou et al. (1999) and Chou and Hsiao (2000) for Taiwan college students (19, 23, and 20–25 h/pw, respectively). They also noted that considering the effect of nationwide college entrance examinations and the tight school schedule of Taiwan high school students, these problematic users spent a substantial portion, if not all of their free time on the Internet. Lin and Tsai noted that long time spent on-line is merely a superficial manifestation of Internet dependence. Internet dependents also displayed other symptoms of non-substance addiction, following the screening criteria of Young (1998a, 1998b), which are in turn based on the screen criteria of Pathological Gambling described in DSM-IV (American Psychiatric Association (1995)) that is tolerance, compulsive use and withdrawal, and consequent problems.

In their series study, Lin and Tsai (2002) investigated Internet use and the psychology of Taiwanese Internet dependent and non-dependent adolescents. Seven-hundred and fifty-three Taiwanese high school students were selected using cluster sampling. Subjects who scored over 80 on the Internet Addiction Scale for Taiwanese high schoolers (IAST; Lin & Tsai, 1999a, 1999b) were considered Internet dependent users ($N = 88$, 11.69% of subject). The analytical results revealed that Internet dependents spent more time on-line than non-dependents. While Internet dependents perceived significantly more negative Internet influences on daily routines, school performance, and parental relation than non-dependents, both Internet dependents and non-dependents viewed Internet use as improving peer relations. Making friends via the Internet has become popular among adolescents, and creates potential for excessive Internet use. The Internet dependents displayed a significantly higher overall IAST score and scores on four subscales (tolerance, compulsive use and withdrawal, related problems: family, school, health, and related problems: Interpersonal and finance) than did the non-dependents.

Findings regarding the relationship between gender and Internet addiction were mixed. Some studies found no relationships (Egger & Rauterberg, 1996; Hall & Parsons, 2001), while a number of studies found that ''addicts'' are predominantly male (Brenner, 1996; Chou & Hsiao, 2000; Greenberg, Lewis, & Dodd, 1999; Morahan-Martin & Schumacker, 1997; Scherer & Bost, 1997; Tsai & Lin, 2000, 2001; Thompson, 1996), Young (1998a, 1998b) and Petrie and Gunn (1998) identified a even sex distribution. Young has also found that ''addicts'' reported above average levels of depression.

Morahan-Martin and Schumacker (1997) studied what they termed 'Pathological Internet Use' (PIU) in 277 students. Pathological Internet users represented 8.1% of the total sample and were more likely to be male than female. Scherer and Bost (1997) surveyed 531 students regarding their Internet use and established a checklist of ten clinical symptoms that paralleled the symptoms of substance abuse and dependency. Results indicated that 49 respondents (13%) scored three or more on the dependency checklist, and moreover the majority of these respondents were male (71%). Lin and Tsai (2002) examined excessive Internet use among Taiwanese adolescents, with a specific focus on the psychological aspect of sensation seeking by these users. Seven-hundred and fifty-three Taiwanese high school students were selected using cluster sampling, 88 of whom were classified as Internet dependent users. Roughly twice as many males as females were identified as Internet dependent.

3. Methods

3.1. Subjects

This study used purposive sampling, and focused on two major municipalities in Taiwan. The target subjects were senior high school adolescents (roughly ages 17–19) from two major municipalities in Taiwan. One class of 10th–12th grades in four high schools and vocational high schools of the two major municipals was randomly chosen for study. The total of 1990 paper-and-pencil survey questionnaires were distributed, and 1708 valid data samples were gathered.

Among the respondents, 56% were boys and 44% girls. Meanwhile, 35.8% of respondents were in the 10th grade, 32.2% were in the 11th grade, and 32% in the 12th grade. The respondents were moderately experienced Internet users, with 4.4% having less than one year of experience using the Internet, 14.9% having 1–2 years of experience, and 30.5% having 2–3 years, 28.0% between 3 and 4 years and 22.1% having over 5 years of experience.

3.2. Research instruments

3.2.1. Internet usage behavior questionnaire

The Internet Usage Behavior Questionnaire, designed by the researchers, aims to reveal general student Internet usage behavior, including the usual times and locations of their online activity, average weekly hours spent on-line, regular Internet activities (i.e., information searching, online games, downloading software), etc. Demographic variables related to subjects' demographic data and network usage, including gender, grades, school location, school type, access to home Internet connection, PC ownership, Internet use experience, and school grades.

3.2.2. Pathological Internet use scale for Taiwanese high school students

Subject Internet addiction was assessed via the Pathological Internet Use Scale for Taiwan high school student (PIUST) developed by Lin and Tsai (2001). PIUST used a four-point Likert scale with 29 items and four subscales.

1. Compulsive use and withdrawal: An examination of the degree of compulsive Internet use and the degree of depression or moodiness if use is restricted ("If I cannot use the Internet for a certain period, I feel depressed"; ten items).

2. Tolerance: An assessment of how subjects perceive less satisfaction from spending the same amount of time or using the same Internet applications compared to previously (e.g., ''I need to spend more and more time on line, to achieve the same level of satisfaction that I experienced in my early days of using the Internet''; seven items).
3. Other problems suffered by Internet addicts as a result of their addiction including problems with their families, schools, and health: An assessment of the problems resulting from Internet use, focusing on family interaction, learning, and personal health (such as, ''My time online has caused me to spend less time interacting with my family''; eight items).
4. Interpersonal and financial problems: An assessment of the problems resulting from Internet use, focusing on peer relationships and financial management (such as, ''Communicating with on-line friends is more interesting than communicating with people I meet in real life.'' and ''The online service charges faced by my family were significantly increased owing to my Internet use''; four items).

This study adapts PIUST into a six Likert style scale, ranging from 1 (strongly agree) to 6 (strongly disagree), indicating the degree to which the statement describes respondent Internet use behavior. The reliability for the whole scale is 0.91.

3.2.3. Young's Internet addiction diagnostic questionnaire

Young (1996b) devised an eight-item Internet addiction Diagnostic Questionnaire (DQ) based on the definition of Pathological Gambling used by the American Psychiatric Association (1995). Young considered that individuals who answered ''yes'' to five or more of the following eight questions can be classified as Internet addicts, while others could be considered non-addicts.

1. Do you feel preoccupied with the Internet (frequently thinking about previous on-line activity or anticipating your next on-line session)?
2. Do you feel the need to spend increasing amounts of time on line to maintain the same level of satisfaction from your Internet use?
3. Have you repeatedly tried unsuccessfully to control, cut back, or completely stop your Internet use?
4. Do you feel restless, moody, depressed, or irritable when attempting to control your Internet use?
5. Do you frequently stay on-line longer than originally intended?
6. Have you jeopardized or risked the loss of a significant relationship, job, educational, or career opportunity because of the Internet?
7. Have you lied to family members, a therapist, or others to conceal the extent of your Internet use?
8. Do you use the Internet to escape from problems or relieve a dysphoric mood (such as feelings of helplessness, guilt, anxiety, depression)?

3.2.4. Internet usage motivation and gratification scale

The Internet Usage Motivation and Gratification Scale is designed to clarify the relationship between user motivation and gratification in using the Internet. The scale requires subjects to indicate their motivation and gratification levels for each of ten motivation

items, including making new friends, communicating with others, searching for information and so on. These items were identified from the related literature. Subjects were required to respond to any item which they considered a motivation for them, and then to use a 6-point scale to indicate the strength of the motivation.

Factor analysis (Principal component analysis with direct oblimin rotation) yielded two factors accounting for 40.13% of the variance (see Table 1). The item loading ranged from 0.787 to 0.438, which was considered good to excellent (Tabachnick & Fidell, 1989). Following are the interpretations of the two factors:

1. Use of the Internet for social/entertainment purposes (items 6, 9, 7, 5, 8).
2. Use of the Internet to search for information (items 2, 1, 3, 10).

3.2.5. Interpersonal relationship scale

Subjects' interpersonal relationships were assessed using the Interpersonal Relationship Scale developed by Ke, Lin, and Chang (1996), which contained 66 items and three subscales of conflict avoidance, dependence and shyness.

Each subscale has 23 yes-no question items indicating levels of agreement or disagreement on a 6-point Likert-type scale, with 6 standing for strong agreement. The Cronbach coefficient α of the subscale was 0.88, suggesting acceptable internal reliability (Nunnally, 1994).

3.2.6. Self-esteem scale

Subject self-esteem was assessed using the Self-Esteem Scale (SES) developed by Rosenberg (1965), which comprised ten items indicating various levels of agreement or disagreement, which were assessed using a 6-point Likert-type scale, where six represented strong

Table 1
Summary of factor analysis for Internet usage motivation and gratification scale

Scale item	Factor labeling	Factor loading	
		Social/entertaining	Instrumental
6	Make new friends	**0.787**	−0.15E − 02
9	Play roles different from those played in real-life	**0.640**	−6.6E − 04
7	Increase the chatting topic with friends Increase conversational possibilities with friends	**0.631**	0.189
5	Express individual ideas to an audience	**0.605**	0.180
8	Seek cybersex	**0.457**	−0.233
4	Kill time for entertainment when bored	**0.439**	0.207
2	Learn about the latest news	8.298E − 02	**0.626**
1	Search, deliver and download schoolwork or other information	−0.168	**0.619**
3	Substitute for traditional methods of contact, such as post and phone	0.179	**0.590**
10	Get in touch with friends in distant places	0.274	**0.455**
Eigenvalue		2.94	1.08
Total variance explained		29.38	10.75
Cumulative percent of variance		29.38	40.13

agreement (Original scale was a 4-point Likert-type scale). High grades indicate high subject self-esteem. Finally, the Cronbach coefficient α of the subscale was 0.86.

3.2.7. Center for epidemiologic studies depression scale

The Center for Epidemiologic Studies Depression Scale (CES-D) developed by Randoff (1977) measures self-reported symptoms associated with depression. The scale asks subjects to report the frequency with which each of 20 events was experienced during the previous week, including "I felt fearful", "I felt lonely", "I talked less than usual", and so on. The subjects answered using the four response items: rarely or not at all (on less than one day), some of a little of the time (on 1–2 days), occasionally or moderately frequently (on 3–4 days), most or all of the time (on 5–7 days) with 3 score given to the most frequency and 0 score to rarely or none frequency. High scores indicate a high level of subject depression. This study uses the Chinese version of the Center for Epidemiologic Studies Depression Scale, which yields the following four factors: depressed mood, feelings of sadness, poor interpersonal relationships and negative self-perceptions. The Cronbach coefficient α of the scale in this study was 0.90.

3.2.8. Perceptions of the Internet influences

The study employs Tsai and Lin's survey on user perceptions of the influence of the Internet, which asks subjects to apply an eight-point scale, ranging from positive to negative, to rate the impact of the Internet impact on six dimensions of their lives: academic studies, daily life routines, relationships with friends/schoolmates, general health, relationships with parents, and relationships with teachers. The entire questionnaire was pre-tested, and revisions, including revisions to question wording, question ordering, instructions, and so on, were made based on the pretest results.

4. Results and discussion

4.1. Internet addicts versus non-addicts

This study used the eight-item Internet addiction Diagnostic Questionnaire (DQ) developed by Young (1996b) to distinguish addicts from non-addicts. Two-hundred and thirty-six subjects (13.8%) were identified as addicts following Young's standard of defining addiction as a positive answer to five or more of the eight questions in her test. This percentage exceeds the 9.8% recorded by Anderson (2001), the 8.1% of Morahan-Martin and Schumacher (2000), and the 8.1% of Tsai and Lin (2001), but closely approximates the 13% noted by Scherer and Bost (1997).

4.2. Relationship between Young and PIUST

Table 2 demonstrated significant differences between addicts and non-addicts in PIUST ($\Lambda = 0.767$, $\eta^2 = 0.233$, $p < 0.001$). Further UNIANOVA testing showed that addicts demonstrated higher tolerance, compulsive use and withdrawal, family, school, and health problems than the non-addict group, as well as peer interaction and financial problems ($F = 281.284$, 412.851, 306.045, 145.262, $p < 0.001$).

A Pearson correlation analysis was conducted to verify the relationship between the DQ questionnaire scores of PIUST and Young. The analytical results indicate that these two

Table 2
Means, standard deviations MANOVA and UNIANOVA of the addict and non-addict groups on PIUST subscales

PIUST subscales	Addicts N = 219		Nonaddicts N = 1389		MANOVA		UNIANOVA	
	M	SD	*M*	SD	*Λ*	*η²*	*F*	*η²*
Tolerance	37.97	8.82	27.42	8.62	0.767[***]	0.233	281.284[***]	0.149
Compulsive use and withdrawal	26.58	5.76	17.38	6.30			412.851[***]	0.204
Related problem: family, school, and health:	25.88	6.26	18.02	6.17			306.045[***]	0.160
Related problem: peer interaction and finance	15.83	3.80	12.42	3.91			145.262[***]	0.082

[***] $p < 0.001$ (2-tailed).

measurements were significantly and positively correlated ($r = 0.699$, $p < 0.001$), with a positive correlation also being found for PIUST subscale: tolerance, compulsive use and withdrawal, family, school, and health problems, as well as peer interaction and financial problems ($r = 0.591, 0.656, 0.578, 0.475$). Consequently, these two questionnaires replicated one another to a degree in assessing subject level of addiction.

4.3. Differences between addicts and non-addicts

4.3.1. Demographic variables

A Chi-square test was conducted to examine the differences in terms of grades, gender, school location, personal computer ownership, school grades and years of Internet usage, when comparing addicts and non-addicts (see Table 3). A Chi-square test revealed significance by gender ($\chi^2 = 46.989$, df = 1, $p < 0.001$) and school types ($\chi^2 = 4.008$, df = 1, $p < 0.05$), with more Internet addicted boys than girls (ratio of 3 boys to 1 girl) and also more Internet addicted vocational school ($n = 132$, 56%) students than high school students ($n = 104$, 44%). Especially notable is the finding that more boys than girls were identified as addicts (with there being roughly three male addicts for each female addict). The finding that more males than females *were actually addicted* agrees with most of the research on Internet usage conducted worldwide (e.g., Brenner, 1996; Chou & Hsiao, 2000; Egger & Rauterberg, 1996; Griffiths, 1998; Morahan-Martin & Schumacker, 1997; Scherer & Bost, 1997; Tsai & Lin, 2000, 2001; Thompson, 1996). Subjects who scored over 5 on Young's DS ($N = 236$, 11.69% of subject, described later) were classified as Internet dependents in this study. Internet experience did not differ between the addicted and non-addicted groups, contrasting with the finding of Lin and Tsai (2002) that Internet dependents had significantly longer experience of using the Internet than did non-dependents.

4.3.2. Internet influences

The Internet addicts and non-addicts perceived significantly different levels of influence of the Internet in terms of all five aspects of life other than peer relations (see Table 4). The Internet addicts felt that the Internet negatively influenced their school learning (addicts $M = 4.64$, non addicts $M = 3.72$, $t = 6.099$, $p < 0.001$), daily routines (addicts $M = 4.61$, non addicts $M = 3.92$, $t = 4.857$, $p < 0.001$), health (addicts $M = 4.39$, non addicts $M = 3.88$, $t = 3.693$, $p < 0.001$), and parental relations (addicts $M = 4.50$, non addicts $M = 3.93$, $t = 4.097$, $p < 0.001$) as well as teacher relations (addicts $M = 4.40$, non addicts

Table 3
Frequencies and χ^2 tests of Internet addicts and nonaddicts on background variables

Background		Addicts (N = 236)		Nonaddicts (N = 1472)		Total N (%)	χ^2	df
		N	Percent	N	Percent			
Gender	Male	180	(77)	774	(53)	954	46.989***	1
	Female	55	(23)	695	(46)	750		
	10th grade	91	(38)	521	(35)	612		
Grade	11th grade	76	(32)	474	(32)	550	1.207	2
	12th grade	69	(29)	477	(33)	546		
School type	High School	104	(44)	752	(51)	856	4.008*	1
	Vocation	132	(56)	720	(49)	852		
School location	Taipei	108	(44)	693	(47)	801	0.141	1
	Kaohsiung	128	(56)	779	(53)	907		
Internet connection at home or not	YES	216	(92)	1290	(88)	1506	2.716	1
	NO	20	(8)	179	(129)	199		
Owning PC or not	YES	168	(72)	959	(65)	1127	3.117	1
	NO	68	(28)	509	(35)	577		
	Upper 1/3	79	(35)	567	(40)	646		
General grade point	Middle 1/3	82	(36)	504	(35)	586	2.509	2
	Bottom 1/3	67	(29)	363	(25)	430		
	<1 year	11	(5)	64	(4)	75		
	1–2 years	26	(11)	228	(16)	254		
Internet experience	2–3 years	72	(31)	447	(31)	519	5.548	4
	3–4 years	64	(27)	413	(28)	477		
	>4 years	63	(26)	313	(21)	349		

* $p < 0.05$ (2-tailed).
*** $p < 0.001$ (2-tailed).

Table 4
Self-reported influences of Internet by groups of addicts and nonaddicts

Internet influences	Addicts		Nonaddicts		t
	M	SD	M	SD	
Studies/school learning	4.64	2.17	3.72	1.84	6.099***
Daily routines	4.61	2.02	3.92	1.82	4.857***
General health	4.39	1.98	3.88	1.76	3.693***
Peer relations	3.07	1.78	2.96	1.55	0.973
Parental relations	4.50	1.98	3.93	1.77	4.097***
Teacher relations	4.40	1.95	3.89	1.71	3.773***

*** $p < 0.001$ (2-tailed).

$M = 3.93$, $t = 4.097$, $p < 0.001$). However, both addicts and non-addicts felt that the Internet positively influenced their peer relations (addicts $M = 3.07$, non addicts $M = 2.96$, $t = 0.973$, $p < 0.05$). Meanwhile, the Internet positively influenced all six aspects of the lives of non-addicts.

Similar to the previous literature (e.g., Brenner, 1996; Egger & Rauterberg, 1996; Young, 1996b), high school students displayed problematic consequences of Internet dependence, for example skipping meals, losing sleep and study time, increasing financial

costs for on-line activity, and rearranging daily routines or even neglecting studies to spend more time online.

Young's study (1998) found that Internet dependents gradually reduced the time spent with family and friends while increasing time in front of their computers. This phenomenon may apply for some Taiwanese Internet users, but the data in this study demonstrated a negative influence on parents but no disruption of peer relationships for either addicts or non-addict. Meanwhile, the findings of this investigation confirmed the findings of both Lin and Tsai (2002) and Chou and Hsiao (2000) that Taiwanese Internet users did not report disrupted peer relationships. Moreover, Kandell (1998) found that the Internet can be used to enhance developmental needs and thus obtain and maintain meaningful interpersonal relationships and intimacy. The findings of this study confirmed those of Kandell (1998), Lin and Tsai (2002) and Chou and Hsiao (2000), that both the addict and non-addict groups saw the Internet as positively influencing their relationships with friends/schoolmates. Furthermore, partially consistent with the findings of Lin and Tsai (2002), this study found that Internet addicts perceived a significantly stronger negative influence from the Internet on their daily routines, school performance, and parental relations than did non-addicts. However, this study failed to find positive teacher relations for the Internet addicts. This study thus infers that Taiwanese high school teachers realize the problems or negative effects that students may encounter in using the Internet, and thus have urged students to make the best use of the Internet, go so far as to monitor and restrict improper Internet use by students and consequently disrupted student relationships.

4.3.3. Internet usage motivation and gratification

Table 5 lists the differences between Internet addicts and nonaddicts in terms of Internet usage related motivation and gratification. The addict group generally had higher Internet usage of social and entertaining motivation and gratification ($t = -12.340$, $p < 0.001$), but displayed no difference in instrumental motivation and gratification ($t = -4.408$, $p > 0.05$). Restated, Internet addicts tend to display stronger social and entertainment motivation for using the Internet, and also obtain considerable satisfaction from their Internet use. Consistent with theories of usage and gratification, students have various needs which they fulfill by using the Internet (e.g. social, academic, and so on), leading to different degrees of exposure to Internet applications and resulting in various degree of gratification and pleasure. The addict group viewed the Internet as more entertaining, fun, and interactive/social than the non-addict group, and moreover considered that the Internet could help them to

Table 5
t test of the addict and non-addict groups' Internet usage of motivation and gratification

	Addicts			Nonaddicts			*t*
	N	*M*	SD	*N*	*M*	SD	
Motivation							
Social and entertainment	232	24.66	5.21	1442	19.83	5.58	−12.340[***]
Instrumental	234	17.21	3.78	1457	16.79	3.74	−1.597
Gratification							
Social and entertainment	219	24.44	5.38	1307	22.62	5.70	−4.408[***]
Instrumental	227	17.02	3.51	1408	17.37	3.30	1.442

[***] $p < 0.01$ (2-tailed).

escape from their real-world responsibilities and identities. Consequently, the Internet group was more satisfied with their Internet usage than the non-Internet group.

Further examination revealed that both the addict and non-addict groups found using Internet to kill time, for entertainment or to deal with boredom to be the most motivating and gratifying use of the medium, consistent with Chen's (1998, 2000) study of high school students, but differing from Hsiao's (1998) findings for university students, among whom the strongest motivation for Internet use was to contact friends.

4.3.4. Internet usage behavior

Statistical results indicated that Internet addicts spent approximately 21.2 h per week on the Internet, while non-addicts spent around 12.1 h ($t = 8.868$, $p < 0.001$). Owing to the different sampling method adopted by this study, the research from the States, and also the different social and cultural contexts, it is difficult to compare the findings effectively. Nonetheless, the weekly Internet usage reported for American Internet addicts or heavy users varied considerably: 38.5 h/pw in Young (1996b), 19 h/pw in Brenner (1997), 13 h/pw in Lavin, Marvin, McLarney, Nola, and Scott (2000), and 8.48 h/pw in Morahan-Martin and Schumacher (2000). Compared with the Taiwanese study, the findings resemble the problem of Taiwanese young adults and college students documented in the previous studies, for example Chou et al. (1999) reported that Internet addicts spent 22 h/pw online, while Chou and Hsiao (2000) reported 20–25 h/pw, both of which were longer than the average of 18 h/pw reported by Lin and Tsai (2002), or the 19 h/pw reported by Chen (1998) as average hours spent online by Internet addicted Taiwanese college students.

This study assumes that most college students, living away from parental monitoring and with fewer classes than high school students, have extensive freedom to explore risky activities that might lead to Internet addiction. This study finds a level of reported Internet usage among high school Internet addicts that is comparable to that for addicted college students. Given the extremely full schedules of Taiwanese high-school students this finding is remarkable. The findings of this study demonstrated that high school students as a group are increasingly vulnerable to developing Internet dependence, and currently are second only to college students in this regard. Consequently, serious consideration should be given to devising method of moderating the influence of extended Internet usage among high school students in Taiwan.

A Chi-square test is performed to examine the differences between Internet addicts and non-addicts in terms of locations for surfing on the Internet (school, home, houses of friends and classmates and cyber cafés). The Chi-square test was significant for school ($\chi^2 = 5.739$, df = 1), and cyber café ($\chi^2 = 33.492$, df = 1). That is, Internet addicted students tended to surf the Internet at cyber cafés rather than at school. With respect to the time for Internet, Chi-square test revealed significance weekdays ($\chi^2 = 12.810$, df = 1, $p < 0.001$) and non-significant for weekends. Addicts thus tend to be online on weekdays. Regarding differences in types of Internet activities, the Chi-square test was significant for information searching ($\chi^2 = 33.003$, df = 1, $p < 0.001$), downloading MP3 ($\chi^2 = 12.980$, df = 1, $p < 0.001$), downloading software ($\chi^2 = 12.042$, df = 1, $p < 0.01$), receiving/sending emails ($\chi_2 = 5.397$, df = 1, $p < 0.05$), playing online games ($\chi^2 = 53.158$, df = 1, $p < 0.001$), surfing pornographic websites ($\chi^2 = 28.503$, df = 1, $p < 0.001$). Addicts thus prefer Internet activities such as information searching, downloading MP3 files and other software, receiving/sending emails, playing online games, and also surfing pornographic websites more than do non-addicts (Tables 6 and 7).

Table 6
χ^2 test of the addict and non-addict groups on location and time of using Internet

		Addicts ($N = 236$)			Nonaddicts ($N = 1472$)			χ^2	df
		N	Percentages	Ranking	N	Percentages	Ranking		
Locations for using Internet									
School	Yes	47	24	3	402	89.53	2	5.739[*]	1
	No	189	15.01		1070	84.99			
Home	Yes	188	13.28	1	1228	86.72	1	2.032	1
	No	48	16.44		244	83.56			
cyber café	Yes	106	21.37	2	390	78.63	3	33.492[***]	1
	No	130	10.73		1082	89.27			
Friend's home	Yes	19	13.97		117	86.03		0.003	1
	No	217	13.80		1355	86.20			
Time for using Internet									
Weekdays	Yes	142	16.84		701	83.16		12.810[***]	1
	No	97	11.18		771	88.82			
Weekends	Yes	192	13.56		1224	86.44		0.463	1
	No	44	15.07		248	84.93			

[*] $p < 0.05$ (2-tailed).
[***] $p < 0.001$ (2-tailed).

Table 7
χ^2 test of the addict and non-addict groups on using Internet-related activities

Internet-activities		Addicts ($N = 236$)			Nonaddicts ($N = 1472$)			χ^2	df
		N	Percentages	Ranking	N	Percentages	Ranking		
Information searching	Yes	112	10.23	4	983	89.77	2	33.003[***]	1
	No	124	20.23		489	79.77			
Checking for news	Yes	55	15.67		296	84.33		1.273	1
	No	181	13.34		1176	86.66			
Downloading software	Yes	126	17.31	3	602	82.69	4	12.980[***]	1
	No	110	11.22		870	88.78			
Chatting	Yes	84	15.85		446	84.15	5	2.664	1
	No	152	12.90		1026	87.10			
Downloading MP3	Yes	91	18.35	5	405	81.65		12.042[**]	1
	No	145	11.96		1067	88.04			
Receiving/sending emails	Yes	164	12.71	1	1126	87.29	1	5.397[*]	1
	No	72	17.22		346	82.78			
Playing online games	Yes	160	20.43	2	623	79.57	3	53.158[***]	1
	No	76	8.22		849	91.78			
Surfing pornographic websites	Yes	50	26.46		139	73.54		28.503[***]	1
	No	186	12.24		1333	87.76			
Online shopping	Yes	11	18.33		49	81.67		1.065	1
	No	225	13.65		1423	86.35			

[*] $p < 0.05$ (2-tailed).
[**] $p < 0.01$ (2-tailed).
[***] $p < 0.001$ (2-tailed).

Table 8
Means, standard deviations MANOVA and UNIANOVA of the addict and non-addict groups on personality variables

	Addicts (N = 209)		Nonaddicts (N = 1356)		MANOVA		UNIANOVA		t
	M	SD	M	SD	Λ	η^2	F	η^2	
Interpersonal relationship									
Conflict avoidance	72.19	14.06	73.83	11.85	0.992**	0.008	3.308	0.0004	
Dependence	93.07	15.94	92.26	13.98			0.586	0.0021	
Shyness	77.01	15.09	74.52	15.10			4.928*	0.0004	
Self-esteem	35.25	8.66	38.22	8.13					−5.137***
Depression scale									
Depressed mood	14.22	7.01	10.01	6.37	0.951***	0.049	82.133***	0.0474	
Feelings of sadness	1.51	1.57	1.06	1.37			19.955***	0.0119	
Poor interpersonal relationship	1.99	1.64	1.35	1.40			38.121***	0.0226	
Negative self-concept	6.30	2.67	5.38	2.64			23.847***	0.0142	

* $p < 0.05$ (2-tailed).
** $p < 0.01$ (2-tailed).

4.3.5. Personality

The Table 8 revealed significant differences between addicts and nonaddicts in interpersonal relationships ($\Lambda = 0.992$, $\eta^2 = 0.008$, $p < 0.01$). Additional UNIANOVA testing demonstrated that the addict group was shier than the non-addict group, but the difference was not very significant at 0.34 η^2($F = 4.928$, $p < 0.05$). The table also revealed significant differences between the addicts and nonaddicts in terms of self-esteem ($t = -5.137$, $p < 0.001$), showing that the Internet addicts had lower self-esteem than the non-addicts.

Significant differences were also found between addicts and nonaddicts in depression ($\Lambda = 0.951$, $\eta^2 = 0.049$, $p < 0.001$). Additional UNIANOVA testing shows that the addict group tended to have higher depression on the four subscales of depressed mood, feelings of sadness, poor interpersonal relationships, and negative self-concepts ($F = 82.133$, $F = 19.955$, $F = 38.121$, $F = 23.847$, $p < 0.001$). These findings confirm previous reports that Internet addicts generally display lower self-esteem than non-addicts (Young, 1998b; Armstrong, Phillips, & Saling, 2000); as well as Young and Rogers (1998) findings that individuals with melancholia are more likely to indulge in Internet addictive behavior.

5. Summary

This study examined the interplay between Internet addiction among Taiwanese high school students, and Internet usage patterns, gratification and communication pleasures. A questionnaire was administered to a stratified sample of 1990 high school students, yielding 1708 valid responses.

The analytical results indicate that Internet addiction does exist among Taiwanese high school students. This study identified 236 Internet addicts using the criteria of Young. The percentage of addicts in the present sample was approximately 13.8%, exceeding the 10.6% reported by Brenner (1997), the 8.1% of Morahan-Martin and Schumacker (1997), and the 8.1% of Tsai and Lin (2001), and closely approximating the 13% reported by Scherer and Bost (1997). The differences compared to these other studies probably result from the

timing of this study (as later than other studies and thus after the Internet had become more prevalent) and the loose criteria of Young's (1996b) eight-item Internet addiction Diagnostic Questionnaire (DQ).

This study found a positive correlation between average weekly hours spent online and Internet addiction. Average weekly hours spent online for addicted individuals are 21.2 h. Notably, Internet addicts spent almost twice as many hours online as non-addicts. Moreover, males were 2.6 times more likely than females to become addicted. Additionally, vocational high school students are more likely to become addicted than high school students, most likely owing to their lighter academic load. Furthermore, students with personalities characterized by dependence, shyness, depression and low self-esteem are more likely to become addicted than students without these characteristics. Entertainment is the major motivating factor for high school students in using the Internet, followed by information searching. However, surfing with social/entertainment motivation and gratification is positively correlated with Internet addiction. Notably, students classified as addicted have higher motivation on social and entertainment and thus higher gratification than non-addicted students.

From the analytical results of this investigation examining the Internet usage habits of over 1700 students, 13.8% of Internet using students use the Internet to such a degree that it interferes with their academic studies, daily lives and general health. While defining this problem as an addiction remains controversial, identifying methods of moderating the impact of excessive Internet usage appears crucial.

This study discussed the recent research on Internet addiction, gathered empirical data from Taiwanese high school students, and produced mixed findings, including both similarities to and differences from previous studies. Whether the difference resulted from cultural or age differences (college students vs. high school students) deserves further study. Although the Internet appears beneficial to most students, some cases of addiction occurred among the samples. Internet usage among the general population and on high school campuses undoubtedly is set to grow exponentially in the future, and the issue of Internet addiction thus will become increasingly important in Taiwanese high schools, and maybe also among students in lower grades. Continuous examination of this topic, along with relevant psychological, demographic variables, and multiple theoretical perspectives, is required to fully understand Internet addiction and its solutions, for example therapy programs, diagnosis and counseling. We propose hat more integrative qualitative and quantitative study be conducted into how the Internet affects addict behavior, social support life adjustment, and so on. This study also suggests that an experimental design such as a therapy program be conducted to guard against Internet addiction, encouraging mental health counselors to be confident in treating people individuals suffering from this emerging, complex, and compelling disorder.

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