

THE QUESTIONNAIRE OF LIFESTYLE CHANGE IN REGARD TO PROBLEMATIC INTERNET USE: FACTOR STRUCTURE AND CONCURRENT AND CROSS-YEAR PREDICTIVE UTILITIES

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ABSTRACT

This study constructed a questionnaire, named “Lifestyle Change in Regard to Problematic Internet Use (LC-PIU),” for helping school psychologists detect early indications of PIU-related lifestyle changes in university populations. Our focus is on all university students who use the Internet, not users who already show dependent symptoms. The lifestyles that we concerned include physical/social activities and dietary/sleep patterns that are notable consequences of excessive Internet use (Lam et al., 2009; Choi et al., 2009). With 708 university students recruited in 2009 (Time 1), we tested the factor structure of LC-PIU and determined the concurrent and cross-year predictive utilities with the same participants in 2010 (Time 2). The 2009-sample was randomly split into two independent subsamples for calibration and validation using exploratory and confirmatory factor analyses. The calibration and validation results, along with convergent and discriminant tests, confirmed that the LC-PIU is composed of five distinct subscales: problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change. All Time-1 LC-PIU subscores were positively correlated with depression, loneliness, and weekly Internet use at Time 1 and Time 2. Only a negative correlation was found between gender and social activity change at Time 1 and Time 2.

INTRODUCTION

The long-term, excessive use of the Internet, often coined problematic Internet use (PIU), resembles the DSM-IV definition of impulse control disorder (Shapira et al., 2000) or pathological gambling (Young, 1996). Various names associated with Internet addiction include cyberspace/online/net addiction, high Internet dependency, Internet addicted disorder, pathological Internet use, problematic Internet use, excessive Internet use, and compulsive Internet use (Davis, Flett, & Besser, 2002; Hur, 2006; Widyanto & Griffiths, 2006).

Previous studies suggest that PIU leads to the disregard of crucial daily responsibilities such as work, academic, family, or social obligations (Morahan-Martin & Schumacher, 2000; Aboujaoude, 2010; Tutgun, Deniz & Moon, 2011, Şahin, 2011). Because the majority of university students live away from home with minimal parental monitoring and easy access to the Internet, we sought to observe whether the initial emergence of PIU alters university students’ daily routines, including changes to their dietary, sleep patterns and physical activities. We were also interested in less-visible (because of their dynamic nature) changes to their social relationships. Lifestyle factors are critical in adolescence because an adequate amount of quality physical/social activities as well as healthy diet/sleep habits facilitate adolescent physiological growth and psychological development.

Young (1998a) was a pioneer researcher who developed the Diagnostic Questionnaire for Internet Addiction as a tool to identify maladaptive Internet users. Following her suggestion, some related research based on the mental disorder view to distinct additive users versus normal users. YDQ and some relevant questionnaires (Beard and Wolf, 2001; Shapira et al., 2003; Ko et al., 2005) have been used to select a small percentage of online users with severe dependent symptoms. Their findings mostly contribute to the secondary and tertiary prevention perspectives. In contrast, our motivation was to construct a questionnaire that we named “Lifestyle Change in Regard to Problematic Internet Use (LC-PIU)” for helping school psychologists and educators detect early indications of PIU-related lifestyle changes in university populations.

Primary prevention regarding the promotion of health and the prevention of illness is evolving in the fields of public health and psychiatry. Wallace (2002) proposed that primary prevention generally involves the prevention of diseases and conditions before their biological onset. Using concepts from the fields of epidemiology and psychiatry, Caplan (1964) defined primary prevention as lowering of the incidence (i.e., rate of new cases) of a specified mental disorder; the aim of primary prevention is to reduce incidences of a problem or disorder before it forms. Accordingly, our focus is on all university students who use the Internet, not users who already show severe dependent symptoms. The PIU is a cause for great concern in Taiwan, a country with more than 1.3 university students comprising 5.8% of the total population (Ministry of Education, 2011). We believe that a significant percentage of these students are facing challenges in terms of managing their Internet usage at some point during their college careers.

In this paper we describe how we tested for a conceptually meaningful factor structure using both exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The EFA was applied to a calibration sample, and the CFA was tested using a validation sample. We also examined the concurrent and predictive cross-year utilities of the LC-PIU on depression and loneliness as well as the relationships among LC-PIU scores, gender and weekly Internet use. In addition, the internal consistency reliability of the total scale and each subscale were tested.

Research of Problematic Internet Use and measurements

Because Internet addiction is not yet recognized in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revised (DSM-IV-TR; American Psychiatric Association, 1994) most research in this area has adapted the diagnostic criteria of pathological gambling. Recently, some experts have supported the inclusion of Internet addiction in the upcoming DSM-V. For example, Block (2008) proposed including the term “Internet addiction” in the DSM-V as a diagnosis of compulsive-impulsive spectrum disorder that involves online, offline, or both types of computer use. He also believes that at least three subtypes should be included: excessive game playing, sexual preoccupation, and e-mail/text messaging. All three are marked by excessive usage, withdrawal, tolerance, and negative repercussions.

Many different diagnostic criteria have been suggested for the identification of Internet addiction. First introduced by Goldberg (1995) and made popular in subsequent empirical research, Young (1996) adopted the DSM-IV criteria for substance dependence to describe the impairment of an individual with “Internet addiction.” Later, Young (1998a) adopted the DSM-IV criteria of pathological gambling, an impulse-control disorder, into her Diagnostic Questionnaire. DQ consists of 8 items. If a participant answers “yes” to more than 5 of the 8 criteria, then the participant is classified as Internet dependent. Young (1998b) also created the 20-item Internet Addiction Test (IAT) with six factors: salience, excessive use, anticipation, lack of control, neglect of work, and neglect of social life. Likewise, Brenner (1997) generated the Internet-Related Addictive Behavior Inventory (IRABI) that uses 32 true-false questions. He extracted three factors from the IRABI: tolerance, withdrawal, and craving. Moreover, Morahan-Martin and Schumacher (2000) developed 13 yes-no questions to assess the problems due to Internet use by adapting Young’s Internet addiction criteria.

Young (1996) proposed the first set of “Internet addiction” diagnostic criteria by adopting the substance dependence criteria from the DSM-IV due to similarities she observed with regard to the states of tolerance and withdrawal. Subsequently, Young (1998a) updated her diagnostic questionnaire using the DSM-IV definition of pathological gambling, an impulse control disorder often described as a behavioral addiction. However, many studies admitted that the term “Internet addiction” is confusing and lacks scientific evidence. For example, Murali and George (2007) suggest that the nosological and conceptual ambiguity surrounding Internet addiction has led many researchers to question its untested validity. These opponents propose that the term “Internet addiction” be replaced by those such as excessive, maladaptive or problematic Internet use. Some researchers avoid using the term “Internet addiction”, while others criticize its definition as being too narrow to capture the population of problematic Internet users. This limitation leads to premature conclusions regarding a new disorder and the patients who have related symptoms (Aboujaoude, 2010). Specifically, Beard and Wolf (2001) as well as Shapira, Lessig, Goldsmith, Szabo, Lazoritz, Gold, and Stein (2003) have suggested using the less controversial term “problematic Internet use” rather than “Internet addiction.” Shapira, Goldsmith, Keck, Khosla, and McElroy (2000) stated that problematic Internet use is characterized by an individual’s inability to control their urge to use the Internet without concern for the consequences. This lack of will power results in feelings of distress and the functional impairment of daily activities. Shapira et al. (2003) conceptualized problematic Internet use as an impulse control disorder. An individual should be diagnosed with problematic Internet use if he or she exhibits three phenomena (a) maladaptive preoccupation with Internet use, such as experiencing an irresistible use of the Internet and using the Internet more than the amount of time intended; (b) clinically significant distress or maladaptive functioning in social, occupational, and other critical areas due to excessive

Internet use; and (c) overuse of the Internet that does not occur during a phase of mania or hypomania and is not otherwise explained by an Axis-I disorder.

Similarly, Caplan (2002) constructed the Generalized Problematic Internet Use Scale (GPIUS), which included seven factors: mood alteration, perceived online social benefits, negative outcomes associated with Internet use, compulsive Internet use, an excessive amount of time spent online, withdrawal symptoms and perceived online social control. Moreover, Demetrovics, Szeredi, and Rozsa (2008) modified Young's (1998b) Internet Addiction Test and added additional questions to create the Problematic Internet Use Questionnaire. This questionnaire measures the problems associated with Internet use, which resulted in a three-factor model that included obsession, neglect, and control disorder. The obsession subscale was defined as mental engagement with the Internet as well as the anxiety, worry, and depression caused by a lack of Internet use. Items about the decreasing typical activities (e.g., work, studies, and partner relations) because of an increased amount of Internet use were named as neglect scale. The control disorder subscale measured the inability to decrease the amount of time spent on the Internet and self-perceptions of Internet use as problematic. The current study adopted the term "problematic Internet use" to describe the core maladaptive behaviors related to excessive Internet use.

The Lifestyle-Related Factors of Problematic Internet Use

Classical sociological theorists originally viewed the concept of lifestyle as a component of stratification systems. For example, Weber emphasized lifestyle as a means for social differentiation. Lifestyle is composed of two basic elements including structured conditions (or "life chances") and personal choice (or "life conduct") (Backett & Davison, 1995). Lifestyle denotes the relationship between an individual and a particular group in which the individual has a sense of belonging to the group due to his or her choice and some suggestions of structured life changes (Abel & McQueen, 1991).

The concept of lifestyle then has been refined and is comparable to the biomedical risk factor and the psychological approaches of major health behavioral research. Lifestyle became a central concept in the development in health promotion theory and practice. Lifestyle provides the loosely defined link between the epidemiologically designated health-risk factors at the individual level (e.g., diet, drinking, exercise level and smoking) and the preventive medicine or health promotions at the population level. In addition, Coulson, Eiser, and Eiser (1997) proposed that the focus of lifestyle includes both the presence of health-damaging and health-enhancing behaviors. Lifestyle can be seen as the distinctive mode of living defined by a set of expressive and patterned behaviors of individuals occurring with some consistency over a period of time.

Ha, Kim, Bae, Bae, Kim, Sim, Lyoo, and Cho (2007) mentioned that adolescents are more at risk for problematic Internet use than adults, and the former group's lifestyle habits are easily affected by the excessive use of the Internet. Some research indicates that adolescents who develop problematic Internet use might have adverse consequences and changes in several lifestyle-related factors including physical inactivity, extended time spent on the Internet, increased use of alcohol and tobacco, short durations/lack of sleep, and irregular dietary habits/poor eating patterns (Gunnell et al., 1998; Lam et al., 2009; Kim & Chun, 2005; Choi et al., 2009).

The present study constructed a new questionnaire to include lifestyle-related factors of problematic Internet use (physical activities, social activities, dietary and sleep patterns). The validation procedure is the focus of this paper. Our specific research questions are:

1. Does the exploratory factor analysis of the calibration sample demonstrate a conceptually meaningful factor structure?
2. Based on the factor structure of the calibration sample, does the factor structure of the validation sample fit the data using a confirmatory factory analysis?
3. Are the alpha reliability coefficients of the LC-PIU factors acceptable?
4. Do the correlations among the LC-PIU scores, depression, loneliness, weekly Internet use and gender support the concurrent and cross-year predictive validity of this measure in 2009 (Time 1) and 2010 (Time 2)?

METHOD

Participants

Participants were drawn from the respondents of a national panel survey funded by the National Science Council, Republic of China which aimed at collecting adolescent Internet use and physical-mental development data. The sample consisted of 708 freshmen (360 male, 348 female) enrolled in Time 1. We randomly divided the sample ($n=708$) at Time 1 into two independent groups for the purpose of validity examinations. One year later, we collected data regarding depression, loneliness, and weekly Internet use of the same participants. There were 540 participants at Time 2 to allow for missing data in the panel study.

Measures

Weekly Internet use. Participants were asked to estimate their average weekly use of the Internet on a seven-point scale ranged from “one day” to “every day.” Next, participants estimated how much time they spent on the Internet on a thirteen-point scale ranged from “less than one hour” to “more than twelve hours.” Most respondents (59.75%) used the Internet 7 days a week (male, 63.89%; female, 55.46%). The majority (48.30%) of the participants spent 2 to 4 hours on the Internet each day (male, 46.39%; female, 50.29%). A composite amount of weekly Internet use was calculated by multiplying the frequency of a week by the daily time. Higher scores indicate that participants Internet use longer.

Questionnaire of Lifestyle Change in Regard to Problematic Internet Use (LC-PIU). The LC-PIU partially consisted of items concerning preoccupation with/irresistible Internet use, tolerance and withdrawal selected from Lin and Tsai’s (1999) Internet Addiction Scale for Taiwanese high school students (IAST). Examples from the LC-PIU include “Though I plan to use the internet for just a while, I stay online longer than originally intended” and “When I try to cut down or stop my Internet use, I feel anxious.”

Additional items were constructed by considering different lifestyle changes described in the problematic Internet use literature. Participants must estimate how much a given statement describes the influence of Internet use on the changes of lifestyle on a 5-point scale. Examples of the physical activity change items include “I neglect exercise due to spending time online” and “I remain seated longer than two hours when I am online.” Examples of the social activity change items are “I reduce face-to-face contact with others because of the Internet” and “I would rather spend time online than attend activities with friends and family.” The dietary pattern change items state “I spend time online such that I ignore regular meals and eat whatever is available” and “While using the Internet I forget to drink water for a long time.” Lastly, the sleep pattern change items include “I have reversed sleep patterns because of the Internet” and “I would rather spend time online than go to bed at night.” The LC-PIU has 23 items in total.

Beck Depression Inventory (BDI). The Beck Depression Inventory (BDI; Beck, Rush, Shaw, & Emery, 1979) is a 21-item, self-report measure of depression severity. Each of the 21 items is rated on a 4-point scale. The ratings are summed and yield a total score that ranges from 0 to 63.

Chinese Version of the Loneliness Scale (LS). Lin and Lin (2007) revised the Loneliness Scale (De Jong Gierveld & Kamphuis, 1985) into Chinese. This scale is composed of two subscales: “emotional loneliness” and “social loneliness.” The former includes six negatively worded items related to aspects of exclusion. An example item states, “I often feel rejected.” The latter subscale includes five positively worded items related to feelings of belonging. An example statement includes “There are plenty people who I can rely on when I have problems.” Each of these 11 items is rated on a 2-point scale. The total score ranges from 0 to 11. In the present study, the Cronbach’s alpha reliability was 0.76 for the total scale.

Statistical analyses

Statistical analyses were conducted in several stages using SPSS 13.0 and LISREL 8.80. The data were randomly divided into two independent subsets for the purpose of examining validity. First, an exploratory factor analysis (EFA) using principal axis factoring with promax rotation was adopted for Subsample 1. Factors were identified as those with eigenvalues greater than 1.00. A value of 0.30 was used as a viable cutoff for judging the saliency of factor loadings. Second, we tested the validity of the factor structure derived from the results of the EFA with Subsample 1 using confirmatory factor analysis (CFA) on Subsample 2 within the framework of structural equation modeling.

In CFA, several criteria are used to determine the overall fit between the data and the hypothesized structure. These include the Comparative Fit Index (CFI), which must meet or exceed 0.90 (Bentler & Bonett, 1980); the Root Mean Square Error of Approximation (RMSEA) in which values less than 0.05 are indicative of good fit and those between 0.05 and 0.08 are indicative of a reasonable fit (Browne & Cudeck, 1993); and the Standard Root Mean Square Residual (SRMR) in which values less than 0.08 indicate acceptable fit (Hu & Bentler, 1999).

RESULTS

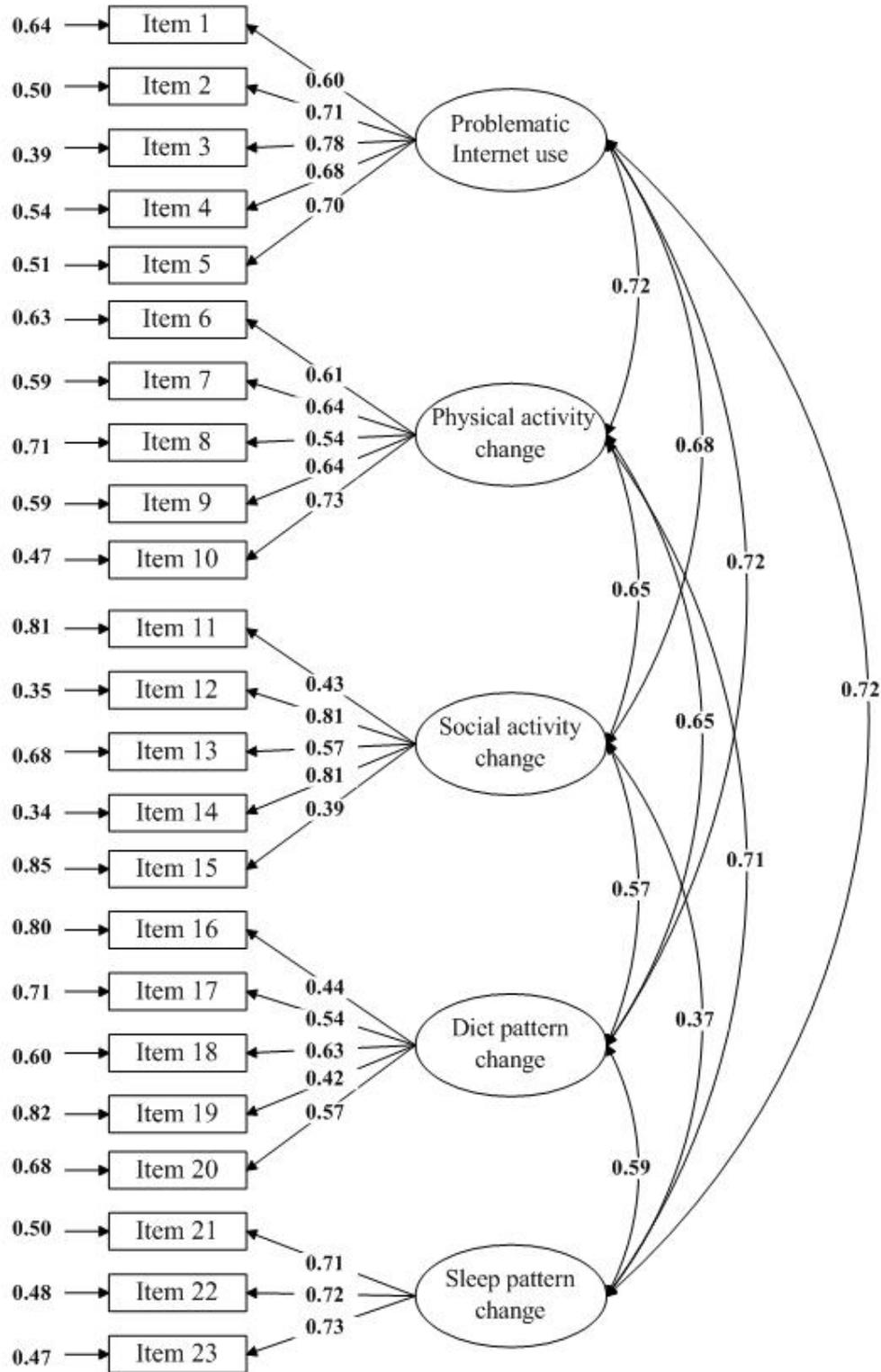
Exploratory Factor Analysis

To generate the factor structure of LC-PIU, a principal axis factoring with promax rotation was conducted for the 23 items in Subsample 1 (calibration sample, $n = 354$) selected from the random split-half of the whole Time 1 sample. This analysis resulted in a five-factor solution that explained 59.75% of the total variance. The first factor included 5 items regarding preoccupation with Internet use, tolerance and withdrawal; thus, this scale was labeled “problematic Internet use.” The second factor, the “physical activity change scale,” included 5 items that described reductions to participants’ exercise schedules due to Internet use. The third factor included 5 items about the reduction in the frequency/quality of participants’ interpersonal relationships including offline friends, family members, and relatives; thus, this factor was labeled the “social activity change scale.” The fourth factor, the “dietary pattern change scale,” included 5 items related to decreases in maintaining a regular diet due to Internet use. The fifth factor, “sleep pattern change scale,” included 3 items about delaying sleep or changing sleep patterns due to Internet use.

Confirmatory Factor Analysis

Based on time-1 Subsample 2 (validation sample, $n = 354$), we conducted a CFA to retest the LC-PIU’s five-factor structure derived from the EFA calibration of time-1 Subsample 1. The results revealed a model that obtained an adequate fit to the data ($\chi^2_{(220, N=354)} = 317.16, p < .01$; CFI = 0.97; RMSEA = 0.050; SRMR = 0.061). Anderson and Gerbing (1988) suggest that examining the convergent and discriminate validities are two approaches to further assess fit. Convergent validity is evaluated on the measurement model by determining whether the estimated coefficient of each indicator on its accordingly underlying latent factor is significant. The standardized coefficients shown in Figure 1 are all statistically significant. The factor loadings of problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change ranged from 0.60 to 0.78, 0.54 to 0.73, 0.39 to 0.81, 0.42 to 0.63, and 0.71 to 0.73, respectively. These results reveal that these five factors have an adequate convergent validity.

To examine the discriminant validity among the five factors, we adopted Anderson and Gerbing’s (1988) approach in which the correlation between any two latent factors was constrained to 1.0, allowing a researcher to perform a chi-square difference test on the values obtained for both constrained and free-estimate models. The chi-square differences of the constrained and free estimated models were $\Delta\chi^2 = 69.59$ ($df = 1, p < .001$) for problematic Internet use and physical activity change, $\Delta\chi^2 = 101.75$ ($df = 1, p < .001$) for problematic Internet use and social activity change, $\chi^2 = 34.2$ ($df = 1, p < .001$) for problematic Internet use and dietary pattern change, $\Delta\chi^2 = 45.49$ ($df = 1, p < .001$) for problematic Internet use and sleep pattern change, $\Delta\chi^2 = 93.66$ ($df = 1, p < .001$) for physical activity change and social activity change, $\Delta\chi^2 = 39.92$ ($df = 1, p < .001$) for physical activity change and dietary pattern change, $\Delta\chi^2 = 31.8$ ($df = 1, p < .001$) for physical activity change and sleep pattern change, $\Delta\chi^2 = 72.51$ ($df = 1, p < .001$) for social activity change and dietary pattern change, $\Delta\chi^2 = 107.33$ ($df = 1, p < .001$) for social activity change and sleep pattern change, and $\Delta\chi^2 = 45.17$ ($df = 1, p < .001$) for dietary pattern change and sleep pattern change. These results indicated that adequate discriminant validities were shown among the five factors. The alpha reliability coefficients for these factors were acceptable ranging from 0.75 to 0.83.



$\chi^2_{(220, N=354)} = 317.16$ ($p < .01$), CFI = 0.97, RMSEA = 0.050, SRMR = 0.061

Figure 1. The five-factor model of the LC-PIU

The association between the LC-PIU and validation measures: Concurrent and cross-year predictive utilities

Pearson correlation was adopted to assess the concurrent validity of LC-PIU. The correlation coefficients between “problematic Internet use”, “physical activity change”, “social activity change”, “dietary pattern change”, and “sleep pattern change” at Time 1 and Time-1 depression were 0.33, 0.28, 0.27, 0.30, and 0.26 ($ps < .01$), respectively; the correlations between LC-PIU subscales at Time 1 and Time-1 loneliness were 0.20, 0.21, 0.29, 0.18, and 0.17 ($ps < .01$), respectively. As also shown in Table 1, participants’ Time-1 weekly Internet use was significantly correlated with problematic Internet use ($r = 0.31$, $p < .01$), physical activity change ($r = 0.44$, $p < .01$), social activity change ($r = 0.22$, $p < .01$), dietary pattern change ($r = 0.28$, $p < .01$), and sleep pattern change ($r = 0.29$, $p < .01$) at Time 1. The longer the participants spent on the Internet per week, the more severe their problematic Internet use and unhealthier lifestyle changes.

Similarly, problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change at Time 1 were positively correlated with Time-2 depression (0.21, 0.27, 0.19, 0.23, and 0.22, respectively, $ps < .01$) and Time-2 loneliness (0.13, 0.18, 0.19, 0.13, $ps < .01$, and 0.10, $p < .05$) that show cross-year predictive utility of the LC-PIU questionnaire. In addition, the LC-PIU of Time 1 were positively correlated with weekly Internet use (0.21, 0.38, 0.15, 0.21, and 0.23, respectively, $ps < .01$) of Time 2, cross year. Gender was not significantly correlated with most of the LC-PIU subscales at either Time 1 or Time 2, although there was a negative correlation between gender and social activity change ($r = -0.12$, $p < .01$ and $r = -0.09$, $p < .05$ at Times 1 and 2, respectively). Men were less active on social activity due to Internet use compared with women.

Table 1. The inter-correlations among the study variables at Time 1 ($n = 708$) and Time 2 ($n = 540$)

	PIU, T1	PAC, T1	SAC, T1	DPC, T1	SPC, T1
Mean	9.11	10.88	7.75	10.88	5.76
SD	3.41	3.50	2.67	3.35	2.30
PIU, T1	---				
PAC, T1	.62**	---			
SAC, T1	.55**	.60**	---		
DPC, T1	.56**	.57**	.48**	---	
SPC, T1	.57**	.57**	.48**	.54**	---
Depression, T1	.33**	.28**	.27**	.30**	.26**
Loneliness, T1	.20**	.21**	.29**	.18**	.17**
WIU, T1	.31**	.44**	.22**	.28**	.29**
Gender, T1 ^a	.01	.06	-.12**	-.01	-.03
Depression, T2	.21**	.27**	.19**	.23**	.22**
Loneliness, T2	.13**	.18**	.19**	.13**	.10*
WIU, T2	.21**	.38**	.15**	.21**	.23**
Gender, T2 ^a	.04	.06	-.09*	.02	.00

* $p < .05$, ** $p < .01$

Note. T1 = time 1; T2 = time 2; PIU = problematic Internet use; PAC = physical activity change; SAC = social activity change; DPC = diet pattern change; SPC = sleep pattern change; WIU = weekly Internet use.

^a 1 = male, 2 = female

DISCUSSION

Using a sample of Taiwanese freshmen, we confirmed that the LC-PIU, a newly developed screening tool for primary prevention, has a meaningful and distinct factor structure. We randomly divided the sample ($n=708$) at Time 1 into two independent groups for the purpose of validity examinations. In Subsample 1, an EFA of the LC-PIU items resulted in a five factors: problematic Internet use, physical activity change, social activity change, dietary pattern change, and sleep pattern change. The CFA on Subsample 2 revealed an adequate-fitting measurement model confirming the five latent constructs extracted from EFA on Subsample 1. Two-step factor structural examinations showed a strong support to the construct validity to LC-PIU questionnaire. The reliability (alphas coefficients) for these five factors were acceptable. The results also revealed an adequate convergent and discriminant validity among these five factors.

A concurrent, cross-year predictive utility examination revealed positive correlations between LC-PIU scores and depression as well as between LC-PIU scores and loneliness at Times 1 and 2. Our result is consistent with previous findings that longer Internet use is associated with higher depression and loneliness in university students. For example, Fortson, Scotti, Chen, Malone, and Del Ben (2007) found that abuse of and dependence on the Internet was associated with depression among undergraduates. Lin, Ko, and Wu (2011) found Internet addiction was positively correlated with a greater number of depressive symptoms in Taiwanese college students. Koç (2011) found the addicted Turkey university students were more depressed than the non-addicted. A. Ceyhan and E. Ceyhan (2008) indicated that loneliness and depression significantly predicted problematic Internet use; loneliness was found to be the most important predictor of problematic Internet use, and depression was the second most predictor among university students. Morahan-Martin and Schumaker (2000) found that loneliness was associated with pathological Internet use in undergraduate students.

In addition, our results indicate that gender was not significantly correlated with problematic Internet use, physical activity change, dietary pattern change, or sleep pattern change but was correlated with social activity change. Specifically, male freshmen reported less active social activity due to Internet use compared with females. Previously, Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, and Scherlis (1998) found that heavy Internet use was associated with longitudinal declines in the size of adolescents' social circle, social contact, and family communication. Nie, Hillygus, and Erbring (2002) found that more time spent on the Internet, less time spent with friends, family, and colleagues. Moreover, previous research (Odell et al., 2000; Thayer & Ray, 2006; Boneva et al., 2001; Subrahmanyam, Greenfield, Kraut, & Gross, 2001) regarding gender differences in adolescent technology use has been reported often. Women use the Internet for interpersonal communications such as e-mail, chat rooms, and communicating with family and friends more frequently than men. Conversely, men are more likely to use the Internet to build web pages, pursue sexual relationships, and play games compared with women. Because men dominated computer-related fields traditionally and there is a gender gap in the types of online activity, the Internet might draw men's attention away from friends and family compared with women.

Our results also show that the more time spent on the Internet, the more likely were to have problematic Internet use and unhealthier lifestyles. In other words, excessive Internet use is problematic because an individual lack of the ability to control his or her online schedule. Stopping Internet use led to anxious feelings as well as maladaptive cognitions and behaviors. These individuals neglected exercises, remained sedentary for long periods and reduced social activities with friends and family. When individuals spent excessive time on the Internet, they changed their dietary patterns by postponing or ignoring regular meals, having a bite of whatever was available, or forgetting to drink water for a long time. They were more likely to stay up late because of Internet use, thereby reversing their sleep pattern. In 1996, Young briefly reported that Internet-dependent users had significant impairments in many areas of lives including health and sociability. Subsequent studies indicated that adolescents who develop problematic Internet use changed with regard to several lifestyle-related factors including decreases in physical activity, increases in time spent on the Internet, shorter durations or lack of sleep, and increasingly irregular dietary habits and poor eating patterns (Gunnell et al., 1998; Lam et al., 2009; Kim & Chun, 2005; Choi et al., 2009). Our study reaffirmed these negative effects of excessive Internet use. Because the LC-PIU provides detailed descriptions of inactive/unhealthier life-event associated with maladaptive Internet use, this assessment has potential to reveal longitudinal consequences of problematic Internet use and to compare harmful consequences of various Internet activities across users of various backgrounds.

Due to the easy access to the Internet/a computer, university students are particularly vulnerable to problematic Internet use. The LC-PIU can be used to evaluate the risk and potential of university student Internet-related problems and may help parents, teachers, and students to reflect upon the consequence of excessive Internet use. As investigating the lifestyle-related factors of Internet use might reveal personal choice health-damaging

patterns, which could be one of the health and well-being issues of primary prevention. Primary prevention can be conducted in numerous ways. One of the possibilities is that one can build adaptive lifestyle patterns conflicting with Internet use, such as involving in sports, outdoor leisure, friends contact, reading books and so on. .

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REFERENCES

- Abel, T. & McQueen, D. V. (1991). *Lifestyle: Concept and Research Implications*. Working Paper, Research Unit in Health and Behavioral Change, University of Edinburgh, Edinburgh.
- Aboujaoude, E. (2010). Problematic Internet use: an overview. *World Psychiatry*, 9(2), 85-90.
- American Psychiatric Association, Task Force on DSM-IV (1994). *Diagnostic and statistical manual of mental disorders: DSM-IV*. American Psychiatric Association.
- Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, 103(3), 411-423.
- Aykut Ceyhan, A., & Esra Ceyhan (2008). Loneliness, Depression, and Computer Self-Efficacy as Predictors of Problematic Internet Use. *CyberPsychology & Behavior* 11(6), 699-701.
- Backett, K. C. & Davison, C. (1995). Lifecourse and lifestyle: the social and cultural location of health behaviours. *Social Science and Medicine*, 40(5), 629-638.
- Beard, K., & Wolf, E. (2001). Modification in the proposed diagnostic criteria for Internet addiction. *Cyberpsychology & Behavior*, 4(3), 377-383.
- Beck, A. T, Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression*. New York: Guilford Press.
- Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588-606.
- Block J. J. (2008). Issues for DSM-V: internet addiction. *American Journal Psychiatry*, 165(3), 306-307.
- Boneva, B., Kraut, R., & Frohlich, D. (2001). Using e-mail for personal relationships: The difference gender makes. *American Behavioral Scientist*, 45(3), 530-549.
- Brenner, V. (1997). Psychology of Computer Use: XLVII. Parameters of Internet use, abuse, and addiction: The first 90 days of the Internet Usage Survey. *Psychological Reports*, 80(3), 879-882.
- Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136-162). Newsbury Park, CA: Sage.
- Caplan, G.. (1964). *Principles of preventive psychiatry*. New York: Basic Books.
- Caplan, S. E. (2002). Problematic Internet use and psychosocial well-being: Development of a theory-based cognitive-behavioral measurement instrument. *Computers in Human Behavior*, 18(5), 553-575.
- Choi, K., Son, H., Park, M., Han, J., Kim, K., Lee, B., & Gwak, H. (2009). Internet overuse and excessive daytime sleepiness in adolescents. *Psychiatry and Clinical Neurosciences*, 63(4), 455-462.
- Coulson, N. S., Eiser, C., & Eiser, J. R. (1997). Diet, smoking and exercise: Interrelationships between adolescent health behaviors. *Child: Care, Health and Development*, 23(3), 207-216.
- Davis, R., Flett, G., & Besser, A. (2002). Validation of a new scale for measuring problematic Internet use: Implications for preemployment screening. *CyberPsychology & Behavior*, 5(4), 331-345.
- Demetrovics, Z., Szeredi, B., & Rozsa, S. (2008). The three-factor model of Internet addiction: The development of the Problematic Internet Use Questionnaire. *Behavior Research Methods*, 40(2), 563-573.
- De Jong Gierveld, J., & Kamphuis, F. (1985). The Development of a Rasch-Type Loneliness Scale. *Applied Psychological Measurement*, 9(3), 289-299.
- Fortson, B. L., Scotti, J. R., Chen, Y., Malone, J., & Del Ben, K. S. (2007). Internet use, abuse, and dependence among students at a southeastern regional university. *Journal of American College Health*, 56(2), 137-144.
- Goldberg, I. (1995). *Internet addictive disorder (IAD) diagnostic criteria*. Retrieved from <http://www.psycom.net/iadcriteria.html> (08. 08. 2011).
- Gunnell, D.J., Smith, G.. D., Frankel, S. J., Kemp, M., & Peters, T. J. (1998). Socioeconomic and dietary influences on leg length and trunk length in childhood: a reanalysis of the Carnegie (Boyd Orr) survey of diet and health in prewar Britain (1937-39). *Pediatric and Perinatal Epidemiology*, 12(1), 96-113.
- Ha, J. H., Kim, S. Y., Bae, S. C., Bae, S., Kim, H., Sim, M., Lyoo, I. K., & Cho, S. C. (2007). Depression and Internet addiction in adolescents. *Psychopathology*, 40(6), 424-430.
- Hu, L. & Bentler, P. M. (1999). Cutoff criteria in fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6(1), 1-55.

- Hur, M. (2006). Demographic, habitual, and socioeconomic determinants of Internet addiction disorder: An empirical study of Korean teenagers. *CyberPsychology & Behavior*, 9(5), 514-525.
- Kim, J. S., & Chun, B. C. (2005). Association of Internet addiction with health promotion lifestyle profile and perceived health status in adolescents. *Journal of Preventive Medicine and Public Health*, 38(1), 53-60.
- Ko, C. H., Yen, J. Y., Chen, C. C., Chen, S. H., & Yen C. F. (2005). Proposed diagnostic criteria of Internet addiction for adolescents. *The Journal of Nervous & Mental Disease*, 193(11), 728-733.
- Koç .M. (2011). Internet addiction and psychopatolog. *The Turkish Online Journal of Educational Technology-TOJET* 10(1), 143-148.
- Kraut, R., Patterson, M., Lundmark, V., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (1998). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, 53(9), 1017-1031.
- Lam, L. T., Peng, Z. W., Mai, J. C., & Jing, J. (2009). Factors associated with Internet addiction among adolescents. *CyberPsychology & Behavior*, 12(5), 1-5.
- Lin, S. S. J., & Tsai, C. C. (1999). *Internet addiction among high schoolers in Taiwan*. Paper presented at the 106th annual convention of the American Psychological Association, Boston, MA.
- Lin, C. L., & Lin, M. J. (2007). The Validity and Reliability of Chinese Version of Loneliness Scale - The Example of the Elderly. *The Archive of Guidance & Counseling*, 29(2), 41-50.
- Lin, M. P., Ko, H. C., & Wu, J. Y. W (2011). Prevalence and Psychosocial Risk Factors Associated with Internet Addiction in a Nationally Representative Sample of College Students in Taiwan. *Cyberpsychology, Behavior, and Social Networking*. Retrieved from <http://www.liebertonline.com/doi/abs/10.1089/cyber.2010.0574> (15. 09. 2011).
- Ministry of Education (n.d.). *2011 Number of Students in Universities, Colleges and Junior Colleges*. Retrieved from http://140.111.34.54/statistics/content.aspx?site_content_sn=8169 (20. 08.2011).
- Morahan-Martin, J., & Schumacher, P. (2000). Incidents and correlates of pathological Internet use among college students. *Computers in Human Behavior*, 16(1), 13-29.
- Murali, V., & George, S.(2007). Lost online: an overview of internet addiction. *Advances in Psychiatric Treatment*, 13, 24-30.
- Nie, N. H., Hillygus, D. S, & Erbring, L. (2002). Internet use, interpersonal relations, and sociability: A time diary study. In B. Wellman & C. Haythornthwaite (Eds.), *The Internet in Everyday Life* (pp. 216-243). Malden, MA: Blackwell.
- Odell, P. M., Korgen, K., Schumacher, P., & Delucchi, M. (2000). Internet use among female and male college students. *CyberPsychology & Behavior*, 3(5), 855-862.
- Shapira, N., Goldsmith, T., Keck Jr., P., Khosla, D., & McElroy, S. (2000). Psychiatric features of individuals with problematic Internet use. *Journal of Affective Disorders*, 57, 267-272.
- Shapira, N. A., Lessig, M. C., Goldsmith, T. D., Szabo, S. T., Lazoritz, M., Gold, M. S., & Stein, D. J. (2003). Problematic Internet use: Proposed classification and diagnostic criteria. *Depression and Anxiety*, 17(4), 207-216.
- Subrahmanyam, K., Greenfield, P., Kraut, R., & Gross, E. (2001). The impact of computer use on children“ s and adolescents“ development. *Applied Developmental Psychology*, 22(1), 7-30.
- Şahin, C. (2011). An Analysis of Internet Addiction Levels of Individuals according to Various Variables. *The Turkish Online Journal of Educational Technology*, 10(4), 60-66,
- Thayer, S. E., & Ray, S. (2006). Online communication preferences across age, gender, and duration of Internet use. *CyberPsychology & Behavior*, 9(4), 432-440.
- Tutgun, A., Deniz, L. & Moon, M. K. (2011). A Comparative Study of Problematic Internet Use and Loneliness Among Turkish and Korean Prospective Teachers. *The Turkish Online Journal of Educational Technology*, 10(4), 14-30.
- Wallace, R. B. (2002). *Primary Prevention*. Retrieved from <http://www.healthline.com/galecontent/primary-prevention> (08. 07.2011).
- Widyanto, L., & Griffiths, M. (2006). Internet addiction: A critical review. *International Journal of Mental Health and Addiction*, 4(1), 31-51.
- Young, K. S. (1996). Psychology of computer use: XL. Addictive use of the internet: A case that breaks the stereotype. *Psychological reports*, 79, 899-902.
- Young, K. S. (1998a). Internet addiction: The emergence of a new clinical disorder. *Cyberpsychology & Behavior*, 1(3), 237-244.
- Young, K S. (1998b). *Caught in the net: how to recognize the signs of internet addiction and a winning strategy for recovery*. New York: John Wiley & Sons, Inc.