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# Research Paper: The Prediction of Internet Addiction in Female Students Based on Cloninger's Temperament and Character

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## Abstract

The present study was conducted on female students of Allameh Tabataba'i University to predict Internet addiction through a seven-factor Cloninger model. The statistical population of the study consisted of all female students of Allameh Tabataba'i University studying in the academic year 2019-2020. Moreover, a sample population of 150 people was selected through the convenience sampling method. Young's Internet Addiction Test and Cloninger's Temperament and Character Inventory (TCI-125) were administered to the sample population. The data were analyzed by Pearson's correlation test, multiple regression. Results of Enter regression indicated that persistence dimension (β=-0.355) could account for 18.6% of variances of Internet addiction. The results of stepwise regression showed that persistence (β=-0.349) could predict 12.2% of variances of Internet addiction. Then, self-directedness was added to the prediction model which increased the explained variances of Internet addiction up to 15.4% of which 3.2% accounts particularly for self-directedness. This study may contribute to more accurate identification of involved factors in this phenomenon and provide a proper approach for prevention and treatment in line with those focused on evaluating the effective factors on Internet addiction.

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## 1. Introduction

A new type of addiction is witnessed by the widespread access to the Internet, i.e. Internet Addiction Disorder (IAD) which is specifically related to the Information Age. Internet addiction is a type of impulse control disorder that refers to the excessive Internet use in such a way that overshadows one's other social activities, leading to a performance decline in different professional, scientific, social, occupational, economic, psychological and family areas, as well as ignorance of real-life relationships among friends and family members. Just like other forms of addiction, Internet addiction is accompanied by symptoms like anxiety, depression, mood swings, impatience, obsessive thoughts or fantasizing about the Internet and breakdown of social relationships (Khatib Zanjani, & Aghahheris, 2015). Several types of research conducted on students show that the extent of Internet use as well as prevalence and spread of Internet Addiction is increasing (Chou, 2004). Internet addiction has gradually become a serious issue in public health worldwide. In the previous studies, the prevalence rates of Internet addiction had significant variance ranging from 0.8% to26.7% (Kuss et al., 2014, cited in Pan, Chiu, & Lin, 2020) depending on the measurement and target population. Mousavi (2020) conducted a study to investigate the prevalence of Internet addiction in Iranian adolescents and young people. The results indicated that the overall prevalence of severe Internet addiction is 2.4 %; 2.9 % for males and 2.2 % for females, and as far as age is concerned, 2.5 % for teenagers and 2.3 % for young people; however, the differences were not significant. In the two groups of females (2.2%) and males (2.9 %), there was no difference in terms of the mean score of Internet addiction, while a difference exists between the groups of teenagers and young people. In addition, the average Internet addiction in the youth age group (2.3 %) is slightly higher than that in teenagers (2.5%). Internet addiction among students is accompanied by several problems, including the decline of interpersonal relationships, anger and aggression (Kim, 2007). Considering the effect of Internet addiction on adolescents' psychological well-being, self-esteem is negatively correlated with Internet addiction, whereas depression and loneliness are positively correlated with Internet addiction. One of the most important questions regarding Internet addiction prevention and treatment concerns whether the occurrence of some personal traits leads to Internet addiction or not. Personality seems to deeply affect Internet use among factors related to Internet addiction (Batıgün, & Hasta, 2010, Liberatore, Rosario, Martí, & Martínez, 2011). In other words, intrapersonal factors can influence Internet users' behaviors and personality traits, such as shyness, subjectivism and social deprivation, have a close relationship with Internet addiction (Kesici, & Şahin, 2009). Young (2017) investigated the relationship between personality traits and Internet addiction. The results of his study on 259 Internet-addicted subjects indicated that they received low scores in self-confidence, emotional sensitivity, flexibility and adaptive behaviors.

Various theories have been proposed concerning human's personality structure and its formation including psychoanalytic,

trait and cognitive theories, some of which seek the main personality traits. Accordingly, different theorists discussed a number of personality factors, from 3 to 16. Cloninger's temperament and character traits theory are one of the proposed theories about personality (Kaviani, & Poor Naseh, 2005). Cloninger, Svrakic and Przybeck (1993) proposed a psychobiological theory, including four temperament and three character dimensions. Initially, the model included only three temperament dimensions, i.e. Novelty Seeking (NS), Harm Avoidance (HA) and Reward Dependence (RD). The temperament dimensions were assumed to be independently heritable and manifest early in development. Variation in each dimension was supposed to be associated with monoaminergic activity (Cloninger, 1986): NS with low basal dopaminergic activity, HA with high serotonergic activity, and RD with low basal noradrenergic activity (Stallings, Hewitt, Cloninger, Heath, & Eaves, 1996). These temperament dimensions are defined in terms of individual differences in behavioral learning mechanisms, explaining responses to novelty, danger or punishment and cues for reward (NS), avoiding aversive stimuli (HA), and reactions to rewards (RD) (Cloninger, 1987). Cloninger developed Tri-Dimensional Personality Questionnaire (TPQ) (Cloninger, 1987) to measure these dimensions. However, research conducted in TPQ has demonstrated that the former RD subscale `Persistence' proved to be relatively independent of the former three temperament factors and was proposed as an additional fourth temperament dimension. To more adequately represent individual differences, the four-dimensional model was extended to a seven-dimensional scheme, including three additional dimensions of character, i.e. Self-directedness (SD), Cooperativeness (CO) and Self-transcendence (ST). Self-directedness refers to the self-determination of the subject which is conceptually related to Rotter's locus of control construct. Cooperativeness accounts for traits characterizing the interpersonal circumflex (Wiggins, 1979, 1980) and the Self-transcendence dimension refers to the experiencing of spiritual ideas (Cloninger, Svrakic, & Przybeck, 1993). Cloninger assumes that character is less heritable than temperament, which matures with age.

Cloninger's model has been widely used in many types of research to investigate the relationship between this model and smoking (Noori Feshalenji, Pourshahbaz, Dolatshahi, Farhoudian, & Chamikarpour, 2012), alcohol, cocaine, benzodiazepine addictions (Schneider, Ottoni, Carvalho, Elisabetsky, & Lara, 2015) and drug abuse (Marquez-Arrico, López-Vera, Prat, & Adan, 2016). Only one study (Rezaii abdoly, & Nokany, 2014) is conducted on Internet users and the relationship between this model and Internet addiction has been analyzed. The statistical population of this study consisted of the youth Internet users in Khoramabad city and the sample included 229 subjects selected by multistage cluster sampling method. Young's Internet Addiction Test (Young, 1998) and Cloninger's Temperament and Character Inventory (Cloninger, 1994) were used for data collection. Their findings indicated that among temperament dimensions, only novelty seeking has the predictability of Internet addiction while self-directedness and cooperativeness character dimensions have the

predictability of Internet addiction. Additionally, novelty-seeking and cooperativeness were more predictive of Internet addiction than other variables. The study conducted by Pettorruso et al. (2020) showed that Young adults with problematic Internet use exhibited lower novelty seeking, harm avoidance, and reward dependence. Besides, Shafiee, Ashoouri, and Dehghani (2020) stated that the character dimension of self-directedness can reduce the adverse effects of insecure attachment and the risk of addiction to social network addiction.

Although some research has been conducted on the Cloninger's model of personality and Internet addiction, more research is still needed to clarify the predictive power of the Internet addiction model. Therefore, the present study aims to answer two questions: (1) "Is there is a relationship between this model and Internet addiction?" and (2) "How can this model explain Internet addiction?"

## 2. Methods

This study is descriptive-correlational. The statistical population consisted of all female students of Allameh Tabataba'i University studying in the academic year 2019-2020, and the sample included 150 subjects selected through the convenience sampling method.

The research materials consisting of online questionnaires were designed and posted on the researcher's Instagram. Then, the female students of Allameh Tabatabai University were asked to participate in this study by filling in Cloninger's Temperament and Character Inventory and Young's Internet Addiction Test. When 150 subjects completed the questionnaires, the sampling was over and then the data were analyzed by Pearson correlation test and multiple regression test (Enter and Stepwise).

The instruments used for data collection are as follows:

**Cloninger's Temperament and Character Inventory**: This inventory includes 125 items that should be completed with yes/no answers. Temperament and Character Inventory operates with seven dimensions of personality traits: four temperaments i.e. novelty seeking, harm avoidance, reward dependence, persistence and three characters, i.e. self-directedness, cooperativeness and self-transcendence. "Yes" coded as 1, "No" coded as 0. This test was first used by Kaviani & Pour Naseh (2005) in Iran and reliability coefficients reported for the Iranian version was as follows: novelty seeking, harm avoidance, reward dependence, persistence, self-directedness, cooperativeness, and self-transcendence were 0.96, 0.91, 0.61, 0.76, 0.85, 0.95 and 0.88, respectively.

In the present study, the reliability of Cloninger's temperament and character questionnaire was 0.92.

**Young's Internet Addiction Test** (short form): Young developed his 20-item questionnaire based on diagnostic symptoms of Internet addiction. The total score of this test ranges from 20 to 100. Scores are interpreted as moderate (20-39), high (40-69) and severe (70-100) addiction (Young, 1998, cited in Zandavian, Heidari, & Bagheri, 2013). Some researchers (Windyanto & MacMurran, 2004) used factor analysis and correlation coefficient to

test the validity of this questionnaire. Factor analyses revealed 6 factors-such as salience, excessive use, neglecting work, anticipation, lack of control, and neglecting social life, showing good concurrent validity. Chronbach alpha was 0.90 in Kim et al.'s study (Kim et. al., 2010). Amiri (2018) investigated validation of the psychometric properties of the short version of Young's Internet addiction questionnaire. Furthermore, analyzing the collected data indicated the validity of this questionnaire, alpha coefficients 0.87 and 0.88, respectively for subscales of the lack of control/management time and desire/social problems. Besides, concurrent validity with the long form of Yang's Internet addiction was 0.89 ($p<0.01$), which has a significant positive correlation with subscales of the Bart Impulsiveness Scale ($p<0.01$), and negatively correlated ($p<0.01$) with Subscales of openness and agreeableness of Big Five personality traits' form. The results of exploratory and confirmatory factor analysis supported the factorial structure of the questionnaire. Yang's Short Form questionnaire of Internet addiction has good psychometric properties in Iranian society.

In the present study, the reliability of Internet addiction questionnaire was 0.89.

## 3. Results

In Table 1, the demographics characteristic of students is shown.

**Table 1**. Demographic characteristics of students

| | | Frequency | Frequency Percentage | |
|---|---|---|---|---|
| Educational level | Bachelor of science | 71 | 47.3 | |
| | Master of science | 79 | 52.7 | |
| | Total | 150 | 100.0 | |
| Marital status | Single | 136 | 90.7 | |
| | Married | 14 | 9.3 | |
| | Total | 150 | 100.0 | |
| Father's educational level | Illiterate | 11 | 7.3 | |
| | Under diploma | 40 | 26.7 | |
| | Diploma | 63 | 42.0 | |
| | Associates degree | 18 | 12.0 | |
| | Bachelor of science | 11 | 7.3 | |
| | Master of science | 7 | 4.7 | |
| | Total | 150 | 100.0 | |
| Mother's educational level | Illiterate | 15 | 10.0 | |
| | Under diploma | 39 | 26.0 | |
| | Diploma | 75 | 50.0 | |
| | Associates degree | 7 | 4.7 | |
| | Bachelor of science | 11 | 7.3 | |
| | Master of science | 3 | 2.0 | |
| | Total | 150 | 100.0 | |
| Age | Min | Max | Mean | Standard Deviation |
| | 18 | 30 | 23.10 | 3.55 |

As Table 1 shows, more than half of the participants of the study were undergraduate students and most of them were single. Also, among the two variables of father and mother's education level separately, diploma had the highest frequency. The average age of students was 23.10 In the Table 2 frequency and frequency percentage of students regarding Internet addiction is presented.

**Table 2**. Frequency and frequency percentage of students regarding Internet addiction

| Internet addiction | Frequency | Frequency Percentage |
|---|---|---|
| Moderate addiction | 73 | 48.7 |
| High addiction | 77 | 51.3 |
| Total | 150 | 100.0 |

As shown, Internet addiction was at a moderate level in 48.7% of students and was at high level for 51.3% of students. No student showed the symptoms of severe addiction to the Internet.

Table 3 shows the mean and standard deviation of Internet addiction and Cloninger's dimensions among students.

**Table 3**. Mean and standard deviation of Internet addiction and Cloninger's dimensions among students

| Variables | Mean | Standard Deviation |
|---|---|---|
| Internet addiction | 40.60 | 12.303 |
| Novelty seeking | 9.41 | 3.188 |
| Harm avoidance | 8.66 | 4.484 |
| Reward dependency | 8.67 | 2.145 |
| Persistence | 2.71 | 1.494 |
| Cooperativeness | 15.59 | 3.535 |
| Self-directedness | 14.24 | 4.618 |
| Self-transcendence | 8.42 | 2.663 |

According to Table 3, the Internet addiction is 40.60 and among Cloninger's theoretical dimensions, the cooperativeness is the highest.

The assumptions of the multivariate regression analysis test were normality of variables and linear correlation relationship between them. Kolmogorov-Smirnov test was used for normality of the data. Statistic z in Kolmogorov-Smirnov test for Internet-addiction, novelty-seeking, Harm avoidance, reward dependence, persistence, cooperativeness, self-directedness and self-transcendence variables were obtained as 1.300, 1.401, 1.263, 1.110, 0.981, 1.012, 1.058, 1.130, and 1.324, respectively which is not significant at $p \leq 0.05$ level. This indicates the normality of variable distribution in the sample. In the Table 4, correlation matrix of research variable is shown.

**Table 4**. Correlation matrix of research variables

| | Variables | Internet addiction | Novelty seeking | Harm avoidance | Reward dependency | Persistence | Cooperativeness | Self-directedness | Self-transcendence |
|---|---|---|---|---|---|---|---|---|---|
| Pearson Correlation | Internet Addiction | 1.000 | | | | | | | |
| | Novelty seeking | 0.145* | 1.000 | | | | | | |
| | Harm avoidance | 0.180* | -0.059 | 1.000 | | | | | |
| | Reward dependency | 0.026 | 0.356** | -0.199** | 1.000 | | | | |
| | Persistence | -0.349* | -0.149* | -0.132 | -0.022 | 1.000 | | | |
| | Cooperativeness | -0.038 | 0.226** | -0.216** | 0.410** | -0.048 | 1.000 | | |
| | Self-directedness | -0.261* | -0.305** | -0.594** | -0.266** | 0.252** | -0.118 | 1.000 | |
| | Self-transcendence | -0.015 | 0.144* | -0.466** | 0.448** | 0.299** | 0.185* | 0.085 | 1.000 |

As shown, a significant positive correlation exists between novelty-seeking and harm-avoidance and Internet addiction, and there is a significant negative correlation between persistence and self-directedness. In addition, the table results indicated that there is a positive significant correlation between reward dependency and cooperativeness and novelty-seeking ($\alpha<0.05$). Additionally, there is a negative correlation between persistence and novelty-seeking ($\alpha<0.05$) and a significant negative correlation between self-directedness and novelty-seeking ($\alpha<0.01$). However, there is a negative significant correlation between reward dependency and cooperation, self-directedness and self-transcendence and harm avoidance ($\alpha<0.01$) Furthermore, there is a significant positive correlation between cooperation and self-transcendence and reward dependency and a significant negative correlation between self-directedness and reward-dependency ($\alpha<0.01$). Besides, there is a significant positive correlation between self-transcendence and cooperation ($\alpha<0.05$). In Table 5 the results of multivariate regression analysis (enter method) for prediction of Internet addiction through dimensions of Cloninger's personality theory are presented.

**Table 5**. the results of multivariate regression analysis (enter method) for prediction of Internet addiction through dimensions of Cloninger's personality theory

| No. | Predictive variable | Unstandardized Coefficients β | Standardized Coefficients β | T | P |
|---|---|---|---|---|---|
| 1 | Constant value | 46.121 | | 3.929 | 0.000 |
| 2 | Novelty seeking | 0.305 | 0.079 | 0.923 | 0.358 |
| 3 | Harm avoidance | 0.371 | 0.135 | 1.111 | 0.268 |
| 4 | Reward dependency | -0.438 | -0.076 | -0.768 | 0.444 |
| 5 | Persistence | -2.924 | -0.355 | -4.232 | 0.000 |
| 6 | Cooperativeness | -0.215 | -0.062 | 0.723 | 0.471 |
| 7 | Self-directedness | -0.297 | -0.112 | -0.945 | 0.346 |
| 8 | Self-transcendence | 0.916 | 0.198 | 1.966 | 0.051 |
| | F= 4.648 | $R^2$= 0.182 | P=0.000 | | |

As shown in the above table, among 7 dimensions of Cloninger's personality theory, persistence (β=-0.355) could explain 18.6% of the variances of Internet addiction among students. In addition, stepwise regression analysis was done for the prediction of Internet addiction, the results of which are presented in Table 6.

**Table 6**: the results of stepwise multivariate regression analysis for prediction of Internet addiction through dimensions of Cloninger's personality theory

| step | Predictive variable | Unstandardized Coefficients β | Standardized Coefficients β | T | P | $R^2$ | $\Delta R^2$ | F | P |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Persistence | -2.874 | -0.349 | 4.532 | 0.000 | 0.122 | ---- | 20.538 | 0.000 |
| 2 | Self-directedness | -.493 | -0.185 | -2.359 | 0.020 | 0.154 | 0.032 | 13.369 | 0.000 |

As shown above, among 7 dimensions of Cloninger's personality theory in the first step, persistence (β= -0.349) could predict 12.2 of variances of Internet addiction. Self-directedness was added to the prediction model at the second step which increased the explained variances of Internet addiction up to 15.4% of which 3.2% accounts particularly for self-directedness.

## 4. Discussion

This study aimed to predict Internet addiction based on Cloninger's temperament and character dimensions among female students of Allameh Tabatabaie University. The results showed that 48.7% and 51.3% of students had moderate and high Internet addiction, respectively, none of which was severe. Comparing these results with previous studies (Nasrollahi et al., 2015, Solhi, Armoon, Shojaeizadeh, & Haghani (2014), Vahabi, Vahabi, Rajabi, Taifuri, & Ahmadian, 2015) indicates that Internet addiction has an increasing trend that can lead to serious risks and damages of mental health and other Internet-addiction-related harms among students and even the whole society, for which some measures should be taken to resolve this issue.

Similarly, it was found that Internet addiction increases in students as novelty seeking and harm avoidance levels increase. In contrast, higher persistence and self-directedness decrease their Internet addiction. High scores in novelty-seeking indicate one's quick mood change, emotional behaviors and impulsiveness.

Subjects with high scores in novelty-seeking have features like exploratory excitability, being excited by novel stimulations, avoidance from frustration, creativity, quick-tempered, insistence on change, susceptibility to absent-mindedness, wasteful, and active and risk-seeking but they avoid regularity. In contrast, people with low novelty-seeking scores are rigid, slow-tempered, conditional, being more prone to repeat previous experiences, showing the disciplined way of working, and parsimonious both in time and money. These people are change-seeking, bored very quickly, impulsive and disordered.

Moreover, it can be said that novelty-seeking people often tend to do exploratory activities, be excitement seeker and against regularity and want to experience novel things (Ko et al, 2006, ko et al, 2010). Individuals with high novelty seeking readily engage in new activities but tend to neglect details and are quickly distracted or bored. Internet activities, especially online games, provide a highly varied virtual environment that satisfies the adolescents' novelty-seeking needs. Adolescents with high novelty seeking might engage in Internet activity with higher motivation and arousal responses. Therefore, high novelty-seeking may predispose an individual to heavy Internet use. This is similar to the effect of high novelty seeking on substance use experience (Ko et al, 2006). A high positive correlation between novelty-seeking and Internet addiction is explainable considering students' monotone lifestyle, low stimulus environment, lack of facilities, lack of attractiveness and various activities.

People with high harm avoidance experience a broader range of negative emotions more intensively (Cloninger, 2000). Based on Cloninger's viewpoint, harm avoidance is a heritable trait found to be an underlying factor of anxiety, depression and anger. However, researchers have shown that the features like shyness, impulsiveness, loneliness, anxiety, depression, neurosis features, anger and hostility, deprivation, embarrassment, stress-vulnerability are effective traits of Internet addiction. Indeed, this excessive experience of negative emotions (anger, anxiety, and depression) explains the level of Internet addiction and its continuance among students. These people do not have any behavioral inhibitor and suffer from several interpersonal problems, because they seek for virtual world and excessive use of the Internet to escape from these problems. Such people are pessimist and worry about predicting events, more fearful from uncertainty, indifferent to problems, experience more social inhibition, fatigue and weakness and show higher levels of Internet addiction. Harm avoidance is thought to reflect variation in the brain's punishment, or behavior inhibition system, which includes the sept hippocampal system, with serotonergic projections from the raphe nuclei in the brain system. Individuals with low harm avoidance are confident, optimistic, carefree, uninhibited, and energetic. High harm avoidance inhibits risk behavior with negative results. High harm avoidance predicts Internet addiction. Since Internet provides an anonymous virtual world and individuals usually perceive less responsibility and harm from it than they do in the real world, online disinhibition effect may relax individual with high harm avoidance in real life and make them vulnerable to Internet addiction (Ko et al, 2006)

Furthermore, the results of enter method regression (Table 5) showed that the persistence scale could explain 18.6% of variances of Internet addiction among students. Besides, the results of stepwise regression (Table 6) showed that persistence could explain 12.2% of variances of Internet addiction at the first step and this amount increased up to 15.4% after introducing self-directedness. This means that self-directedness accounts, particularly for 3.2% of variances of Internet addiction, which is consistent with the study of Hahn, Reuter, Spinath, and Montag (2017). To explain these findings,

the persistence scale in Cloninger's theory originates from individual differences in the mental system for regulation of alternative reinforcement in such a way that the signals of alternative punishments change to the signals of potential rewards, expecting that one continues its tasks. Diligence, continuity in practice despite pressure, being pioneered to do the task, compatibility in unexpected conditions and challenges in front of difficulties are general features of people with high scores on this scale. Indeed, these traits help diligent people to make life challenges more controllable and take them as an opportunity for learning and purposefully cope with problems rather than escape or avoid them. Those who are precise, plan for tasks, are diligent and try to progress definitely, cannot none-purposefully waste long hours surfing on the Internet (Khanjani, & Akbari, 2011). As mentioned above, this scale had the most predictability of Internet addiction among other scales, while people with higher persistence are more capable of self-control and self-regulation to enter the virtual world and its non-addictive use (Kaviani, & Poornaseh, 2005). To explain these findings, those with high self-directedness have more self-acceptance, less self-blame, are responsible and resourceful (Cloninger, & Svrakic, 2005) and have more solutions for managing their mental pressure and negative emotions. However, they are likely to show more self-regulation about Internet use and have more maturity and capability to coherence and govern their personal life.

Comparing similar studies on other disciplines and Universities' students with this study can be useful. To better explain the relationship between Cloninger's theory and Internet addiction more studies can be conducted on none-student populations. Moreover, the sample group consisted of only female students. It is recommended that more studies be conducted taking into account the gender to make the results more generalizable.

## 5. Conclusion

The results of the present study indicated that students with high novelty seeking are more prone to Internet addiction. Therefore, it is suggested that the students' novelty-seeking feature be directed by performing careful planning; hence, their internet addiction is prevented. In addition, it was found that the caution and behavioral inhibition of the students with high harm avoidance are affected when exposed to cyberspace, and their Internet addiction increases. Therefore, it is suggested that universities try to increase students' media literacy and subsequently prevent Internet addiction. The results showed that self-directedness and harm avoidance are negatively related to Internet addiction, which can predict Internet addiction among students. Such results can be useful for higher education system planners in teaching strategies to increase student self-directedness and persistence.

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## Conflict of Interest

The author declares that there is no conflict of interest.

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