Research Paper:

Modeling Structural Relationships of Metacognitive States With Tendency to Virtual Networks Through Mediating of Social Adjustment in Gifted Students

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ABSTRACT

Introduction: Cyberspace covers many aspects of human life and the tendency to cyberspace can influence his cognitive and emotional aspects.

Objectives: Therefore, the purpose of the present study was to model the structural relationships of metacognitive states and the tendency to virtual networks mediated by the social adjustment in gifted students.

Materials and Methods: This correlational-descriptive research using structural equations modeling was conducted on all 300 eleventh grade gifted students of Sampad High School studying experimental sciences in the academic year 2019 in Gorgan city. A total of 300 students were selected through the census method and evaluated by the Virtual Networks Questionnaire by Mojarradi et al. State Metacognitive Inventory by O'Neill & Abedi, and California Test of Personality. Data analysis was done by structural equation modeling using SPSS 18 and Amos 23 software.

Results: The results showed a significant negative relationship between metacognitive states and social adjustment, and tendency to virtual networks (P≤0.01). The research model was well-fit and confirmed. Also, 0.31 of the variance of the tendency to virtual networks was explained by metacognitive states and social adjustment and social adaptability played a mediating role in the relationship between metacognitive states and the tendency to virtual networks (P≤0.01).

Conclusion: Changes in tendency to cybersecurity can be explained directly based on metacognitive and indirect social adjustment states in gifted students. This study has practical implications for school counselors.

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1. Introduction

Using new technologies is one of the obvious manifestations of the modern world [1] and virtual networks also play an important role in the evolution of the people of the community as one of new aspects of these new technologies in the contemporary world [2, 3]. The major disadvantage of communications via virtual networks is that these communications are fundamentally text-based and, therefore, there are no visual and auditory signals compared with face-to-face interactions [4]. The tendency to virtual networks is influenced by cognitive, behavioral, and personality factors, such as meta-cognitive states [5].

Allen et al. [6] and Fergus & Spada [7] have shown that one of the most crucial aspects of the tendency of individuals to virtual networks is the level of cognition and metacognition. Metacognition is one of the famous cognitive constructs that influence the learning process and academic performance [8]. Metacognition refers to psychological structures, knowledge, events, and processes that contribute to the control, modification, and interpretation of thought [9]. It has influenced human beings' cognitive processing through the processes, such as control, monitoring, planning, and correction, and is effective in interacting with one's emotional processing style, mental health, or vulnerability to mental disorders [10]. Therefore, meta-cognition, as a construct, on which the individual's cognitive activities depend and can influence psychological disorders, should be considered [11].

On the other hand, due to the existence of improper cognitive processing, inefficient information processing structures will be created that result in reduced social interactions, and ultimately less adaptability. These structures are caused by an individual's mood, as well as the environment [12]. The term adjustment is used when a person is involved in a considerable and continuous process to express his talents and in the reaction to the environment, which can be effectively changed at the same time [13].

Also, adjustment refers to a state of complete equilibrium between the organism and the environment [14]. This process enables individuals to understand and predict the other individuals' behavior [15], control their behavior, and regulate their social interactions [16]. In this regard, Dehghanpour et al. showed that the level of using virtual networks has a positive and significant relationship with social adjustment and affection control [17]. Kaur indicated a significant relationship between addiction with virtual networks, perceived social self-efficacy, and social adjustment among the students, and also some differences were observed between the two genders regarding this issue [18].

Spada & Marino concluded that social adjustment and emotional processing are predictors of the students' use of virtual networks [19]. Chuang et al. reported significant relationships among cognitive-mental theories, the social adjustment in virtual networks, and self-efficacy resources in virtual networks affecting positive and negative behaviors and emotions in learners [20]. Concerning the tendency of the gifted students, recent studies, such as those conducted by Lavrijsen et al. [21] and Jonassen [22] have shown that gifted students' tendency to cyberspace, as a safe space, is increasing because the real world cannot meet their needs and can even affect their quality of life and interactions with family and teachers in the communication environment. On the one hand, gifted students sometimes incur many disadvantages in education, such as boredom,

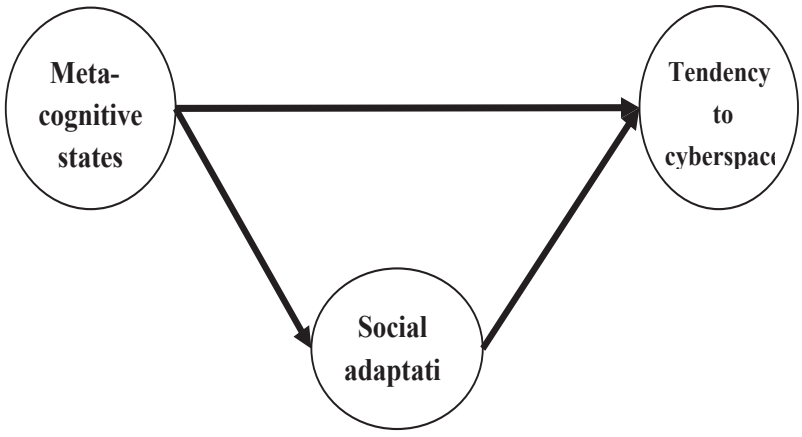

Figure 1. The conceptual model of the research

as the level of educational contents is always lower than their underlying cognitive-behavioral levels [23], and on the other hand, the communication circle of their peers is smaller than others and they face a highly competitive environment, which causes them to experience behavioral and emotional problems and even more frustration. Therefore, such cases harbor cyberspace [24].

Extreme tendencies to virtual networks cause them to spend less time with their families leading to negative effects on their families [25] and an increase in feelings of loneliness, depression, and low self-esteem [26]. They are also more vulnerable to financial, physical, and cultural problems [27]. Therefore, to bridge the gap between the findings of previous studies (Figure 1), the present study aimed at investigating the mediating role of social adjustment in the relationship between meta-cognitive states and the tendency to virtual networks in gifted students.

2. Materials and Methods

This correlational-descriptive research using structural equations modeling was conducted on all 300 eleventh grade gifted students of Sampad High School studying experimental sciences in the academic year 2019 in Gorgan city. A total of 300 students were selected through the census method considering the number of observed variables and the assigning the coefficient 20 for each observed variable (13 variables observed in the model) according to the Klein method [28], as well as the probability of the incomplete questionnaires.

Inclusion criteria included male gender, students of Sampad high schools, eleventh-grade students, residing in Gorgan city, signing the informed consent form, no psychological and physical problems for cooperation according to the subjects' reports. The exclusion criteria included reluctance to complete the questionnaires or withdrawal from the study for any reason.

Before sampling, the students were explained about the research objectives and assured of the confidentiality of the information. The informed consent letter was received from the students and then, the questionnaires were provided to the samples.

Data were collected by the Virtual Networks Questionnaire designed by Mojarradi et al, State Metacognitive Inventory developed by O'neil and Abedi, and California Compatibility Questionnaire (CCT). Data analysis was done by structural equation modeling using SPSS 18 and Amos 23 software.

The Virtual Networks Questionnaire

This questionnaire was designed by Mojarradi et al [29] and consists of 19 questions assessing three aspects of the amount of use, type of use, and the amount of trust in the user. It is scored on a 5-point Likert scale from strongly disagree to strongly agree. The construct and content validity of the scale was confirmed by the developers with the Cronbach's alpha coefficient of 0.76 for the amount of use, 0.80 for the type of use, 0.71 for trust in users, and 0.83 for the whole scale. In the present research, its reliability using Cronbach's alpha method was obtained 0.81 for the amount of use, 0.79 for the type of use, 0.66 for the amount of trust in users, and 0.80 for the whole scale.

State Metacognitive Inventory

This questionnaire was developed by Oneil and Abedi with 20 items and 4 subscales of awareness, cognitive strategies, planning, and self-study [30]. Five phrases are allocated to each subscale and the subjects should score their level of agreement or disagreement with each item on a 4-point Likert scale (not at all=1, sometimes= 2, usually= 3, and very often= 4). The construct and content validity of the scale has been confirmed by the developers. Its reliability has been reported with the Cronbach's alpha of 0.72 for meta-cognitive awareness, 0.81 for cognitive strategy, 0.85 for planning, 0.87 for self-review, and 0.91 for the whole scale. Also, in Salarifar and Pakdaman research [31], the reliability was calculated using Cronbach's alpha method and with the coefficients of 0.79 for meta-cognitive awareness, 0.83 for cognitive strategy, 0.81 for planning, 0.82 for self-review, and 0.94 for the whole scale. In the present research, its reliability was obtained 0.75 for meta-cognitive awareness, 0.74 for cognitive strategy, 0.81 for planning, 0.82 for self-review, and 0.8 for the whole scale using Cronbach's alpha method.

California Test of Personality

This questionnaire was developed by Thorpe et al. and has 91 items [32]. It has two subdivisions of personal adjustment and social adjustment. Social adjustment was used in this study and it has six subscales, including social frameworks, social skills, antisocial interests, school relationships, family relationships, and social relationships in the form of yes and no questions, in which the score one indicates correct answers and 0 represents the false ones based on the test's correction key of all the six subscales. The content and construct validity of the scale were confirmed by the developers and its re-

liability using the Kuder-Richardson method was 0.87 for social frameworks, 0.82 for social skills, 0.80 for antisocial interests, 0.76 for school relationships, 0.89 for family relations, 0.87 for social relations, and 0.90 for the whole scale. Also, it's content and construct validity were confirmed by Khodayari Fard [33] and its reliability was obtained 0.85 for social frameworks, 0.80 for social skills, 0.78 for antisocial interests, 0.74 for school relationships, 0.80 for family relationships, 0.83 for social relationships and 0.89 for the whole scale. In the present study, its reliability using the Kuder-Richardson method was 0.83 for social frameworks, 0.78 for social skills, 0.76 for antisocial interests, 0.7 for school relationships, 0.83 for family relations, 0.84 for social relations and 0.87 for the whole scale.

3. Results

First, statistical assumptions were evaluated using the skewness–kurtosis test, box plot, and Kolmogorov-Smirnov test, and the normal distribution of the data was confirmed. The three-variable measurement model was confirmed, as well.

The results of Table 1 show a significant correlation between metacognitive states and social adjustment, and tendency to cyberspace in the subjects. There was a significant negative relationship (P=0.01) between meta-cognitive states and social adjustment, and tendency to cyberspace, i.e. the tendency to cyberspace in students decreased when meta-cognitive states and social adjustment increased.

According to Table 2, the value of RMSEA is equal to 0.031; therefore, it was less than 0.1 that indicates that the mean square of the model errors was appropriate and the model was acceptable. Also, the x^2/df was between 1 and 3 (2.754), and the goodness of fit index, comparative fit index, and normed fit index values were approximately equal to and greater than 0.9, indicating that the measurement model of the research variables as appropriate.

According to Table 3, metacognitive states' pathways and social adjustment had a significant direct effect on the tendency to cyberspace. Specifically, metacognitive states with a beta of -0.236 affected the tendency to cyberspace and social adjustment with a beta of -0.198 affected the tendency to cyberspace.

As can be seen in Table 4, two indirect pathways were considered based on the values obtained in the bootstrap method were significant at the level of 0.01 and were confirmed.

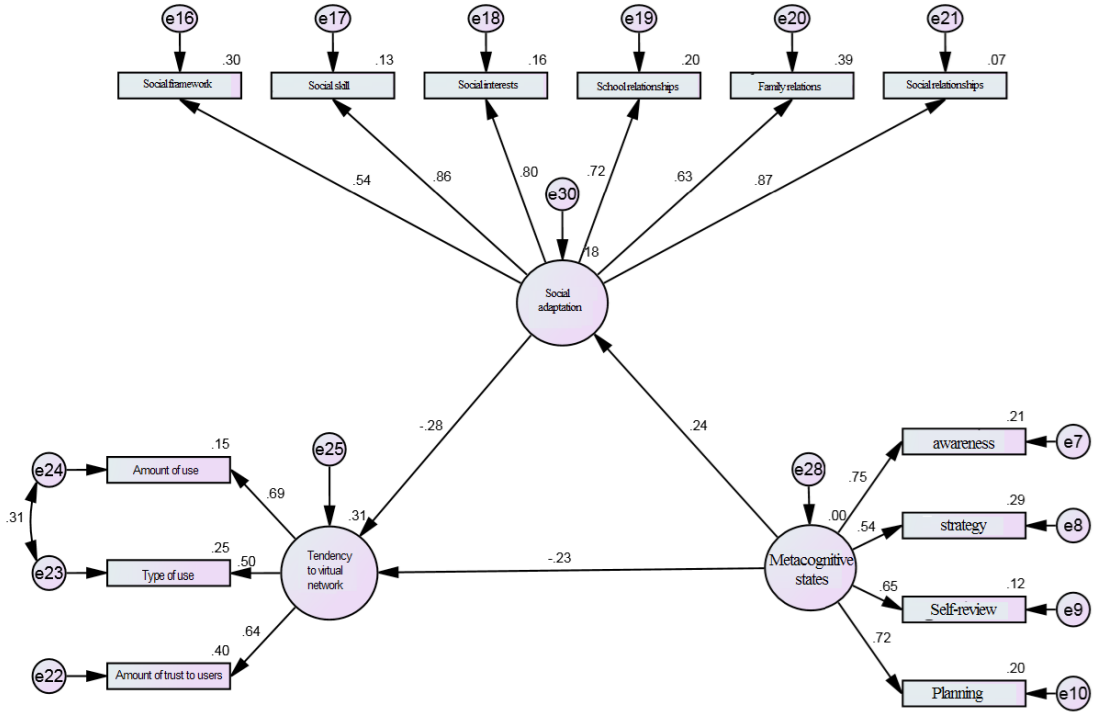

Figure 2. The final tested model along with the standardized prediction statistics

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Table 1. Descriptive statistics and Pearson correlation matrix between metacognitive states and social adjustment, and the tendency to cyberspace

Variable	Mean±SD	1	2	3	4	5	6
Metacognitive awareness	14.46±3.60	1					
Metacognitive strategy	15.04±2.43	0.48*	1				
Self-review	12.26±3.12	0.52*	0.62*	1			
Planning	10.96±3.23	0.54*	0.50*	0.65*	1		
Metacognitive states	52.68±9.70	0.73*	0.80*	0.84*	0.71*	1	
Social relationships	5.42±1.864	0.25*	0.18*	0.31*	0.24*	0.22*	1
Family relations	4.75±1.086	0.28*	0.31*	0.20*	0.16*	0.19*	0.42*
School relationships	4.10±1.705	0.23*	0.23*	0.28*	0.18*	0.18*	0.49*
Social interests	4.96±1.246	0.28*	0.25*	0.24*	0.29*	0.19*	0.46*
Social skill	3.75±1.778	0.21*	0.28*	0.19*	0.27*	0.25*	0.52*
Social framework	4.11±1.771	0.26*	0.22*	0.18*	0.20*	0.24*	0.62*
Social adjustment	23.27±5.826	0.33*	0.24*	0.24*	0.28*	0.36*	0.82*
Amount of use	13.73±2.461	-0.16*	-0.18*	-0.14*	-0.12**	-0.21*	-0.18*
Type of use	10.24±1.847	-0.14**	-0.21*	-0.19*	-0.18*	-0.24*	-0.16*
Users trust	15.35±1.708	-0.17*	-0.19*	-0.20*	-0.19*	-0.20*	-0.14**
Tendency to cyberspace	39.32±5.193	0.19*	-0.22*	0.23*	-0.20*	-0.29*	-0.19*

Variable	7	8	9	10	11	12	13	14	15	16
Metacognitive awareness										
Metacognitive strategy										
Self-review										
Planning										
Metacognitive states										
Social relationships										
Family relations	1									
School relationships	0.42*	1								
Social interests	0.53*	0.44*	1							
Social skill	0.39*	0.45*	0.44*	1						
Social framework	0.47*	0.49*	0.52*	0.47*	1					
Social adjustment	0.80*	0.78*	0.61*	0.63*	0.58*	1				
Amount of use	-0.10*	-0.20*	0.14*	-0.19*	-0.17*	-0.24*	1			
Type of use	-0.09*	0.13*	-0.18*	-0.10**	-0.18*	-0.28*	0.50*	1		
Users trust	0.14**	0.17*	-0.21*	-0.16*	-0.17*	-0.17*	0.43*	0.54*	1	
Tendency to cyberspace	-0.18*	-0.20*	-0.23*	-0.20*	-0.19*	-0.35*	0.61*	0.69*	0.70*	1

* Significant at the level of 0.01;

** Significant at the level of 0.05

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Table 2. Fit indices derived from data analysis and variables

Test	Acceptable Values	Obtained Values
X^2/df	>3	2.754
RMSEA	>0.1	0.031
GFI	<0.9	0.994
NFI	<0.9	0.998
CFI	<0.9	0.990
DF		

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x^2/df: Chi-square relative to its degree of freedom, RMSEA: Root Mean Square Error of Approximation, GFI: Goodness of Fit Index; NFI= Normed Fit Index, CFI= Comparative Fit Index, DF= Degree Of Freedom =119

Table 3. Direct model estimation using the maximum likelihood (ML3) method

Variable	B	β	R^2	t	P
Metacognitive states on tendency to cyberspace	-0.413	-0.236	0.098	5.540	0.000
Social adjustment on tendency to cyberspace	-0.304	-0.198	0.060	4.321	0.001

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Table 4. Direct estimation of the model using the Bootstrap method

Variable	Values	Lower Limit	Upper Limit	P
Metacognitive states on the tendency to cyberspace through mediated by social adjustment	-0.319	-0.154	-0.387	0.000

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According to Figure 2, 0.31of the variable dispersion of tendency to cyberspace was influenced by social adaptation and metacognitive states.

4. Discussion

The main purpose of this study was to investigate the mediating role of social adjustment in the relationship between metacognitive states and tendency to cyberspace in gifted students, and according to the results, the social adjustment had an indirect effect in the relationship between metacognitive states and the tendency to cyberspace in gifted students. These results are in line with the findings of Allen et al. [6], who found that inappropriate use of virtual networks is due to the level of emotions' processing and metacognitive beliefs in users. Kaur [18] concluded that there is a significant relationship between addiction with virtual networks, perceived social self-efficacy, and social adjustment in the students, which were also different between the two genders.

Chuang et al. [20] reported significant relationships between cognitive theories, the social adjustment in virtual networks, and self-efficacy resources in virtual networks, including positive and negative emotions and behaviors in learners. Dehghanpour et al. [17] showed that the level of using virtual networks has a positive and significant relationship with social adjustment and affection control. Spada & Marino [19] in their research concluded that social adjustment and emotional processing are predictors of students' use of virtual networks.

In explaining these results, it can be stated that proper management of self-recognition in stressful conditions creates a better metacognitive ability and metacognitive states under different circumstances [6], thus the person receives less environmental pressures and his performance improves in all conditions [30]. External factors, which can explain the adjustment construct as the adjusting mediator of behaviors and choices, are the characteristic of cognitive processing and cognitive adjustment [19]. From a cognitive sciences perspective, it

can be pointed out that social adjustment is known as a category of schemes based on information processing, which includes symbolic and non-symbolic embodiments and processes [12]. Also, a reduction in expression of affection is essentially indicative of the absence or the misregulation of cognition. Therefore, any damage to cognitive processing capacities based on failure in cognition may be a potential risk factor for several risky behaviors and problems [8].

On the other hand, the adjustment seems to refer to a cognitive-emotional style resulting in a specific impairment in positive cognitive processing and emotional expression and is defined as distress in verbal expression of affection [7]. Positive adjustment appears to have components similar to these avoidant and problem-oriented coping strategies, one of which is characterized by a difficulty in distinguishing between physical sensations and feelings [9] so that people with negative adjustment have deficiencies in internal emotions and verbal expression of affection, and their bodies can express their emotions on their behalf [20].

Cognitive processing can be done by metacognitive states, such as metacognitive strategies and metacognitive awareness [15]. When the positive adjustment is made, the individual would not be emotionally and cognitively distressed and frustrated, which does not impair the organization of one's emotions and cognitions [11]. Thus, these individuals are usually able to identify, understand, and describe their emotions and are more capable of adapting to stressful situations because of their emotional awareness and ability for cognitive processing of their emotions [34]. When individuals cannot express and delete the negative emotions caused by stress, then the psychological aspect of the emotions and psychological distress expression systems increases, which results in a tendency to an unadaptable behavior and in all environments, such as cyberspace to deplete emotions and pressures to reduce the tension [35].

It is suggested that to conduct this study in larger geographical areas using samples from different and larger communities to make the results more generalizable. Considering emotion regulation-based training and metacognitive states improvement, counselors and psychologists can reduce the negative tendencies to cyberspace in gifted schools.

This research faced some limitations; for example, the research samples were limited to the gifted students' schools, male gender, eleventh-grade gifted students, those studying in the first semester of the academic year 2019 in Gorgan city, and also data collection was done using self-reported questionnaires.

Our results showed that social adjustment plays a mediating role in the relationship between metacognitive states and the students' tendency to virtual networks, and in general, 0.31 of the explained variance of the tendency to cyberspace can be explained by social adjustment and metacognitive states in direct and indirect paths. In general, the students with stronger metacognitive states have a better social adjustment and less negative tendency to cyberspace.

Ethical Considerations

Compliance with ethical guidelines

The present study was approved by the Islamic Azad University, Ahvaz branch (Ethics Code: IR.IAU.AH.REC.1398.059).

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Authors' contributions

All authors contributed equally in preparing all parts of the research.

Conflict of interest

There is no conflict of interest.

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