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**MODELING LATENT VARIABLES OF INFORMATION PROCESSING SPEED  
AND OPENNESS TO EXPERIENCES WITH STUDENTS' CREATIVITY AND  
DETERMINING MEDIATION ROLE OF INTELLIGENCE**

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**ABSTRACT**

One of the most important features of human is their power of thinking and the best showing of human thoughts is creative thinking. The power has been able so far to make decisions and solve problems. Creativity is one of the mental features of persons or their power to solve a problem efficiently. In fact, creativity refers to flexibility of persons or ability of finding several answers for a unit question. Creativity can be also creation of an emerging product, which can be appeared from relationship among individuals' personalities on one hand, and from conditions and event of life on the other hand. Creativity is one of the most concepts of individual differences, which can affect human life significantly. The present study would predict creativity using structural equation

modeling method and also using structures of fluid and crystallized intelligence; information processing speed; and openness to experiences. Studied population includes all students of human sciences in Tehran University and also applied sample includes 481 volunteer students. The sample would respond to Wechsler intelligence tests; divergent thinking test; creativity questionnaires in daily life; creative growth; self-evaluation creativity; two tests of ZVT and DT; and questionnaire of openness to experiences. Structural equations modeling would be also applied in order to investigate assumed models and study relations among the variables.

**Keywords: Information Processing Speed, Openness To Experiences, Intelligence, Creativity, Structural Equations**

## **INTRODUCTION**

In cognitive and psychological theories, individual differences are so important in cognitive activities. However, this issue is vital for unity and future changes of psychology and lack of existence of oriented theories in this regard would increase risk of isolating to several strings, which are weakly related together and have no common idea. As it was mentioned, creativity is a significant structure in psychology of individual differences and has been considered less than similar issues such as intelligence by researchers. Lack of studies can be probably related to problems in defining and measuring creativity [1].

Through having an overview on relevant literatures, it could be mentioned that there is not still an integrated pattern for understanding creativity; although, about

70 years has passed beginning of studies in regard with creativity [2]. On the other hand, most studies in this regard are mainly related to empirical studies and still models based on basic cognitive and psychological factors are rarely under consideration. In addition, most relevant studies are mainly limited to simple correlation assessments and have not achieved comprehensive and theoretical stages. Due to lack of explanatory models of creativity based on individual differences in literature, the present study has tended to fill gap in literature and expand literature of the study [3].

At the present study, one of the most important psychological structures has been investigated and its structure has been also explained. Additionally, the study has

applied structural equation in order to investigate role of cognitive and individual factors of creativity. Since multidimensional view for variables can provided an integrated conclusion for their direct and indirect relations, the study has considered mostly the mentioned important structure of human ability [4]. In other words, the study has investigated simultaneously relationships between two cognitive and personality variables for information processing speed or openness to experiences with creativity in a study. The study has also investigated significance level of intelligence in relations between information processing speed and openness to experiences with creativity through using advanced statistical method of structural equation modeling [5].

Since the study has been aimed at explaining structure of creativity based on basic personality features and basic cognitive abilities, using literature of creativity the study has selected several important individual variables and their role in explaining the structure. As it was mentioned, the most focus of previous studies has been on exploring correlated relations of a variable with creativity.

However, due to complexity of this issue, recognition of a set of effective variables in creativity would provide an exact image about it. In other words, the present study has been aimed at determining effective factors in creativity through simultaneous assessment of models' direct and indirect variables [6].

One variable of individual differences, which has been investigated frequently in literature of creativity, is intelligence. Contrary to conducted studies in this regard over the years, still the issue is a critical and challenging issue. There are limited studies in regard with testing and modeling structural equations related to relationship of creativity with intelligence and other effective variables in this significant issue. However, most conducted studies in this regard have been in kind of simple correlation study; multiple regression; or experimental patterns for increasing creativity [7]. Yet, more studies are required in regard with causal structure of creativity, since considering creativity and intelligence in form of latent variables in close to reality and some deficits of multiple regression can be removed through structural equations. the most important question would be as follows

where there is a positive and significant relationship between creativity and intelligence: whether intelligence can have causal effect on creativity or the relation is just because of morphological changes? Recently, researchers have concluded that intelligence is a variable, which can affect creativity and creative phenomena. For example, Rindermann, Michou, and Thompson (2011) have investigated direct effect of intelligence on creative activities of children and have found that intelligence can significantly affect creativity. Nusbaum and Silvia (2011) have found also in their study that fluid intelligence can predict changes of components during doing task of producing ideas [8].

Benedek, Franz, Heene, and Neubauer (2012) have also found that fluid nature of intelligence can improve creative abilities. Almost all recent studies in this regard indicate that intelligence can affect creativity directly. However, an important gap in this studies is that, whether the effect or relations between intelligence and creativity is resulted from another basic change or not? On the other hand, recent studies have identified some variables, which can explain changes in both creativity and intelligence. Here, two

important variables would be investigated including information processing speed and openness to experiences [9].

Dabiri (1993) has investigated processing speed as a determinant factor for improving cognitive abilities. Processing speed in early stages of understanding would affect cognitive growth of individuals during growing time. Small differences in processing speed might lead to big differences in intelligence and cognitive ability [10]. Recently, role of information processing speed has been considered significantly by researchers; for example, Rindermann et al (2011) in their study have found that speed of information processing has direct and indirect effect on creativity. Since the main objective of the study has been investigation of creativity based on basic variables of individual differences and studying literature of the study shows an important and effective variable for creativity, one of the basic features of personality has been selected, which is mostly related to genetics and is significantly related to intelligence and creativity. This is because, existed literature in this regard indicates that relationship between intelligence and creativity can be resulted from effect of

another variable [11]. Variable of openness to experiences is a variable, which can predict both intelligence and creativity. However, the effect is in average level and would suggest new ideas, which can't be explained completely by openness to experiences, but researchers of creativity should also consider other factors [12].

**Chamuro, Permusic and Furnham (2006)** have found that intelligence psychology and creativity psychology have been originated from different traditions of psychology and have been recently studied commonly in relevant studies. Studying wide literature of intelligence, creativity, and openness to experiences indicates relationship among the three domains. Study of personality is one of the oldest domains with regard to creativity sciences. Structure of openness to experiences would be also related to intelligence in terms of theoretical domain and considering obtained results from correlation studies [13]. Openness to experiences has the closest relation with intelligence and creativity among 5 personality factors. Intelligence and creativity would also be related to each other in average level. Therefore, the present study has proposed a theoretical

model including basic variables of individual differences in order to predict creativity. The study can be considered as an important step toward expanding literature and introducing an important theoretical pattern for future studies, since structure and effectiveness of the variables has been studied in details at the present study [14].

Due to mentioned literature, research question can be as follows: whether a structural model can be provided, in which information processing speed and openness to experiences can predict creativity as latent factors of higher levels? Whether intelligence can play role of a mediator between two variables of information processing speed and openness to experiences?

## **METHODOLOGY**

The present study has been in kind of basic studies according to its objective and data collection method has been in kind of descriptive method and based on correlative patterns and structural equation modeling method. Studied population has been selected from all students of human sciences in Tehran Universities for first semester of 2011-12. Among these universities, Allame Tabatabayi, Tehran

University, and Shahid Beheshti University have been selected as the sample of the study [15]. Since answering Wechsler test and other questionnaires required a lot of time on behalf of researcher and participants and possibility of answering random tests has been low and according to nature of measuring random sampling was not provided like other studies, an announcement was published in media under title of "IQ and creativity test for free" for attracting participants. Author of the study has used assistance of 4 experts in Clinical Psychology, who had passed previously courses of Wechsler testing, for data collection and conducting tests. All tests were implemented individually. In general, total number of sample was equal to 500 persons, which scores of 19 persons were omitted because of incomplete filling of some questionnaires. 260 out of 481 persons were female and 221 persons were male. Age average of females was equal to 24.08 with standard deviation of 2.95 and was equal to 24.10 with standard deviation of 3.27 for males. 229 out of all students were in BA level; 195 students were in MA level; and 57 students were in PhD level [16].

Openness to experiences was evaluated through 9 small-scale questions in questionnaire of 5 personality factor NEO-FFI. 9 out of 12 questions for openness to experiences were placed in 3 different levels. The levels included aesthetic interests (questions 3, 6, and 9); intellectual interests (questions 1, 10, and 12); and being unconventional (questions 2, 4, and 8). Answering method has been in form of 5-point Likert scale (absolutely disagree, disagree, no idea, agree, and absolutely agree). In a study by **Costa and Maccrae (1992)**, validity of the factor was obtained equal to 0.65. Validity coefficient of the mentioned factor in the present study has been equal to 0.63.

### **IQ Test**

In order to test IQ, subscales of Wechsler have been applied for adults. Horen ranking has been also applied for evaluating fluid intelligence. In WAIS-R, fluid intelligence includes digit span, image setting, similarities, designing cubes, and assembling pieces. Since validity of subscale of assembling pieces in studies has been reported usually in low level, and on the other hand, since there have been some similarities in both factors of fluid and crystallized intelligence, just 3

dimensions of digit span, image setting, and designing cubes have been applied for assessing fluid intelligence [17]. Abedi, Omid, and Rezayat (1995) have confirmed also validity of the mentioned test. Validity coefficient for re-test of subscales has been between 0.58 and 0.87 and also validity coefficient of IQ has been between 0.76 and 0.94. The present study has divided sample to two parts and obtained validity for whole sample has been between 0.58 and 0.82.

### **Creativity Test**

**Divergent Thinking:** In order to test divergent thinking, three divergent thinking tasks have been applied. In this test, participants were asked to produce unusual applications for brick, knife, and box. For each task, 3min was considered. Then, unusual answers were added together and their average was an indicator for divergent thinking [18]. At the present study, test-retest method has been applied in order to evaluate validity of the test and its validity was obtained equal to 0.83.

**Everyday Creative Behaviors:** in order to measure creativity in everyday behavior, 28-option questionnaire of everyday creative behavior has been applied on a 5-point scale. Coefficient of Cronbach Alpha,

obtained by **Dollinger (2007)**, has been equal to 0.83. At the present study, coefficient of Cronbach Alpha has been equal to 0.85.

### **Creative achievement questionnaire:**

creative achievement has been evaluated using creative achievement questionnaire through a scale in 10 different points. In each point, individuals have answered those questions, which have been focused on previous tasks [19]. Score of each question was equal to number of the same question and score of each point was obtained through adding scores of questions of the same point. Sum of scores in each point was able to determine score of the same point and sum of all scores of 10 points would present total score [20]. Validity and consistency of the questionnaire was obtained equal to 0.81 by Carson, Peterson, and Higgins. At the present study, coefficient of Cronbach alpha has been equal to 0.88.

**Self-reported creativity:** self-reported creativity has been calculated using self-reported creativity questionnaire based on a 5-point scale. Creativity of individuals has been evaluated by 10 questions, 9 of which have been related to measuring creativity in different domains and one of them has

been related to measuring creativity totally [21]. Validation of the questionnaire has been obtained equal to 0.87 by Kaufman and Baer using Cronbach alpha. At the present study, coefficient of Cronbach alpha has been equal to 0.82.

**Information processing speed test:** in order to measure information processing speed, two tests of ZVT and KDT have been applied [22]. In these tests, participants should connect numbers 1 to 90 by some lines. The test should be completed within 30sec. in order to scoring test, at the first the time limitation should be considered and then scores would be obtained based on number of digits, which have been connected together within 30sec. at the present study, validity has been obtained through two methods of test and retest equal to 0.84. KDT test is similar to ZVT test and the only difference between them is that in this test, English letters are also spread inside the circles in addition to ordinary numbers. Participants should start with No.1 and then letter A, No.2 and then B and ...and connect them together. At the present study, validity has obtained equal to 0.81 using test-retest method [23].

## **RESULTS**

**Table 1** has presented descriptive indices of participants in each variable of the study.

Before evaluating main assumptions of the study, assumptions of structural equation modeling have been evaluated. The assumptions are as follows: (1) normality of variable distribution; (2) linear relation among variables; (3) observed multiple variables; (4) over-identified model; (5) lack of linearity among hidden endogenous and exogenous variables; and finally (6) distances of measuring scale.

In order to test normality of studied variables, Kolmogorov-Smirnov test (KS-test) has been applied. According to the results from early analysis of data and amount of Kolmogorov-Smirnov Z ( $p < 0.01$ ), no significant difference among sample members regarding variables of the study and distribution of all variables reported. About the second assumption, table2 has presented correlation matrix among hidden variables [24]. Clearly, all variables have linear relation and there is significant relation among hidden variables of the study ( $p < 0.01$ ). Therefore, assumption ocausal relation among variables has been confirmed. At the **Table 2**, the highest correlation relation is related

to openness to experiences with creativity ( $r=0.7$ ).

Third assumption, based on presence of more than 3 indicators for endogenous and exogenous variables, has been confirmed. About fourth assumption, it should be mentioned that those model can be over-identified, which have more than one answer and through the answers, estimation of each parameter would be possible [25]. Software programs of structural equation modeling can conduct consistency estimations as a part of model validation and they are mainly related to under-identified conditions of logical warnings. According to outputs of Amos program, no warning has been appeared based on under-identification. At the present study, applied structural equation model has been evaluated, as table3 indicates. Outputs of the model indicate that consistency has been observed in this model. Due to obtained results in table, DOF of 82 confirms model's consistency [26].

About fifth assumption, Cline (2005; quoted from Weston and Gore, 2005) has referred those correlations of two variables more than  $r=0.85$  can indicate multiple linearity. Correlation among variables of the study indicates that the assumption has

been confirmed. Finally, sixth assumption, based on nature of data, has been confirmed [27].

Table4 has presented Pearson correlation among all variables of the study. Clearly, there is significant correlation among dimensions of a structure, which confirms validity of tests and questionnaires of the study. For example, there is correlation between two dimensions of information processing speed  $r=0.55$ ; or there is significant correlation among dimensions of practical intelligence [28].

After evaluation of assumptions and correlations among variables, and before evaluating main assumption, creativity would be predicted using predictor variables (information processing speed; fluid intelligence crystallized intelligence; and openness to experiences). Since using regression methods has some limitations; for example variables can't be considered latently or correlation among predictor variables can't be considered, researchers have conducted the work using structural equations. Obtained results from regression have been presented in **Figure 1**. As it is clear in **Figure 1**, weight of standard regression for openness to experiences on creativity is equal to 0.54 and weight of

non-standard regression is equal to 0.318, which is significant in confidence level of 1% ( $p < 0.01$ ). The significance level has been presented in **Table 4**. Weight of regression for openness to experiences is higher than other weights. For example, standard regression of information processing speed on creativity is equal to 0.25 and weight of non-standard regression is equal to 0.040. It should be noted that, in this study fluid and crystallized intelligence have not been resulted in significant prediction of creativity as it is shown in **Table 5**.

Before investigating the assumption in order to test effect of mediator variable on proposed model and to determine its significance, **Baron and Kenny method (1986)** has been applied. According to this method, 4 steps have been conducted with 3 regression equations and it was found that, intelligence would mediate relationship between openness to +experiences and creativity.

At the first step, regression coefficient of openness to experiences and creativity was calculated and openness was applied as one and only predictor variable for creativity. Obtained results have indicated that standard path coefficient of openness to

experiences toward creativity (0.698) has been significant in level of 1% ( $p < 0.01$ ). At the second step, regression coefficient of openness to experiences and intelligence was calculated and openness was the only predictor of intelligence. Obtained results indicate that standard path coefficient of openness to experiences toward intelligence (0.341) has been significant in level of 1% ( $p < 0.01$ ). At the third step, regression coefficient of openness to experiences was calculated for intelligence and creativity and openness and intelligence were simultaneously as predictors for creativity. Obtained results indicate that, when intelligence is added to creativity as the second predictor variable, regression of the first predictor variable would be decreased (0.565); although, it would be still significant in level of 1% ( $p < 0.01$ ). This situation would confirm effect of intelligence in this regard. In order to use Sobel Formula (1982), regression coefficients and standard deviation of two paths were required: Regression coefficients for openness to experiences  $\rightarrow$  intelligence  $\rightarrow$  creativity. T ratio ( $t = 11.11$ ) was obtained based on Sobel theory (1982), since if the ratio is more than  $\pm 1.96$ ,  $H_0$  would be rejected in level of

$\alpha=0.05$ . Therefore, considered path was significant as it was expected based on previous results. In general, obtained results have confirmed indirect relationship between openness to experiences and creativity through applying intelligence [29].

### Mediation Intelligence Test

Moreover, in order to test effect of mediator variable of intelligence in relation of information processing with creativity in proposed model and also to determine its significance, 4 steps would be required as follows. According to this method, 4 steps have been conducted with 3 regression equations and accordingly, it was found that intelligence would mediate relationship between information processing speed and creativity.

At the first step, regression coefficient of information processing speed and creativity was calculated and information processing speed was applied as the only predictor variable for creativity. Obtained results indicated that, coefficient of standard path for processing speed to creativity (0.512) has been significant in level of 1% ( $p<0.01$ ). At the second step, regression of information processing speed and intelligence was calculated and processing

speed was applied as the predictor variable for intelligence. Obtained results indicated that coefficient of standard path for processing speed to intelligence (0.383) has been significant in level of 1% ( $p<0.01$ ). At the third step, regression coefficient of information processing speed, intelligence, and creativity was calculated and both processing speed and intelligence were applied as predictor variables for creativity. Obtained results indicated that when intelligence is added to regression as the second predictor, regression of first predictor would be decreased (0.331); although, it would be significant in level of 1% ( $p<0.01$ ). This situation would confirm effect of intelligence in this regard. In order to use Sobel formula (1982), regression coefficients and standard deviation were required in twppaths: regression coefficient for information processing speed path→ intelligence→ creativity. T ratio ( $t=32.1$ ) has been obtained based on Sobel theory (1982), since if the ratio is more than  $\pm 1.96$ ,  $H_0$  would be rejected in level of  $\alpha=0.05$ . Therefore, considered path has been significant according to previous results. In general, obtained results have confirmed indirect relationship of

information processing speed with creativity through applying intelligence.

**Table 6** has presented direct, indirect, and total effects of all variables on each other. All the coefficients have changed into standard form and should be between 0 and 1. In order to investigate validity of the model, due to literature of proposed approach, structural equations have been applied. **Figure 2** has presented standard coefficients and correlations among latent variables. Before assessing coefficients of path and regression weights, validity indices should be evaluated. As it is obvious in **Table 7**, model's validity indices are approximately far away from

desired amount and the model can't be considered as validation model. For example, amount of index CFI is equal to 0.741, which is significantly less than desired value (0.90).

Since validation indices of proposed model don't have desired value, regression weights would not be evaluated and hence, proposed model is not valid as higher level variable for direct effect of information processing speed and openness to on creativity; it is not valid also for effects of intelligence as mediator variable between openness to experiences with processing speed and creativity.

**Table 1: Descriptive statistics of research variables (n=481)**

Variable	Mean	Standard deviation	Lowest score	Highest score
1.information processing test (ZVT)	50	10	31.04	77.88
2.information processing test (KDT)	50	10	29.55	74.07
3.openness to experiences (aesthetics)	10.87	2.98	7	15
4.openness to experiences (intellectual interests)	11.13	3.12	6	15
5.openness to experiences (being unconventional)	10.02	2.34	6	15
6.creativity (divergent thinking)	8.35	3.21	4	17
7.creativity (self-evaluation creativity)	35.32	8.54	21	48
8.creativity (everyday creative behaviors)	33.61	13.56	5	39
9.creativity (creative achievement)	14.23	10.25	2	22
10.intelligence (words treasury)	11.30	3.01	8.12	14.33
11.intelligence (digit span)	10.99	3.11	7.34	14.54
12.intelligence (information)	11.20	2.45	8.36	14.12
13.intelligence (understanding)	10.98	2.34	7.21	13.87
14.intelligence (designing cubes)	11.03	3.12	7.21	13.67
15.intelligence (image setting)	11.13	2.93	7.76	13.45

Table 2: Results of correlation among hidden variables in whole model

	1	2	3	4
1.openness to experiences	1			
2.information processing speed	0.26 **	1		
3.intelligence	0.35**	0.37**	1	
4.creativity	0.7**	0.7**	0.59**	1

\*\* Correlation is significant in level of 1% (\*\*p<0.01)

Table 3: Evaluating consistency of proposed model

Model	No of sample's torques	No of different parameters	DOF
1	132	50	82 (132-50)

Table 4: Pearson correlation among variables of the study

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.information processing test (ZVT)	1														
2.information processing test (KDT)	** 0.55	1													
3.openness (aesthetics)	0.15	0.17	1												
4.openness (scientific interests)	0.13	0.15	** 0.55	1											
5.openness (being unconventional)	0.13	0.16	** 0.65	** 0.59	1										
6.creativity (divergent thinking)	** 0.31	** 0.39	0.25	** 0.32	** 0.38	1									
7.creativity (self-evaluation creativity)	* 0.25	** 0.27	** 0.45	** 0.43	** 0.34	** 0.34	1								
8.creativity (everyday behaviors)	** 0.33	** 0.31	** 0.37	** 0.42	** 0.26	* 0.25	** 0.55	1							
9.creativity (creative achievement)	* 0.21	** 0.29	** 0.43	** 0.49	** 0.45	* 0.24	** 0.61	** 0.61	1						
10.intelligence( words treasury)	0.19	* 0.24	** 0.45	0.17	** 0.26	** 0.29	** 0.33	** 0.43	** 0.43	1					
11.intelligence (digit span)	* 0.20	* 0.20	0.13	0.05	0.12	* 0.21	0.15	* 0.23	*8 0.35	** 0.52	1				
12.intelligence(i nformation)	0.17	** 0.26	0.13	* 0.25	0.15	** 0.32	** 0.37	** 0.29	** 0.42	** 0.72	** 0.56	1			
13.intelligence(u nderstanding)	0.16	* 0.21	** 0.34	0.15	* 0.21	0.16	** 0.33	** 0.34	** 0.31	** 0.72	** 0.45	** 0.65	1		
14.intelligence(d esigning cubes)	** 0.29	* 0.25	0.05	0.15	0.12	** 0.35	0.19	* 0.22	* 0.25	** 0.40	** 0.28	** 0.42	** 0.42	1	
15.intelligence(i mage setting)	* 0.22	** 0.27	0.09	0.13	0.16	** 0.42	* 0.21	** 0.26	** 0.28	** 0.45	** 0.49	** 0.44	** 0.34	** 0.48	1

NOTE: \*\*Correlation is significant in level of 1% (\*\*p<0.01); \*Correlation is significant in level of 5% (\*p<0.05)

Table 5: Non-standard regression weights and significance level in predicting creativity based on fluid intelligence, crystallized intelligence, information processing speed, and openness to experiences

	Non-standard coefficients	Standard deviation	Critical ratio (t)	Significance level
Openness to experiences (creativity)	0.318	0.045	7.042	***
Fluid intelligence (creativity)	0.105	0.088	1.199	0.231
Information processing (creativity)	0.040	0.011	3.728	***
Crystallized intelligence (creativity)	0.121	0.78	1.543	0.123
Creativity (divergent thinking)	0.191	0.025	7.558	***
Creativity (self-evaluation creativity)	4.501	0.505	8.918	***
Creativity (everyday creative behavior)	6.995	0.790	8.853	***
Creativity (creative achievement)	5.850	0.641	9.133	***
Information processing (KDT)	1.012	0.113	8.928	***
Information processing (ZVT)	1			
Crystallized intelligence (words treasury)	1.328	0.060	22.106	***
Crystallized intelligence (understanding)	0.918	0.047	19.360	***
Crystallized intelligence (information)	1			
Fluid intelligence (designing cubes)	0.918	0.086	10.737	***
Fluid intelligence (digit span)	1.056	0.088	12.038	***
Fluid intelligence (image setting)	1			
Openness to experiences (being unconventional)	0.769	0.047	16.279	***
Openness to experiences (scientific interests)	0.965	0.062	15.498	***
Openness to experiences (aesthetics)	1			

Table 6: Direct and indirect and total effects of all studied variables on each other

Variable	Direct effect	Indirect effect	Total effect	Determined variance
From information processing speed to:				
Intelligence	0.320 **	—	0.320 **	—
Creativity	0.252 **	0.101 *	0.353 **	0.55
From openness to experiences to:				
Intelligence	0.257 **	—	0.257 **	—
Creativity	0.531*	0.081	0.613 **	0.60
From intelligence to:				
Creativity	0.316	—	—	—

\*\*correlation is significant in level of 1% (p<0.01); \*correlation is significant in level of 5% (p<0.05)

Table 7: Indices of adjusting empirical model with theoretical model

Validation indices	Chi-square	DOF	RMR	GFI	CFI	RMSEA	NFI
Model	803.05	82	2.204	0.832	0.741	0.130	0.786

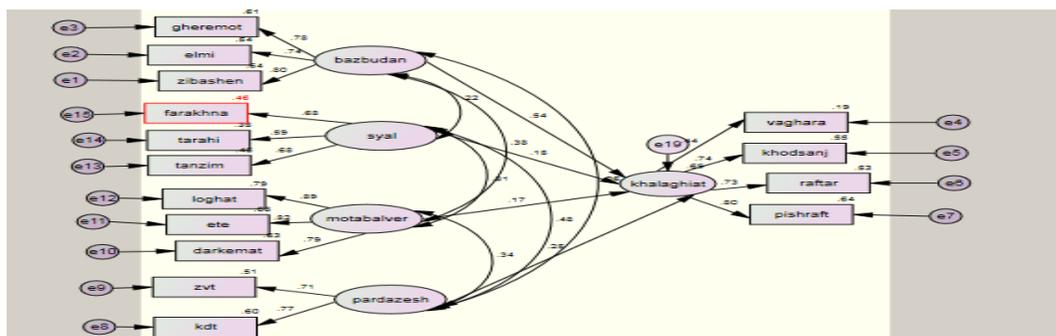


Figure1: Predicting creativity based on fluid intelligence, crystallized intelligence, information processing speed, and openness to experiences

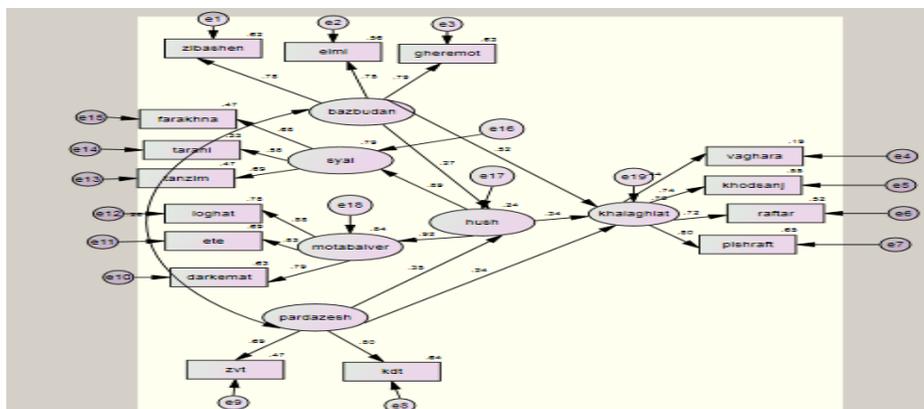


Figure 2: Assumed structural model by author in order to predict creativity based on intelligence, openness to experiences, and information processing speed (considering intelligence as mediator variable)

## DISCUSSION AND RESULTS

Examining assumptions of the study indicated that, the proposed structural model didn't include desirable validity due to empirical data. Clearly, assessing direct, indirect, and total effects of openness to experiences and information processing with intelligence and creativity indicated that, direct effect of information processing speed on intelligence has been in high level; although, direct effect of information processing speed on creativity is in lower level. In addition, indirect effect of information processing speed on creativity has been significant; although, indirect effect of openness to experiences on creativity has not been significant. On the other hand, total effect of information processing speed on creativity has been in high level. Obtained results can be described as follows: however openness to experiences had more important role than

intelligence and processing speed in predicting variance of creativity scores, which has been tested through the first model of the study, but in first assumption and structural model, it couldn't be considered as a basic variable, in which intelligence could be applied as the mediator variable between openness and creativity.

The proposed structural model, which has been provided for determining creativity based on basic factors of processing speed and openness to experiences, and also role of intelligence as mediator between the variables and creativity, includes strong theoretical literature. One of the most important causes of low validity for this model is that, openness to experiences has not probably role causal role in intelligence. Relationship between openness to experiences and intelligence

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has been considered by many researchers since many years.

However, complex models, which are able to combine intelligence and personality and make interactions between them, have been considered by researchers rarely. Theoretical models have investigated rarely relationship between openness to experiences and fluid intelligence and limited studies in this regard have provided undesired results. Some researchers believe that correlation between openness to experiences and fluid intelligence is in a low level that the relation should not be considered as a basic interaction. For example, Ackerman and Heggestad (1997) have reported insignificant correlation between intelligence and openness to experiences. However, results of logic research have indicated that there is a mean and significant correlation between openness to experiences and fluid intelligence.

Moreover, Motafi, Furnham, and Cramp (2003) have reported that openness to experiences can be a good predictor for fluid intelligence; although, they have considered some dimensions of openness that have significant relation with fluid intelligence. Other studies have also reported the correlation between them

equal to 0.10 and 0.25. Some researchers believe that in regard with evaluating relation between openness to experiences and intelligence, style of measuring the relation would significantly affect their correlation. On the other hand, some researchers lie Ashton et al (2000) have found that crystallized intelligence and openness to experiences would measured many similar dimensions and hence, relationship between the two structures is stronger than relation between fluid intelligence and openness to experiences. However, some studies have indicated that, openness to experiences is mostly a genetic issue, it seems that learning and environment can significantly affect the structure.

Mentioned findings and disagreement of the proposed model with empirical data have indicated that probably openness to experiences couldn't be considered as causal factor for intelligence. However it could have causal effect on creativity, contrary to processing speed, which has strong role in intelligence and has been confirmed in literature. Openness to experiences, which has been measured using questions of test 5 personality factors, would have probably correlation with intelligence, especially crystallized

intelligence, and would not refer to causal path of the variable to intelligence. Obtained results from the present study have been consistent with other studies including Nusbaum and Silvia (2011); Rindeman *et al*, 2011; Silvia and Sanders, 2010; Furnham and Niterstorm, 2010; Schpard and Vernon, 2008; Dorfman *et al*, 2008; Furnham and Bakhtiar, 2008; Vartanian *et al*, 2007; Rindermann and Neubauer, 2004; Harris, 2004; Bates and Shieles, 2003; Dabiri, Dir, and Ford, 2001; Dabiri, 2000; Ackerman and Heggstad, 1997; Jansen, 1982. Obtained results from the study have been also inconsistence with some other studies as follows: Ziegler *et al*, 2012; Gregory *et al*, 2010; Gow *et al*, 2005; De Young *et al*, 2005; Moutafi, Furnham, and Cramp, 2003; Asendorpf and VanAken, 2003. However the proposed model didn't include desirable validity, obtained results might be limited to statistical methods or applied tools and the subject should be considered in further studies.

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