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The Exploratory and Confirmatory Factor Analysis of Five Factor Model in Personality

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ABSTRACT

This study has been conducted to the exploratory and confirmatory factor analyses of five factor model in personality. 382 students (189 boys and 193 girls) of Islamic Azad University (Sanandaj Branch) were selected using cluster sampling. For assessing the big five factor of personality, Goldberg's IPIP questionnaire was used. The results of exploratory factor analysis showed that the five factor model explains the most variance of the questionnaire. Afterwards, three different models (five-factor, two-factor and one-factor models) were inspected, using the confirmatory factor analysis, to determine how many factors have the best fitness with data. The results show that the two-factor model has better goodness of fitness index in comparison with the other two models. The obtained results show a confirmation of Digman's theory (Alpha & Beta).

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INTRODUCTION

One of the most outstanding approaches in the realm of personality is the traits approach. It believes that personality composed of stable inner characteristics which can be reflected in behavior. Traits are integrated dimensions that construct a person's behavior and manner. Traits categorization dates back to Hytocrates, ancient Greek physician, who made a distinction among people and divided them in to four different types: happy, sad, neurotic, phlegmatic. This classification was built based on old notion of body fluids (liquids) or temperaments [17]. Another idea was put forward by Allport (1936). He differentiated among primary, pivotal, and secondary traits. Allport claims that the most important ones are primary traits. He confirms that each trait demonstrate a comprehensive and certain readiness in one's life and, indeed, each action done by a person is influenced by that trait [16]. However, there are some other traits' approaches psychologists who have made use of factor analysis as a tool for identifying the number of factors and for seeing each test are harmonious. One of the pioneering figures of factor analysis of traits psychology is Cattel. Cattel believed that the best way for determining personality structure is to quantitative approaches such as factor analysis. Cattel used lexical approach and recognized 4500 traits. Afterwards, he omitted synonyms, then he did a factor analysis and eventually gained 16 factors. Just like Cattel, Eysenck applied factor analysis for recognizing traits. He believed that people's personality comprised of two dimensions: Introversion/ Extraversion and neuroticism/ emotional stability (Meili). After Eysenck putting emphasis on the first two primary dimensions, he added the third dimension and relabeled it as neuroticism [9]. Nevertheless, the most significant approach among all these is Big 5 Factor approach and the first one who accentuated it prominence was Mcdogal. He believed that personality may constitute of 5 differentiable factors including manner, intelligence, temperament, temper, and wrath [9]. Other psychologists also stressed this 5 factor [13]. The factor of extroversion including some attributes such as, talkativeness, courage, energy; the agreeableness factor including attributes such as kindness, trustworthiness, good humor; the conscientiousness factor that includes well-organized, careful, and trustworthy people; the psychoticism factor consists of anxious, nervous, and excited people; and openness to experience including traits such as curious, creative, and imaginative [16]. More novel studies have shown that these factors have correlation [4] and even the number of factors can be lessened [1,6,11]. Digman [6] in a meta-analysis

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conducted about 14 inter-scale studies concluded that there are 2 higher order factor and labelled them as stability (alpha) and elasticity (beta). Stability factor is saturated with agreeableness, conscientiousness, and excitement stability whereas elasticity factor consist of extraversion and openness to experience. In Becker's idea [1] these 2 factors are more fundamental than 5 factor. In another study done by DeYoung, Peterson, & Higins [5], they reconfirmed these two factors. Digman *et al* [7] attributed these two factors to neuropsychological functions and believed that stability factor relates to serotonergic and elasticity factor to central dopaminergic. Even in some other researches a single factor has been stressed. For instance, Saucier and Goldberg found traces implying the existence of a factor called social desirability versus unpleasantness. Stankov [18] concluded the same result and called them the general factor of personality or "g". Musek [15] conducted a study in Slovenia on Slovenians with another factor as its result. Nonetheless, the common weak point found in most of the studies which resulted in one or two factors is that they did not consider which question on which factor has more impact on the factor. They have aggregated the scores of the questions, and afterwards they have done a confirmatory factor analysis. Therefore, this study is intended to investigate how many factors confirmatory factor analysis of the questions will bring about.

Methodology

Sampling Method and Measurements:

The sample to be used in this study consisted of B.A students of Islamic Azad University, Sanandaj branch in the school-year of 2008-2009. The participants were 189 males and 193 female student selected through clustering sampling during different stages. The participants were selected among students of Faculty of Humanities, Faculty of Basic Science, Par medicine, Agriculture, and Technical Engineering. The average age of students were 22.8 and the S.D was 2.25.

Measurement tools:

In order to assess the big five factor in personality, the researchers applied Goldberg [10] personality short test format which comprised of 50 questions in 5-point likert format. IPIP questions is self-reporting one analyzing 5 dimensions of personality. Reliability evaluations for factor's scores is dispersed through non-weighing aggregation of scale scores between 84%and 89 % [6]. In this study reliability coefficient of the questions has been calculated through Cronbach alpha and the coefficient for extroversion, agreeableness, conscientiousness, emotional stability, and openness to experience are 76%, 56%, 74%, 85%, and 68% respectively.

Results:

Exploratory factor analysis of the questionnaire:

Before carrying out factor analysis to investigate the sufficiency of sampling the researchers used KMO measure and to assure that matrix, the basis for factor analysis, in the sample is not equal to zero Bartlett's test of Sphericity was applied.The result have been shown in table1.

Table 1: result of KMO and Bartlett's test of Sphericity.

KMO Test of Sample Sufficiency Scale		0.675
Bartlett's test of Sphericity	Chi-Square(x2)	288.7726
	Degree of Freedom	1225
	Level of Significance	0.001

If KMO would be more close to 1, it would imply sampling sufficiency and acceptable amount is 0.60,furthermore, Bartlett's test of Sphericity minimum degree is 0.05 [2]. As the results demonstrates the sampling is a sufficiency one and the data has the capability to be a factor. Therefore, other factor analysis indices can be carried out.

For explanatory factor analysis of the data, the researchers applied used the method of analysis with Varimax rotation, to determine the number of main factors 3 indices were used:

a) Special value b) the proportion of explained variance of each factor and c) special value graph (screen plot)

According to the results, 17 factors have the quantity of more than 1 and on the whole explain 69.6% of total variance. However, the portion of first five factors is more considerable and form 31.601 % of the variance. Thus, for the next stages of the study these five factors were considered meaningful and influential and probably constructed the basis of the study. These five factors will be processed. For determining each variable's (question) impact on the element (factor), only questions were selected that seemed to have minimum factor scores of 30% on that factor and do not have high factor score on the other factors. At last, there were 15 qualified questions, and confirmatory factor analysis was carried out by these questions.

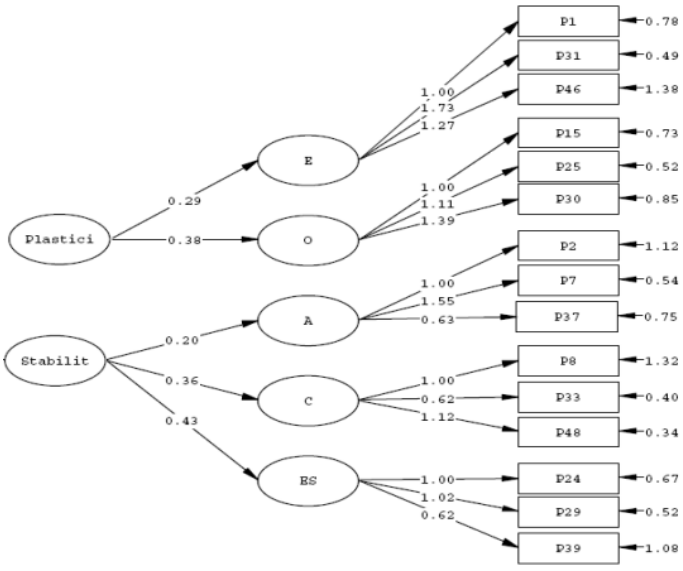
Confirmatory Factor Analysis of the Questionnaire:

Confirmatory factor analysis was administered through LISREL 8.54 in a way that for each of these five factor obtained from explanatory factor analysis 3 items and totally 15 items were selected for confirmatory analysis. Afterwards, three different models were tested. The first model was first-order factor analysis with 5 latent variables. The second model was second-order confirmatory factor analysis.

Table 2: Models' Goodness of Fitness.

Fitness indices Measurement Models	df	X2	SRMR	RSMEA	AGFI	NFI	CFI	CN
1st order factor analysis. 5 latent variable	80	159.81	0.04	.0510	.029	0.84	0.89	75.215
2nd order factor analysis. 2 latent variable	84	195.08	0.05	0.05	0.29	0.85	0.91	54.209
2nd order factor analysis. 1 latent variable	84	353.03	0.07	0.09	0.84	0.78	0.82	17.109

In order to investigate goodness of fitness, one cannot rely merely on one single index but on different ones. One of these indices is the proportion of X2 to degree of freedom. The acceptable proportion is between 2 and 3; though the smaller the number, the more satisfying the goodness. RSMEA (Root Mean Square Error of Approximation) indices and RMR (Root Mean Square Residual) are also among authentic indices. These indices are more desirable when they are close to zero and less than 0.05 is appropriate. If critical N index would be more than 200, the model would be considered fit. For the other indices, that are, Adjusted Goodness of Fit Index (AGFI), Goodness of Fit Index (GFI), Comparative Fit Index (CFI), we can say that the more their score, the better fitness can be. These indices in desirable cases are 90.0 or more [8]. According to these indices we can say the first and second models are acceptable but the third one is not meaningful. Between first and second model, the second one that is second order confirmatory factor analysis with five latent variables has better fitness indices than its counterpart with two latent variables. The related graph of the model and its standardized way coefficients are provided in figure.1



Conclusion and discussion:

The study was done in two sections. During the first section, explanatory factor analysis was carried out to find out the number of factors that explains the major portion of the questionnaire's variance. Based on gravel graph, special values and the number of variance explained by each factor, it has been found out that the 5 factor explained most of the variance. During the second section, confirmatory factor analysis was carried out for testing 3 different models that is a 5 factor model of first-order, 2 factor model of second-order, and 1 factor model of first-order. Goodness of fitness indices of model showed that 5 factor model and 2 factor model have brazes with the data and these two models are adjusted to the data. 1 factor model, however, has no good fitness with the data. The results were in line with work of Digman, Becker [1], De Young, Peterson, Hegin and Jangetal [11]. Nevertheless, such agreement cannot be seen. With result it should be mentioned that although 5 factor model has been accentuated once more in this study, when two scientific theory are not the same level of acceptability and rationality, according to brevity principle, the logicality simple of theory is preferable. As a

result, 2 fact model is more acceptable specifically since these two factors are related to neurophysiologic functions. It has been also claimed that stability factor is linked to serotonergic system and elasticity factor is connected to dopaminergic in fact, this theory, like Eysenck 2 fact theory which composed of stability factor and elasticity factor identified 4 different types: First type (high elasticity and stability): these are people who have excitement stability, conscientiousness, agreeableness, extroversion, and high openness to experience. Second type (high stability and low elasticity): are the people with high emotional stability, conscientiousness, agreeableness, but less extrovert, and less open to experience. Third type (low stability and low elasticity): high extroversion and openness to experience. Last but not least, the fourth type (low elasticity and low stability): whose emotional stability, conscientiousness, agreeableness, extroversion, and openness to experience are not significant.

Limitations and suggestions:

Although Goldberg 50 questions questionnaire is among the most outstanding indices of personality, more precise results would be possibly obtained if its long form or 240 tests of McCerry and Costa (NEO) would be used since they examine not only factors but also approaches, moreover, it is better to conduct the researcher with diverse age and culture samples to compare their result with those of prior studies.

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