

ADAPTATION OF COGNITIVE STYLE INDICATOR: VALIDITY AND RELIABILITY STUDIES OF THE INDICATOR

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Abstract

Cognitive Style Indicator (COSI) is a scale developed by Cools and Van den Broeck (2007) which evaluates cognitive style in university students. COSI is a five-point Likert-type scale consisting of 3 cognitive styles and 18 items. COSI cognitive styles are as follows: Knowing, planning, and creating. The aim of this study was to determine the validity and reliability of the university students. The study was conducted on 1851 university students. 1035 female and 816 male students participated in the study. The sampling group consisted of 1851 1st- 4th year students studying at 63 universities during the fall 2012-2013 academic year. However, the data gathered from 331 respondents were excluded from the analysis due to incorrect or missing marking; therefore, the analysis was conducted using a 1520-person data set. The number of female students participating in the study was 885 and the number of male students participating in the study was 635. In addition, test-retest reliability method and internal consistency Analysis were used in order to evaluate the reliability of the scale. As a result of the factor analysis study, the COSI consisted of 18 items and 3 factors (knowing, planning, and creating). Exploratory and confirmatory factor analyses were carried out in order to test the construct validity of the scale. It was found that the Cronbach Alpha of the knowing, planning and creating were respectively 0.72, 0.77 and 0.80, and test-retest coefficients of the knowing, planning and creating were respectively 0.83, 0.87 and 0.93. Study findings revealed that this measurement tool can be used for Turkish university students as both a reliable and valid one.

Keywords: Cognitive Style Indicator, university students, knowing, planning, creating

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Introduction

In today's world, an individual's cognitive styles play a very significant role in shaping their attitudes, emotions and lives. Thus, individuals need to raise their awareness about their cognitive styles. The cognitive style literature review shows that there is no meaningful correlation between intuitive thinking and cognitive style. Meanwhile, it was found that there is no positive or negative relationship between cognitive style and decision-making indicator style (Simuth & Sarmany-Shuller, 2010). Cools, Van den Broeck and Bouckenoghe (2009) found that there is a correlation between individuals' cognitive styles and job attitudes such as job satisfaction, job seeking behaviors and job leaving tendencies.

It has been observed that the amount of research into scale studies concerning the cognitive style indicators of university students is limited in Turkey. Therefore, a measurement tool is needed in order to determine the cognitive styles of university students. In this study it is believed that the Cognitive Style Indicator (CoSI) developed by Cools and Van den Broeck (2007) will contribute to the field in terms of carrying out validity and reliability studies. In addition, this study will also be beneficial in further research aiming to determine the cognitive style indicators of university students.

Since there are no tools to assess the cognitive styles of university students (late adolescents) in Turkey, in this study, it is thought that conducting studies on reliability and validity of Cognitive Style Indicators, developed by Cools and Van den Broeck (2007), would contribute to the field.

Method

Participants

The sampling group consisted of 1851 first- fourth year students studying at 63 universities during the fall 2012- 2013 academic year. However, the data gathered from 331 respondents were excluded from the analysis due to incorrect or missing marking; therefore, the analysis was conducted using a

1520-person data set. The number of female students participating in the study was 885 and the number of male students participating in the study was 635.

Research Instruments

Cognitive Style Indicator (CoSI). The indicator developed by Cools and Van Den Broeck (2007). Cognitive Style Indicator (CoSI) is a five point Likert-type scale consisting of 3 subscales and 18 items. CoSI subscales are as follows: Planning, knowing, and creating. The CoSI distinguishes between three cognitive styles: a planning style (seven items, e.g., I prefer clear structures to do my job), a knowing style (four items, e.g., I like to analyze problems), and a creating style (seven items, e.g., I like to extend the boundaries) Cools and Van den Broeck (2007). CoSI factor loadings in study 1, study 2 and study 3 respectively are for planning 0.44-0.71, 0.54-0.77, 0.44-0.74; for creativity 0.44-0.72, 0.50-0.81, 0.36-0.71 and for knowing -0.57- -0.68, -0.56- -0.90, -0.53- -0.63. Meanwhile, Cronbach Alpha Coefficient is respectively in study 1, study 2 and study 3 for planning 0.81, 0.84, 0.85; for creativity 0.79, 0.82, 0.78 and for knowing 0.73, 0.79, and 0.76.

Procedure

CoSI draft was implemented on students in a classroom environment as a group. Prior to the implementation, the students were informed of the aim of the study and they were assured that their responses would be kept secret.

Data Analysis

Data analysis was carried out through Lisrel 8.54 ver. SPSS 18.0 package programmes. The upper limit of the margin error was determined as 0.05. In the frame of construct validity, Exploratory Factor Analysis (EFA) was carried out for the data gathered from the first group in order to determine to what extent the items are included in the three factors. After this procedure, the construct validity was tested by conducting Confirmatory Factor Analysis (CFA) for the data obtained from this group. Meanwhile, the model was tested, test-retest was carried out and Cronbach's Alpha was obtained for the data gathered from the second study group (Buyukozturk, 2005; Sumer, 2000).

Results and interpretation

This section covers the findings regarding the validity of CoSI.

Findings regarding the Validity of CoSI

Exploratory Factor Analysis (EFA) and Principal Component Analysis (PCA) as a factoring technique were conducted in order to examine the factorial structure of CoSI (Kline, 1994). While the factorial structure was being examined there was no limitation to the number of factors and the minimum eigen value was determined as 1.00 in the first analyses. Prior to the factor analysis, Kaiser-Meyer-Olkin (KMO) coefficient and Barlett Sphericity were carried out in order to determine the appropriateness of the data. KMO value was found as 0.934 and the result of Barlett test ($\chi^2=7743,004$; $p<0.00$) was meaningful. After that, Exploratory Factor Analysis (EFA) was conducted through using Varimax Rotation and Principal Component Analysis. The results revealed that 18 items of CoSI were grouped under three factors and the explanation of variance regarding the scale was found 48.21%. The factor loadings of the subscale items gathered from the factor analysis are given in Table 1.

Table 1. Knowing, Planning and Creating Factor Loadings of Cognitive Style Indicator

Items	Factors		
	Creating	Planning	Knowing
s_17	0.69		
s_4	0.69		
s_1	0.66		
s_5	0.65		
s_11	0.63		
s_14	0.59		
s_7	0.52		
s_10		0.73	
s_9		0.64	
s_12		0.62	
s_18		0.57	
s_16		0.55	
s_8		0.52	

Table 1. Knowing, Planning and Creating Factor Loadings of Cognitive Style Indicator - *continued*

Items	Factors		
	Creating	Planning	Knowing
s_15			0.66
s_3			0.64
s_6			0.59
s_2			0.58
s_13			0.49
Percentages of Variance Explanation	17.55	16.28	14.37
Total Percentages	17.55	33.84	48.21

It was found at the end of the analysis that 48.21% of the variance of CoSI was explained. Creating consists of seven items whose factor loadings vary between 0.52 and 0.69 and explains 17.55% of the variance of Cognitive Style Indicator. Planning consists of six items whose factor loadings vary between 0.52 and 0.73 and explains 16.28% of the variance of CoSI. Knowing consists of five items whose factor loadings vary between 0.49 and 0.66 and explains 14.37% of the variance of CoSI. (If the factor loading is 0.45 and over it means it is a good measurement to be used; however, when there are few items for an implementation this limit value can be reduced to 0.30 (Buyukozturk, 2005). In general, it can be argued that the factor loadings of the items are over the limits, which is considered as acceptable.

After that, Exploratory Factor Analysis (EFA) was conducted so as to test the factorial structure of CoSI. It was assumed that cognitive style is explained by creating, planning and knowing with this in mind the data gathered from the study group was tested to determine whether it would fit this assumption. In other words, this above-mentioned test was carried out in order to determine whether the proposed model fits the data. The aim of the model is to explain the change in the measurement variables and covariance. The nature of the model structure may change according to the choice of the indicators and the findings and comments may also be affected according to the order of the indicators. In fact, the study and the comments depend on the appropriate studies into the latent variables (MacCallum, 1986; MacCallum & Austin, 2000). Adjustment statistics can be grouped under three headings; namely, Chi-Square Goodness of Fit, Goodness of Fit and Comparative Fit Indices. In Chi-

Square Goodness of Fit, if the fit between the data and the model is perfect, the gathered value should be close to “0” and the p value should not be meaningful. If χ^2 degrees of freedom are relatively bigger, then the model is rejected. If χ^2 degrees of freedom are not meaningful or smaller, then the model is accepted (Anderson & Gerbing, 1988; Marsh, Balla, & McDonald, 1988; Sumer, 2000). The calculations made concerning the fit indices reveal that the proposed model has been proved. The Model is given in Table 2 and the indices regarding this analysis are given in Table 3.

Table 2. The Chi-Square Goodness of Fit test of Cognitive Style Indicator

The Chi-Square Goodness of Fit Test	Degree of Freedom	P	P value
21296.01	132	0.000	P<0.05

Table 3. The Fit Indices of Cognitive Style Indicator

Fit Indices	Goodness of Fit Values	Acceptable Limit of Goodness of Fit
Root Mean-Square Error of Approximation (RMSEA)	0.05	< 0.08
Standardized RMR	0.04	< 0.08
Comparative Fit Index (CFI)	0.98	> 0.90
Bentler-Bonett Normed Fit Index	0.97	> 0.90
Bentler-Bonett Non-Normed Fit Index	0.98	> 0.90
Bollen (Incremental Fit Index, IFI) Fit Index	0.98	> 0.90

The Findings regarding the Reliability of Cognitive Style Indicator ***Test-retest Reliability***

CoSI was first implemented on 120 students and four weeks later it was implemented again on 82 students. Test-retest reliability coefficient was calculated at the end of implementation (Baykul, 2000). Test-retest reliability coefficient of CoSI was found 0.87 for planning, 0.93 for creating and 0.83 for knowing.

Internal Consistency

The reliability of the scale was calculated by utilizing the data gathered from the 18 items proved valid according to the factor analysis procedure. Cronbach Alpha related to subscales of CoSI was calculated according to the

results of the implementation carried out on the study group consisting of a total of 1520 students. Cronbach alpha coefficients related to the subscales of CoSI were found 0.77 for planning, 0.80 for creating and 0.72 for knowing. Item-total correlations and Cronbach alpha internal consistency coefficients are given in Table 4.

Table 4. Item-total Correlations and Cronbach Alpha Internal Consistency Coefficients regarding the Subscales of Cognitive Style Indicator

	Items	Item-total Correlations	Cronbach Alfa
Planning	Item 3	0.40	0.88
	Item 6	0.49	0.88
	Item 9	0.55	0.87
	Item 10	0.51	0.87
	Item 12	0.53	0.87
	Item 16	0.52	0.87
	Item 18	0.51	0.87
Creating	Item 1	0.45	0.88
	Item 4	0.52	0.87
	Item 5	0.48	0.88
	Item 7	0.36	0.88
	Item 11	0.55	0.87
	Item 14	0.53	0.87
	Item 17	0.51	0.87
Knowing	Item 2	0.54	0.87
	Item 8	0.57	0.87
	Item 13	0.56	0.87
	Item 15	0.55	0.87

If the measurement of the factor loading is 0.30 or over it means it is a good measurement, however, this value limit can be decreased to 0.30 since there are few items in the analysis (Buyukozturk, 2005). When the item-total correlation is 0.30 and/or higher than this value, it is generally known that this value distinguishes individuals effectively, when it is between 0.20 and 0.30 the items are subjected to a test and needs to be corrected if there is an obligation, and if it is below 0.20 the items should not be tested (Buyukozturk, 2005).

When the data given in Table 4 is examined, it can be observed that Cronbach Alpha internal consistency coefficients vary between 0.87 and 0.88 and thus it shows that item-total correlations are valid in terms of distinguishing individuals participating in the study.

Discussion and Suggestions

In this study, the factor analysis and construct validity were carried out for the Cognitive Style Indicator, which is developed so as to assess students' cognitive style in terms of their planning, creating and knowing dimensions. In the frame of construct validity, Exploratory Factor Analysis (EFA) was carried out for the data gathered from the first group in order to determine to what extent the items are included in the three factors. After this procedure, the construct validity was tested by conducting Confirmatory Factor Analysis (CFA) for the data obtained from this group in order to confirm to what extent the items are included in the three factors. It can be argued that the scale is both a valid and reliable assessment tool when the findings of this study are considered. It should be considered that the goodness of fit coefficients are at a high level.

A support service programme could be carried out in order to determine the behaviours of university students as individuals or as a group during psychological counselling sessions by determining their planning, creativity and knowing cognitive style indicators. Therefore, a positive outcome can be achieved in a way that individuals are able to achieve self-acceptance by developing healthy personalities. Meanwhile, this could contribute to their academic development as well. In addition, individuals might be able to benefit most from their academic studies, which prepare them for their future work life thanks to the personal development oriented psychological counselling services provided at universities. Thus, university students could be given assistance in order to realize themselves.

The relationships between personality types, separation-individuation and cognitive style indicator can be investigated. Cognitive style indicator can be tested through a variety of hypothesis models involving variables such as gender, class level and social economic level.

Conclusions

In this study, the reliability and validity of Cognitive Style Indicators for Turkey were tested. Exploratory and Confirmatory Factor Analyses were conducted in order to test the reliability of Cognitive Style Indicators. Exploratory factor analysis and confirmatory factor analysis were carried out by gathering the data from the study group in order to reveal the unique factor structure of Cognitive Style Indicators.

The study is limited to the sampling units which are studied on in this study. Since all the stages, regarding the adaptation of Cognitive Style Indicators, conducted on university students, it is necessary to carry out reliability and validity analyses again before conducting studies on other sample groups rather than university students. It is thought that new studies on Cognitive Style Indicators will highly contribute to the cognitive style development of individuals.

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