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Structural Validity of Turkish Version of the Error Oriented Motivation Scale (EOMS) for University Students*

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Abstract

This paper describes the psychometric properties of the Error Oriented Motivation Scale (EOMS) in Turkish sample. The EOMS was developed to determine individuals' strategies in case of occurring errors. The current study consisted of two different studies designed in survey research. The research group of study 1 was composed of 242 university students. The mean age was 21.66 (Sd: 1.65) with an age range from 18 to 26 years. The results of confirmatory factor analysis, item analysis, and reliability analysis appeared strong support for reliable and valid measure. Study 2 including second order confirmatory factor analysis was conducted to get evidence for cross factorial validation of EOMS. Participants of study 2 were 100 graduate students. The age of participants ranged from 18 to 26. Study 2 demonstrated that the three factor model of EOMS in Turkish sample showed excellent model with sufficient fit indices. In total, the EMOS is a reliable and valid measure among Turkish university students.

Keywords: Error Oriented Motivation, reliability, validity, factor structure

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Goal orientation theory has emerged into motivational researches as a new huge tendency (Dweck & Leggett, 1988; Harackiewicz & Elliot, 1998; Maehr, 1989; Nicholls, 1989; Weiner, 1990). This theory was developed in social cognitive structure that focuses on perceived and maintained goals in creating achievement process. The focus point is that how individuals assess themselves, their goals and performances instead of regarding their motivation or deficiencies of their motivation (Ames, 1992). Orientations provide individuals with a structure that they can evaluate the events and react to them. At the same time, orientations are concluded with different aspects of cognition, effect, and behavior (Bal & Baruss, 2011; Dweck & Leggett, 1988; Li et al., 2011; Odacı, Çelik, & Çikrıkci, 2013).

Errors are perceived as discrepancies between the expected and real outcome of an action. Human error comprises of three dimensions (Free & Peters, 1988; Rasmussen, 1987; Reason, 1990). Errors should occur in accidental and solely in goal oriented event. Moreover, people making errors must be aware of better performance (Homsma, Van Dyck, De Dilder, Koopman, & Elfring, 2009). Error and error consequences are different structures. Error refers an action that results in undesires outcomes (Van Dyck, 2009). People can be motivated from errors (Argyris, 1992; Weiner, 1985).

There has been a consensus that errors and failures, which prompt some agents related to learning such as information processing, diverted people's attention on learning from experience (Catino & Patriotta, 2013; Lipshitz, Popper, & Friedman, 2002). Perceptions of individuals towards errors are considered crucial in performing performance. In certain events, errors can hide invisible new opportunities in its construct and result in learning from errors. However, the increase in negative effects of errors is observed when people take some precautions for errors. As for the reason of this increase, it is pointed that people do not expect errors to happen (Bainbridge, 1983; Nonaka & Takeuchi, 1995; Reason, 1990). Learning from errors can occur when people comprehend the reasons errors and coping with errors which have an instructive role (Arnold & Roe, 1987).

The theoretical background of EMOS can be summarized that errors play an important role in shaping behaviors and displaying performance. In other words, individuals embrace their errors and show performance on their tasks given errors. It can be perceived that error will give birth negative consequences in every time, though, results if a relevant research shows that error may be effective tool for learning (Keith & Frese, 2008).

There is no theoretical structure which completely explains error-oriented motivation. However, theories of goal orientations (Dweck & Leggett, 1988; Elliot & Harackiewicz, 1996; Elliot & McGregor, 2001) compensate for the error orientations and supply systematized structure (Schell, 2012). Moreover, an actor must be aware of the likelihood of adaptive and maladaptive consequences by making decision based on an approach/avoidance continuum (Elliot, 1999). In this process, the actor must also take into account which standards can be more useful in assessing goal attainment. With respect to the goal orientations theory, a structure aforementioned above possesses similar standards with mastery-performance dimension (Elliot & Mcgregor, 2001; Elliot & Sheldon, 1997).

Mastery orientations are associated with utilizing skill and competence in displaying performance. While actors tending to mastery orientations has internal motivations processes, for example, "internal satisfaction and independent of externally-imposed benchmarks (p.352)", actors with performance orientations generally employ external standards in displaying performance (Schell, 2012).

The EMOS was developed based on the goal orientations theory. The EMOS has three dimensions namely avoidant error orientation, covering errors and learning from errors orientation. In avoidant error orientation, an error could be perceived as a maladaptive trigger to perform. Self-perceptions and self-evaluations may be affected adversely in proportion to the actors' own perceptions (Schell, 2012). According to Seyle and Swann (2007), negative self-referent events bring about disaffection and disengagement. Due to the fact that error includes negative affect, there appear some behavioral patterns. The actor can act as if neglecting the error, refusing the error, interpreting the error rationally, and redefining the error etc. The avoidant error, in brief, refers that individuals aim to motivate themselves by running away from errors with several behavioral options above instead of focusing on negative outcomes of error (Schell, 2012).

Rybowiak, Garst, Frese and Batinic (1999) pointed that covering error orientation could be classified within a general coping concept (Lazarus & Folkman, 1984). The actor with covering errors orientation can apply two different ways for coping with negative consequences of errors. At first, the actor can embrace a more suitable way in which the actor should be active and approach-oriented. On the other way, the actor is active but avoidant-oriented. Furthermore, because individuals who generate errors perceive errors as a sign of weaknesses, the initial aim of them is to make errors less apparent for others. Coping with

errors directly and decreasing negative outcomes of errors fall within the second aim (Schell, 2012).

According to this viewpoint, it can be claimed that covering errors orientation is similar to Performance Orientation (Dweck & Leggett, 1988) and Performance Approach/Avoidance (Elliot, 1999; Elliot & McGregor, 2001). Schell (2012) noted that covering errors orientation shows theoretical similarities with Performance-Prove dimension of goal orientation theory (VandeWalle, 1997, 2003).

The last dimension of error orientation in motivational concept is learning from error orientations. The error provides opportunity with individual to learn and improve his/her knowledge about the task or skill, if he/she is inclined to approach errors in the scope of learning. The learning from errors orientations enable the actor to cope with errors forcefully, explore the sources of errors and perceive error as an opportunity for improvement in knowledge. After the actor accepts the responsibilities of errors and is aware of these opportunities, negative outcomes will be under controlled (Keight & Frese, 2005). Given the theoretical background of learning from errors orientations, it can be drawn the attention that there are several similarities between learning from errors motivations and Mastery Goal Orientation. Mastery goal orientation refers to possess a tendency to develop mastery on tasks and skills (Dweck & Leggett, 1988).

There are very few studies that directly have examined the correlations between error oriented motivation (Buljac-Samardžić, Van Woerkom, & Paauwe, 2012; Fay & Frese, 2001; Schell & Conte, 2008). Rybowiak et al. (1999), who developed the Error Oriented Questionnare (EOQ) including error competence, learning from errors, error risk taking, error strain, error anticipation, covering up errors subscales, pointed that there were significant relationships between all subscales of EOQ and self-efficacy, control rejection, negative affectivity, self-esteem, optimism, depression. Additionally, error competence, learning from errors, error risk taking and covering up errors were associated with plan orientation, action orientation after failure, readiness for change, need for achievement.

Error orientations related to motivational processes among adults should be associated with learning process, attitudes for achievement, and outcomes of errors. This is why valid and reliable instruments to determine error orientations are required and important for further studies. In Turkish sample, there is no instrument of error orientations. Achievement Goal

Orientations Scale (Akın & Çetin, 2007) that was based on the orientation theories is still available. The need of suitable measure of error orientations can be realized. For the purpose of eliminating this requirement, we agreed to adapt the EOMS into Turkish. The main aim of this study was to examine the psychometric properties of Turkish EOMS.

Study 1 (CFA, Item Analysis, and Internal Reliability)

The purpose of study 1was to explore the psychometric properties of Turkish form of Error Oriented Motivation Scale (EOMS). In this section, results of confirmatory factor analysis, item analysis and reliability analysis were presented.

Method

The Study 1 was performed with survey research design that is one of the quantitative research methods. In survey researches, investigators gather quantitative data using questionnaires or interviews to identify the attitudes, opinions and behaviors of research group as to the currently studied matter (Cohen, Manion, & Morrison, 2007). Creswell (2012) pointed two phases of survey research as follow: "collecting data through questionnaires and designing instruments for data collection" (p. 380-381). These two phases of surveys are very crucial to gather standardized information about research group. In addition, there are several applications of surveys in education. Generating valid and reliable instruments through revision is included in survey research design (Cohen et al., 2007).

Research Group

Research group consisted of a total of 242 university students, 43.81% (n=106) of them were female and 56.19% (n= 136) of them were male. The average age of the participants was 21.66 years old (Sd= 1.65) with an age range from 18 to 26 years.

Research Instruments

The Error Oriented Motivation Scale (EOMS; Schell, 2012) and personal information form were administered to research group. The comprehensive information about research instruments are presented below.

Error Oriented Motivation Scale (EOMS). The 21-item Error Oriented Motivation Scale (EMOS) was developed by Schell (2012) to assess the motivational sources of reactions to individuals' self-produced errors. Each item was rated on a 5-point likert scale ranging from 1 (not at all like me) to 5 (completely like me). The Cronbach's Alpha value of error oriented learning (EOL), error oriented covering (EOC) and error oriented worrying (EOW) subscales was found *.88, .88, .91*, respectively. There are no reverse scored items. Confirmatory factor analysis revealed that fit indices ($x^2_{(186)}$ *= 676.81, RMSEA= .08, CFI= .88, CI = .10 - .06*) supported the three factor structure.

Procedure

In this article, the translation process based on back translation method was achieved in two phases (Brislin, 1970). First of all, three lecturers expert in both English and Turkish and two academicians who earned their MA degree in America translated the original form into Turkish separately. After all of translations into Turkish gathered, only a Turkish form was determined by consensus. After that, the original form and the Turkish form were compared and similarities and discrepancies of translations were investigated. Moreover, final Turkish form was examined by experts and teachers. Eventually, we agreed the final Turkish form after aforementioned evaluation process.

The requisite permission to conduct the present study was granted from lecturers who were familiar with the research process. The EMOS was administered to students in groups. The data collection process took just 10 minutes, in a single session.

Data Analysis

The validity and reliability analysis were completed in line with 242 forms. The sample size was examined with previously suggested guidelines for minimum ranges of participants to items (Gorsuch, 1983; Nunnally & Bernstein, 1994). According to suggestions, the sample size should be five or ten times the number of items. Therefore, it could be adduced that the sample size for study 1 was suitable. Descriptive analysis of study was performed via SPSS 17.0. The structural validity including confirmatory factor analysis was examined by Lisrel 8.51. According to the fit indices, it was determined whether the model showed good fit or not.

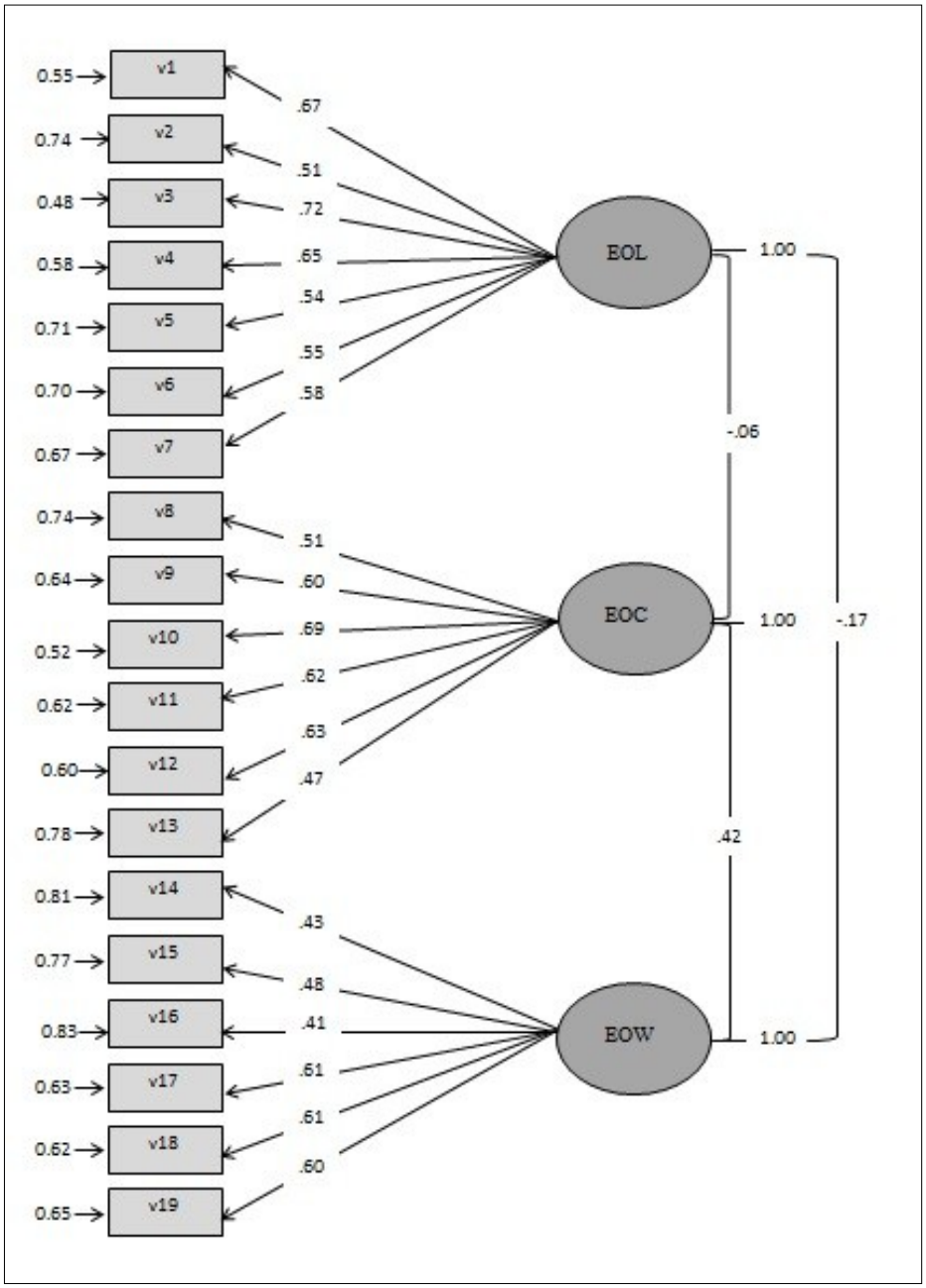
Results

This section includes the initial psychometric properties of Turkish Error Oriented Motivation Scale (EOMS) in university sample.

Confirmatory factor analysis (CFA)

Confirmatory factor analysis (CFA) was generally performed to confirm a factorial structure and theoretical model determined previously (Thompson, 2004). In this process, fit indexes from CFA enable researchers to explore what extent the model account for the data. Additionally, researchers can reject or accept the model in line with the fit indexes. We reported results for several fit indices in current paper. General agreements about fit indexes are that *CFI, IFI, GFI, AGFI*, and *NNFI* values of .90 or greater indicate satisfactory fit; *RMSEA* and *SRMR* values of .05 or lower show excellent fit (Kline, 2011). According to the results of initial analysis, t values of two items (16, 17) were determined nonsignificant ($p>.05$). Therefore, these items were excluded from the pool and CFA was conducted with 19 items.

After the required modification indices (19-18, 16-10, 15-14, 13-12) consistent with theoretical content was applied, results of confirmatory factor analysis indicated that the model was sufficient fit to the data: $x^2_{(df=142,\ N=242)}= 221.96$, $x^2/sd= 1.53$ $p= .00$; *RMSEA = .04; CFI = .93; IFI =.93; GFI = .91; AGFI = .88, NNFI = .91, SRMR = .06*. Factor loading of 19 items, ranging from .41 to .72, are presented in Figure 1.



EOL: Error Oriented Learning, EOC: Error Oriented Covering, EOW: Error Oriented Worrying

Figure 1. Factor loadings for the EOMS

Item analysis

Item analysis is an essential process in which participants' responses to items are investigated to determine what extend each item is sufficient to measure the participants' attitudes (Everitt & Skrondal, 2010). At first, the item-total correlation was employed to explore problematic items of whole scale. In the light of literature (Tavşancıl, 2010), we agreed to the criterion of .20 as the cutoff item-total point. Based on the criterion no item was eliminated due to the sufficient correlation coefficient between the sum score of the items and

item. As seen from Table 1, item-total correlations ranged from .23 to .53. Secondly, the differences between mean scores of the upper 27% and lower 27% were calculated for each item by conducting the independent t test. The t test results demonstrated that there were significant differences between each items' means of the upper 27% and lower 27% points (Henson & Roberts, 2006).

Table 1
Item-total score correlations, differences between mean scores of the upper 27% and lower 27%

Item	r_{tt}	t	Item	r_{tt}	t
1	.23**	3.03**	**11**	.41**	6.89***
2	.26**	3.17**	**12**	.57**	8.25***
3	.28**	3.26**	**13**	.52**	7.26***
4	.26**	3.29**	**14**	.46**	6.74***
5	.26**	3.23**	**15**	.53**	9.84***
6	.25**	2.61*	**16**	.39**	6.27***
7	.37**	5.06***	**17**	.39**	6.43***
8	.44**	6.63***	**18**	.45**	8.10***
9	.53**	8.61***	**19**	.47**	8.75***
10	.54**	9.83***			

***p<.001, **p<.01, *p<.05; r_{tt}: Item-total score correlation coefficient

Internal Reliability

The internal reliability was evaluated through the Cronbach's Alpha Coefficient. As presented in Table 2 the Cronbach's Alpha coefficient for the entire scale was found as *.72*, for error oriented learning subscale was found to be *.79*, for error oriented covering subscale was found to be *.76*, for error oriented worry was found to be *.72*. Cronbach's alpha value of the EMOS for female students was found to be *.72*; for male students was found to be *.73*. Moreover, Cronbach's Alpha coefficients of the subscales according to the gender were displayed in Table 2. Therefore, it could be concluded that these results demonstrated good internal consistency of the items in the total scale.

Table 2
Internal consistency, means, standard deviations, and correlations among EMOS subscales

Scale	Range			M	SD	Correlations			
	α	Min	Max			1	2	3	4
1.Total Scale	.72	39	87	64.97	8.71				
Female	.72	39	84	64.92	8.90	-			
Male	.73	46	87	65.02	8.59				
2.EOL Subscale	.79	10	35	28.03	4.11				
Female	.79	10	35	27.75	4.32	.41**	-		
Male	.79	15	35	28.25	3.93				
3.EOC Subscale	.76	6	30	20.09	4.96				
Female	.79	6	30	19.86	5.38	.73**	.01	-	
Male	.73	9	30	20.27	4.63				
4.EOW Subscale	.72	7	29	16.84	4.83				
Female	.73	8	29	17.30	4.90	.69**	.08	.31**	-
Male	.72	7	28	16.49	4.76				

**p<.01; EOL: Error Oriented Learning; EOC: Error Oriented Covering; EOW: Error Oriented Worry; M: Mean; SD: Standard Deviation; α: Cronbach's Alpha Coefficient

Study 2: Cross Validation of Factor Structure

To perform cross validation of factor structure of EMOS, second order confirmatory factor analysis was employed. Due to the fact that the EOMS contains three subscales, we agreed to apply second order confirmatory factor analysis. Byrne (2009) focused that second order confirmatory factor analysis must be applied in case of the instruments consist of three or more factors.

Method

Research Group

Research group was composed of 100 graduate students. The age of participants ranged between 18 to 26 (Sd: 1.80).

Results

Second Order Confirmatory Factor Analysis

Results of second order confirmatory factor analysis showed that the model was sufficient fit to the data: $x^2_{(df=143,\ N=100)} = 135.21$, $p<.66$; $x^2/df = .94$, $RMSEA = .00$; $CFI = .99$; $IFI = .99$; $GFI = .87$; $AGFI = .83$; $NNFI = .99$, $SRMR = .08$. In addition, results of first and second order confirmatory factor analysis could be compared through the Table 3.

Table 3
Goodness-of-fit statistic obtained from first and second order confirmatory factor analysis for the Turkish Version of EMOS

Process	x^2	df	RMSEA	CFI	IFI	GFI	AGFI	NNFI	SRMR
First Order CFA	221.96	142	.04	.93	.93	.91	.88	.91	.06
Second Order CFA	135.21	143	.00	.99	.99	.87	.83	.99	.08

Discussion

The main purpose of the present study was to test the usability of Error Oriented Motivation Scale (EOMS) in Turkish sample. This study contains two spate studies aimed to explore the factorial structure of EOMS. Study 1 included language equivalence, confirmatory factor analysis, item analysis, and reliability analysis. In addition, the final form of EOMS from study 1 applied second research group to determine cross validation of factorial structure of scale. At first, the Turkish translation of the EOMS was performed by means of back translation method.

The factorial structure of the EOMS in Turkish sample was investigated via confirmatory factor analysis. In first phase of factorial structure three factor model was confirmed by confirmatory factor analysis (CFA). According to the results of CFA, the EOMS showed appropriate model with sufficient fit indices. After CFA, we conducted item analysis including item total correlations and differences between higher and lower 27% group in order to examine each item can be sufficient to evaluate the participants' attitudes. Given the results of item analysis, no item from scale was eliminated according to the cut off item total correlation.

As for reliability analysis, internal consistency was examined both total scale and subscales. The Cronbach's Alpha values of total scale and subscales suggested that the EOMS

was a reliable measure. In present study, reliability coefficient of .70 was accepted as a criterion for the satisfactory internal consistency (Creswell, 2012). Although the EOMS demonstrated the sufficient internal consistency coefficient, the values were very closer to the criterion. Moreover, the corrected item total correlations ranged from .23 to .57. To support cross validation of factorial structure of EOMS, second order CFA was applied because of the fact that it has three subscales. Byrne (2009) recommended that applying second order CFA could show the factorial structure of instrument effectively. Second order CFA showed excellent model with marvelous fit indices.

In the light of the combination of these results, we can report that the EOMS in Turkish sample has a strong support for reliable and valid measure. The EOMS is an instrument to examine motivational strategies of people from errors. The Turkish version of EOMS has nineteen items formatted with five point scale and there are no reverse scored items. The range of total scores differs from 19 to 95. There are three subscales in the EOMS namely error oriented learning, error oriented covering and error oriented worrying. Scores getting from scale should be assessed with respect to the subscales to determine which strategy is preferred by individuals. Overall, the EOMS in Turkish sample seems to be a suitable measure with acceptable reliability and validity of its scores.

Limitations and Implications

Some potential limitations have been recognized in present study. First, several problems can occur due to the methodology. Generalizability of the results is the other limitation of study. Moreover, the EOMS is still need of further psychometric validation in Turkish sample. Test-retest reliability that is one of the weaknesses of the study should be carried out so as to examine the temporal stability of the scale. To investigate the convergent validity, several studies which examine the relationships between error orientations and other related variables such as achievement goals, coping with stress should be conducted with reliable and valid instruments. Further validity and reliability studies in different samples are crucial to get contribution the strength of measurement of the EOMS.

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