Postgraduate Students' Perceptions of Research Self-Efficacy and Critical Thinking Disposition and their Impact on Academic Creativity: Case of Mersin University

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ABSTRACT
Postgraduate education plays a key role in assessing the welfare level of today's societies and in the process of creating labor in line with the social development needs of developing countries. The structure of this educational process requires graduates to be individuals that possess scientific research competencies, critical thinking skills who can create original academic studies. In this study, it was aimed to determine the self-efficacy, critical thinking dispositions and academic creativity of postgraduate students and to investigate their effects on academic creativity and; descriptive and relational survey model were used. Due to the factor analysis' findings, the sub-dimensions of both the Critical Thinking Disposition Scale and the Academic Creativity Scale differed, and the research hypotheses were arranged according to these new sub-dimensions. According to the findings, while the research self-efficacy of the students had a high impact on their academic creativity, it was found that the engagement sub-dimension of critical thinking dispositions could affect the investigative creativity. These results showed the role of research techniques education in postgraduate studies. In addition, the complex and multifactorial structure of the phenomenon of creativity has validated itself at the academic level, but new research is needed on how academic creativity is affected by different factors.
Keywords: *Academic creativity, critical thinking, postgraduate education, research self-efficacy*

INTRODUCTION

Regardless of the type or field of postgraduate education, it is expected to deliver products beyond the level of undergraduate education, both on personal development and on academic production levels. Macro reasons for such an expectation may include socio-economic conditions and the need for qualified human beings in developing countries. Particularly, underdeveloped countries have to train the highly qualified manpower they need in today's conditions through universities (Limon & Durnalı, 2018; Özmen & Aydın Güç, 2013). Postgraduate education is a planned and programmed process that aims to educate the scientists who can support the country's development by producing science-technology through research and which consists of the stages following the undergraduate process (Karaman & Bakırcı, 2010). Therefore, it should have principles, objectives, methods and contents different from the purpose and scope of undergraduate education.

When we look at the general objectives of postgraduate education, it is emphasized that besides the training of the scientists and faculty members needed in a country, researches on producing science and art and solving the problems of the country and providing technological development are emphasized. (Karaman & Bakırcı, 2010; Özmen & Aydın Güç, 2013). It can be said that master's degree with thesis focuses on developing the ability to use the relevant scientific methods in order to carry out a research process based on undergraduate education, whereas doctoral education aims to produce the results of an original research that will make new additions to the existing scientific knowledge, to develop new methods and to create new theories (Karaman & Bakırcı, 2010; Tonbul, 2017). Although there are different views on the overall objectives of doctoral programs, it is generally accepted that they contribute to the existing knowledge through new research and teach transferable skills and competences (Limon & Durnalı, 2018). Although this process works differently in different countries and universities, it is noteworthy that there are common points in terms of learning outcomes, among which scientific research skills, critical and creative thinking are prominent (Brodin & Frick, 2011). In the conditions announced by the European Council of Doctoral Candidates and Junior Researchers in 2005, it was pointed out that the main component of doctoral education is scientific research and that doctoral candidates should learn through research (As cited in Bitusikova et al., 2010). For example, the general standards in Germany's doctoral education system emphasize that doctoral candidates are to have the ability to solve problems, master scientific methods of research, and succeed in working in collaboration by participating in research projects (Bitusikova et al., 2010).

Looking at the postgraduate education practices in different countries of the world, although high emphasis has been placed on the development of creativity and critical thinking skills, it cannot be said that the expectations on this issue have been sufficiently fulfilled. Majid's (2010) study shows that although students are aware of the

importance of creativity and innovation, there is not enough support from educational institutions to develop these skills. According to Adriansen (2010), critical thinking and creativity, which are essential for effective learning, are co-existing and complementary processes, and the development of creativity is possible through collaborative social relations.

Based on the aforementioned matters, postgraduate education programs can be expected to target students who can produce quality studies with the self-efficacy of scientific research, question and contribute to the critical thinking disposition in doing so, and demonstrate creativity while conducting their research. Therefore, in this study, the effect of the variables of scientific research self-efficacy and critical thinking disposition on the assumption that the creativity of postgraduate students is the final product of the postgraduate education process was investigated. In research on postgraduate education processes in Turkey, it was observed that there are studies focused on problems and solutions, but there is no research on the effects of students' critical and creative thinking processes. When we accept the ability to conduct an original scientific research as an indicator of academic creativity, such a product should possess an original quality in a philosophical approach, theoretical structure or method (Brodin & Frick, 2011). Hence, it can be expected that obtaining such an output will depend on both the efficacy of conducting research and the ability to think critically. The main aim of this study is to determine the postgraduate students' perceptions of self-efficacy and critical thinking dispositions and to investigate their effects on academic creativity levels.

LITERATURE REVIEW

Research Self-Efficacy

Scientific research activity, which can be defined as the process of obtaining scientific knowledge, consists of social relationships, hypotheses, observations, measurements, statistical procedures and findings. To overcome this successive process requires research self-sufficiency, which covers basic skills in research methods, statistics, measurement and data processing (Keskinkılıç & Ertürk, 2009; Wester et al., 2019). From the point of Bandura's definition for self-efficacy, as one's belief in own ability to achieve an intended goal (As cited in Saputro et al.,2020), research self-efficacy can be described as confidence in conducting a whole research process from literature research to publishing the findings as an article (As cited in Baltes et al., 2010). Hence, postgraduate education is expected to enable to perform such efficacies. Besides, research self-efficacy is related with scholarly productivity, including faculty and postgraduate students (Wester et al., 2019). Due to structure of courses in postgraduate education (teaching and research combination) academic performance of students in postgraduate education might be associated with research self-efficacy (Tiyuri et al., 2018).

Some of the surveys conducted in Turkey's different universities have shown that many of postgraduates lack of research competencies and research self-efficiacy, whereas some of findings about doctoral students' efficacies indicate vice versa (Akgün & Güntaş, 2018; Bahadır & Tuncer, 2017; Büyüköztürk & Köklü, 1999; Kart & Gelbal, 2014; Keskinkılıç & Ertürk, 2009). In some foreign studies, significant positive correlations were observed between academic performance and research self-efficacy of postgraduate students, and in comparison with master students, the doctoral students' research self-efficacy scores were higher (Tiyuri et al., 2018).

Critical Thinking Disposition

Critical thinking, a high-level thinking skill, is a complex process in which most people fail to succeed. From an educational perspective, it can be argued that cognitive strategies are used to obtain the targeted product in this process (Erdamar Koç & Alpan Bangir, 2017). On the other hand, theoretical definitions for the conceptualization of critical thinking can be classified on the axes of philosophy and psychology and the nature and quality of critical thinking are emphasized as cognitive processes and components in the psychological perspective and as a product on the philosophical level (Atabaki et al., 2015; Lorencova et al., 2019). According to Brookfield, critical thinking begins with the definition and questioning of basic assumptions, resulting in the discovery and imagination of new options. However, it is emphasized that the individual needs to be supported and assisted (by consultants and other researchers) to turn this process into an academic skill (As cited in Brodin & Frick, 2011). In academic studies on critical thinking, it can be said to be represented by the following concepts: rationality, selectivity, analytical thinking and evaluative perspective (Adriansen, 2010). Additionally, critical thinking bi-dimensionally includes skills and dispositions, and dispositional aspect involves with self-confidence, broad-mindedness and truth-bearing (Saputro et al., 2020).

In recent studies on critical thinking in Turkey, it has been found that studies focused on both preservice and in-service teachers' level of critical thinking and the effect of independent variables that affect this level, and that their critical thinking dispositions are mostly low (Akyüz et al., 2015; Erdamar Koç & Alpan Bangir, 2017; Hayırsever & Oğuz, 2017; Karaman, 2016; Şahin et al., 2016; Şen, 2009). Additionally, it is observed that the relationship of critical thinking with many different factors was studied in researches around the world. For

instance, such studies' findings show that emotional intelligence may affect critical thinking as a behavioural disposition; critical thinking disposition is correlated with self-confidence; and critical thinking disposition is indispensable to gain effective thinking and learning skills (Sk & Halder, 2020; Lorencova et al. 2020).

Academic Creativity

Creativity as a psychological and learning term can be defined as the generation of new and useful responses, ideas or solutions to a task or problem solving and can be represented by concepts such as originality, diversity, imagination and innovation (Adriansen, 2010; Amabile, 2012; Meng et al., 2017). Simply, it refers to something (an invention or an idea) new and valuable (Mullen, 2019). However, creativity, defined in different ways according to different disciplines and approaches, is the subject of many theories from fields such as philosophy, psychology, fine arts and education according to its function on academic and artistic levels (Onur & Zorlu, 2017) and person, process, environment and product-oriented models stand out in the literature (Özaşkın & Bacanak, 2016). According to the Componential Theory of Creativity, individual's specific skills, cognitive processes leading to creativity, and intrinsic motivation of the individual are the determinant components of his/her creativity (Amabile, 2012; as cited in Meng et al., 2017). Kaufman and Bauer, on the other hand, emphasized three key elements necessary for an adult to become a creative person: Appropriate level of knowledge, a well-developed critical thinking ability, and a broad imagination as in a child (As cited in Brodin & Frick, 2011). Also, in the definition of creativity of Guilford fluency, flexibility, accuracy and authenticity are the main features described (As cited in Matraeva et al., 2020).

While general creativity refers to being outside the box, going beyond the ordinary and proposing new axes of thought, scientific/academic creativity involves defining a new product or process and developing a theory (Çeliker et al., 2015). At this point, the connection between creativity and education must be discussed. Some of the researches around the world have shown that there is a connection between creativity of students and creativity of teachers, related to teachers' character and way of leadership in class. Furthermore, as a cultural output beyond teachers, the educational system play critical role and have direct affects on students' skills and competencies within the context of creativity (Matraeva et al., 2020). In addition, in studies conducted on students of different educational levels from Turkey, the change of creativity levels according to various demographic factors was examined (Gülel, 2006; Kanlı, 2017) and there are not enough studies on the effects of different kinds of variables on creativity and its components either.

METHODOLOGY

Research Goal and Research Design

The aim of this study is to determine the postgraduate students' perceptions of self-efficacy and critical thinking dispositions and to investigate their effects on academic creativity levels.

The research questions of the study are as follows:

1- At what level are the postgraduate student's perceptions of self-efficacy, critical thinking disposition and academic creativity?

2- What are the views of postgraduate students' on postgraduate education's impact on the critical thinking disposition and academic creativity?

The hypotheses of the study are as follows:

H1: Scientific research self-efficacy of postgraduate students has a significant and positive effect on their academic creativity.

H2: Critical thinking disposition of postgraduate students has a significant and positive effect on academic creativity.

This study was carried out within the scope of survey research which is one of the quantitative research designs and due to the research questions and hypotheses, it has characteristics related to both descriptive and relational survey models. Survey research allows describing a past or present situation without having an impact on variables or factors. Survey researches that explain the exchange of variables are called relational screening (Mazlum & Mazlum, 2017). The independent variables of this study were the critical thinking disposition and research self-efficacy, and its dependent variable was academic creativity. Figure 1 shows the research model.

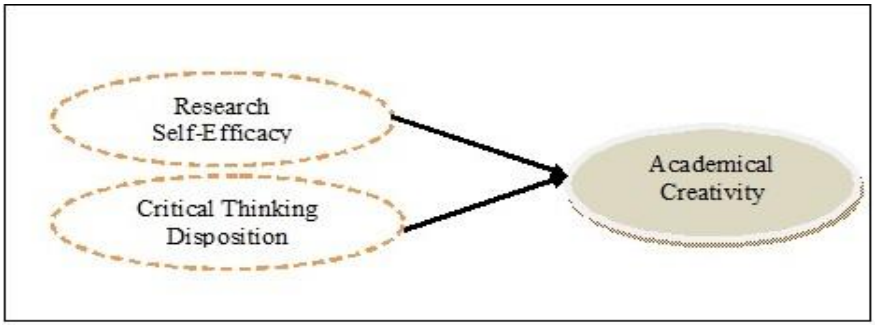

Figure 1. Research Model

Sample and Data Collection

The population of the study consists of students who are in postgraduate education at Mersin University. As of 2019-2020, the total number of students enrolled in the institutions of Social Sciences, Science, Educational Sciences, Health Sciences and Fine Arts at Mersin University, is 3560. A total of 330 forms were distributed and the number of questionnaires that could be accessed and obtained solid data was 300. Since the students who are continuing their postgraduate education were chosen, purposeful/intentional sampling was applied and voluntary participation was ensured. In this sample type, which includes the most appropriate ones for the purpose of the research, the selections are made using clusters in order to provide the widest representation (Balcı, 2010). To accomplish this, a study group was formed with participants from all institutes and different departments (30 different departments) at Mersin University.

The size of the study group was 300 and the demographic profile of the study group was as follows: 53% of the participants were female (159 people) and 47% (141 people) were male students. 60.3% (181 people) of the participants were between the ages of 20-29 and 34% (102 people) were between 30-39 years of age. The remaining 17 people (5.6%) were 40 years or older.

Table 1. Postgraduate Education Profile of the Study Group

Institute	**f**	**%**	**Program**	**f**	**%**	**Stage**	**f**	**%**
Social Sciences	158	52,7	Master degree	190	63,3	Course	165	55
Natural Sciences	58	19,3	Doctor's degree	110	36,7	Dissertation	135	45
Educational Sciences	60	20						
Other*	24	8						
Total	*300*	*100*	*Total*	*300*	*100*	*Total*	*300*	*100*

* Institute of Health Sciences and Institute of Fine Arts.

As can be seen in Table 1, 52.7% of the study group continues their postgraduate education within the Institute of Social Sciences. The majority of the participants (63.3%) are in the master's and 36.7% are in the process of doctorate and 55% of these participants are still taking courses.

In this study, Research Self-Efficacy Scale developed by Bieschke et al. and adapted to Turkish by İpek et al. (2010), UF/EMI Critical Thinking Disposition Scale, developed by the University of Florida and adapted to Turkish by Kılıç and Şen (2014) and Kaufman Domains of Creativity Scale developed by Kaufman and adapted to Turkish by Şahin (2016) were used. Data were collected through a questionnaire including 11 questions related to demographic profile and academic activities of the participants in addition to the 50-item scales that include the selected sub-dimensions.

Ipek et al.'s (2010) Turkish adaptation of the Research Self-Efficacy Scale is a 5-point Likert-type scale consisting of 4 sub-dimensions and 50 items: Preliminary preparation, conceptualization, application and reporting & presentation. Since the explained variance values of the Conceptualization and Application sub-dimensions of the scale were below 0.50, they were not included in this study, thus it has been applied as a total of 14 items with 6-item preliminary preparation and 8-item reporting-presentation dimensions. In the study of İpek et al.(2010), the Cronbach Alpha value of the Preliminary-Preparation sub-dimension was 0.860; the reporting & presentation sub-dimension was 0.870. In this study, the overall Cronbach Alpha value of the scale, which was applied in 2 sub-dimensions, was found to be 0.930.

UF/EMI Critical Thinking Disposition Scale, adapted by Kılıç and Şen (2014) into Turkish, is a 26-item 5-point Likert-type scale encompassing engagement, cognitive maturity and innovativeness sub-scales. All sub-

dimensions of the scale, which was reduced to 25 items in the Turkish version, were included in this study. While the overall Cronbach Alpha value of the scale was 0.910 in the study of Kılıç and Şen, it was 0.919 in this study. Kaufman Domains of Creativity Scale, developed by Kaufman for different fields and adapted by Şahin (2016) into Turkish has a total of 5 sub-dimensions and 42 items: Artistic, Daily, Artistic Performance, Scientific-Mechanical and Academic and is a 5-point Likert-type scale. For the scope and purposes of the study, only the 11-item sub-dimension of Academic Creativity was included in this study. In Şahin's study, the Cronbach Alpha value of the Academic Creativity sub-dimension was 0.870, and it was 0.912 in this study.

Reliability and validity of data collection tools

Reliability, which can be defined as the freeing a measurement of random errors, is a prerequisite for validity. As the reliability of the scale, which expresses the consistency of the scale and giving close results under all circumstances increases, the validity coefficient also increases. Validity is the level by which a measurement tool can accurately measure a property that it aims to measure and it can be found in different forms (Balcı, 2010).

Some criteria were taken into consideration while reliability analysis was performed and the items that did not meet these criteria were removed from the scales and the analyzes were renewed. The first of these criterions is that the Cronbach Alpha coefficient, which is considered as an indicator of scale reliability, is between 0.60-0.79, which is the accepted reliability range, and has a value of 0.80 and above if possible (Şencan, 2005). The second criterion is the effect of the items of the scale on the reliability. As a result of the analysis, it was found that the Scientific Research Self-Efficacy Scale and the Academic Creativity Scale were not an item that impaired the reliability of the scale. On the other hand, the multiple correlation coefficient of Maturity-4 (M4) and Innovativeness-7 (Ino7) items in the Critical Thinking Disposition Scale was found to be below .30, but it was decided to check the results of factor analysis to make a final decision to remove them. Cronbach Alpha statistics of the scales with sub-dimensions are given in the Table 2 and as shown below, the reliability values of all are high.

Table 2. Reliability Values of Measurement Tools

Scales with Sub-Scales	**Research Self-Efficacy**	**Critical Thinking Disposition**	**Academical Creativity**
α	Reporting& Presentation: ,891 Preliminary Preparation: ,844	Cognitive Maturity: ,806 Solution Oriented Engagement: ,768 Communication Oriented Engagement: ,820	Investigative Academic Creativity: ,852 Analytical Academic Creativity: ,807
Totally	0,930	0,919	0,912

In the literature, different types of validity are mentioned. The most commonly used ones are content and construct validity. Content validity explains how well a measurement tool can measure targeted subjects and targeted behaviors related to those subjects. Construct validity is the testing of the previously accepted cause-effect relationships in a study and one of the most common methods of this is factor analysis (Balcı, 2010).

Factor analysis is used to convert the data set of related variables into independent and less variable data sets, to create new conceptually meaningful structures from the variables in the newly created data set and to determine the impact power of these structures (Altunışık et al., 2010; Çokluk et al., 2010; Şencan, 2005). In the factor analysis application process, the inter-item load value differences in the factorization of the items were targeted to be more than 0,100, as a factorization technique, Varimax rotation technique, which is commonly used as a vertical rotation method, is used for Principal Component Analysis and rotation process, which aims to gather a large number of variables under a small number of factor structures (Çokluk et al., 2010; Hair et al., 2010).

Exploratory factor analysis attempts to determine the possible relationship between variables (Altunışık et al.2010). In this study, it was carried out in 3 stages, for two independent and one dependent variables. Firstly, as a result of the analysis applied to the Research Self-Efficacy Scale, it was found that the Reporting-Presentation (32.44%) and Preliminary Preparation (30.99%) subscales explained 63.48% of the variance; and KMO (,892 $p \leq 0.05$) and Bartlet's Sphericity Test statistics (1791,506; $p \leq 0.001$) were found to be significant. The reliability of both dimensions is high and the major dimension is the Reporting&Presentation which has a higher variance value. In the second step, although the items of the Innovativeness sub-dimension of the Critical Thinking Disposition Scale (three sub-dimensions) load more than one dimension, the factor load differences of the majority

of the items remain below 0.100 and these items are sorted out, this sub-dimension was removed from the scale because the innovation dimension was distributed irrelevantly to the other dimensions. In the last stage, a three-factor structure emerged in which the dimensions of Engagement which transformed into two sub-dimensions (*Solution-Oriented* 20.54% and *Communication-Oriented* 17.97%) and Maturity (21.18%), explained 59.69% variance. KMO (,863; p≤0.000) and Barlet's Sphericity Test (1375,709; p≤0.000) statistics of this structure were also found to be significant and the major dimension turned out to be the cognitive maturity. In the third step, although the Academic Creativity Scale was one-dimensional, a two-dimensional factor structure emerged from the first analysis. Items that load more than one dimension were removed; as a result of the second analysis, it was found that both KMO and explained variance values increased. The total variance value of these two sub-dimensional structures, which were named as *Analytical Creativity*(%34,09) and *Investigative Creativity* (27%) , was found to be 61.10%; and KMO (,890; p≤0.000) and Barlet Sphericity Test values (1354,455; p≤0.000) were also found to be significant.

Confirmatory factor analysis provides a test of the construct validity of the measurement tool (Hair et al., 2010). It tests the compatibility of the scale by showing the extent to which the determined factor structures correspond to the structure claimed to exist in theory (Altunışık et al.2010; Hair et al., 2010). The explained mean of variance (AVE) and composite reliability (CR) of each dimension were calculated. While a value of 0.50 for AVE is an indicator of adequate concordance between latent and observed variables. Values of 0.70 and above for CR indicate that the observed variables represent the latent variable at a high degree (Hair et al., 2010). As can be seen in Table 3, all t-values were statistically significant at 0.01 level; it was observed that the standardized load values ranged between 9.59 and 19.66, the highest error margin of the variables was 0.68, and therefore there was no item to be removed from the model. When the explained mean variance and combined reliability statistics were examined, no problem was observed in CR scores of any of the 7 variables calculated, however, problems were observed in 3 variables in terms of AVE values. It was observed that the variables of preliminary preparation and maturity of these three variables remained below the lower limit with a small score difference and only the solution-oriented variable (0.40) found to be noteworthy. Model modification suggestions for removing this were reviewed, and it was understood that none of the modifications would increase the goodness of model fit, so the scales were left as they were.

Table 3. Descriptive Statistics of Confirmatory Factor Analysis of Measurement Model

Sub-scales & Items	Std. load	Margin of Error	R^2	t	AVE	CR
Reporting&Presentation					**0,63**	**0,89**
RP4	0,68	0,53	0,47	13,07		
RP5	0,82	0,32	0,68	17,00		
RP6	0,90	0,19	0,81	19,66		
RP7	0,86	0,26	0,74	18,20		
RP8	0,69	0,52	0,48	13,31		
Preliminary Preparation					**0,48**	**0,85**
PP1	0,59	0,65	0,35	10,57		
PP2	0,75	0,44	0,56	14,40		
PP3	0,76	0,42	0,58	14,86		
PP4	0,72	0,48	0,52	13,79		
PP5	0,73	0,46	0,54	14,05		
PP6	0,60	0,64	0,36	10,75		
Cognitive Maturity					**0,46**	**0,80**
M1	0,73	0,46	0,54	13,59		
M2	0,69	0,52	0,48	12,62		
M3	0,65	0,58	0,42	11,59		
M5	0,65	0,58	0,42	11,54		
M7	0,65	0,58	0,42	11,58		
Solution Oriented Engagement					**0,40**	**0,77**
SOE1	0,59	0,66	0,34	10,05		
SOE2	0,56	0,68	0,32	9,59		

SOE3	0,72	0,49	0,51	12,91		
SOE4	0,61	0,63	0,37	10,53		
SOE5	0,68	0,54	0,46	12,01		
Communication Oriented Engagement					**0,61**	**0,82**
COE8	0,72	0,48	0,52	13,42		
COE9	0,78	0,39	0,61	14,93		
COE10	0,84	0,30	0,70	16,47		
Investigative Acad. Creativity					**0,50**	**0,85**
RAC6	0,80	0,36	0,64	16,01		
RAC7	0,79	0,37	0,63	15,81		
RAC8	0,70	0,51	0,49	13,30		
RAC9	0,66	0,57	0,43	12,17		
RAC10	0,66	0,56	0,44	12,37		
RAC11	0,59	0,66	0,34	10,58		
Analytical Acad. Creativity					**0,51**	**0,80**
AAC1	0,80	0,36	0,64	15,71		
AAC2	0,65	0,58	0,42	11,89		
AAC3	0,76	0,42	0,58	14,70		
AAC5	0,63	0,60	0,40	11,44		

In the CFA analysis performed by considering the structures in the exploratory factor analysis, Normalized Chi-Square statistics and RMSEA goodness of fit statistics (Hair et al., 2010; Şimşek, 2007) showing the basic agreement about the measurement model were examined. The normalized chi-square goodness of fit statistic of the model was found to be 2.02 (1025.05 / 506) and the RMSEA statistic was found to be 0.059. The convergent validity of the measurement model was tested in terms of other goodness of fit such as AGFI, GFI, RMR, SRMR, CFI, NFI, NNFI, IFI, RFI, CAIC which take into account or do not take into account the sample size, degrees of freedom in the model, and the complexity of the model (Şimşek, 2007). All in all, when the compliance statistics of the measuring instrument and the reference values are compared, as can be seen from Table 4, it is possible to suggest that the measurement model has an acceptable level of goodness of fit and convergent validity as a whole.

Table 4. Confirmatory Factor Analysis Measurement Model Goodness of Fit Statistics

Goodness of Fit Index	**Current Study's Scale Measures**	**Reference Values***	
		Adjusted Goodness of Fit	**Acceptable Goodness of Fit**
X^2/ df	1025,05/506=2,02	0≤ X^2/ df≤ 2,5	3<X^2/ df≤ 5
RMSEA	0,059	0≤RMSEA≤ 0,05	0,5<RMSEA≤0,08
AGFI	0,80	0,95≤AGFI≤1,00	0,90≤AGFI≤0,95
GFI	0,83	0,90≤GFI≤1,00	
RMR	0,048	RMR≤0,05	
SRMR	0,061	SRMR≤0,08	
CFI	0,97	0,95≤CFI	0,90≤CFI
NFI	0,94	0,90≤NFI	
NNFI	0,97	0,90≤NNFI	
IFI	0,97	0,95≤IFI	0,90≤IFI
RFI	0,93	0,90≤RFI	
Model CAIC/Saturated CAIC	1621,69 / 3988,75	Model CAIC<Saturated CAIC	

*Source: Hair et al., 2010.

Analyzing of Data

In this study, structural equation modeling which is considered as the combination of regression model and factor analysis was used. This model, which provides the opportunity to estimate and test the direct and indirect relationships between variables, is analyzed through computer software due to the mathematical complexity of the multivariate structure. LISREL software is one of the most widely used one for this purpose (İlhan & Çetin, 2014). Furthermore, path analysis including multiple regression analysis methods was used for causal modeling and, by

doing so, the significance, direction and effect levels of the correlations among the variables in terms of the hypotheses tested were investigated (İlhan & Çetin, 2014; Şimşek, 2007). In this context, data analysis was performed through LISREL 8.80 software.

FINDINGS

First of all, if we are to start with the research questions, it is necessary to look at the profile of graduate students' level of scientific research self-efficacy, critical thinking and academic creativity perceptions, and views about effects of postgraduate education on critical thinking disposition and academic creativity.

1- At what level are the postgraduate student's perceptions of self-efficacy, critical thinking and academic creativity?

Table 5. Postgraduate Students' Perception Levels Regarding Research Variables

Variables	**N**	**X**	**Sd**
Research Self-Efficacy	300	3,764	,667
Critical Thinking Disposition	300	4,133	,432
Academical Creativity	300	3,584	,658

As can be seen from Table 5, the postgraduate students' perceptions of critical thinking disposition (4,133) were found to be higher than the others. The lowest perceived score was in academic creativity (3,584).

Table 6. Correlation Analysis of Variables

	Res. Self Effic.	Matur.	S.Or. Enga.	C.Or Enga.	Inv. A.Crea.	Anly. A.Crea.
Res.Self Effic.	1	,310**	,416**	,488**	**,554****	,595**
Maturity	,310**	1	,427**	,446**	,348**	,195**
Sol.Or. Engage.	,416**	,427**	1	,510**	,414**	,346**
Com.Or.Engage.	,488**	,446**	,510**	1	,442**	,393**
Inves.A.Creativity	**,554****	,348**	,414**	,442**	1	,620**
Anly.A.Creativity	**,595****	,195**	,346**	,393**	,620**	1

**Correlation is significant at the 0.01 level (2-tailed).

According to the correlation (r) values in Table 6, it can be said that all the correlation between the variables are positive and significant, but they are at low levels. The highest positive and significant correlations are between research self-efficacy and both investigative and analytical academic creativity, which are positive and moderate (r=0,554; p=0,000<0,01; r=0,595; p=0,000<0,01).

2- What are the views of postgraduate students' on the postgraduate education's impact on critical thinking disposition and academic creativity?

The participants of the study group were asked whether the postgraduate education they received had a positive effect on their critical thinking and creativity in their academic studies, and the profile of responses based on their personal views is presented in Table 7.

Table 7. Postgraduate Students' Opinions Regarding the Education They Received

	Agree		**Disagree**		**Total**	
Influence of Postgradute Education	**(f)**	**%**	**(f)**	**%**	**(f)**	**%**
Positive Influence on Academical Creativity	281	93,7	19	6,3	300	100
Positive Influence on Critical Thinking Disposition	278	92,7	22	7,3	300	100

As shown in the Table 7, the majority of postgraduate students think that their education has positive contributions to their academic creativity and critical thinking dispositions. However, the ratio of those who think that postgraduate education contributes to critical thinking was found to be lower.

Based on the research in the literature, the hypothesis H1 and H2 generated were reorganized by dividing the dependent variable of the model into two dimensions as a result of both EFA and CFA analysis (analytical and investigative academic creativity).

Hypothesis 1: The sub-dimensions that make up the perceptions of research self-efficacy of postgraduate students, have a significant and positive effect on analytical academic creativity.
Hypothesis 2: The sub-dimensions that make up the perceptions of research self-efficacy of postgraduate students, have a significant and positive effect on investigative academic creativity.
Hypothesis 3: The sub-dimensions that make up the perceptions of critical thinking disposition of postgraduate students, have a significant and positive effect on analytical academic creativity.
Hypothesis 4: The sub-dimensions that make up the perceptions of critical thinking disposition of postgraduate students, have a significant and positive effect on investigative academic creativity.

In the Table 8, standardized regression coefficients, standard error values, t-values that test the significance of regression coefficients of the model tested as a result of structural equation modeling path analysis, R^2 values showing the exploratory power of the independent variables and model goodness of fit statistics are included. When normalized chi-square and RMSEA, in particular, compliance statistics such as CFI, NFI, RFI, RMR and SRMR were compared with reference values, it was observed that the measurement model had a decent goodness of fit as a whole (Şimşek, 2007).

Table 8. Structural Equation Model Path Analysis Descriptive Statistics & Hypothesis Results

Hypothesis	Cor. & Direction			Coef.	Std.Er.	t	p	Result	R^2
H1a	Rep.Present.	→	An.A.Creat.	0.13	0.12	1.53	p≥0.05	Rejected	0,50
H1b	Pre.Prep.	→	An.A.Creat.	0.51	0.16	4.62	p≤0.01	Accepted	
H3a	Maturity	→	An.A.Creat.	-0.16	0.12	-1.82	p≥0.05	Rejected	
H3b	Sol.Or.Engage.	→	An.A.Creat.	0.13	0.13	1.42	p≥0.05	Rejected	
H3c	Com.Or.Engage.	→	An.A.Creat.	0.15	0.13	1.63	p≥0.05	Rejected	
H2a	Rep.Present	→	Inv.A.Creat.	0.19	0.11	2.43	p≤0.05	Accepted	
H2b	Pre.Prep.	→	Inv.A.Creat.	0.30	0.13	3.16	p≤0.01	Accepted	
H4a	Maturity	→	Inv.A.Creat.	0.05	0.11	0.67	p≥0.05	Rejected	0.48
H4b	Sol.Or.Engage.	→	Inv.A.Creat.	0.13	0.12	0.97	p≥0.05	Rejected	
H4c	Com.Or.Engage.	→	Inv.A.Creat.	0.22	0,13	2.45	p≤0.05	Accepted	

Goodness of fit: Chi-Square/df=2.19(1112.93/507), RMSEA:0.063, GFI:0.82, CFI:0.96, NFI:0.94, RFI:0.93, RMR:0.056, SRMR:0.070, AGFI:0.79

R^2An.A.Creat.$^{=}$ 0.18*Rep.Pres. + 0.72* Pre.Prep. - 0.22* Maturity + 0.19* Sol.Or.Engage.+0.22*Com.Or.Engage

R^2Inv.A.Creat.$^{=}$ 0.27*Rep.Pres. +0.42* Pre.Prep.+ 0.073* Maturity + 0.12*Sol.Or.Engage.+ 0.31*Com.Or.Engage

When the correlations in Table 8 are examined, it is seen that 4 of the 10 sub-hypotheses tested were accepted and 6 were rejected. In terms of the 4 main hypotheses, H1 and H4 were partially accepted, H3 was completely rejected and H2 was fully accepted.

In examining the sub-hypotheses in detail, it is seen that the only common variable that affects both sub-dimensions of Academic Creativity in a significant and positive way is the "preliminary preparation" variable of the research self-efficacy (p≤0.01). However, preliminary-preparation affects the analytical academic creativity (r=0.51, p≤0.01) more strongly than the investigative creativity (r=0.30, p≤0.01). Remarkably enough, the only variable affecting the analytical academic creativity was the preliminary preparation variable, there was no statistically significant effect of the other 4 variables observed (p> 0.05). When the variables that affect the investigative academic creativity were examined, "reporting & presentation" (r=0.19, p≤0.05) and "preliminary preparation" (r=0.30, p≤0.01) sub-dimensions of research self efficiacy, and "communication-oriented engagement" (r=0.22, p≤0.05), one of the sub-dimension of critical thinking disposition, were found to have a significant and positive effect. However, when the effects of these three variables are examined, it can be seen that the preliminary preparation variable has a higher positive effect (p≤0.01). No significant effect of "maturity" and "solution-oriented engagement" was observed (p>0.05). These two sub-dimensions are common variables that do not significantly affect both analytical and investigative academic creativity. The correlation between the variables is shown in Figure 2.

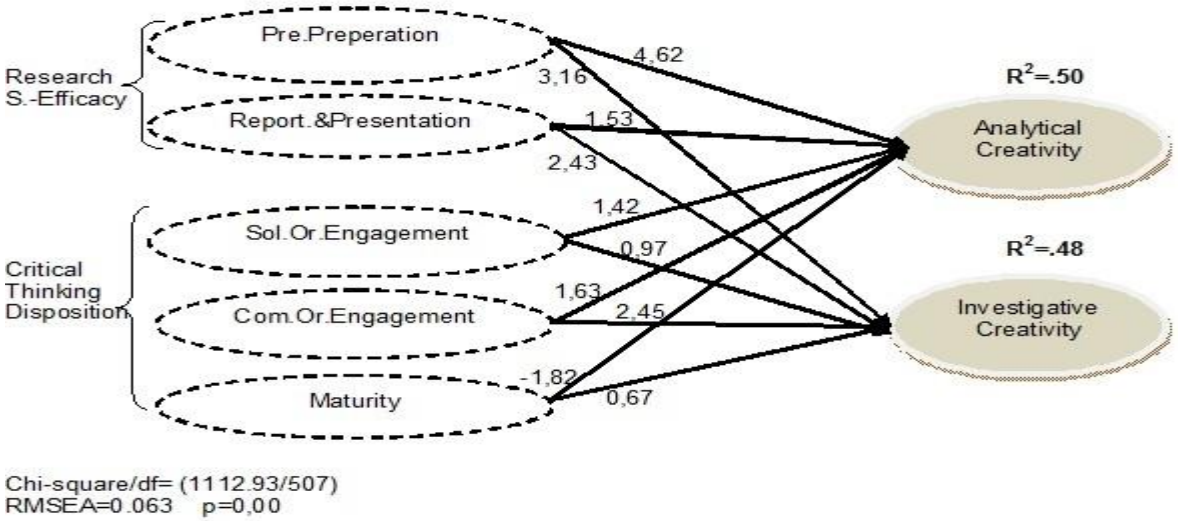

Figure 2 . Structural Equation Model Path Analysis Results

DISCUSSION AND CONCLUSION

As mentioned above, since the results of EFA and CFA analysis led us to restructure the basic hypothesis according to new sub-dimensional necessities, it can be argued that academic creativity's monolith looking structure which was included in the scale, has become invalid. Exploring such binary structure of academic creativity may deserve to be investigated in accordance with new independent variables. Particularly, the preliminary preperation as the main component of perception of research self-efficacy, was found to be a key variable to analyze academic creativity with its two sub-dimensions.

In the study by Wu et al.(2014), it was found that the social environment and family structure primarily affect creativity, and that the school environment is less effective. In addition, it was also seen that the achievements of the philosophy of lifelong learning are more important than professional knowledge and the formal education in increasing students' creativity. In Gupta's (2015) study, the learner and instructor based factors which affect students' academic creativity were personality, knowledge level, thinking style, motivation, family environment, group work and cooperation. These findings are not incompatible with the effect of research self-efficacy on academic creativity, which is an effective independent variable and a product of formal education process in this study. Because, it might be argued that academic creativity in postgraduate education has different components than general creativity.

According to our findings, research self-efficacy and academic creativity perceptions of postgraduate students in the study group were moderate and their critical thinking perceptions were at a high level. The majority of students think that postgraduate education has a positive effect on both their critical thinking disposition and their academic creativity. Whereas, according to the research findings of Limon and Durnalı (2018), while half of the participants expressed negative opinions about the doctorate education they received, their opinions towards the faculty members were more positive. In the study of Büyüköztürk and Köklü (1999) on the research efficacy of postgraduate students, according to the evaluations of the faculty members, it was seen that graduate students did not have research competencies and doctoral students had problems related to literature review. In the study of Şahan and Yasa (2017), the majority of students who have completed postgraduate studies on Lifelong Learning and Adult Education stated that postgraduate education has positive contributions to professional life and social relations, however, a certain group of participants stated that the achievements did not meet expectations. In the study of doctoral students in Sweden, nearly 20% of the students stated that there was insufficient training in scientific methodology which is essential for professional development (Bitusikova et al., 2010).

In our opinion, one of the most important findings of this study is that it is wrong to evaluate and measure academic creativity in uni-dimensional terms. As a matter of fact, the relational existence of the analytical and investigative creativity sub-dimensions according to the significance content of the scale items was partially confirmed. In this study, it can be said that the hypothesis about the research self-efficacy was validated more strongly than the hypothesis about critical thinking. Because it has been seen that both sub-dimensions of academic creativity can be affected by the preliminary preparation and reporting & presentation dimensions of research self-efficacy. On the other hand, it is interesting to note that the critical thinking disposition does not affect analytical academic

creativity, but instead the investigative academic creativity. Such finding may confirm a positive relation between critical thinking disposition and investigational curiosity that may provoke academic creativity.

Meng et al. (2017) 's research on graduate students showed that there is a positive correlation between students' intrinsic motivation and creativity and there is a negative correlation between intrinsic motivation and poor advisory service. Research on the creativity and innovation perceptions of postgraduate students in Malaysia showed that the relevant institutions need more support to put out innovative and creative graduates (Majid, 2010). In Olatoye et al.'s (2010) research on emotional intelligence, creativity and academic achievement among business students, it was found that there is no significant relationship between creativity and course achievement, whereas emotional intelligence has a strong connection with academic creativity. In Çeliker et. al. (2015) research, a high and positive correlation was found between students' motivation and scientific creativity levels. In the study of Kanlı (2017) examining gifted students at high school level, it was found that scientific attitude predicts scientific creativity.

As commonly conducted, the postgraduate education process results in a dissertation within classical model. Thus, while skills and competencies to prepare such a report which presents all stages and findings of a scientific research process should be acquired, many studies (Tonbul, 2017), which demonstrate that they cannot be adequately acquired, also confirm that research competencies and critical thinking skills cannot be given at the level that would lead to academic creativity. As a matter of fact, according to Tonbul's (2017) research findings, postgraduate courses are taught without having students acquire critical thinking.

This findings showed that the function of postgraduate education to help students acquire the scientific research skill and efficacy had a critical role in terms of academic creativity. The connection between critical and creative thinking skills in Brodin and Frick's (2011) model with transformative learning emphasized that critical thinking is a whole with creative thinking. As stated and disscussed in the systematic review, which was based on the analyzes of studies indexed in worldwide databases, of Lorencova et al.'s (2019) it has been shown that despite of it's widely shared feature as essential component for efficient learning and teachings, the critical thinking is not systematically included and employed in teacher education activities. As mentioned above, critical thinking is supposed to be both a means and a goal which may stimulate efficient learning and creativity, in this study, it was found that the critical thinking disposition did not affect academic creativity as a whole, in addition to the need to examine its engagement dimension into two new sub-dimensions as solution and communication orientedness. Such an unprecedented finding exhibits complex and bi-dimensional structure of critical thinking, as for creativity. In the relevant literature, there are a large number of studies from a wide range of countries on the factors affecting creativity in general, but there aren't studies sufficiently discussing academic creativity. In particular, the creativity of employees in the fields of business and business management was extensively studied. For example, in the compilation of Jovanovic et al.(2016), it was found that anger and positive-affect facilitate and stimulate creativity. In a study comparing Chinese and American students, it was seen that social values and school system directly affected students' creativity, and students who grew up in an environment supporting individualism and independent self could be more creative than others (Niu & Sternberg, 2003). According to the findings of another study for postgraduate students in China, participation of graduate students in various research projects affects academic and scientific creativity performance (Zhao et al., 2017). These findings show that creativity is open to combining the inner world of the individual and external factors. Therefore, it can be said that the variables of research self-efficacy and critical thinking disposition in this study confirm the effect of variables of school-education system once again. In fact, as stated in the European Union's report on the quality of doctoral education, postgraduate education models should be developed in accordance with the needs of research-oriented and massified education (Bitusikova et al., 2010).

In this study, it was also seen how such scales could demonstrate different factor loads according to the conditions in which they were used and the characteristics of the study group. Especially, the fact that the innovation dimension of critical thinking disposition becomes dysfunctional and that its engagement dimension should be divided are noteworthy. This showed that different scales related to critical thinking disposition should be adapted to different conditions.

RECOMMENDATIONS

Although research and discussions about the definition and components of creativity in general continue, there is not much research found on the sources and sub-dimensions of academic creativity. Hence, it can be thought that the investigative and analytical dimensions of academic creativity can also emerge in different study groups. It is important to target new curriculum and application models for the development of both scientific research techniques and critical thinking disposition in postgraduate education processes. In this context, the quality of

postgraduate education processes in universities should be improved with the help of experimental studies aimed at developing investigative and analytical academic creativity.

Hence, future researches on academic creativity must focus on its multidimensional structure and so curriculums of postgraduate programs to be designed in accordance with such results.

LIMITATIONS

The scope of the research is limited to the perceptions and opinions of the postgraduate students of the 2019-2020 academic year who were willing to take part in the study voluntarily at Mersin University. In addition, the interpretation of the findings was made within the framework of the research design and statistical methods.

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