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Examining the Relationship Between Cognitive Flexibility and Effective Problem Solving Skills in School Principals: A Canonical Correlation Analysis

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Abstract

Current study aims to explore the relationship among cognitive flexibility variables (alternative and control) and effective problem solving variables (impulsive, reflective, avoidant, monitoring, problem solving confidence, and planfulness) in school principals' sample. The population of the research consists of 564 school administrators working in public schools in Siirt, Turkey, in the 2020-2021 academic year. Research data were collected from 50 female and 261 male administrators who volunteered to participate in the research among school administrators. "Cognitive Flexibility Inventory" and "Problem Solving Inventory" were used as data collection tools in the study. Two independent t-tests were conducted to examine gender differences in participants' both cognitive flexibility and overall problem-solving scores. According to the research findings, it was determined that school administrators' cognitive flexibility levels and problem solving skills did not differ significantly according to gender. The canonical correlation analyze was utilized to test interrelationship between two set of variables. The canonical correlation analyze revealed two significant canonical functions. The findings of first canonical function indicated that, when both alternative and control sub-dimension of cognitive flexibility and total cognitive flexibility scores increase impulsive and avoidant scores decrease, while reflective, monitoring, problem solving confidence, and planfulness sub-dimensions of effective problem solving and total problem solving scores increase. The results also showed that there was a high and a positive correlation between overall cognitive flexibility level of school administrations and their effective problem solving skills. The findings of second canonical function also indicated that when alternative scores increase and control scores decrease, reflecting, monitoring, and impulsive problem solving scores decrease. Overall, the results suggest that the cognitive flexibility and effective problem solving nicely complement each other. In these respect, in order to be equipped to effectively solve problems, school principals need to be also equipped with cognitive flexibility skills.

Keywords: Flexibility, Cognitive Flexibility, Effective Problem Solving, Canonical Correlation, School Principals,

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Okul Müdürlerinin Bilişsel Esneklikleri ile Etkili Problem Çözme Becerileri Arasındaki İlişki: Bir Kanonik Korelasyon Analizi

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Öz

Bu çalışmanın temel amacı, okul müdürleri örnekleminde bilişsel esneklik değişkenleri (alternatif ve kontrol) ile etkili problem çözme değişkenleri (dürtüsel, yansıtıcı, kaçınmacı, izleme, problem çözme güveni ve planlılık) arasındaki ilişkiyi araştırmaktadır. Araştırmanın evrenini, 2020-2021 eğitim-öğretim yılında Siirt ilinde kamu okullarında görev yapan 564 okul yöneticisi oluşturmaktadır. Araştırma verileri okul yöneticileri arasından araştırmaya katılmaya gönüllü olan 50 kadın ve 261 erkek yöneticiden toplanmıştır. Araştırmada veri toplama aracı olarak 'Bilişsel Esneklik Envanteri' ile 'Problem Çözme Envanteri' kullanılmıştır. Katılımcıların hem bilişsel esneklik hem de genel problem çözme puanlarındaki cinsiyet farklılıklarını incelemek için iki bağımsız t-testi yapılmıştır. İki değişken grubu arasındaki karşılıklı ilişkiyi test etmek için ise kanonik korelasyon analizi yapılmıştır. Araştırma bulgularına göre okul yöneticilerinin bilişsel esneklik düzeyleri ile problem çözme becerilerinin cinsiyete göre anlamlı fark göstermediği belirlenmiştir. Kanonik korelasyon analizi sonucunda iki anlamlı kanonik fonksiyon saptanmıştır. Birinci kanonik fonksiyona ait bulgular, bilişsel esnekliğin hem alternatif hem de kontrol alt boyutu ile toplam bilişsel esneklik puanları arttığında, aceleci ve kaçıngan puanların azaldığını; düşünen, değerlendirici, kendine güvenli, planlı ve toplam problem çözme puanlarının arttığını göstermiştir. Sonuçlar ayrıca okul müdürlerinin genel bilişsel esneklik düzeyleri ile etkili problem çözme becerileri arasında yüksek ve pozitif bir ilişki olduğunu göstermiştir. İkinci kanonik fonksiyonun bulguları ayrıca, alternatif puanlar arttığında ve kontrol puanları azaldığında yansıtma, izleme ve aceleci problem çözme puanlarının azaldığını göstermiştir. Genel olarak, sonuçlar bilişsel esneklik ve etkili problem çözmenin birbirini güzel bir şekilde tamamladığını göstermektedir. Bu açıdan okul müdürlerinin sorunları etkili bir şekilde çözebilecek donanıma sahip olmaları için bilişsel esneklik becerileri ile de donatılmaları gerekmektedir.

Anahtar Kelimeler: Esneklik, Bilişsel Esneklik, Etkili Problem Çözme, Kanonik Korelasyon, Okul Müdürleri

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Introduction

Throughout the history, from all aspects of the life, human beings have faced with problems and these problems become indispensible part of our lives. Although individuals easily overcome some problems, others can be quite challenging. As today's intense and rapid changes and developments in all domains of life force whole society to develop new adaptable skills and transform themselves in accordance with demands of conditions. Thus, people need to develop and improve adaptation skills for decision-making and generating solutions to the given problems (Palancı & Okutan, 2010). In this respect, the position of administrators is very important in educational institutions, which are one of the most important institutions today. Administrators have many responsibilities regarding all students, parents, teachers, other schools and institutions overall. Administrators also encounter many problems in the school environment, and sometimes they have to deal with very serious crises. It is natural to experience problems and crisis situations in schools, which are a lively and social institution consisting of students, teachers, parents, and other school personals. The people who are the managers of such important institutions should be equipped to solve the problems and crises that may occur in these institutions in the most correct way.

As known, problems cause tension in individuals and make them feel the need to find a solution. Therefore, individuals resort to various ways to solve the problem. Morgan (1961) defines problem solving as 'finding the best way to overcome the obstacle'. Problem solving is process in which people try to reach a desired aim by engaging a set of actions in order to eliminate difficulties and barriers (Bingham, 1998). Problem–solving could be defined as a set of comprehensive and complex cognitive process involving meta–cognitive thinking, trying to find most effective solution to the problem and making decisions effectively (D'Zurilla & Nezu 2001).

Effective problem solving involves defining and formulating the problem (pinpointing the issue), generating alternatives, decision-making (pros and cons for each option and selection of alternatives), and implementation and verification (assessment of outcome) (Nezu et al., 2012; Nezu et al., 2019). Stevens (1998) also argued that problem solving involve six stages. These are identification of the problem, gathering required information/data, determining the root of the problem, getting a potential solution, choosing the most suitable solution, and finally solving the problem. The problem solving is "core of" (Leithwood & Steinbach, 1995) and the forefront of the administration. In addition, one of the most important skills needed to be a school principal is effective problem solving (Lowe et al., 1996; Mullins, 2000).

Cognitive flexibility also an important factor which helps human-being pursue complex tasks, changing their behavior in the light of new demands, discovering a new adaptable solution to given problem or solving a problem in a new, different, and effective way (Ionescu, 2012) and producing responses from a different and wide perspective. But, there is no any consensus on definition of the cognitive flexibility. According to Dennis and Vander Wal (2010) the core component of cognitive flexibility is "switch cognitive sets to adapt to changing environmental stimuli".

Individuals who are cognitively flexible can adapt to the situations which change quickly and successfully reconstruct their current knowledge according to the situation. From this point of view, cognitive flexibility can be defined as adapting to new

situations quickly and restructuring information effectively (Corey, 2008). Cognitive flexibility is also defined as the individual's awareness of being able to engage in different behaviors before exhibiting a behavior in newly encountered situations. In other words, cognitive flexibility can be expressed as "the ability of an individual to have different perspectives and the belief that he or she has the ability to produce alternative solutions" (Taş & Deniz, 2018). In accordance with situational demands cognitive flexibility is the ability to alter one's thoughts or actions (Geurts et al., 2009), the ability to flexibly shift perspectives and focus of attention (Diamond, 2006), the ability to generating alternative strategies by shift between responses and mental sets (Bennett & Müller, 2010), in encountering changing environmental demands the ability to tailor goal-directed behavior (Garcia–Garcia et al., 2010), and modification of cognitive processes when faced with changing task demands (Deak, 2006).

People who are cognitively flexible are open to change, have a pluralistic approach that is not fixed-minded, and do not prefer to set rigid and unchanging rules for themselves and others. They are aware of how rigid, dysfunctional cognition affects their emotions, thoughts, and behaviors. Thus, awareness levels for their feelings and thoughts are quite high (Satan, 2014; Gündüz, 2013). Martin and Anderson (1998), contrary to choosing the right path which is immediately come to mind, cognitive flexibility is the ability to monitoring all options before making a choice or come to conclusion. Moreover, individuals who have higher cognitive flexibility skills are thought to be more effective and productive at problem solving (Esen-Aygun, 2018).

By being "core of" (Leithwood & Steinbach, 1995) and the forefront of the administration and being one of the most important skills needed to be a school principal (Lowe et al., 1996; Mullins, 2000) effective problem solving need to be studied. Before making any decisions examining all options, having a pluralistic approach to problems, being open-minded, counting on one's ability to produce alternative solutions and many other effective characteristics of cognitive flexibility bring us to study its relationship with effective problem solving. As Esen-Aygun (2018) also argued that having higher cognitive flexibility skills made individuals to be more effective and productive at problem solving. In this context, purpose of current study was to examine the relationship between effective problem solving and cognitive flexibility of school principals. In order to achieve this main purpose, the study sought to answer the following research questions.

1. What is the cognitive flexibility and problem-solving skills levels of school administrators?

2. Do school administrators' cognitive flexibility and problem-solving skills levels differ according to their gender?

3. Is there a statistically significant relationship between the cognitive flexibility levels of school administrators and their problem-solving skills?

4. What are the relationship among cognitive flexibility variables (alternative and control) and effective problem solving variables (impulsive, reflective, avoidant, monitoring, problem solving confidence, and planfulness) in school principals' sample?

Methodology

Overall Research Design of the Study

In order to examine the links among variables of effective problem solving and cognitive flexibility correlational study design was used. Correlational research paves the way to identify the nature of the relationship between two or more variables and is useful to make predictions about an outcome variable (Fraenkel et al., 2012).

Population and Sample Group

Ethical approval was obtained from the Siirt University's Ethical Review Board, prior to data collection. The population of the study was 564 school principals (505 male and 59 female) worked in Siirt city center and its provinces in 2020-2021. Considering the number of school principals in the population, all school principals were reached based on the idea that the population is accessible; a specific sampling method was not used. In data collection process all school principals were reached and data were collected from 324 volunteering participants face to face by researchers themselves. But 311 of them were included to the study as 13 of them had many unanswered questions. These 13 participants answers were examined via descriptive statistics and it did not reveal any patterns. According to Tabachnick and Fidell (2013) at least 10 observation per variable need to conduct canonical correlation and our sample exceed this criteria.

Data Collection Instruments

The Cognitive Flexibility Scale

The Cognitive Flexibility Scale (CFS) was developed by Dennis and Vander Wal (2010) to determine the ability of individuals to produce alternative and appropriate thoughts in the face of difficult situations. The scale consists of two sub-dimensions: alternatives and control. The "Alternatives" dimension consists of 13 items and consists of items that related to the finding alternative solutions in difficult situations and being aware of alternative explanations for different life situations and human behaviors. The "control" sub-dimension consists of 7 items and consists of statements about difficult situations can be controlled.

The scale includes questions such as "When in difficult situations, I consider multiple options before deciding how to behave" and "When encountering difficult situations, I become so stressed that I cannot think of a way to resolve the situation" for two subscales respectively. The items rated on a 7 Point-Likert scale ranging from 1=strongly disagree to 7=strongly agree. The highest score that can be obtained from the scale is 100 and the lowest score is 20. An increase in the scores obtained from the scale means that the level of cognitive flexibility also increases. The adaptation study of the Cognitive Flexibility Scale into Turkish was done by Gülüm and Dağ, (2012). The Cronbach's alpha value in the first and last measurement of the alternatives sub-dimension was .91. The Cronbach's alpha values of the control sub-dimension were found as .86 in the first measurement and .84 in the last measurement (Gülüm & Dağ, 2012). In the current study calculated Cronbach's alpha value for total score of cognitive flexibility scale was .93. The calculated Cronbach's alpha value for alternatives sub-dimension was .83 and for control sub-dimension was .86.

The Problem Solving Inventory

The Problem Solving Inventory was developed by Heppner and Peterson (1982) to measure of applied problem solving in the United States. The scale consists of six sub-dimensions: impulsive style, reflective style, problem solving confidence, avoidant style, monitoring, and planfulness. The scale includes questions such as "I make snap judgments and latter regret them", I try to predict the overall results of carrying out a particular course of actions", I trust my ability to solve new and difficult problems", "When my first efforts to solve a problem fail, I become uneasy about my ability to handle the situation", When confronted with a problem, I consistently examine my feeling to find out what is going on in a problem situation" , and "When confronted with a problem, I stop and think about it before deciding on a next step" for all subscales respectively. The inventory is a 32-item Likert-type instrument and items rated 1=strongly agree to 6=strongly disagree. The highest score that can be obtained from the scale is 198 and the lowest score is 32. The mean score of the scale is 112. Values above the average indicate that the person is insufficient in problem solving, while values below indicate that the person is good at in problem solving. The adaptation study of the problem-solving inventory into Turkish was done by Savaşır and Şahin (1997). In the current study calculated Cronbach's alpha value for total score of problem solving was .91. The Cronbach's alpha value for subscales was range from .70 to 85.

Data Analysis

The data in the study were collected by using interval scale, variables are continuous, and skewness and kurtosis standard values were less than the critical value (1.96 for α = 0.05, 2.58 for α = 0.01) and that the sample size was over 50 (Hair et al., 2010). Thus, it was decided that the data almost normality distributed and parametric tests were applied in data analysis. Since the method of dividing the skewness and kurtosis values coefficient by their standard error is very similar to the standard value method of the skewness coefficient (Uysal and Kılıç, 2022), we preferred to use the method of kurtosis and skewness standard values as criteria. The main analysis of the current study is canonical correlation. Before conducting the analysis all related assumptions of the canonical correlation (independent observation, absence of outliers, absence of multicollinearity, in each sets & across sets, univariate, bivariate and multivariate normality [for cognitive flexibility variables all skewness (ranged from .28 to 1.78) and kurtosis (ranged from -.39 to -.74) values and for problem-solving variables all skewness (ranged from - .38 to 1.48) and kurtosis (ranged from .51 to 1.09 values did not exceed -1.96 and +1.96] (Tabachnick & Fidell, 2013), linearity within and between the sets, homoscedasticity between all pairs within and between the sets, VIF<.4 (for the current study none of values exceed 1.42), Tolerance>.20 (in the study all values were above .71), r<.90) (Menard 1995; Pan & Jackson, 2008;) were checked and ensured.

Results

Descriptive Statistics

Demographic characteristic of the participants in the current study presented at the table below:

Table I Demographic Characteristic of the Study Sample

Variable						Total
		Female	Male			
Gender	*N*	50	261			311
	%	16.1	83.9			100
		20-25	26-30	31-40	41 and over	
Age	*N*	29	116	122	44	311
	%	9.3	37.3	39.2	14.1	100
Marital Status		Married	Single			
	N	203	108			311
	%	65.3	34.7			100
		Preschool	Primary School	Middle School	High School	
School Level	*N*	14	97	115	85	311
	%	4.5	31.2	37.0	27.3	100
Year of Exprience		1-5	6-10	11-20	21 and over	
	N	133	82	69	27	311
	%	42.8	26.4	22.2	8.6	100

As seen from the table, the sample of the current study includes 50 (16.1%) female and 261 (83.9%) male. In terms of their ages there are 29 (9.3%) participants between the ages of 20-25; 116 (37.3%) between the ages of 26-30; 122 (39.2%) between the ages of 31-40, and 44 (14.1%) school administrators aged 41 and over. According to their marital status 203 (65.3%) of school administrators are married and 108 (34.7%) of them are single. In terms of school administrators' school level 113 of them (35.7%) were pre-school and primary school, 115 (37.0%) of them work in secondary school and 85 (27.3%) in high school. When school administrators' years of experiences examined; 133 (42.8%) of them were had an experience of 1-5 years; 82 (26.4%) of them 6-10 years and 91 (30.8%) of them had 11-20 years or more experience as a school administrator. The cognitive flexibility and problem-solving skills levels of school administrators presented at the table below:

Table 2 Descriptive Statistics of Participants' Problem Solving Skills and Cognitive Flexibility

Variable	**N**	$\bar{x}$	*SD*
Impulsive Style	311	77.4	.77
Monitoring style	311	70.7	.82
Avoidant style	311	60.4	.80
Reflective style	311	76.1	.89
Problem solving confidence	311	72.6	.85
Planfulness	311	74.2	.63
Total problem solving	311	74.2	.81
Alternatives	311	85.2	.43
Control	311	78.6	.68
Overall cognitive flexibility	311	82.8	.46

According to Table 2, the average score value of the problem solving inventory is 112. Values above the average indicate that the person is insufficient in problem solving, while values below indicate that the person is sufficient in problem solving (Şahin & Savaşır, 1997). In other words, scores between 32 and 112 indicate high level of problem solving skills, and scores between 112 and 192 indicate low level of problem solving skills. Considering that the problem solving mean score of the participants is 74.24 and the range of scores that can be obtained from the scale varies between 32 and 192; It can be stated that the participants problem solving skills are at a high level. At the same time, it was observed that participants' problem solving skills were high in all sub-dimensions of problem solving scale. Because of the reverse coded high values in both avoidant and impulsive style means that participants do not use them too much. At the same time, when the table was examined, it was seen that the cognitive flexibility score average of the participants was 82.80. Considering that the range of scores that can be obtained from the scale varies between 20 and 100, it can be stated that the cognitive flexibility level of the participants are high. As seen from the table that the average scores of the alternatives sub-dimension value is 85.2 and the average of the control sub-dimension is 78.6. It is understood that the average scores of the participants in both sub-dimensions is high. In order to examine gender differences in both cognitive flexibility and overall problem solving scores of participants, two independent t-tests were run. The results are shown in Table 3 below:

Table 3 *T-test Results of Cognitive Flexibility and Overall Problem Solving Scores of the Participants in terms of Their Gender*

	Gender	*N*	$\underline{X}$	*SD*	*df*	*t*	*p*
Cognitive Flexibility	Female	50	80.6	.43	309	-.1.96	.05
	Male	261	83.4	.46			
Problem Solving	Female	50	77.1	.56	309	1.02	.31
	Male	261	73.9	.64			

The results indicated that there was not a statistically significant gender difference in the both cognitive flexibility score [female (M =80.6, SD=.43) and male (M =83.4, SD =.46); t(309) =-1.96 p=.05] and problem solving [female (M =77.1, SD=.56) and male (M =73.9, SD =.64); t(309) =1.02 p=.31] scores of participants. According to these results, both overall cognitive flexibility and overall problem solving level of participants did not differentiate in terms of their genders. In order to examine how well cognitive flexibility (alternative and control) variables correlate with problem solving variables (impulsive style, reflective style, avoidant style, monitoring, problem solving confidence, and planfulness) in the school principals sample a canonical correlation analysis was run. The canonical correlation analysis results presented at table II below:

Table 4 *Correlations and Standardized Canonical Coefficients Between Cognitive Flexibility and Problem Solving Variables and Their Canonical Variates*

	First variate		Second variate	
	Correlation	Canonical Coefficient	Correlation	Canonical coefficient
Cognitive Flexibility (CF) Variables				
Overall CF	.99*	2.21	-.04	1.47
Alternatives	.88*	-.79	-.48*	-1.95
Control	.87*	-.59	.48*	.28
Percent of variance	.85		.15	
Redundancy	.53		.01	
Problem Solving Variables				
Problem Solving	.97	-.17	-.01	.41
Impulsive style	-.71*	.25	-.37*	.51
Reflective style	.85*	.20	-.41*	-1.24
Avoidant style	-.80*	.32	-.12	-.08
Monitoring	.73*	.11	-.46*	-.76
Problem solving confidence	.91*	.45	.03	.67
Planfulness	.82*	.09	-.14	.34
Percent of variance	.69		.08	
Redundancy	.44		.01	
Canonical correlation	.80		.29	

*$p < .01$.

Analysis of canonical correlation indicated two significant canonical functions, and first of them revealed values of $F(21)$=18.97, *wilk's* λ=.34, p=.00, since criteria of .30 (Hair et al., 2010) considered. This canonical correlation was meaningful with rc_1=.80 (rc_1^2=64), representing 64% of overlapping variance for the pair of canonical variates. Results revealed a second significant canonical function based on $F(12)$=2.31, *wilk's* λ=.91, p=.01, This canonical correlation was meaningful with rc^2=.29 (rc_2^2=08), representing 8% of overlapping variance for the pair of canonical variates. In sum, the second model did not satisfy the criteria of .30, and first model showed more overlapping variance for the pair of canonical variates. For the first canonical function, based on the criteria .30 as seen from the table 2 for the set 1, results showed that the relationship between alternatives subscale of CF and CF was meaningful r=.88, referring that 77% of variance in overall CF variate overlap with alternative subscale. The relationship between overall CF and control subscale was also meaningful r=.87, referring that 76% of variance in CF variate overlap with control variable.

For the set 2, the relationship of problem solving with all variables was meaningful. Problem solving relationship with impulsive style is r=.71, with reflective style is r=.85,

with avoidant style *r*=.80, with monitoring *r*=.73, with problem solving confidence *r*=.91, and with planfulness *r*=.82. These relationships refer that 50%, 72%, 64%, 53%, 83%, and 67% of the variance in problem solving variate overlap with impulsive style, reflective style, avoidant style, monitoring, problem solving confidence, and planfulness variables respectively.

The percentage of variance values revealed that 85% of variance in CF variate was accounted by its canonical variables. In addition the percentage of variance values revealed that 69% of variance in problem solving variate was explained by its canonical variables. Redundancy values were also considered and results demonstrated that 53% of variance CF variate was explained by problem solving variables, while 44% of variance problem solving variate was explained by CF variables.

For the second canonical function, based on the criteria .30 as seen from the table 2 for the set 1, results showed that the relationship between alternatives subscale of CF and CF was meaningful *r*=-.48, referring that 23% of variance in overall CF variate overlap with alternative subscale. The relationship between overall CF and control subscale was also meaningful *r*=.48, referring that 23% of variance in CF variate overlap with control variable.

For the set 2, the relationship of problem solving with impulsive style, reflective style, and monitoring were meaningful, while not meaningful with avoidant style, problem solving confidence, and planfulness. Problem solving relationship with impulsive style is *r*=-.37, with reflective style is *r*=-.41, with monitoring *r*=-.46. These relationships refer that 14%, 17%, 21%, of the variance in problem solving variate overlap with impulsive style, reflective style, and monitoring variables respectively.

The percentage of variance values revealed that 15% of variance in CF variate was accounted by its canonical variables. In addition the percentage of variance values revealed that 8% of variance in problem solving variate was explained by its canonical variables. Redundancy values were also considered and results demonstrated that 1% of variance CF variate was explained by problem solving variables, while 1% of variance problem solving variate was explained by CF variables.

All in all, based on first canonical function results, it can be concluded that when both alternative and control sub-dimension of CF and total CF scores increase impulsive style and avoidant style scores decrease, while reflective, monitoring, problem solving confidence, and planfulness sub-dimensions of effective problem solving and total problem solving scores increase. The results also showed that there was a high and a positive correlation between overall CF level of school administrations and their effective problem solving skills. However results of second canonical function indicated that when alternative scores increase and control scores decrease, reflecting, monitoring, and impulsive problem solving scores decrease.

Discussion

Today's intense and rapid changes and developments in economy, technology, politic and social domains of life force whole society to develop new adaptable skills and transform themselves in accordance with demands of conditions they faced with. These changes effects school as lively organizations and school principals have no place to escape from this revolution, they are not immune to these changes. In this respect the main purpose of current study was to examine the relationship between effective

problem solving and cognitive flexibility of school principals via canonical correlation analysis. Analysis of canonical correlation indicated two significant canonical functions. Based first canonical function, findings of current study indicated that when both alternative and control subscales of CF and total CF scores increase impulsive style and avoidant style scores decrease, but reflective style, monitoring, problem solving confidence, planfulness sub-dimensions of problem solving and total problem solving scores increase. The results also showed that there was a high and a positive correlation between overall CF level of school administrations and their effective problem solving skills. Findings of present study also indicated that 44% of variance in problem solving variate was explained by CF variables. These findings supported by the findings of another studies conducted by Esen-Aygün (2018) and Sucu and Bedel (2021).

High cognitive flexibility helps school administrators to reflect deeply on the demands of new situation, monitoring all options and generations alternatives before making a decision which would be best way to solve given problem. It also makes school principals feel that they are in control about what is going around them and things under their control. Effective problem solving also requires that generating alternatives, examining pros and cons of each options before any decision making (Nezu, et al., 2012; Nezu et al.,, 2019). Thus, the strong link between cognitive flexibility and effective problem solving is not a surprised thing. Instead, it showed that school administrators need to be more cognitively flexible to effectively solve their institutions' problem and overcome the obstacle they face with in different spheres. Based on this finding it can be said that not only effective problem solving is the most important needed skill to be school administer (Lowe et al., 1996; Mullins, 2000), but also it requires cognitive flexibility along with itself in order to improve its effectiveness and being more productive.

It is clear that when people encounters with problems, it cause tension in individuals and they try to solve the problems in a most effective way. In this context, it can be said that the main goal of modern education is to also help people overcome the problems they encountered in their both daily and organizational lives. In these respect, in order to be equipped to effectively solve problems, school principals need to be also equipped with cognitive flexibility skills.

Results of current study also indicated that there were positive and high correlation between control and alternative dimensions of cognitive flexibility and problem solving confidence which is counting one's ability to solve difficult problems. This finding was in congruence with the finding of Esen-Aygun (2018) who find positive link between control and self-confidence to solve problem in per-service teacher sample. It was also founded that control and alternative sub-dimensions of cognitive flexibility were positively related to reflective, monitoring, and planfulness styles sub-dimensions of effective problem solving. In line with these findings another study results showed that initiative taking behaviors of administrators were positively related to reflective, monitoring, problem solving confidence and planfulness styles sub-dimensions of effective problem solving (Tekin & Akın, 2021). In this respect, reflective, monitoring, problem solving confidence and planfulness styles sub-dimensions of effective problem solving are crucial factors needed to be in an effective problem solving process in order to get successful results, while impulsive and avoidant styles deteriorate the importance of this process. In impulsive style people tries to solve their problem immediately without sufficiently researching and evaluating options that they have. In avoidant style

they even escape from taking responsibility and thinking on problems and looking for alternative solutions. Based on these findings it can be concluded that when school principals concerned about losing their control and not believing they are in control and not being aware of the fact that there are alternatives to every situation encountered in life and the behavior of individuals and not being able to produce a large number of solutions in order to bring the most effective solution to this situation (Asıcı & İkiz, 2015) and not openness to alternatives in the face of demanding or difficult situations they might also be pessimistic to solve the problems which they face anyway and not being able to reflect, monitor, be planfull and of course not feel confidence to solve problems. When this is the case by believing they are not in control and not able to evaluate or produce alternatives, they might also avoid to taking the responsibility which is also bring a logical explanation for the negative correlation between control and alternative dimensions of CF and avoidant and impulsive problem solving styles determined in the present study as congruent with the findings of another study which showed that initiative taking behaviors of administrators were negatively correlated with impulsive and avoidant problem solving styles (Tekin & Akın, 2021).

Results of second canonical function also indicated meaningful correlation between two set of variables. According to findings, when alternative scores increase and control scores decrease, reflecting, monitoring, and impulsive problem solving styles decrease. Findings also indicated that 1% of variance in problem solving variate was explained by CF variables. As discussed above when school administers are concerned about losing their control, they might not be able to reflect on and monitor possible solutions to the given problem. But it is surprising to determine and see that when control sub-dimension of CF decrease, impulsive problem style also decrease. This result might came from the idea that when school administrator feel that they are losing their control over problems or situations, they might also not concerned to solve their problems. In line with this idea, they might not have any attempts to solve their problem at all and people who has impulsive problem solving style are try to solve their problem immediately without thinking over them enough. So when control decrease, if school administrators do not try to solve their problems, impulsive problem solving could also decrease as it requires to coming up with a solution whether it is the good one or not.

In terms of the meaningful link between alternative sub-dimension of CF and impulsive problem solving style, it can be said that school administrators with high flexibility of alternatives do not jump into immediate solutions to the problems. Instead, they take the time to produce and evaluate more options and they do not come up with quick solution. This explanation is contrary to the idea behind impulsive problem solving and it make sense to observe school administrators who look for alternatives are not use impulsive problem solving style. Lastly, findings of second canonical variate contrary to the findings of first canonical variate, showed a negative correlation between alternative dimension of CF and reflecting and monitoring problem solving styles. This finding is contradictory and should be addressed by future studies.

Al in all, although there are some differences, in general the results of the present study were in congruence with the findings of other studies conducted in the literature. Today, school administrators who are cognitively flexible and have high problem-solving skills are needed more and more. It is an expected and desired situation to be cognitively flexible (who can see many alternatives related to the problems they face and the results of these alternatives, feel in control and who are open to innovations and

can adapt easily) and who have high problem solving skills. As being most important social institutions in our lives, more attention need to be given the selection of school principals. In addition, some programs should be developed to help school principals develop and increase their both effective problem solving skills and cognitive flexibility levels.

Although the findings of current study outline the importance of high link between cognitive flexibility and effective problem solving skills of school principals, in the study a cross-sectional design employed. As a limitation to support this relationship over time, findings of current study need to be verified through longitudinal and experimental studies. In future studies the replication of the current study is needed, in a more representative sample, by using random sampling. The current study also did not explore the real life experiences of the participants from their subjective point of views by conducting qualitative or mixed methodology studies. Thus, the future studies could be conducted based on qualitative or mixed methodology in order to increase deep understanding related to the subject.

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