Compare Executive Performance and Working Memory in Individuals with Low and High Schizotypal Personality Traits

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Abstract
This study was aimed to compare the executive performance and working memory in individuals with low and high schizotypal personality traits. The research method of this study was causative-comparative. The statistical population included all undergraduate students studying in 1393-1394 academic year at Urmia universities. The sampling method of this study was multi-stage random that a sample size of 3000 were chosen out of statistical population. These people were screened with SPQ questionnaire. This study included 400 junior undergraduate students from 2014 to 2015 with schizotypal personality structure that half of them have high schizotypal personality structure and the other half have schizotypal personality structure. In each group, there were 200 girls and 200 boys that out of this 200-individual group, 100 girls have high schizotypal personality structure and 100 girls have low schizotypal personality structure. To collect information, schizotypal personality questionnaire, Wisconsin card sorting test, Stroop word-color test, Wechsler Digit Span test, and step by step listening sequence were used. Hypotheses were analyzed by using inferential statistics as independent t-test and multivariate variance analysis. The results indicated that students with high schizotypal personality structure have weaker executive performance and working memory than students with low schizotypal personality structure. Also, the results indicated that students with high schizotypal personality structure have weaker attention than students with low schizotypal. The findings of research indicated that students with high schizotypal personality structure have weaker working memory than students with low schizotypal personality structure. In addition, women with high and low schizotypal personality structure have lower working memory and men with high and low schizotypal personality structure have higher Working memory respectively.

Keywords: executive performance, working memory, schizotypal personality, attention.
Introduction
Schizotypal personality disorder is a pervasive pattern of social and interpersonal shortcomings with cognitive or perceptual distortions has been determined by such thoughts: assignment, magical thinking, unusual perceptual experiences, strange thinking and speech, paranoid ideation, social anxiety, irrational behaviors and unusual and little capacity to communicate closely and sincerely (American Psychiatric Association,2000). This disorder is also known as pre-morbid and a mild form of schizophrenia, and includes a set of perceptual, cognitive and affective characteristics (Compton, Chien,2008; Hergovich et al,2008; Dinn et al,2002). Cognitive disorders including executive performance is very important in the etiology and determine the course of treatment. Recent studies have emphasized on the importance of cognitive deficits such as problems with memory, attention and language. The inability to Cognitive function is effective better than the clinical symptoms in prognosis of this disorder (Green,1996). Executive functions from the perspective of neurological function is associated with a wide network functions of the frontal cortex, and contains a large number of cognitive and metacognitive processes, such as self-regulation of behavior and cognitive development and social skills which are formed in transition of children. These functions play an important role in information processing, daily life skills and self-care health. And when these functions are damaged, people are experiencing difficulties in communicating with others and perform their usual activities, etc. (Zelazo et al,2003).so far, more researches have been done in relation with executive performances in schizotypal patients. These Studies have shown that there is a significant difference between executive performances and sustained attention in high schizotypal in normal group (Alilou et al,2011). In general, review of research literature suggests the existence of executive performance deficits in schizophrenia. Also neuropsychological test results indicate that the executive performance and attention is disrupted in schizophrenia disorders, particularly schizotypal (Moritz,et al,2001). In a study, Heinrichs & Zakzanis (1998) concluded that patients with schizophrenia have neurological defects and this defect has been seen in some extra homework tests which are taken from these patients. It can be said that cognitive deficits in patients with schizotypal, are considered as the precursors of this disorder and multiple studies have shown mild cognitive anomalies before the onset of the disease.
In general, two forms of cognitive abnormalities seen in patients with schizotypal: First, cognitive defects on the basis of developmental disorders and developmental growth which is associated with limitations in cognitive skills and occurs as dropping in IQ and academic problems. Second, cognitive defects that are related to the onset of disease., which appears as an acute decline in cognitive function and cognitive inability in using the pre-learned skills. thinking and verbal relationship has been disordered in schizotypal personality disorder. People who Suffering. It is in trouble often in executive performance and working memory problems behaviors. Although this disease has been determined along with positive and negative symptoms such as hallucinations and delusions, thought disorder and inappropriate superficial affect, but recent studies have emphasized on the importance of cognitive deficits such as problems with memory, attention and language (Green,1996; Meltzer et al,1996). So far, numerous studies have done relating to working memory in different populations. Working memory deficits is approved in schizophrenia spectrum disorders (Conklin et al,2005; Pukrop et al,2002; Mitropoulou et al,2005, Zarshenas et al,2012). Also working memory deficits have been proven in schizotypal personality disorder (McClure et al,2007). The results of Goudarzi and
colleagues (2013) showed abnormalities in patients with Mango schizotypal and working memory and visual way. The results of another study showed that there was a significant relationship between working memory and verbal fluency, including schizophrenia and schizotypal patients (Fossati et al,1999). also The survey of Pennington and colleagues (Pennington et al,1996) demonstrated the significant positive relationship between executive function and working memory in the mentally ill, including schizotypal persons. In another study Kheirkhahan et al (2015), emphasized that the majority of patients have schizotypal personality disorder, cognitive impairment in working memory, visual memory, logic and memory, attention and concentration. The so-called working memory was used for the first time by Miller, Galantire and Pribram. Their working memory were introduced as a temporary storage system for projects and programs and set personal goals (Dehn,2008). Imitation of any proposed an integrated model for memory and working memory model framework integrates processing levels. But it is basically the process of model of working memory not as a substitute for it, but as an adjunct to consider it. The counterfeit model of working memory and short term memory is any effective report (Baddeley, Hitch,1974). Although this model initially was proposed to explain the adult memory performance, but it is proved to be great value in determining the short-term memory development during childhood years (Baddeley, Wilson,2002). Imitation model of working memory is composed of the four-part, Central executive, phonological circuit, the visual - spatial and temporary savings event. Browse through the circuit phonetic and audio information stored while the information is dumped into space by the visual - spatial - is dumped into storage and are review (Baddeley,2001). Temporary storage event has been added to this model in 2000; And is the component that has not been tested so much. And it is assumed that the components of working memory and long term memory under the control of hub administrator creates connection and causes the integrity of processed data (Baddeley,2000).

Taking into account what was said with regard to the necessity and importance of the issue, and as far as a researcher have been searched among the researches and studies, despite research and studies in the field of each variables of present study was performed alone or with other variables, no similar study to this has not been compared the executive performance and working memory in individuals with high and low schizotypal personality structure, was not found. Considering the lack of studies in this field was needed, this study aimed to compare the executive performance and working memory in individuals with high and low schizotypal personality structure.

Materials and Methods

This study is a descriptive and causal- comparative study. The study population included all undergraduate students of Urmia University (Medical Sciences, State university, Azad and PNU) in the academic year 2014 -2015, at first stage among them 3000 students were selected as a sample of study using multi-stage random sampling method and answered Schizotypal personality questionnaire items. then at the next stage, 200 students according to scale has a high Schizotypal personality and 200 has a low Schizotypal personality were selected as a final sample of study and answered another test questions (Wisconsin card sorting test, color-word Stroop test, the Wechsler Digit Span test and Audio test step by step sequence) (Mohammad-Zadeh,2011). The data were analyzed using multivariate analysis of variance & Wilks Lambda test. Questionnaires were used as bellow:
1. Schizotypal personality questionnaire
   The questionnaire includes 74 items to measure nine schizotypal diagnoses is made by Rain. Schizotypal personality questionnaire is answered yes / no. no is scored zero and yes is scored 1. It has three factors (perceptual- cognitive, interpersonal, and disorganization) that these three factors are based on the nine criteria. Normative data and psychometric properties of this scale in Iran, have been conducted by Bakshipour and colleagues and Cronbach’s alpha coefficient of the questionnaire subscales were reported, respectively, 0.90 -.82 & 0.59 (Bakhshipour Roodsari et al, 2011).

2. The Wisconsin Card Sorting Test (WCST):
   is a neuropsychological test of "set-shifting", i.e. the ability to display flexibility in the face of changing schedules of reinforcement? The WCST was written by David A. Grant and Esta A. Berg (1948). A number of stimulus cards are presented to the participant. The participant is told to match the cards, but not how to match; however, he or she told whether a particular match is right or wrong. The original WCST used paper cards and was carried out with the experimenter on one side of the desk facing the participant on the other. The test takes approximately 12–20 minutes to carry out and generates a number of psychometric scores, including numbers, percentages, and percentiles of: categories achieved, trials, errors, and perseverative errors. It is one of several psychological tests which can be administered to patients to measure frontal lobe dysfunction. When administered, the WCST allows the clinician speculate to the following "frontal" lobe functions: strategic planning, organized searching, utilizing environmental feedback to shift cognitive sets, directing behavior toward achieving a goal, and modulating impulsive responding. The test can be administered to those from 6.5 years to 89 years of age. The WSCT, relies upon a number of cognitive functions including attention, working memory, and visual processing. The WCST test may be used to help measure an individual's competence in abstract reasoning, and the ability to change problem-solving strategies when needed (Fallgatter & Strik,1998). In this test, a number of cards are presented to the participants. The figures on the cards differ with respect to color, quantity, and shape(Nejati,2013). The reliability of this test is based on the coefficient agreed-evaluation of participants in the study of Aspirin and Strauss (Spreen & Strauss,1991), 0.83 and test-retest reliability of this test in Iranian population is reported, 0.85.

3. The Stroop Color and Word Test:
   This test is used to examine the effects of interference on reading ability. The Stroop contains three parts: word page (the names of colors printed in black ink), color page (rows of X's printed in colored ink) and word-color page (the words from the first page are printed in the colors from the second page; however, the word meanings and ink colors are mismatched), each with 5 columns containing 20 items. The subject's task is to look at each sheet and move down the columns, reading words or naming the ink colors as quickly as possible, within a given time limit (45 seconds). Three scores, as well as an interference score, are generated using the number of items completed on each page, with higher scores reflecting better performance and less interference on reading ability. The Stroop can be used on both children and adults (Grade 2 through adult), and testing can be done in approximately 5 minutes.
4. The test of the Wechsler Intelligence Scale for Adults
is an item that has been designed both the Digit Span forward and reverse. This test consists of multiple sequences of numbers that is presented in the form of listening to participants and participants should arrange for direct and reverse sequence to repeat. Digit Span test of working memory, the performance depends central player (Nazarboland et al, 2012).

5. Paced Auditory Serial Addition Test (PASAT)
It is a neuropsychological test used to assess capacity and rate of information processing and sustained and divided attention, Originally the test was known as the Paced Auditory Serial Addition Task (PASAT). The subjects are given in the version used as part of the Multiple Sclerosis Functional Composite a number every 3 seconds and are asked to add the number they just heard with the number they heard before. This is a challenging task that involves working memory, attention and arithmetic capabilities. Versions with numbers presented every 2 seconds are also available. The original version presented the numbers every 2.4 seconds with 0.4 decrements for subsequent trials.

Results
Descriptive findings showed that from total of 400 students participating in study, in terms of gender, 200 were girls and 200 were boys, in terms of university, 84 students of Medical Sciences, 127 students of National University of Urmia, 95 students of Payam Noor University and 94 students of Azad University. In terms of marital status, 290 were single and 110 married. The mean age of the students was 22.4 years with 4.13 standard deviation. In Table 1, the descriptive (mean and standard deviation) of the studied variables are presented.

Table 1: the descriptive of the studied variables

<table>
<thead>
<tr>
<th>variables</th>
<th>group</th>
<th>minimum</th>
<th>maximum</th>
<th>Mean</th>
<th>standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive performance</td>
<td>High Schizotypal</td>
<td>1</td>
<td>28</td>
<td>17.41</td>
<td>5.46</td>
</tr>
<tr>
<td></td>
<td>Low Schizotypal</td>
<td>2</td>
<td>24</td>
<td>10.54</td>
<td>6.31</td>
</tr>
<tr>
<td>Special attention</td>
<td>High Schizotypal</td>
<td>3</td>
<td>13</td>
<td>8.13</td>
<td>2.03</td>
</tr>
<tr>
<td></td>
<td>Low Schizotypal</td>
<td>2</td>
<td>12</td>
<td>7.02</td>
<td>1.78</td>
</tr>
<tr>
<td>Digit Span</td>
<td>High Schizotypal</td>
<td>1</td>
<td>16</td>
<td>8.89</td>
<td>3.69</td>
</tr>
<tr>
<td></td>
<td>Low Schizotypal</td>
<td>1</td>
<td>16</td>
<td>9.85</td>
<td>3.43</td>
</tr>
<tr>
<td>Working memory</td>
<td>High Schizotypal</td>
<td>1</td>
<td>24</td>
<td>10.63</td>
<td>6.78</td>
</tr>
<tr>
<td></td>
<td>Low Schizotypal</td>
<td>2</td>
<td>24</td>
<td>11.95</td>
<td>7.06</td>
</tr>
</tbody>
</table>
Results of Table 1 shows that the average error of attention and executive performance tests specific groups, those with high schizotypal personality traits, larger than the average group with low schizotypal personality traits. Also people with high schizotypal personality traits, lower scores on the working memory and recall figures are low compared to those with low schizotypal personality traits. To ensure there is a significant difference between people with high and low schizotypal personality structure covered in variables, the multivariate analysis of variance (MANOVA) was used. Before examining the results, the necessary assumptions to use multivariate analysis of variance (MANOVA) ensured. preliminary analysis of Embox test showed that the level is significantly higher than 0.05 and the assumption of homogeneity of variance holds, therefore, it reported the results of statistical analysis. also based on the Levin test results, the variance of scores of people with high & low schizotypal personality structure in the 0.05 research variables was not significant (Table 2).

<table>
<thead>
<tr>
<th>variables</th>
<th>F</th>
<th>DF 1</th>
<th>DF 2</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive performance</td>
<td>0.14</td>
<td>1</td>
<td>398</td>
<td>0.706</td>
</tr>
<tr>
<td>Special attention</td>
<td>1.80</td>
<td>1</td>
<td>398</td>
<td>0.195</td>
</tr>
<tr>
<td>Digit Span</td>
<td>0.23</td>
<td>1</td>
<td>398</td>
<td>0.633</td>
</tr>
<tr>
<td>Working memory</td>
<td>0.33</td>
<td>1</td>
<td>398</td>
<td>0.568</td>
</tr>
</tbody>
</table>

To ensure there is a significant difference between the scores of people with high & low schizotypal personality structure on the research variables, a multivariate analysis of variance and the results are presented in Tables 3 and 4.

<table>
<thead>
<tr>
<th>test</th>
<th>Value statistics</th>
<th>F</th>
<th>Supposed DF</th>
<th>DF error</th>
<th>P</th>
<th>Chi Eta</th>
<th>Statistical power</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilks Lambda</td>
<td>0.70</td>
<td>42.74</td>
<td>4</td>
<td>395</td>
<td>0.001</td>
<td>0.302</td>
<td>1</td>
</tr>
</tbody>
</table>

As seen in Table 2, F amount equal to 74/42 at less than 0.001, statistically significant. And that means that there is a significant difference between persons with high & low schizotypal personality structure on the research variables (executive function, specific attention span and working memory). Also according to the Chi Eta 0.30, it can be said that the difference between the two groups is related to the research variables. Be covered by one of the variables, in addition to the adequacy of the sample size, the accuracy of the analysis indicates a significant difference.
in the detection of 100%. According to the results presented in Table 4, it was observed there were significant differences between groups in all studied variables. Executive performance with Chi Eta 0.279, has the highest Chi Eta among the research variables.

**Table 4: differences between groups**

<table>
<thead>
<tr>
<th>Index variables</th>
<th>Ss</th>
<th>DF</th>
<th>Ms</th>
<th>F</th>
<th>P</th>
<th>eta</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive performance</td>
<td>4717.40</td>
<td>1</td>
<td>4717.40</td>
<td>153.64</td>
<td>0.001</td>
<td>0.279</td>
</tr>
<tr>
<td>Special attention</td>
<td>123.90</td>
<td>1</td>
<td>123.90</td>
<td>31.68</td>
<td>0.001</td>
<td>0.074</td>
</tr>
<tr>
<td>Digit Span</td>
<td>93.70</td>
<td>1</td>
<td>93.70</td>
<td>5.54</td>
<td>0.019</td>
<td>0.02</td>
</tr>
<tr>
<td>Working memory</td>
<td>174.77</td>
<td>1</td>
<td>174.77</td>
<td>3.80</td>
<td>0.050</td>
<td>0.01</td>
</tr>
</tbody>
</table>

**Discussion and conclusion**

This study aimed to compare the executive performance and working memory in individuals with high and low schizotypal personality features. Results showed that the mean error of attention and executive performance tests, those with high schizotypal personality traits, was larger than the low schizotypal personality traits. Also people with high schizotypal personality traits, had lower scores on the working memory and recall figures compared to those with high schizotypal personality traits. So students with high schizotypal personality structure have higher levels of executive performance errors and lower levels of working memory errors than low schizotypal students. These findings are consistent with results of previous research. In the study of Khodaie Ardakani and colleagues (2015) showed weaker performance of Schizophrenia Patients. And these patients formed the concept of cognitive activity and cognitive flexibility, show greater deficits and repetitive behaviors and preservation of mental and doing more templates. Study Gooding et al (Gooding et al,1999) showed reproducible in test subjects Wisconsin weaker than the control group and have more perseveration errors. ALilou et al study (2011) showed that there is a significant difference between executive functions and sustained attention in high schizotypal with the normal group. Working memory deficits in schizotypal personality disorder have been approved by McClure and colleagues (2007). In another study Kheirkhahan et al (2015), emphasized that the majority of patients have schizotypal personality disorder, cognitive impairment in working memory, visual memory, logic and memory, attention and concentration.

In general, cognitive function is centralized on memory, learning, information processing speed, visual-spatial perception and executive performance. It is believed that sustained cognitive structures, are reasons of an individual's susceptibility to psychiatric disorders (Ebrahimi &
According to studies, it seems that these patients have memory problems can also affect other areas of their cognitive function (Brahmbhatt et al., 2006). The limitations of the present study follow: limit the generalizability of the findings of research studies to university students of Urmia University to other provinces faced with difficulty and must be handled with care. Not cooperating of some students and officials in the study, self-reporting of data collection tools, and the use of foreign tests are another limitations of the present study. According to the results of research propose, in the persons with high schizotypal personality features, purposeful interventions and training to improve their working memory and executive performance errors.

**Acknowledgments**
We appreciate all officials and students participating in this study.
References


