



Research Paper

Comparison of Critical Thinking based on Decision-making Style and Brain-behavioral System in Psychology Students

Mahbod Fadaei Fooladi ^{*1}, Soghra Ebrahimi Ghavam ², Mohammad Hossein Zarghami³

1. Corresponding author: Master of Educational Psychology. Department of Educational Psychology, Faculty of Education and Psychology. Allameh Tabatabai University, Tehran, Iran
2. Associate Professor of Psychology. Department of Educational Psychology. Faculty of Education and Psychology. Allameh Tabatabai University, Tehran, Iran.
3. Assistant Professor of Assessment and Measurement. Behavioral Sciences Research Center. Baqiyatallah University of Medical Sciences, Tehran, Iran.

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Abstract

Aim: This study aimed to compare the levels of critical thinking based on decision making styles and behavioral brain systems through a causal comparative study. The research population consists of all students of the master's degree in psychology in Allameh Tabataba'i University in the second semester of 2017-18. A sample of 117 men and women was selected by convenience sampling. Then, Critical Thinking Questionnaire, Behavioral Brain System Scale and Decision-Making Styles Questionnaire were completed. The results of ANOVA and independent t-test revealed a significant difference between critical thinking of the two modes of behavioral brain system. In terms of decision-making styles, critical thinking did not show significant differences between individuals with rational and intuitive styles. Therefore, it can be concluded that individual characteristics, particularly the type of decision-making style and type of brain-behavioral system, can affect critical thinking.

Keywords: *Critical Thinking, Decision Making Style, Brain-Behavioral System*

Introduction

Critical thinking involves the conceptualization, analysis, synthesis, and evaluation of information obtained through observation, experience, reasoning, or communication (Porter, 2018; Ulger, 2018). A lack of critical thinking can lead to rigid thinking; therefore, it is necessary to understand the nature and function of critical thinking and its development in the academic community in a comprehensive and accurate manner (Aihua, 2017). Furthermore, to assess each situation, individuals need decision-making skills to choose the most desirable solution from two or more strategies to achieve a specific goal (Lombardi et al., 2017). In this regard, studies have reported a significant relationship between decision-making styles and critical thinking (Kashaninia, Hosseini, and Yusliani, 2016; Zare and Nahravanian, 2017). We can explain this difference in decision-making styles by the personality traits of individuals and the way they deal with problems (Urieta et al., 2022).

The theory of "reinforcement sensitivity" is one of the theories proposed to explain differences among individuals due to their sensitivity in the two basic systems of behavioral activation and behavioral inhibition in the brain (Sommer, van der Molen, and De Pascalis, 2016). The relationships among these variables have been examined. Meanwhile, researchers have not studied a person's critical thinking in terms of both decision-making style and brain-behavioral system. In addition, previous research has been conducted in the nursing students, and have reported conflicting results. Brain-behavioral systems and decision-making styles affect how one responds to the environment, while critical thinking is affected by the judgmental nature of mental health domains. Therefore, studying this issue in psychology students who need clinical judgment for their professional requirements is essential. To this end, the present study addresses the question: "Is critical thinking different among psychology students with different decision-making styles and behavioral brain systems?"

Methodology

The statistical population of this causal-comparative study included Master's of Psychology students (all majors) of Allameh Tabataba'i University in the second semester of 2017-18. The statistical sample included 117 people who met the inclusion criteria. We used the following tools to measure the variables considered in the present study:

California Critical Thinking Skills Test: This test has 34 multiple-choice questions, including 20 questions with four options and 14 questions with five options. Scores range from zero to 34. We obtained the reliability of the test using the Kuder-Richardson coefficient from 0.68 to 0.70. Mehrinejad

(2007) reported the reliability of the adapted form of the test as 0.78 using the half-split method and as 0.83 using the Cronbach's alpha coefficient for the whole test. Cronbach's alpha in this study was 0.79.

Scott and Bruce Decision-Making Styles Questionnaire: This tool has 25 items designed as a five-point Likert scale. The score in this questionnaire ranges from 25 to 125. Scott and Bruce (1995) reported the reliability coefficient of this questionnaire for each of the subscales using Cronbach's alpha as 0.85 for rational style, 0.84 for intuitive style, 0.86 for dependency style, 0.94 for instant style, and 0.87 for avoidance style. In their study, Zarea and Arab Sheibani (2010) also calculated the reliability of this tool using Cronbach's alpha for each of the subscales as 0.77 for rational style, 0.78 for intuitive style, 0.76 for dependence style, 0.86 for instant style, and 0.83 for avoidance style. In the present study, Cronbach's alpha was 0.82.

Behavioral Inhibition / Activation Systems Questionnaire: This questionnaire has 24 items, four of which do not affect scoring. As a result, the main form of this scale has 20 questions, which consists of two general factors of inhibition (7 questions) and activation (13 questions). Mohammadi (2008) reported psychometric properties of the Persian version of this scale in Iran among a sample of students from Shiraz. He also reported the validity as 0.68 for the activation subscale (BAS) and 0.71 for the inhibition subscale (BIS). We obtained its Cronbach's alpha as 0.84.

We used statistics such as frequency, mean, standard deviation, independent t-test and ANOVA to describe the data.

Results

A total of 117 students (77 females and 40 males) with a mean age of 25.29 ± 3.93 years for males and 26.15 ± 2.85 years for females.

Table 1. Mean and standard deviation of critical thinking in terms of decision-making style and brain-behavioral system

| | Brain-behavioral | | Decision-making style | | | | | Gender | | Total |
|-----------|------------------|-----|-----------------------|-----------|-----------|---------------|----------|--------|------|-------|
| | BAS | BIS | Rational | Intuitive | Dependent | Instantaneous | Avoidant | Female | Male | |
| Frequency | 60 | 57 | 24 | 25 | 18 | 37 | 13 | 77 | 40 | 117 |

| | | | | | | | | | | |
|--------------------|-------|------|-------|-------|------|------|------|-------|-------|-------|
| Mean | 12.25 | 9.57 | 14.91 | 14.84 | 7.55 | 9.21 | 5.76 | 10.29 | 12.20 | 10.94 |
| Standard deviation | 4.26 | 3.12 | 3.04 | 1.81 | 1.29 | 1.43 | 1.01 | 3.67 | 4.26 | 3.97 |

According to Table 1, BAS dimension scored higher than BIS dimension, the rational and intuitive styles had the highest mean, and the instantaneous and avoidant styles had the lowest mean. Then, we used the independent t-test to measure the difference in critical thinking of individuals in terms of the subscales of brain-behavioral system and gender. The results show that critical thinking was significantly different between the two brain-behavioral subscales ($t = 3.84$; $p < 0.001$), and critical thinking had a higher mean on the BAS subscale. In addition, critical thinking was different between the two sexes ($t = -2.39$; $p < 0.01$), and the mean scores were higher in men than those in women.

The difference between critical thinking of individuals and different decision-making styles was investigated using one-way ANOVA, which revealed a significant difference between the groups ($t = 97.63$; $p < 0.01$). In addition, Tukey's *post hoc* test in Table 2 shows the differences between the groups.

Table 2: Tukey's *post hoc* test examined differences in decision-making styles

| I | J | The mean difference | Standard deviation | Sig |
|---------------|---------------|---------------------|--------------------|-------|
| Rational | Intuitive | 0.07 | 0.54 | 0.99 |
| | Dependent | 7.36 | 0.59 | 0.001 |
| | Instantaneous | 5.7 | 0.50 | 0.001 |
| | Avoidant | 9.14 | 0.65 | 0.001 |
| Intuitive | Dependent | 7.28 | 0.45 | 0.001 |
| | Instantaneous | 5.62 | 0.38 | 0.001 |
| | Avoidant | 9.07 | 0.51 | 0.001 |
| Dependent | Instantaneous | -1.66 | 0.42 | 0.001 |
| | Avoidant | 1.78 | 0.53 | 0.07 |
| Instantaneous | Avoidant | 3.44 | 0.47 | 0.001 |

Tukey's test showed a significant difference between rational style and all styles except intuitive style. There was also a significant difference in critical thinking between the intuitive and other decision-making styles, i.e.,

dependent, instantaneous and avoidant ($p < 0.001$). On the other hand, the dependent style significantly differs from the instantaneous style, but it is not significantly different from the avoidant style ($p > 0.07$). In addition, this difference was significant between avoidant and instantaneous styles ($p < 0.001$).

Discussion and conclusion

In general, the present study showed that underlying characteristics such as decision-making style and arousal of inhibitory or activating behavioral areas in the brain play a role in developing critical thinking. Another significant result of this study is that individuals with critical thinking skills can achieve higher scores with rational and intuitive decision-making styles. This result proves that we can use the tacit readiness by emphasizing individual differences for effective action in the critical challenges and use the available tools and facilities to the best of their ability if we select the right people for the job. We can also conclude that psychologists should be selected clinical work from among those with higher critical thinking or a more favorable background. Fatigue due to completing the questionnaires and the impossibility of conducting the test were the limitations of this study. Further studies are recommended to focus on the effects of mental states and situational effects such as situational anxiety.

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