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Research Article

COMPARISON OF THE INFORMATION PROCESSING SPEED, WORKING MEMORY AND EMOTION REGULATION OF THE MONOLINGUAL AND BILINGUAL STUDENTS

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ABSTRACT
The aim of this study is to compare the information processing speed, working memory and emotion regulation of monolingual and bilingual students. The research method is descriptive and causal-comparative; statistic population consists of secondary school students in the city of Ardabil in the academic year 2014-2015. The statistic sample consisted of 60 subjects (30 monolingual people and 30 bilingual people) who were selected by random cluster sampling. In this study, information processing questionnaires, emotion regulation and working memory were used for data collection. At the end, the questionnaires were collected from both groups and information was analyzed using SPSS software. To analyze the data collected in the first part, descriptive statistics such as mean, standard deviation, etc. were used, and the multivariate analysis of variance method (MANOVA) was used to test the hypotheses. The results of this study showed that there is a significant difference in the speed of information processing in monolingual and bilingual students and speed of information processing in the bilingual students is more than monolingual students. The results showed that due to the value of F=1252.034 and also considering that the significant level of test error for confidence level 0.99 is less than 0.01, there is a significant difference between emotion regulation in monolingual and bilingual students and emotion regulation in bilingual students is more than monolingual students; and there is a significant difference between working memory of monolingual and bilingual students and working memory in bilingual students is more than monolingual students.

Keywords: *Information Processing, Working Memory, Emotion Regulation, Monolingual and Bilingual Students*

INTRODUCTION
Problem Statement
According to Bloomfield (1998) a bilingual person is a person who his linguistic knowledge in both languages is as native users of the two languages. Such a view narrows the range of assignment of bilingual persons (Bloomfield, 1998). Moreover, it seems that operating such a definition based on native fluency of a language is difficult. According to the Oxford dictionary, the term bilingual refers to a person who is able to put his words in two languages or a person who knows two languages and uses the two (McCain, 2005). The term bilingual generally refers to individuals or groups that their language proficiency in the two languages, especially in the verbal aspect is as the local users. However, according to Butler and Hacuta (2006) Bilingualism is a complex behaviour of psychological, linguistic, cultural and social with different dimensions.
Hagen (1993) considers the bilingual persons the persons who have the full expression ability and are able to express concepts in language of each other. Based on this definition, novice language learners are considered as bilingual ones. Other researchers have considered varying degrees to assign different people as bilingual individuals. However, bilingualism is considered on a spectrum. The recent practice follows some researchers based on changing the attention from learning the rules governing a language to learning the skills of that language. According to this, the people are considered to be bilingual persons that in addition to their native language, at least they have ability in the field of the skills of a second

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language. Bilingualism is a global phenomenon that exists in most countries. The bilingualism is a regular use of two languages and bilingual children are the children that are required to use two languages in their everyday lives at home and in school (Hartsuiker, 2015).

Bilingualism is a state that a person is trained in a language other than their native language. Native language is the first language learned by the person that speaks in it, he grows with it and touches and understands his social and cultural elements by it. The term bilingualism can be used about people and communities using two languages in communications (Modaresi, 2014). In education or school bilingualism, the person learns another language or a non-native language in the process of formal education and in school and an official language learning program is designed for it (Hartsuiker, 2015). Another psychological component associated with monolingual and bilingual persons is speed of information processing. In the information processing point of view, the mind is seen as an information system that selects, changes, encodes, saves and retrieves information, and produces information and behaviour (Alaghbandrad, 2004). Vaezi and colleagues (2012) reported on the results of their study that it appears monolingual and bilingual people do not have a significant difference in terms of mental information processing and especially intelligence. Also Sato (2008) showed that information processing in the amygdala plays a role in emotion recognition and defect of information processing in the amygdala leads to the inability to recognize emotion faces and cognitive processes (attention, working memory and cognitive processing). One of the components associated with information processing is memory. In fact, memory as the ability to retain (storage) and read out information, personal experiences and practices (skills and habits) (Bull *et al.,* 2008) and working memory is a mental system that does accumulation and temporal information processing in the same time. This memory plays a significant role in many of the actions and cognitive tasks, such as understanding, thinking, calculating, reasoning, and learning.

Working memory is memory system workshop or the component of memory interface in which new data is temporarily stored and combined with long-term memory information (Just and Carpenter, 1992). The working memory is like the workspace or a computer display screen. The content of working memory is activated information, something that we already think about it. For this reason, some psychologists consider working memory to be synonymous with consciousness (Woolfolk, 2001). A bilingual person has two sets of cognitive organization and two tissues of encoding and retrieval, and since encoding and retrieval are two main structures in memory, we can say that these two are the main axes of studies of psychologists of language on bilingualism (Kormi-Nouri *et al.,* 2003); and leads to the formation of concepts and thus an increase in other mental abilities. In other words, the experience of being bilingual has a significant impact on the development of cognitive processes that this factor affects their cognitive memory (Williams *et al.,* 2007). Festman *et al.,* (2011) reported in the results of their study that there is a significant difference between monolingual and bilingual people in terms of functions related to working memory. Literature and psychological studies show that emotion regulation is an important factor in determining the health and having a successful performance in social interaction. Emotional has a significant role at all of affective disorders. Schizophrenia includes emotional changes; neuroticism is dependent on the anxiety; sociopathy is rooted in the apparent lack of emotion; common mental disorders and a variety of abnormal behaviours are rooted in emotional problems and even mental retardation is often considered as emotional retardations (Shakoori, 2015). Also, according to Berck (2007) emotion regulation appeared as strategies to set the emotional state at optimal intensity level that we can reach the targeted goals. Such processes allow people to more enjoy the positive events of their lives and avoid negative events and increase or reduce their severity, or even build excitement facial expression according to the norms of society (Gross, 2007). The aim of this study is to compare the speed of information processing, working memory and emotion regulation in bilinguals and monolingual persons.

MATERIALS AND METHODS

Method

This study is a descriptive and causal comparative one because the aim of this study is to compare the rate of information processing, working memory and emotion regulation between the two groups of

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monolingual and bilingual students and there is a group comparison in which the behaviour and the items are correlated (Delawar, 2000). The study population consists of secondary school students in the city of Ardabil in the academic year 2014-2015. The total number of these students is 14640 people according to the statistics of the Department of Education in Ardabil province. A questionnaire was used to collect data in this study. This means that after the selecting statistic sample (that 1 Education District was randomly selected from 2 Education Districts of Ardebil, then from the middle schools 3 girls and 3 boys' schools were selected randomly); from among students (30 monolingual and 30 were bilingual) were selected. Then the objectives of thee research were explained to them and then research questionnaires (emotion regulation scale, memory and information processing questionnaire) were given to them to be completed. Finally the questionnaires were collected from both groups and the information was analyzed using SPSS software. Descriptive statistics was used to analyze the data collected in the first part (mean, standard deviation, etc.) and multivariate analysis of variance (MANOVA) was used in the second part to test the hypotheses.

RESULTS AND DISCUSSION

Results

Descriptive Findings

The mean and standard deviation of age in studied groups

standard deviation	Mean	Group
4.35	12.54	Monolingual
4.85	13.43	bilingual

As can be seen, age mean of monolingual persons is 12.54 and bilingual ones 13.43.

The mean and standard deviation of information processing speed, working memory and emotion regulation among monolingual and bilingual persons

standard deviation	Mean	Group	Variable
0.54	2.27	Monolingual	Speed of information processing
0.5	2.34	Bilingual	
1.64	18	Monolingual	Working memory
1.57	20	Bilingual	
1.78	17.83	Monolingual	Emotion regulation
1.63	19	Bilingual	

As can be seen, the mean of information processing speed in monolingual persons is 2.27 and 2.34 in bilingual people. Average working memory in monolingual persons is 18 and in bilingual people 20 and the average emotion regulation in monolingual people 17.83 and bilingual people 19.

The inferential findings

Levine test result for the speed of information processing, emotion regulation and working memory

The significance level	Degrees of freedom 2	Degrees of freedom 1	F	Variable
0.026	0.59	38	0.982	information processing
0.013	0.64	42	0.259	Emotion regulation
0.005	0.37	32	1.640	Working memory

According to Levine test result in Table 4.4, the test is significant (significance level less than 0.05). It is also possible to do Manoa for the study hypotheses.

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The results of significance test of multivariate variance analysis for the study variables

Eta square	P	Df of Error	Df of hypothesis	F	Value	Test name	
0.94	0.0023	89	2	112.15	0.75	Pillay effect	
0.94	0.0023	89	2	112.15	0.015	Lambda Wilkes	
0.94	0.0023	89	2	112.15	92.34	Hotelling effect	Model
0.94	0.0023	89	2	112.15	92.34	The greatest error root	
0.42	0.0023	89	2	28.31	0.32	Pillay effect	
0.42	0.0023	89	2	28.31	0.69	Lambda Wilkes	
0.42	0.0023	89	2	28.31	0.89	Hotelling effect	Group
0.42	0.0023	89	2	28.31	0.89	The greatest error root	

As can be seen significant levels of all tests allow the use of multivariate analysis of variance. The results show that in the studied groups at least there is a significant difference in terms of one of the dependent variables (Lambda Wilkes=0.69, F=28.31, P>0.05). Eta square shows that the difference between groups with respect to the dependent variables are in total significant and this difference value is 0.69 based on Wilkes Lambda test, it means that 69% of the variance of the difference between groups is caused by the interaction of the dependent variables.

The results of multivariate analysis of variance (MANOVA) on the study variables

Eta	P	F	Mean of squares	Freedom degree	Total of squares	Depended variable	Change source
0.062	0.045	0.107	0.038	1	0.038	Information processing	
0.059	0.023	0.26	0.251	1	0.251	Emotion regulation	model
0.051	0.019	0.013	0.4	1	0.04	Working memory	
1	0.000	645.609	227.945	1	227.945	Information processing	
1	0.000	1252.034	236.127	1	236.127	Emotion regulation	group
1	0.000	4644.426	14037.017	1	14037.017	Working memory	
			243.407	45	243.407	Information processing	
			244.453	45	244.453	Emotion regulation	Error
			14175	45	14175	Working memory	

The table shows there is a significant difference between the speed of information processing, emotion regulation and working memory of monolingual and bilingual students (P>0.05) and speed of information processing, emotion regulation and working memory in bilingual students is more than monolingual students.

It can be said that the first hypothesis is confirmed and there is a significant difference between the speed of information processing in monolingual and bilingual students and speed of information processing in the bilingual students is more than monolingual students. According to F=1252.034 and also considering that the significance level of test error for reliability level 0.99 is less than 0.01, it can be said that the second hypothesis is confirmed and is a significant difference between emotion regulation in monolingual and bilingual students and emotion regulation in bilingual students is more than monolingual students. Also considering F=4644.426 and also considering that the significance level of test error for reliability level 0.99 is less than 0.01, it can be said that the third hypothesis is confirmed and is a significant difference between working memory in monolingual and bilingual students and working memory in bilingual students is more than monolingual students.

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Conclusion

The results of this study showed that there is a significant difference between the speed of information processing among bilingual and monolingual persons. Speed of information processing in bilinguals is more than monolingual people. A significant difference was observed between working memory among bilinguals and monolinguals.

Working memory in bilingual people is more than monolingual people. A significant difference was observed between emotion regulation among bilinguals and monolinguals. Emotion Regulation in bilinguals is more than monolingual people. In general it can be concluded that the variables of information processing speed, working memory and emotion regulation in bilinguals are more than monolingual people. In the end we can say, bilingualism is a multidimensional phenomenon that several factors influenced by social, ethnic and personal factors are involved in shaping it. Bilinguals may be fluent in both languages without any function like monolinguals in those languages. This means that the language system of bilinguals can be different in some ways with monolinguals. Therefore a sensible expression of bilingualism cannot be made based on the theory that places the monolinguals' ability in their work format. Future research may consider monolingual and bilingual people in different age groups and compare them according to factors such as speed of response to the intelligence questions or confidence rate during responding. This research was faced with the following limitations to complete its data:

The lack of information about the studied variables, the lack of enough time to research is one of the limitations of the present study, and limited statistic population in the secondary school in Ardebil province

Research Proposals

1. The subject should be placed in a vast geographical extent to achieve a desirable and logical conclusion.
2. It is recommended that a research to be performed on the factors that increase the speed of information processing, working memory and emotion regulation of monolingual people.

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