

Resolving the Issue: Does Intelligence Nurture Bilingualism or Bilingualism Nurture Intelligence?

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Abstract

In past literature authors raised a significant issue of role of intelligence in learning different languages. Whether an intelligent individual learns two or more languages easily or an individual who has learnt two or more languages perform better on tests of intelligence. In learning a second language, intelligence has been considered as an effective factor (Stern, 1984). Acknowledging the above issue, a heterogeneous sample of 38 bilinguals (17 boys and 21 girls) and 44 monolinguals (19 boys and 25 girls) was selected. The scores on intelligence test ranged from 34-41. Monolinguals and Bilinguals were then compared on problem solving ability, concept formation (wrong responses), verbal and figural creativity. To find out the significance of differences between the two groups t-test was applied. The results specified that Bilinguals performed significantly better on problem solving ability as compared to monolinguals, they show an edge on figural fluency and even flexibility and elaboration on both verbal and figural tests of creativity in comparison to monolinguals. Whereas no significant differences were found between the two groups on verbal fluency, concept formation which was measured by wrong responses committed by both the groups. Therefore in nutshell we can argue that bilinguals performed better than monolinguals on various cognitive abilities and language has a profound and nurturing role in overall development of intelligence.

Keywords: Bilingualism, Intelligence, Monolinguals, Problem Solving Ability, Concept Formation

Introduction

The process of learning a language is not only to learn the linguistic forms of the language but also to use them appropriately in several contexts. Proficiency in a language does not only mean that one knows what has to be marked and expressed but also to understand as to what shall be inferred by the listeners (Berman and Slobin, 1994). This understanding comes to first language learner over a period of time and by adulthood, they are able to use various language forms to express events and thoughts. Baker (1988) stated that “Bilingualism is to intelligence as food is to human fitness”. A simple statement about bilingualism and intelligence is as impossible as one simple food for human survival. The experts are discussing the issue for the last thirty years concerning the bilingual child and his mental abilities

relating to intelligence and education. Originally they believed that bilingual person cannot be an intellectual since he/she was carrying two or more languages in their head, but consensus has proved that children with bilingual ability offer an opportunity to explore connections between language and thought (Bialystok, 2002). Bilingual children have advantages in education, due to cognitive development, divergent thought and mental flexibility.

Some researchers raised a valid question - does bilingualism enhance cognitive development or do more intellectually gifted children become highly proficient bilinguals? In order to study the issue of cause and affect it is imperative to conduct longitudinal studies as opposed to collecting co relational data form cross sectional studies. Barik & Swain (1975) conducted one of the only early longitudinal studies in this area. They evaluated changes in IQ scores for children from regular and Canadian-French immersion programs and found that the later group had significantly higher IQ scores throughout testing points during the five year period. Relevant longitudinal findings were also presented by Diaz (1985) who studied five old Spanish-English bilingual children enrolled in bilingual education programs. Assessing performance on cognitive tasks had two points in time (6 months apart); Diaz (1985) found that second language (English) proficiency was a strong predictor of various cognitive measures, including metalinguistic awareness and performance on Raven's non-verbal abilities. Thus, there is a need to infer the causal directions in such a relationship when conducting the study in future. Knowledge of language has been considered as the principle basis of intelligence. (Oller, 1981). Also, intelligence has been considered as one of the important factors affecting learning in general, and learning a language in particular. Brown (1994) stated that the individuals' success in education and in life on the whole correlates directly with the level of his/her intelligence. Intelligence has been considered as an important factor in learning a second language (Stern, 1984; Kassaian, 1998), and thus can be claimed that an intelligent person due to his or her talent learns a second language with more ease and success (Brown, 1994). Bilingual children are capable of focusing on the content of words rather than their forms because bilinguals learn early on the abstractness and symbolism of words and have the ability to separate two different words for each referent. Leopold (1949) examined this thoroughly and found that by exposing his daughter Hildegard to two different languages increased her mental development.

Hernandez (1983), Tuck (1983) and Clarkson & Galbraith (1992) have found support for the positive relationship between bilingualism and mathematical problem solving. However, the literature on bilingualism included few studies examining the effect of degree of bilingualism in mathematical word problem solving and the ways in which balanced bilinguals demonstrate their mental flexibilities when faced with challenging mathematical word problems expressed in two languages of testing. The findings of comparative studies have confirmed that bilingual sample outperformed their monolingual counterparts on measures of intelligence and on non-verbal tests. The bilinguals showed higher performance on cognitive abilities such as advanced concept formation, classification, attentional tasks, divergent thinking, problem solving and different verbal skills. (Peal & Lambert, 1962; Cummins, 1979, 1991; Diaz, 1983; Hakuta, Ferdman & Diaz, 1987; Andreou & Karapetsas, 2004; Wodniecka, Craik, Lou & Bialystok, 2010).

“Bilinguals had a more diversified structure of intelligence and greater mental flexibility, and therefore the cognitive functioning of bilinguals benefited from their bicultural experience, and from positive

transfer between languages.” (Hoffman, 1991). Hamers & Blanc (1989) cited in Bialystok (1992) compiled evidence that demonstrated how bilinguals outperformed monolinguals in reconstructing perceptual situation, verbal and non-verbal intelligence, verbal originality, symbol substitutions, piagetian concept formation, among others. Bilingualism plays a supportive role in second language learning was investigated by Mustapha (2012). He examined the bilinguals and monolinguals' performance in English language learning in Nigeria. Terminal results in English language tests of 108 Yoruba/English bilinguals and 108 Nigerian English monolinguals at the Senior Secondary School level were compared. Findings revealed that more bilinguals are found in the pass region than monolinguals or more monolinguals were found in the fail region than bilinguals. These results confirmed the position that bilingualism plays supportive role in second language learning, especially in second language situation. Gueye (2015) proposed the idea that one should not have a negative view regarding bilingualism, because bilingualism fosters linguistic creativity and open mindedness. The author showed that the complex relationship between intelligent quotient and linguistic performance is rather correlational and not causal. The mistakes which occur at phonological, syntactic, semantic and stylistic levels in a written discourse of foreign language learning by the student are part and parcel of the learning process and may not be considered as the sign of lack of intelligence on the part of the learner. Thus, the author concluded that there is a correlation between intelligent quotient and bilingualism and errors or mistakes committed have to be tactfully handled by the teachers by giving a positive feedback to the students and making them more apt in learning a foreign language.

Ghonsooly & Showgi (2012) examined the possible effects of foreign language learning on individuals' divergent thinking abilities. The researchers tend to control the factors like age, gender, socio-economic status, and previous learning experiences in the study. The performance of advanced learners of English as a foreign language (EFL) and non-EFL learner monolinguals were compared on the Torrance Test of Creative Thinking. The findings indicated that learning English as a foreign language to an advanced level significantly enhances all four divergent thinking abilities, i.e., fluency, elaboration, originality and flexibility. This improvement can be contributed to the specific cognitive practices that language learning brings, and the psychological consequences of being trained under a system different from school system.

Nosratinia, Mojri & Sarabchian (2014) examined the relationship between language learning strategies and EFL learners' creativity. 140 EFL students, ranging from 19 to 32 years old, were randomly selected from Islamic Azad University and were assessed on the creativity questionnaire and the strategy inventory for language learning. The results of the study concluded that there is significant relationship between EFL learners total use of language learning strategies and their creative abilities. Another set of analysis indicated that social strategy predicted 79% of creativity score, affective strategy counted up the percentage of prediction to 82.6% and finally the meta-cognitive strategy entered the model on the last step and increased prediction up to 93.2%.

Leikin, Tovli & Malykh (2014) conducted a study to find out the impact of bilingualism on the development of creativity in general and mathematical creativity in particular. For the very purpose, the samples of 15 Russian-Hebrew balanced bilinguals and 15 native Hebrew-speaking monolinguals with mean age of 60.9 months were taken from same kindergarten. All the subjects were assessed on the

figural form A (Thinking Creativity with Pictures) from Torrance tests of creative thinking, and in order to assess the subjects on mathematical creativity, the other set of questionnaire, i.e. Creating Equal Number task (CEN) based on Tsamir, Tabach & Levenson (2009), a creative problem solving task was included in the study. The results indicated that the bilingual children depicted higher creative abilities than the monolingual children. The overall analysis indicated that the bilingualism affects various domains of creative ability differently. The results also demonstrated that the relationship between bilingualism and creativity components is task dependent and when the differences between bilinguals and monolinguals are assessed, they are always in favor of bilinguals.

Feiz, Mohammadi & Maghsoudi (2014) investigated the relationship between learner's linguality and the degree of creativity in the subjects regarding their gender differences. In order to examine this, the sample of 171 EFL (English as Foreign language) bilinguals (46 males and 40 females) and monolinguals (41 males and 44 females) were randomly selected from high schools of Markazi province (Arak and Farahan). All the subjects were given Torrance test of creativity and a background questionnaire. By using one way ANOVA, it was found that male and female bilinguals performed better than monolingual males and females. On the other hand even male bilinguals outperformed female bilinguals. Thus, it was concluded that male bilingual learners had higher level of creativity in comparison to female peers.

The continuous use of language control in bilinguals has been shown to have an impact on other general executive control functions. Indeed, researchers have found that bilinguals are at an advantage when it comes to using executive control functions (Bialystok, 1999, 2001; Bialystok & Martin, 2004; Craik & Bialystok, 2006). Bialystok (1999) found that bilingual children outperformed their monolingual peers in a dimensional change card sorting task, which required the participants to shift the criterion of classification from colour to shape. Bialystok, Craik, Klein & Viswanathan (2004) compared the performances of several groups of monolinguals and bilinguals from different ages on the Simon Task, a task that requires participants to inhibit a prepotent response tendency. The authors found that bilinguals again outperformed monolinguals. The advantage was present for all age groups (Craik & Bialystok, 2006; Bialystok, Craik & Ruocco, 2006) and the findings suggested that more research is needed to clearly show a behavioural difference between monolinguals and bilinguals at all ages.

Bilingualism

Bilingualism can be defined as “knowing two languages”. However, a major difficulty centers on the definition of what it means to “know” a language. Some bilinguals are highly proficient in both languages they speak, while others clearly have a dominant or preferred language.

Monolingualism

Monolingual is the person who is able to speak only one language (Macquarie Dictionary) or a person/community with only one language, are called unilingual. A monolingual is a person who has an active knowledge of only one language, and he has a passive knowledge of other.

Methodology

A mixed sample of 38 bilinguals (17 boys and 21 girls) and 44 monolinguals (19 boys and 25 girls) was selected from different schools of district Amritsar. The sample scores on intelligence test ranged from 34-41. This range of scores was selected due to non-availability of a sample of monolinguals and bilinguals who used to get the same score on intelligence test. This was done by assuming that monolinguals and bilinguals have almost same level of intelligence due to narrow range of scores, if any difference was occurring among them, was due to the role of learning second language. While selecting the sample, socio-economic status, age of the subjects and the degree of monolingualism and bilingualism were taken into consideration. Language proficiency was assessed by reading, writing, speaking and understanding skills of the language. The students, who read, write, speak and understand only one language at all the places viz., school, home, family and friends were considered as monolinguals. On the other hand, those who can read, write, speak and understand more than one language at school, home and in company of friends were considered as bilinguals. All the subjects belonged to 8th grade with age range of 12 to 14 years. some important variables such as socio-economic status, sex, degree of lingualism, age and the actual test used (which play a crucial role in data analysis) were sufficiently controlled during the study.

Measures Used

The measuring instruments are given below:

1. Language Proficiency Test (Kharkhurin, 2005)
2. Standard Progressive Matrices (Raven, 1984)
3. Problem Solving Ability Test (Dubey, 2011)
4. Concept Formation Test, (Hoffmann and Kansanian, 2005)
5. Torrance Test of Creative Thinking, (TTCT: Torrance et al., 2002)

(The tests used in the study are well known and have quite often been used by various investigators in India and abroad. It is therefore, not necessary to give detailed information of these measures.)

Results

To find out the significant differences between monolinguals and bilinguals a univariate t-test was applied (Guilford, 1973). The t-test indicates the statistical significance of differences between two independent groups. The results of which are given in Table 1. bilinguals ($M = 7.53$) performed significantly better on problem solving ability as compared to monolinguals ($M = 5.07$). From the table we can see that on verbal flexibility, verbal originality and verbal elaboration the mean of bilinguals ($M = 64.55$, $M = 37.89$, $M = 56.47$) is more in comparison to mean of monolinguals ($M = 63.93$, 31.36 , 36.98) respectively. Even on figural components it is clear from the table that bilinguals show a clear mean difference ($M = 27.05$, 21.13 , 35.82) on all three components of figural creativity, i.e. figural fluency, figural flexibility, figural elaboration in comparison to monolinguals ($M = 21.57$, 16.61 , 33.41). This personifies that bilinguals perform better than monolinguals when intelligence is controlled.

Table 1: Showing Means, Standard Deviations and t-ratios and Level of Significance on Problem Solving Ability, Concept Formation (Wrong Responses) and Torrance Test of Verbal and Figural Creativity of Bilinguals and Monolinguals with Intelligence Test Scores Range from 34-41. (MB: N = 19; MG: N = 25 and BB: N = 17; BG: N = 21)

Sr. No.	Variable	Monolingual		Bilingual		t-ratio	Level of Significance
		M	S.D	M	S.D		
1	Problem Solving Ability	5.07	2.14	7.53	3.09	4.23	.001
2	Wrong Response	9.14	13.25	7.26	6.60	0.79	N.S
3	Verbal Fluency	63.93	27.70	64.55	22.65	0.11	N.S
4	Verbal Flexibility	31.36	9.94	37.89	12.01	2.70	.001
5	Verbal Originality	36.98	15.81	56.47	19.02	5.07	.001
6	Verbal Elaboration	13.02	8.43	19.39	9.25	3.26	.001
7	Figural Fluency	21.57	7.42	27.05	8.95	3.03	.001
8	Figural Flexibility	16.61	4.90	21.13	6.06	3.73	.001
9	Figural Originality	33.41	23.46	35.82	13.80	5.55	.001
10	Figural Elaboration	37.27	23.67	28.89	12.31	1.96	N.S

MB = Monolingual Boys, MG = Monolingual Girls, BB = Bilingual Boys, BG = Bilingual Girls

Discussion

The results show that bilinguals have better problem solving abilities as compared to monolinguals. There is no significant difference between monolinguals and bilinguals on concept formation which was measured by wrong responses committed by both the groups. Bilinguals have shown higher flexibility and elaboration on both verbal and figural tests of creativity. The results of the present study are in close agreement with Bialystok (2005, 2009) which showed that bilinguals outperformed their monolingual counterparts on non-verbal tasks requiring control process such as selective attention to relevant aspects of a problem, inhibition of attention to misleading information and switching between competing alternatives. Bilingual children tend to solve problems that contain conflicting or misleading cues at earlier age than monolinguals (Bialystok and Martin, 2004). Likewise, the results of Douglass and Rawirez’s study (1974) indicated that fourth grade Mexican-American bilingual males scored higher than American monolingual males on both verbal fluency and flexibility measures. Wang (1982) also obtained the results favouring bilinguals than monolinguals on verbal associational fluency, ideational fluency and flexibility. One cause of increase in creativity may be the flexibility that is required to frequently switch languages and cultural behaviours (Walters, 2005). Ghonsooly (2012) investigated the possible influence of foreign language learning on individual’s divergent thinking abilities. The subjects were compared on the Torrance test of creative thinking. The findings revealed that learning English as a foreign language to an advanced level significantly enhances all the four divergent thinking abilities, i.e. fluency, elaboration, originality and flexibility. Kharkhurin (2009) studied Farsi-English bilinguals and Farsi monolinguals and showed that bilinguals outperformed monolinguals on innovative capacity. Carringer (1974) also found that high school Spanish-English bilingual students scored higher than monolingual students on verbal and figural creativity measures (fluency, flexibility, originality and

elaboration). Konaka (1997) reported that the degree of bilingualism of sixth and seventh grade Japanese-English speaking students predicted abilities related to verbal and figural creativity.

Conclusion

From the above discussion it can be concluded that bilinguals show higher scores on problem solving ability, and on different components of verbal and figural creativity. Bilinguals have better ability to add pertinent details relating to the activity and can produce more elaborative ideas which are not generally produced by monolinguals. Also, bilinguals have scored higher on figural fluency as compared to monolinguals, which means, bilinguals are in a better position than monolinguals to produce elaborative and beautifully embedded ideas. On the other hand, there is no significant difference between monolinguals and bilinguals on verbal fluency. It means that both the groups are able to produce almost similar number of ideas related to a given activity. In contrast to above stated information bilinguals have scored higher on verbal originality as compared to monolinguals, whereas there is no significant difference on figural originality. It means that bilinguals have the ability to produce the unique ideas and to interpret similar stimuli in different ways. Bilinguals scoring higher on verbal originality may be due to the role of an additional learning of language which enables bilinguals to produce numerous, interpretable, meaningful and relevant responses related to a specific activity. Therefore we can conclude that bilingualism foster the different cognitive abilities in general and intelligence in particular.

Implications

1. Second language proficiency can be clearly predicted through the study of cognitive abilities of both language groups, as we can explore through the study that either it is verbal or non-verbal tests, bilinguals always have an edge over monolinguals.
2. Study confirms that magnitude and nature of any bilingual effects may depend on the typology of the bilingual population under investigation.

Limitations

1. The structure of language was not considered.
2. Other variables like executive functioning, working memory, emotional intelligence and many other related factors have remained untouched in the study.
3. The study was limited to 8th grade students whereas the study can be performed on various age groups.

Future Directions

1. It was assumed that learning of two languages is very difficult and the child would have done better if he had limited to one but the studies later on proved that bilinguals have outperformed the monolinguals. So it is better to resolve the controversy over the issue concerning when a child can start to learn the other/foreign language.
2. One should Investigate the effects of the economic and cultural levels of the parents on the creative and conceptual capacities of children because creativity is a multifaceted phenomena which involves originality and the tongue dualism enhances mental capacity and creativity.

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