The role of bilingualism on memory recall

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Abstract

This experiment uses a between-subject design that compared groups whose first language was English and another group whose native language was non-English. The purpose of this experiment was to determine if being bilingual had any effect on recall. Participants were given 6 word lists where each word was read at a rate of one word per two seconds follow before recall. The word lists contained either five or fifteen words, all in English. The independent variables therefore are the list length and number of languages spoken whereas the dependent variable would be the number of words recalled. The underlying question in this experiment is to whether being bilingual presents any complications in recall by way of competition. Competition refers to an increase in retrieval time due to associations in memory that share the same concept. So, bilinguals would theoretically have to compete between their native and other languages. This experiment follows from Yoo and Kaushanskaya, 2012 which concluded that monolinguals performed better in easier tasks but as difficulty increases, the differences between groups vanish. This experiment did not follow the conclusion from the original study. Rather, it was found that memory was not different between groups on both five- and fifteen-word lists. This may be due to a number of confounds, but likely due to the nature of the sample of this experiment.

Introduction

There exists a plethora of literature on the effects of bilingualism on the brain. Initially, it was thought that learning more than one language would be detrimental to development as it may lead to confusion (competition during retrieval). In a continuously integrated world, the boundaries of languages seemingly mesh which may have impacts on learning. The collision of multiple languages can be seen in Creole, Spanglish etc., and is more so evident in younger generations being exposed to the internet. Cities like Toronto boast a population where as much as 50% of persons speak at least two languages which makes this experiment all the more salient. Due to this, it may be worthwhile to investigate the effects of bilingualism on learning and memory. There seems to be confusing and sometimes contradictory results in the current literature. Bilinguals perform better on tests requiring symbol manipulation and reorganization. However, the verbal skills on bilinguals are weaker in each language than that on monolinguals in each language (Craik et. al., 2012). The mechanism that underlies the consequences of bilingualism is joint activation which controls the inhibition of the non-required or non-target language. This inhibition can be global where an entire language system is repressed when focusing on another. This explains why we do not see as much competition in bilinguals during recall than the theories suggest. In addition to this, executive functioning is more robust in bilinguals than monolinguals (Yoo & Kaushanskaya, 2012). This allows for bilinguals to have the edge in more complicated memory tasks such as recall of 15-word lists. Given these ideas, the hypothesis for this experiment is that bilinguals would perform better at recall in the 15-word lists but not necessarily on the 5-word lists.

Method

Participants

The participants in this study consisted of 121 students from the University of Toronto taking the second-year cognitive psychology class ‘PSY270’. Out of 121 students, 83 were female, 30 were male and 3 identified as other. The average participant was 20 years old and in their second year of study.

Design and Procedure

Participants were split based on the number of languages they spoke and if English was their native language or not. So, the groups created were English only, wo or more with English as native or Two of more with native language being non-English. The study used a between-subject design to compare the performances of each group in different list lengths. The experiment ran through the online platform of Tophat. Participants were shown a list of words on a screen during class and then had to write down all words they can remember after 2 seconds. The words were not semantically related. This allowed for the conclusions to be made about recall to be free of the confound of semanticizing words to aid recall. Participants were then split into groups by answering multiple choice questions on Tophat which sorted students into their groups as well as grabbed information about their demographics such as age, gender etc.

Results

There was no use for a t-test in this experiment due to the design, however an analysis of variance (ANOVA) was conducted to examine the relationship between native language and recall performance. The results indicated that for 5-word lists, the obtained p-value was less than the pre-determined significance level of 0.05, suggesting a statistically significant difference in recall ability based on participants' native language. We can therefore conclude that those with English as their native language recall more words than non-native English speakers for 5-word lists. However, for the 15-word lists, the p-value was greater than our cut-off value so we cannot conclude that there is a statistically significant difference. In other words, for 15-word lists, there is no difference in memory for native and non-native English speakers. Finally, another ANOVA test was used to determine if there is a difference between monolingual and bilinguals on recall in both 5-word and 15-word lists. From this test, we conclude that memory was not different between any groups on both word lists since again the p-value was not less than our cut-off value.

Discussion

The findings of this experiment did not follow the conclusion from the original study neither did it support the hypothesis stated in the introduction of this paper. The results showed there is no difference in recall for monolinguals and bilinguals. This may be due to the demographic of the sample used in this study. The sample was drawn from a psychology class who have had exposure to memory theories etc. In addition, the students selected belonged to the University of Toronto, which is a school for high performers. Students in such environments typically have a greater IQ and as much better working memory etc., than the general population. In addition, the socioeconomic status of the students should also be considered. In addition to being an expensive school, the campus of the University is located in downtown Toronto, which is an affluent area and as such reflects the type of students it attracts. In a similar study of free recall, high IQ participants were more likely to recall more words than average IQ participants (Cohen & Sandberg, 1977). In addition, lower-SES adolescents had worse working memory performance and smaller hippocampal and DLPFC volumes than their higher-SES peers (Leonard et. al., 2015).

This study can be improved by conducting it in a controlled environment rather than a classroom. This allows for the possibility of cheating. In addition, it would also be prudent to expand the demographics of the participants by not restricting it to a psychology class in a top performing school. For future research, an avenue to possibly explore is doing this task with bilingual people who speak similar languages such as Spanish and Portuguese. This may help our understanding of theories such as competition for memories within the brain. When two items are similar, it is harder to discern in memory making recall time higher (Craik et. al., 2012). Despite the multiple

benefits of learning multiple languages, as far as this experiment is concerned, being bilingual has no effect on memory.

References

Bialystok, E., Craik, F. I. M., & Luk, G. (2012). Bilingualism: Consequences for mind and brain. *Trends in Cognitive Sciences*, *16*(4), 240–250. https://doi.org/10.1016/j.tics.2012.03.001

Cohen, R. L., & Sandberg, T. (1977). Relation between intelligence and short-term memory. *Cognitive Psychology*, *9*(4), 534–554. https://doi.org/10.1016/0010-0285(77)90019-6

Leonard, J. A., Mackey, A. P., Finn, A. S., & Gabrieli, J. D. (2015). Differential effects of socioeconomic status on working and procedural memory systems. *Frontiers in human neuroscience*, *9*, 554. https://doi.org/10.3389/fnhum.2015.00554

Yoo, J., Kaushanskaya, M. Phonological memory in bilinguals and monolinguals. *Mem Cogn* **40**, 1314–1330 (2012). https://doi.org/10.3758/s13421-012-0237