DOES GENDER AFFECT SEMANTIC MEMORY?

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ABSTRACT

*The influence of gender on cognitive and other higher mental functions remains debatable. While several investigations provide evidence in support of a gender difference (e.g., Xu et al., 2014) others refute such an influence. Thus, the influence of gender on semantic processing remains equivocal. This study aims to investigate the difference in semantic memory retrieval scores between males and females. The reaction times of 251 adults, including 128 females in the age range of 30 to 60 years were measured with Psychopy software. Results did not show any significant differences between the genders.**Keywords: Cognition, Semantic Memory, Gender, Sex differences*

INTRODUCTION:

The word cognition originates from the Latin word 'cognitio' which means 'knowledge'. Cognition indeed refers to the mental process by which external or internal input is transformed, reduced, elaborated, stored, recovered (Neisser, 1967). Darwin's theory of evolution (1859) provided an insight about how organisms learn about their environment and how we can evaluate them. It provided a strong framework to help understand how the organisms possess knowledge at birth and how they acquire new information later in life. Even to this day, we know very little about human cognition and its neural functions. Therefore, researchers believe we need to study them independently.

LITERATURE REVIEW:

Carroll and Maxwell (1979) in their annual review of psychology have said that there are individual differences in cognitive capacities. In the results of Binet's test of intelligence, Thorndike revealed that even though the IQ scores of the individuals remain stable, the patterns of their abilities were unstable. In a pilot study done by Hunt, Frost and Lunneborg (1979), the cognitive tasks used had a significant relationship with performance on scholastic aptitude tests which measured verbal and quantitative aptitudes. An experimental study done by Sternberg (1986) revealed large variations in reference ability tests, letter series tests, reasoning and vocabulary tests. There appear to be very less experimental studies on individual differences in number and quantity tasks. However, the works of Krutestskii reveal that mathematical skills vary between individuals and he calls it 'inborn inclination'. Individual differences in perceptual skills and vision and audition processes were also found. In a study done by Cooper, where the subjects were supposed to mentally rotate the image to a specific position and compare to the other image, differed in their mental rotation speeds.

There are several factors affecting cognition. Some of them are age, gender, literacy and culture. There has always been a debate whether there is cognitive decline due to aging. Some studies say that there is, but it happens later in life and is small in magnitude. Whereas, few other studies say otherwise.

Horn & Donaldson said that there is cognitive decline at least for some tasks if not all the cognitive tasks. (Schaie & Parham,1977), in his study also revealed that there is cognitive decline due to age but was significant only after the age of 60. Similarly, Friedman (1974), found that the correlation between digit and word span tasks were higher than that of young individuals. In the review article done by (Rushton & Ankney, 1996), stated that the brain size also differs with age. Many studies also have reported increase in brain size from infancy to adulthood and decreased with increasing age. The mental abilities were also found to increase from infancy to adulthood, decrease slowly from the age of 25 to 45, then quickly decreased until 65 years of age. The existing studies also report that the reaction times become slower with age (Era, Jokela, & Heikkinen, 1986).

Literacy is a major factor when it comes to cognitive abilities and performance in various cognitive tasks. According to (Bertolucci, Brucki, Campacci, & Juliano, 1994), illiterates differed in arithmetic, writing, reading when compared to literates

in the MMSE test. (Bramäo & colleagues, 2007) found that illiterates showed poorer performance in performance of visuo-motor tasks when compared to that of literates. It has been observed that illiterates have difficulty using pseudo words and repetition of high frequency words are easier than low frequency words (Rosselli et al., 1990). Illiterate people also display a less precise categorical boundary and a stronger lexical bias (Serniclaes et al., 2005; Ventura, Kolinsky, Querido, Fernandes, & Morais, 2007). (Ardila et al., 1989; Cole, Frankel, & Sharp, 1971; Cole, Gay, Glick, & Sharp, 1971; Folia & Kosmidis, 2003; Montiel & Matute, 2006; Nitrini et al., 2004), said that illiterates perform poorly in memory tasks when compared to literates.

It is an already known fact that culture and socio-economic status affects how we perceive the world and also how we attend to certain stimulus and tasks. (Berry, 1976) stated that our cognitive styles and our culture are related. Researchers found that Asians performed poorer when compared to European American population and were more field dependent. Another researcher Nisbett and his colleagues have supported the fact that culture plays an important role in reasoning. European North Americans were found to use more analytical way of thinking when compared to East Asians who emphasized more on the object and the relationship between objects and used less formal logic. Asians were also found to pay more attention to other people's emotions and anticipate and remember their behavior when compared to European Americans. In this way, research in this field has expanded our knowledge about how culture affects cognition and cognitive capacities and has also helped us to understand one another on an interpersonal level. Early studies done by (Broca, 1861) and others also revealed that the brain size of people of higher socio-economic status was larger than people from lower socio-economic status.

Another factor that can influence cognition is gender. According to (Weber, Skirbekk, Freund, & Herlitz, 2014), in the episodic memory task, the females in northern Europe performed better than males. Whereas, in the central and southern Europe, the females showed an advantage who fell under the birth cohort of 1932 and later. On the hand, for numerical tasks, males of all regions and birth cohorts showed an advantage over females. There were no significant differences across males and females for category fluency tasks. Andreano and (Cahill, 2014) in their article on "Sex differences on the neurobiology of learning and memory" stated that males have found to have a greater advantage than females in spatial rotation tasks. A study done by (Shepard and Metzler, 1971) and many other researchers support this finding. This male advantage has also been observed cross culturally. A significant male advantage was also found for navigations tasks where the participants were asked to reconstruct a path through a map (Galea and Kimura 1993; Dabbs Jr. et al. 1998; Postma et al. 2004) a virtual environment (Astur et al 1998; Moffat et al. 1998; Sandstrom et al. 1998; Iaria et al. 2003), or real world space (Silverman et al. 2000; Malinowski and Gillespie 2001; Saucier et al. 2002). They have found a relation between testosterone levels and navigation tasks as well. Some authors have pointed out that there is a male advantage for object location, other authors have reported female advantage for object location as well. Some other authors have found equal performance in both males and females (Dabbs Jr. et al. 1998; Epting and

Overman 1998; Lewin et al. 2001; Postma et al. 2004). However, these findings are debatable.

Semantic memory involves meaning of words. There are not many studies which focus on gender differences in semantic memory. The existing studies are controversial. Some of the articles state that there are differences in the performances of males and females, while some do not. In a study done by (Capitani, Laiacona, Barbarotto, 1999), they found that females performed better in categories such as fruits and animals and males in categories such as tools and vehicles. (Baxter, Seykin, Flashman, Johnson, Guerin, Babcock, Wishart, 2002) states that structural changes among males and females have been observed for certain language functions. Females show more bilateral activation of IFG and STG and less diffuse left activation and greater right posterior temporal and insula region activation when compared to males. Another study done by (Konrad et al., 2008) found no differences in gender in semantic memory.

Assessing cognitive abilities is necessary to understand how it varies across individuals. Several attempts have been made to assess short term memory, and semantic memory across gender to find out significant differences among them, if any. Some studies have found significant differences in short term memory and semantic memory across gender, but a few have not. Although there have been many studies in western population with respect to short term memory and semantic memory across gender, the need for the study to assess these abilities in Indian individuals is more as there is a enthralling and developing literature that suggests culture affects cognitive processes in many ways. On one hand, the notion that cognitive processes are culturally bound entities is surprising to most cognitive scientists who tend to focus on commonalities in mental processes across individuals. Researchers are eager to study further on how various stimuli and conditions play a role in identifying differences in cognitive processes within individuals.

METHODOLOGY:

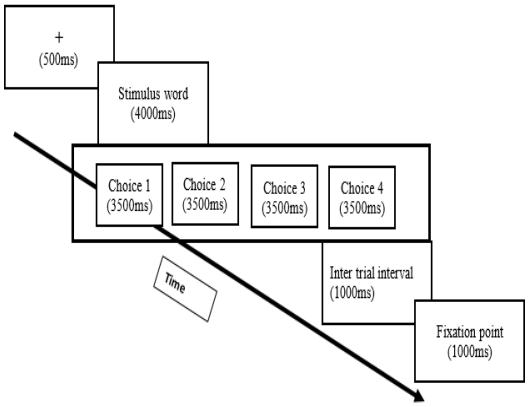
Participants:

The participants included 251 right handed, neurologically normal participants, in the age span of 30 to 60 years residing in Manipal, Karnataka were recruited for the study (Females=128). The sampling method used was convenience sampling. All of the subjects were given an informed consent and the study was conducted only after their consent had been taken. Subjects whose literacy level was more than 8 years of formal education were considered for the study. All of them had normal visual acuity and manual dexterity.

Stimulus and test procedure:

A list of 30 familiar concrete words served as the stimuli. Each list consisted of 5 words. The first one being the target word with four response choices. One of the response choices was semantically related to the target word. The words used were in Kannada language and validated for familiarity. Psychopy software (Pierce, 2003) was used to calculate the reaction times. The stimulus target and the response choices were presented one after the other with an inter-stimulus interval of 1000 ms each after the fixation point (+) that lasted for 500 ms. The subject had to choose the semantically related word out of the four choices to the target word by pressing the

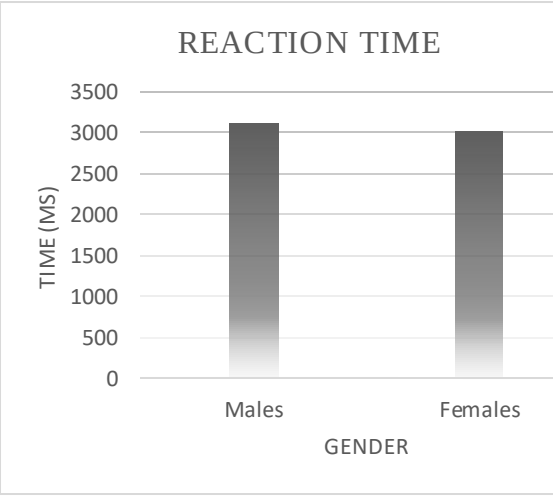
assigned button. The position of target item was equally distributed among all four position for both groups of participants. The scheme of the stimulus presentation is presented in Figure 1.



DATA ANALYSIS AND RESULTS:

The reaction time of the accurate responses were analyzed using independent sample *t*-test with SPSS (version 15).

The response times of the female participants (3011ms) did not significantly differ from that of the male participants (3111ms), $t\,(249) = 0.239$, $p > 0.05$).



DISCUSSION:

The data from the study did not show any significant difference across gender in the reaction times of the semantic memory tasks. The reason for this might be because of the literacy levels of the individuals. All the subjects had more than 8 years of formal schooling and most of them were graduates. In a study done by (Capitani, 1999) he analyzed the effect of gender on semantic fluency tasks using verbal fluency tasks using specific categories like fruits, vegetables, tools etc. In contrast, to our study, a mixture of lexical items was used. this might be another reason as to why the differences were not significant among males and females. However, these studies have important methodological differences from the current investigation, and that can be another valid reason for the difference in results.

CONCLUSION:

This study provides evidence for the comparable performance on general unselected semantic memory task between males and females residing in Manipal, Karnataka with more than 8 years of formal education in the age range of 30 to 60 years.

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