Effects of word length on memory recall differences

Abstract

An experiment was carried out among university students to investigate whether any memory recall diferences in the number of items recalled correctly between words that were long or short and between letters whether it is similar or dissimilar. The 131 participants each completed a online cognition lab session and results shown that there were greater number of items recaled correctly in words that were shorter compared to words that were longer and the outcome also revealed a greater number of items recaled correctly in letter that were disimilar than letters that were similar. This experiment was limited to local university students, imbalance in respects to age and gender. Therefore, future research required to clarify the role of age, gender and individual diferences in order to generalise the results to a larger population.

Memory Processing and Capacity in Recalling

In today's context, people are more capable of recaling items that are shorter or disimilar than words that are longer or similar, according to Baddeley, Thomson, and Buchanan (1975) that imediate memory performance is straightforwardly affected by the spoken length of memory items, in other words, an arranged serial recall of lists of one-sylable words such as hit, take, and sum was impressively better compared to recall of lists containing five-sylable items such as refrigerator, opportunity, and university. This word length effect in imediate memory was discovered both for memory lists that were exhibited visually and auditory. Past research have shown that when individual are asked to recall a list of items, their

performance is generally worse when the items sound similar than when the items sound disimilar, such effect is known as the phonological similarity effect or the acoustic similarity effect (Conrad, 1964).

The phonological similarity effects are able to take place even without any auditory input, as people tends to read the items silently to themselves and this suggest that individual recodes the information themselves and if the items were presented visualy, there will be more confusion when the items looked similar, for example, b and d or f and t (Baddeley, Papagno & Norris, 2014). According to Baddeley and Hitch (1974) multi-component model of working memory, one of the components of working memory is the phonological loop where it contains a phonological store and articulatory control process, research results indicates that the phonological store able to hold speech-based information for about 2 seconds unless rehearsed, the memory traces will fade and decay.

Past research argued that phonological similarity effect could be avoided if the articulatory control process is kept busy as the articulatory control process works by making an interpretation of visual data into a speech based code and stores in the phonological stores where it refreshes a trace and offsetting the decay process (Gatherole & Baddeley, 2014). This suggests that there were be no diferences between similar items and disimilar items if articulatory suppression technique is used.

Many researchers explored the working memory system and concludes that memory capacity was limited to a certain amount of information for a short period of time and Lee, Kwon, Lee, Ghaja, and Suh (2011) argued that

individual diferences has an impact towards experimental outcome as individuals with larger memory capacity are able to keep different stimuli in mind which, therefore, gives them an advantage for a wide variety of cognitive tasks.

According to Miller (1956), individuals are constrained in the amount of things that they can hold in memory and that the memory span was capped at approximately seven items, or, plus or minus two items. However, recent studies explained that memory capacity could be afected by a variety of stimulus characteristics, for instance, if the stimuli are letters that sounds similar, the memory span is shorter and in additionally, the memory span is also shorter when lists of words are long than lists of words that are short (Logie, 2014).

The intention of this experiment was to explore the diferences in the level of numbers of item recalled correctly between different word length and between similarities of letters displayed among university students.

In this study, it was hypothesized that if the word length is short, the numbers of item recaled correctly will be greater compared to when the word length is long. It was also hypothesized that if the letters are disimilar, the numbers of item recaled correctly will be greater compared to when the letters are similar.

Method

Participants

This study consist of 131 participants from an Australian University, with ages ranging from 19 to 59 years, and a mean age of 24. 80 (*SD* = 8. 31). The participants in this study consisted of 101 females and 30 males.

Materials

The online cognition lab was constructed to measure participants' memory span and the experiment consisted of 30 trials, 10 for each type of the stimulus and was presented on a computer screen. In this experiment, participants were given a list of items and asked to recal the list. On every trial, a sequence of digits, letters, or words will show up, with each item presented on the screen for 1. 5 seconds in lists of varying length, for instance, a range of digits ranging from 0 to 9, long words such as " Refrigerator" and short words like " Cup", the trial also includes letter that were either similar or disimilar. The trial is displayed in the middle of a large rectangle box outlined in black and background was in white so that participants can see the full area before beginning the lab, after the full sequence has been presented, a set of buttons wil be displayed at the bottom of the rectangle box, each one marked with a number, letter, or word, including those just shown and after the full sequence has been presented, a set of buttons will be displayed at the bottom of the rectangle box, each one marked with a number, letter, or word, including those just shown.

Procedures

All 131 participants were instructed to complete the lab session. Before the lab commences, participants were given instructions such as logging into the system and to ensure that they can view the full area of the rectangle box and were told to click or tap on the buttons is the same order that the stimuli were shown, for instance, if the first letter in the sequence was " g", participants were required to click the button labelled " g" first. Participants were advised to click on " start next trial" for completion of each trials and were told that any mistake made such as recaling the wrong items or in the wrong order will be considered as incorrect and that there will be no way to correct it. Participants were given sufficient time to complete the experiment and results will be collected at the end of the lab session.

Results

In this experiment, a paired samples *t* test was used to compare the mean diferences between short words and long words, and between similar letters and disimilar letters. The alpha level where mean diferences are considered as significant different is set at . 05. In this data, there were three outliers identified and these cases were subsequently removed from the data set prior to analyses.

An initial analysis of the data found significant mean diferences between short words and long words, and between disimilar letters and similar letters, and the results indicating a significant differences between word length as participants were able to recall more items correctly for words that are short (M = 5. 15, SD = 0. 97) than long words (M = 4. 08, SD = 0. 93), t (128) = 10. 53, p < . 001, consequently, the correct recall rates were higher on

letters that are disimilar ($M = 5.56$, $SD = 1.03$) compared to letters that are similar ($M = 4.93$, $SD = 1.04$), $t(130) = 6.29$, $p < .001$. The results also revealed that the highest stimuli recaled correctly was digits ($M = 6.39$, $SD = 1.07$).

Discussion

As anticipated, results from the paired samples t test have revealed a significant diferences in the number of item recalled correctly between long words and short words, and between similar letters and disimilar letters. The results support the findings of Baddeley, Thomson, and Buchanan (1975) and Logie (2014) where individual are able to recall better when items presented were short words or disimilar letters.

In additionally, the results also revealed that people are able to recall digits better than words or letters and reason may be due to that people are more practiced in recaling of digits in order such as remembering telephone numbers than other items, this findings is consistent with Dehaene (2011) that recall rates are higher when stimuli are digits where such results may be consistent in real-life settings as people tends to memorize numbers more due to recording of telephone contacts.

However, there are some limitations in this experiment that may affect the outcome. One of the limitations is the individual differences as it was not thoroughly examined and defined in this study and according to Kwon, Lee, Ghaja, and Suh (2011), people with larger memory capacity have the tendency to perform better than others as they are able to hold more items in memory storage which give them an advantage in this study.

Secondly, this study has an gender imbalance in the samples as there are research indicating that females tends to outperform males on a range of linguistic tasks which includes lexical retrieval and results have shown that females performance is better than males on short-term verbal memory tasks (Kaushanskaya, Marian & Yoo, 2011), hence this study outcome may not be sufficient in describing both genders having the same performance levels of recaling items.

Another limitations of this study was the sample size, as the participants were from the same university, this considers as a threat to external validity where results will not be applicable to other university, in this case, this experiment was conducted based on onsite-campus student hence it hinders generalization to the larger population.

Lastly, a further limitation of this experiment was the wide age range as this study consists of age ranging from 19 to 59 years where there are past research supporting that age diferences have an impact in processing speed on recall and recognition tasks. According to Whiting and Smith (1997), recaling requires greater amount of processing capacity compared to recognition and implies that adults who are older have a greater procesing capacity limitations than adults who are younger, results shown that the older adults remembers a significant fewer words than younger adults where this support the procesing resource theory of cognitive aging. During recalling of stimuli, there is a greater procesing demands required and older adults tends to display more difficulty recaling information than recognizing them. Future research could prevent this by analysing different age groups separately.

This experiment can be further improvise by including a well-balanced of gender, better sample size in terms of different participants from a wider range of population and including a intelligence test for individual to complete and review the results carefully so to clearly define each individual diferences as there are research supporting that memory span often linked to performance on intelligence tests, reading skills and other variety of cognitive tasks, suggesting that individual who have larger memory span will perform better in recaling items compared to other individuals (Kwon, Lee, Ghaja, & Suh, 2011).

In conclusion, the overall results of this study suggest that people are able to recall correctly more when words are short and when letters are disimilar. Nonetheless, further research required to carry out in order to generalize the outcome of this experiment to the large population.