

An examination of the word-length effect

Introduction

'Working memory is a limited capacity store for retaining information for a brief period while performing mental operations on that information' (McLeod, 2012). The working memory concentrates on the short-term memory, which seems to be between 15 to 30 seconds, and storage takes in around seven items at the ready for immediate mental use. The working memory is 'more complicated than short-term memory because the working memory involves an active manipulation of information during the involving of short-term memory as the passive storage of information' (Gediz, 2021).

Baddeley et al (1975) is known for his work on the short-term memory and states to remember information, the stimuli must go through a form of practice or repetition. Baddeley et al (1975) developed a model that explained the process of memories and how information transfers from the short-term memory to the long-term memory store. 'Baddeley's model argues that working memory is like a multi part system, and each system is responsible for a different function. Each part is only able to processes so much and the components of this system, according to Baddeley, function independently of one another' (Anon,2022).

The phonological loop is the first piece of the working memory model, as it temporarily processes and holds verbal and auditory information. The information is likely to be remembered by using the 'articulatory rehearsal system' (Anon, 2015). The phonological loop focuses on the written and spoken information, which divides the loop into two sections. The phonological store, known as the inner ear, this stores the stimuli based on speech for a short period. When someone says something to you, it goes through phonological store as you perceive it. The other section is the articulatory control process. Which is the 'component that interprets and rehearses the information from the phonological loop, when you say something, the articulatory control process is producing the words' (Anon, 2022).

The word length effect 'represents the storage system responsible for phonological short-term memory (PSTM), the ability of individuals to remember small amounts of heard information over short periods of time. This type of memory has been closely studied in adults and children for many years', including the word length effect (Baddeley et al., 1975; Mueller, Seymour, Kieras, & Meyer, 2003; Anon,2022). The reason behind the length effect occurs because the 'verbal rehearsal for long items takes longer in real time than verbal rehearsal for short items. This word length disadvantage for longer items allows more time for decay of the memory trace within the phonological store' (Anon,2022). Baddeley et al (1975) stated that 'immediate memory span is better with short than with long words. This is explained by the fact that short words can be articulated faster, so that more words can be silently articulated before they decay' (ScienceDirect, n.d).

The Cowan's working memory model supports Baddeley's model as Cowan as it looks beyond Baddeley's model. In Cowan's model, 'working memory can be abstracted as a short-term storage component with a capacity limit that is heavily dependent on attention and other central executive processes that make use of stored information or that interact with long-term memory' (Chai, 2018). 'Cowan's model has two important features. The first of these features is the different forms of coverage between activated memory and attentional processes. The second feature is that the activated memory component is based on a short-term memory system' (Gediz, 2021).

Both Cowan's and Baddeley's models explore the working memory, however, each model focuses on their own unique theory. 'Baddeley's model tries to name the components of the working memory, but these regions, which are named, are only the parts examined. In Cowan's model, the components of the working memory are not examined for naming purposes and are categorised according to their assignments' (Gediz, 2021).

Rationale

The word length effect, 'the finding that lists of short words are better recalled than lists of long words, has been termed one of the benchmark findings that any theory of immediate memory must account for' (Jalbert, 2011). The psychologists did the word length effect experiment, to show that short words can be formulated quicker, so that more words can be expressed before they are forgotten. The aim of the study was to demonstrate that our memory span is better with shorter words.

Hypothesis

Students will recall significantly more short words than long words (one-tailed).

Methodology

Designs

A within-subjects design was used. There was one independent variable with two conditions: the length of words used (long or short words). There was one dependent variable: the number of words recalled. Participants took part in both conditions of the experiment.

Participants

A convenience sample of thirty-four participants completed both conditions of this study: 2 were male and 32 females. Ages ranged from 18 to 49 years (*Median* = 25.36, *SD* = 3.41 years). Participants were all undergraduate students from West Wales. All participants were naive to the purpose of the experiment.

Materials

The participants were shown 15 short words, such as 'snap' and 15 long words such as 'transaction', view appendix 1 for the word list. The words were in font size 72 displayed individually on the large blue screen for two seconds and the participants used pen and paper to write down their answers.

Procedure

Participants completed the experiment in a field setting, which was done individually. See appendix 2 for the standardised instructions.

Reference list

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Appendices

Appendix 1-Word list

Condition 1 – Long Words

Condition 2 – Short Words

Transaction	Desk
Forgiveness	Leap
Physician	Mood
Proximity	Tank
Constitution	Rules
Rationalise	Roof
Interaction	Mend
Deductions	Snap
Representation	Tomb
Impatiently	Slow
Reinstate	Tape
Intimidating	Rack
Disorganised	Snore
Understanding	Lose
Illuminate	Paid

Appendix 2-Standardised instructions

To ensure that all participants have the same experience, researchers should ensure that they are all tested:

1. In the same place, with the same equipment and materials placed in the same way.
2. Under the same conditions, so the level of lighting, noise and heat remains the same for all participants.
3. At roughly the same time of day, as people may behave differently if tested at nine o'clock in the morning rather than five o'clock at night.
4. Given identical standardised instructions in exactly the same way

Standardised Instructions: these are given in the chosen location and there may be more than one set for different (IV) conditions of the investigation. The standardised instructions are important, as each participant must receive the same instructions so they understand what to do in the study. Also, it ensures that each participant is treated the same and should help eliminate experimenter effects. You can read the instructions to the participant(s), or let them read the instructions themselves.

Standardised procedure for the word length effect study

An opportunity sample of students was used. Presumptive consent was gained.

The following instructions were presented verbally:

1. Participants were asked to sit quietly facing the projector screen situated on the wall in front of them.
2. You will take part in a short memory task.
3. Please ensure that you have a pen and paper in front of you.
4. Can you all see the screen and text on the power point clearly?
5. You will be presented with 2 word lists – consisting of 15 words each.
6. Following the first list – you will be asked to write any words remembered from the list (in any order). The next 15 words were presented in the same way.
7. Participants received the long words first followed by the short words. They had 90 seconds to recall and write down the words from list one and list two.
8. Words were presented in the middle of a blue screen every 2 seconds, for 1 second.
9. The font was Arial, white, size 72.
10. Participants were thanked for their participation.
11. Participants were fully debriefed regarding the aim and hypotheses of the experiment.

Following the making of the accuracy of recalled words, raw data was analysed using a Wilcoxon signed-rank test on SPSS 26.

Appendix 3-Information sheet and informed consent sheet



Centre for Psychology and Counselling

Study Consent Form

I understand that this research study is being carried out by a 3rd year Psychology Student for their dissertation, and that taking part in this study will involve *viewing the white board that presents 15 short words and 15 long words and the participant must try to remember as many words as they can after they're told to recall.*

This study will take approximately 30 minutes to complete.

I understand that participation in this study is voluntary and I am free to withdraw participation during or at the end of the study without giving a reason. I understand that once I leave the study, I will not be able to withdraw my data, as it will be anonymised. I am aware that if I have concerns about the study, I can discuss these concerns with the researcher at any time during or after the study. I understand that I will be provided with the contact details of the research supervisor at the end of the study, should I have any concerns.

I understand that the information provided by me will be held confidentially, with a code assigned in place of my name. These data will be stored indefinitely in accordance with the Data Protection Act.

I also understand that at the end of the study I will be provided with a debrief form and the

opportunity to discuss any issues with the researcher.

I, **Charlotte Evans** consent to participate in the study conducted by **Charlotte Greenway**, Centre for Psychology and Counselling, University of Wales Trinity Saint David, under the supervision of **Charlotte Greenway**.

Participant Signature: CAE

Date: 8/03/2023

Name and signature of researcher taking consent: Charlotte Greenway

Appendix 4-Debrief sheet.



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Centre for Psychology and Counselling

Study Debrief Sheet

An examination of the word length effect

Thank you for taking part in the study.

The aim of this study was to explore whether immediate memory span is better with short than with long words. We specifically wanted to find out whether the participant would recall more short words or long words after viewing the 15 words presented on the white board.

If you wish to withdraw your data from the study, you must tell the researcher now. After this point, all of your data will be anonymised and we will not be able to trace it back to you.

If taking part in this study has raised any questions, please speak to the researcher on **Charlotte Evans** 2206694@student.uwtsd.ac.uk or contact the academic supervisor **Charlotte Greenway** c.greenway@uwtsd.ac.uk

Thank you once again for taking time to participate in this study.

Charlotte Evans

(BSc Applied Psychology, or BSc Psychology, or BSc Psychology and Counselling)

University of Wales Trinity Saint David

Appendix 5-Raw data (scores)

	Long_words	Short_words	var	var	var	var	var
1	2	5					
2	5	6					
3	3	5					
4	1	3					
5	3	2					
6	4	6					
7	1	4					
8	5	4					
9	7	8					
10	3	4					
11	6	12					
12	4	9					
13	2	6					
14	3	5					
15	4	9					
16	5	11					
17	4	7					
18	4	8					
19	2	6					
20	3	7					
21	3	10					
22	4	7					
23	5	12					
24	4	9					
25	5	12					
26	3	6					
27	2	4					
28	5	9					
29	4	11					
30	5	6					

	Long_words	Short_words	var	var	var	var
13	2	6				
14	3	5				
15	4	9				
16	5	11				
17	4	7				
18	4	8				
19	2	6				
20	3	7				
21	3	10				
22	4	7				
23	5	12				
24	4	9				
25	5	12				
26	3	6				
27	2	4				
28	5	9				
29	4	11				
30	5	6				
31	4	8				
32	3	9				
33	4	11				
34	5	9				
35						
36						

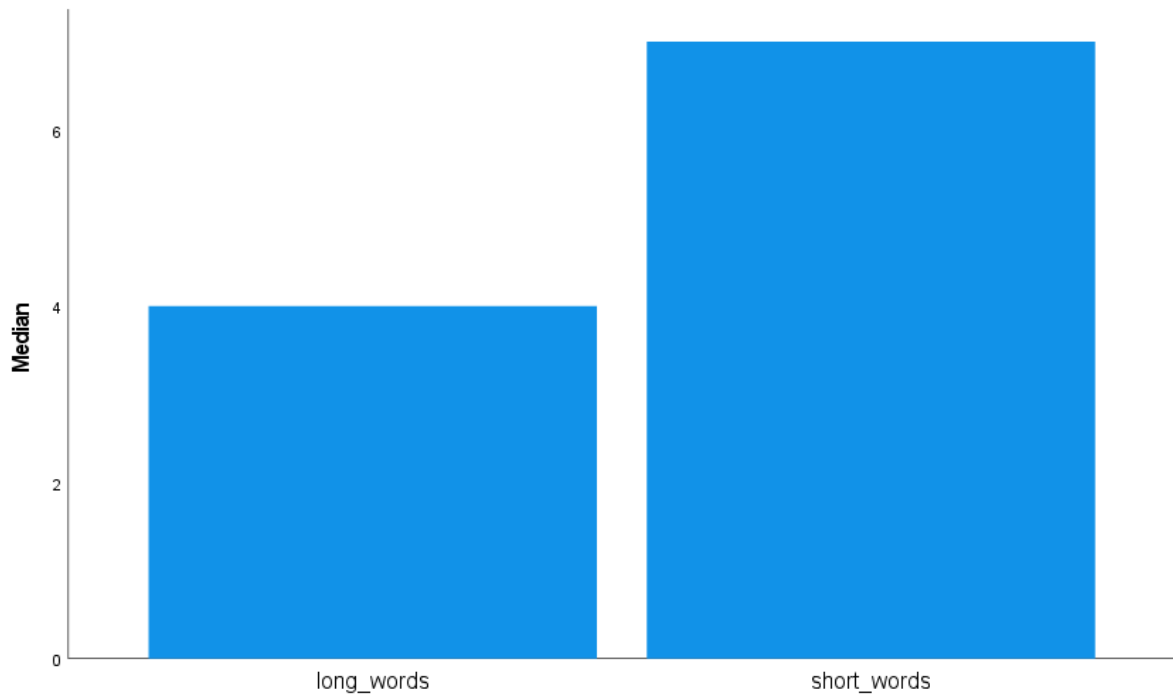
Appendix 6- SPSS results

Results

The following results present the findings for the amount of words that were recalled after being displayed on the white board.

Chart 1

Median scores for long and short words.



The median for shorts words was 7 (SD=7) and for the long words was 4 (SD=4).

Chart 1 shows that short words were recalled better than long words.

To examine if the median scores for both conditions are significantly different to the probability of .05, the non-parametric Wilcoxon statistical test was carried out.

A Wilcoxon signed-rank test showed a significant difference between the long and short word conditions ($Z = -4.981$, $p < .001$). Median recall scores for short words were significantly better than for long words (*Median*: 4.0 and 7.0 respectively).

The results indicate that the hypothesis that correct, as participants were able to recall more shorts words than long words was supported and provides support for the Word length effect.