

An examination of the word-length effect

Abstract

This study was a partial replication of the WLE study. To examine if word length (IV) has an impact on the number of words participants can recall during a recall experiment (DV). The hypothesis predicts that participants will recall more short words than long words. A convenience sample of 34 was collected (2 males, 34 females) between the ages of 18-49. A within subject's design. All participants viewed a large white screen and wrote down as many words as they were able to recall. A Wilcoxon test was carried out and revealed a significant difference between the two conditions supporting the hypothesis. The results indicate that long words take longer to run off the phonological loop, thus prone to fading.

Introduction

What is working memory? Working memory is a limited short-term, categorised by processors and their functions allowing for easy recall during cognitive tasks, (Baddeley, et al. 1974). Working Memory is brief, only storing information for 15-30 seconds without rehearsal. The working memory model depicts 3 subcomponents and their inputs into WM, the central executive directs information and the phonological loop and episodic buffer follow.

The model assumes that while our brain performs complex cognitive tasks, there must be a system dedicated to processing information like a 'workspace' (Baddeley, 1999). Baddeley and Hitch aimed to test the existence of working memory and gave a name to the different processors involved in things like planning a journey, comprehending written and spoken language, and solving maths problems.

The first component of working memory is the central executive. (Baddeley, 1986) assumes that the central executive is not an information store, but a processing system that decides where attention is needed the most while drawing information from a larger storage system (long-term memory) This allows the brain to focus on prioritising the stimuli we respond too, instead of becoming overwhelmed and being unable to focus on cognitive tasks. (Neath et, al. 2011)

Next is the phonological loop, Baddeley describes this as a slave system to the central executive the phonological loop is responsible for speech perception and spoken information is held within this store for 1-2 seconds. Whereas written information needs to be spoken before being converted into articulatory code to be processed through the phonological store. (Baddeley, 1986)

Lastly the visuo-spatial sketchpad handles visual stimuli by identifying an object by the shape, size, and colour. For example, when moving around your house in complete darkness your visuo-spatial sketchpad will be active subconsciously preventing bumping into objects.

Working memory is essential for many aspects of daily life, such as problem solving, planning a journey and interpreting conversation. The amount of information that can be stored in working memory differs however theorists agree to an extent that working memory can be improved by spoken repetition, or chunking information such as a phone number: 07734-789-123. Likewise, when working out a maths equation working memory breaks down the sum allowing for a quick reactive response. (Cowan, 1956)

The word length effect (WLE) has a long-standing history within the discussion of memory, with the focus being that longer words receive less rehearsal within the phonological loop leaving them prone to fading. (Campoy, 2008).

Evidence in support of the WLE can be found in the research of Dr Jalbert in their Bilingual word-length effect, a study between English and Welsh speakers concluded that after being subjected to two conditions participants recalled significantly less Welsh words than English. This occurred because Welsh words have more syllables than English words. The phonological loop processes verbal information and the Welsh list of words had less rehearsal. (Jalbert, et al. 2011).

Like Baddeley and Hitch, Dr Nelson theorises working memory in conjunction with The Working Memory Model (Baddeley et, al., 1974). The Model suggests that Working memory stores information for longer than STM but far less than STM, with the working memory model acting as a functioning coordination system constantly running in the backgrounds of our minds helping us to prioritise attention when performing complex cognitive activities. Much like Baddeley, Cowan aims to identify the existence of working memory and supports Baddeley's theory however there are differences between both models. Nelson assumes working memory from a very different perspective than Baddeley. With the model proposing that working memory is activated and processed from long-term memory. (Cowan, 1999).

The word length effect occurs when participants are asked to recall two sets of words shortly after reading them, most participants will recall more short words than long words. This happens because long words take longer to run off the phonological loop. This supports Baddeley's working memory model and the existence of the phonological loop.

The aim of the study was to explore WLE.

Hypothesis: Participants will recall significantly more short words than long.

Methodology

Design – a related subjects design was used to explore the WLE. There was one independent variable: word length. With one dependant variable: number of words recalled.

Participants took part in both conditions of the experiment (long and short words).

Participants – Convenience sample of 34 participants, 2 males and 32 females. Ages ranged between 18-49 (*med* 25.36 = *SD* 2.41). all participants were undergraduate applied psychology students from West Wales and were naive to the purpose of the study.

Materials: 15 long words, 15 short words (see appendix)

Paper

Pen

Large screen (whiteboard)

Blue writing, size 72, in font Arial.

Presented new word every 2 seconds.

Procedure: (See appendix 2 for procedure)

Participants presented with 30 words on a large screen, and asked to write down as many words as they can remember.

Participants recalled more short words than long.

Results:

The following results present the findings for The World Length Effect

Chart 1

Median scores for long and short words.

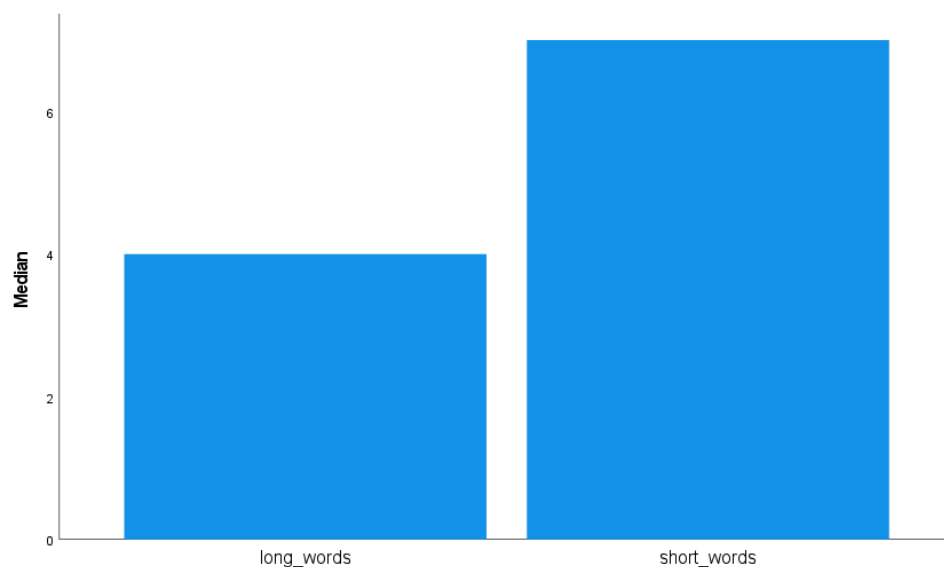


Chart shows that short words were recalled more than long words. The median for long words was 4 ($SD = 1.35$.) The median for short words was 7 ($SD = 2.75$). To examine if the median scores for both conditions are significantly different to the probability of .05, the non-parametric Wilcoxon statistical test was carried out. A Wilcoxon signed-rank test showed a significant difference between the long and short word conditions ($Z = 4.98$, $p < .001$). Median recall scores for short words were significantly better than for long words (Median: and respectively).

The results indicate that the hypothesis that participants would recall more short words than long words was supported and provides support for the Word length effect.

Appendices:

1)

Word List Table

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

2) Standardised procedures

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.

3) 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.

Appendix 4)



Centre for Psychology and Counselling

Study Information Sheet

This document provides key information regarding the study and provides details about what will be expected of you as a participant. Therefore, please read this information carefully before providing consent to take part.

During this study you will be required to do the following:

- Complete a demographics form detailing your age and gender.
- Complete a 30-item paper-based questionnaire measuring the word length effect.
 - Further instructions on how to complete this will be provided at the top of the questionnaire.
- You will then be presented with a list of 30 words on the computer screen.
 - Each word will be presented individually for two seconds, and your task is to simply read the word.
- You will then be required to write down as many of the words as you can remember on the piece of paper provided. You will have two minutes to complete this task. Once the two minutes is up, that will be the end of the study.

At the end of the study, you will be debriefed by the researcher, and you will be provided with the study debrief sheet.

If you feel you would be uncomfortable answering personal questions about your anxiety levels, you are advised not to take part in this study.

Due to this research involving an auditory component, you must be capable of listening to music through headphones in order to take part.

If you have any questions, please ask the researcher now.

If you are happy to take part in this study, please read and sign the consent form.

Appendix 5)



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

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 **put brief description of the study in here**

This study will take approximately **XX** 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, _____ (NAME) consent to participate in the study conducted by **put your name here**, Centre for Psychology and Counselling, University of Wales Trinity Saint David, under the supervision of **put supervisors name here**.

Participant Signature: _____

Date: _____

Name and signature of researcher taking consent.

Appendix 6)

Condition 1	Condition 2
2	5
5	6
3	5
1	3
3	2
4	6
1	4

5	4
7	8
3	4
6	12
4	9
2	6
3	5
4	9
5	11
4	7
4	8
2	6
3	7
3	10
4	7
5	12
4	9
5	12
3	6
2	4
5	9
4	11
5	6
4	8
3	9
4	11
5	9

Test Statistics^a

	short_words - long_words
Z	-4.981 ^b
Asymp. Sig. (2-tailed)	<.001

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

3) References:

1. Baddeley, A. D., & Logie, R. H. (1999). *Working Memory: The Multiple-Component Model. Models of Working Memory*, 28–61.
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