تقييم لغوي نفسي لدور منظور القراءة في الذاكرة العاملة واسترجاع النص

A Psycholinguistic Assessment of the Role of Reading Perspective in Working Memory and Text Recall

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Abstract

This research examines the relation between the reading span capacity of working memory and the strategy of taking a perspective when reading a text, and then recalling its information. The study was conducted on a group of 36 native Arabic speakers, who were divided into three equal groups. Two tests were administered: Daneman and Carpenter's (Daneman & Carpenter, 1980) The *Reading Capacity Test,* and Pichert and Anderson's (Pichert & Anderson, 1977) *The Perspective-based Reading Test*, which were administered to measure the participants' reading span and how reading perspective triggers specific cognitive strategies that cause reading span capacity to recall text information better. The results prove that purposeful reading with particular guiding perspectives enhances participants' working memory by directing attention to aspects more connected to the reader's purpose, considering that reading with a repeated perspective encodes more information relevant to that assigned perspective. Also, the two tests have confirmed

that cognitive capacity and strategies, such as attentional focus, schematic representations, and schema activation, can maintain and enhance working memory span and retrieval.

Keywords: Perspective-based Reading Test, Psycholinguistic assessment, Reading Capacity Test, Schema activation, Working memory.

المستخلص

تتناول هذه الدراسة العلاقة بين سعة مدى القراءة في الذاكرة العاملة واستراتيجية تبنّي منظور معين أثناء قراءة النص ومن ثم استرجاع معلوماته. وقد أُجريت الدراسة على عينة مكوّنة من ٣٦ متحدثًا أصليًا باللغة العربية، تم تقسيمهم إلى ثلاث مجموعات متساوية. وتم استخدام اختبارين: اختبار سعة القراءة لدانيمان وكاربنتر (١٩٨٠)، واختبار القراءة المرتكزة على المنظور لبيكيرت و اندرسون (١٩٧٧)، لقياس سعة مدى القراءة لدى المشاركين وكيفية تأثير تبنّي منظور معين في أثناء القراءة على تفعيل استراتيجيات معرفية محددة تسهم في تعزيز قدرة الذاكرة العاملة على استرجاع المعلومات النصية. وقد أظهرت النتائج أن القراءة الهادفة الموجّهة بمنظورات محددة تسهم في تعزيز أداء الذاكرة العاملة من خلال توجيه الانتباه إلى جوانب أكثر صلة بهدف القارئ، مع الأخذ في الاعتبار أن القراءة المتكررة من منظور معين تساعد في الترميز الذهني لمعلومات أكثر ارتباطًا بذلك المنظور المعيّن. كما أكّدت نتائج الاختبارين أن القدرة المعرفية واستراتيجيات مثل تركيز الانتباه، وبناء التمثيلات الذهنية، وتفعيل المخططات المعرفية، تساهم في الحفاظ على مدى الذاكرة العاملة وتعزيزها واسترجاع محتوياتها بفعالية .

الكلمات المفتاحية : اختبار القراءة المرتكزة على المنظور، تقييم لغوي نفسي ، اختبار سعة القراءة ، تفعيل المخططات المعرفية ، الذاكرة العاملة

1. Introduction

(Baddeley, 2003), (Fernandez & Cairns, 2011), and (Aggleton, 2025) define working memory as a temporary and limited storage system where information (that is believed to be significant for further complex cognitive processes) is kept and processed for a very short duration before it is transformed into long-term memory. It

is "some special state or place where [a Plan] can be remembered while it is being executed" (Truscott, 2022, p. 9). The concept of working memory was first recognised in the 1960s when different studies supported two distinct types of memory. (Atkinson & Shiffrin, 1968) suggested that information first enters the short-term memory, which is an entrance to the long-term memory. In this model, the temporary short-term memory is a site for complex cognitive activities such as reasoning, learning and comprehension. Working memory is crucial to our everyday activities as it facilitates efficient information processing. It achieves this work by preserving, updating, and recalling task-relevant information while disregarding or suppressing irrelevant details for the present situation (Furley & Memmert , 2012).

Figure 1

(Baddeley & Hitch, 1974) initial three-component model of working memory

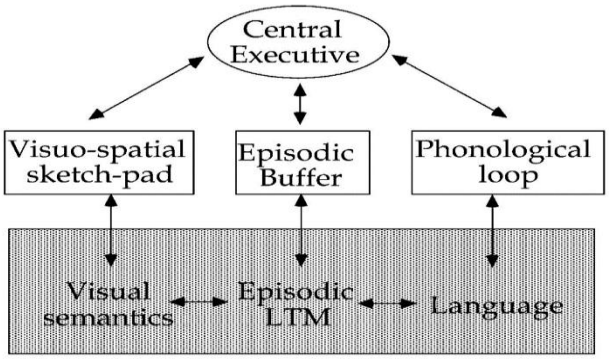
(Baddeley & Hitch, 1974) suggest that working memory is not a unitary component. Instead, it comprises three subcomponents coordinating work to accomplish the whole task. Figure 1 shows that these three components are the phonological loop, the visuospatial sketchpad, and the central executive. A fourth subcomponent, the episodic buffer, was added to this model in the 1990s.

The phonological loop is mainly concerned with verbal and acoustic information. It could be divided into two subsystems: a temporary storage that holds traces of

information only for a few seconds, and a rehearsal system that maintains these traces through the inscription of visual information [the forms of the written characters] inside the storage. The visuospatial sketchpad unifies spatial, visual, and supposedly kinesthetic information into a unified representation that can be temporarily retained and processed. The third subcomponent is the central one in charge of the attentional control of working memory. The efficiency of the cognitive processes in this subcomponent represents one of the main factors according to which individuals' working memory spans are differentiated. (Baddeley & Logie, 1999) later proposed the episodic buffer to redefine the central executive's role. The executive had previously been believed to have a temporary capacity for storage. The episodic buffer is entirely responsible for this function, while the central executive is only assigned the attentional control function. The episodic buffer integrates information from the other subcomponents with the data stored in long-term memory.

Figure 2

Working memory model after the addition of the episodic buffer



(Schwieter John & Wen Zhisheng Edward, 2022) state that comprehending language in speech or writing necessitates utilising working memory, even when dealing with familiar content. Baddeley's elaborated model proposes that working memory in language understanding heavily relies on information representations stored in long-term memory. As we actively engage with spoken or written language, the activation of long-term memory occurs, making relevant linguistic structures and words readily accessible. This activation enhances comprehension efficiency, allowing for swift understanding. When information in long-term memory is actively attended to, it enters the range of the attentional focus, processed with high detail, but with limited capacity. Strategies, such as forming chunks in working memory based on preexisting associations, can overcome these limits. The central executive directs attention to the relevant concepts, guiding automatic processes in interpreting conversations.

This research tries to answer the following questions:

(1) How is the reading span capacity related to recalling information verbatim when reading a narrative passage from a given perspective?
(2) What is the effect of switching the perspective of reading on memory retrieval in individuals with different levels of reading span capacity?
(3) To what extent are attentional control and schema activation enhanced to recall literal information in purposeful reading?

2. Attention

Psychologists and cognitive scientists, such as (Block, 2011), (Cohen, 2014), (Neumann, Heijden, & Allport, 1986), and (Posner, 2012), define attention as the mental mechanism that increases the efficiency of our limited cognitive resources by selecting the most relevant stimuli for optimal cognitive performance. (Bahmani, et al.,

2019) agree that attention and other mental processes in working memory are interconnected, so some neural mechanisms can be shared. Accordingly, they view attention as:

> The process by which a specific target is selected for further processing and neural resources are directed toward that target. The content of [Working Memory] can be used to direct attention, and attention can, in turn, determine which information is encoded into [Working Memory] (p. 129).

Chun et al. (2011) suggest that attention is operational throughout all perceptual and cognitive processes. They propose that attention has three functions: selection, modulation, and vigilance. Selection is conceived to be the main attribute of Attention, as it leads to considerable internal and external information being filtered and processed within the limited capacity of working memory. Once a target or representation is selected from many options, modulation determines how the selected data is processed, how accurately it is stored, and whether it will be recalled later. Finally, vigilance determines how long attention can last.

Controlled attention plays a role in decoding single words and comprehending longer texts when reading. It is crucial for storing and retrieving multilevel text essential for reading comprehension. Both individuals with poor word decoding skills and those with poor comprehension exhibit deficits in working memory. However, the operation of working memory may vary between reading decoding and reading comprehension, particularly concerning skills related to the central executive component. This subcomponent collaborates with the other subcomponents for moment-to-moment monitoring, processing, and maintenance required for successful reading. The central executive's primary function is to allocate attentional resources, and variations influence differences in working memory in attentional control.

Attentional control is vital for cognitive processes that support language and reading comprehension, involving managing attention effectively, inhibiting irrelevant responses, and focusing on task-relevant information (Arrington, et al, 2014). (Field, 2003) asserts that readers (as well as listeners) are selective in what they focus on. The mental model they construct usually reflects their attention (i.e./their sense of what is significant or not). Or it might reflect the requirements of the task they must perform.

3. Schema activation

Working memory helps maintain and manipulate information. At the same time, sensory input is no longer available; it will focus on the internal representations (of what was previously externally available stimuli), which are now integrated with older representations stored in the long-term memory (Chun, et al., 2011). These internal representations are called schemas.

Psychologists and cognitive scientists define schema as an abstract mental model in long-term memory used to organise mental information. Schemas are accumulations of memories and repeated past experiences, and each individual has unique schemas. (Rumelhart & Ortney, 1977) maintain that schemas refer to generalised concepts about objects, situations, events, and actions. (Brewer & Nakamura, 1984), who addressed the role of schema in recalling information and constructing new knowledge, say: "In brief, [schemas] are higher-order cognitive structures that have been hypothesised to underlie many aspects of human knowledge and skill. They serve a crucial role in explaining how old knowledge interacts with new knowledge in perception, language, thought, and memory".

It is agreed upon that mastering reading skills requires coordinated exploitation of several lower-level cognitive processes (such as word decoding), and higher-level

cognitive processes which include text-level skills (such as, the ability to infer meaning, and to make sense of the text), as well as specific sources of knowledge, and some general cognitive processes (such as attention). All of these operations work in coordination to develop a coherent internal representation of the text (Arrington, et al, 2014).

The literature on language teaching and reading comprehension suggests that using schema activation as a reading strategy improves reading skills (Grabe, 2006). It helps readers to be engaged in more purposeful reading experiences. (Moreillon, 2007) states that if people have no schema for the subject matter of what they read, they will immediately lose comprehension. Such a reading strategy leads to constructing meanings by integrating the reader's background knowledge, the information extracted from the texts, and the overall context of the reading situation (Hashemi, Mobini, & Karimkhanlooie, 2016). It also facilitates the systematic retrieval of information from memory and allows for reconstructing knowledge that was not learned or forgotten (Anderson & Pearson, 1984).

Cognitive scientists, such as (Brewer & Lichtenstein, 1980) and (Mandler & Johnson, 1977), have studied how stories are structured and recalled by exploring story schema. This term refers to "the idealized internal representation of the parts of a typical story and the relationships among those parts. It is claimed that people use this type of representation of stories to guide comprehension during encoding and as a retrieval mechanism during recall" (p. 111). (Anderson, 1994) proposes the following six functions of schemas that have an impact on learning and remembering text information and ideas:

1- Providing an ideational basis for comprehending text information by preparing a slot for each piece of information.

2- Guiding selective attention by determining the significant aspects of a text that must be attended to.
3- Facilitating inferential elaboration of implicit information
4- Permitting a systematic search in the memory, as it can prescribe the types of information that need to be retrieved for the reader.
5- Editing and summarising significant propositions, and discarding irrelevant ones.
6- Filling gaps in memory by generating hypotheses about the missing information.

4. Methodology

The participants in this study were initially 50 first-year students at the University of Mustansiriyah/ College of Arts/ Department of Translation, morning and evening studies (2024-2025) who volunteered to help with this research. Two tests were administered, namely, *Reading Capacity Test* (RCT) and *Perspective-Based Reading Test* (PRT). The RCT is adapted from (Daneman & Carpenter, 1980) who deviced a measure for the reading capacity by asking their subjects to read aloud a number of sentences and then recall the final word of each sentence. The PRT is an adaptation from (Pichert & Anderson, 1977) experiment for which they designed a narrative passage that consists of bits of information relevant to burglars, and others relevant to house buyers. This passage was translated into Arabic to be used in the PRT in the current research.

After the first test, only 36 students proceeded to the second one. Both tests were conducted in Arabic, their native language. RCT required answer sheets, a data projector to display the materials to be read and recalled, and cards inside envelopes with instructions given to the groups before each reading.

4.1 The RCT

The steps of the RCT were explained clearly to the participants so they became familiar with the procedures. The whole test comprised 18 unrelated sentences written in an academic style. Each one is 12 to 16 words long, and all of them were generated with the assistance of ChatGPT. The participants were asked to read the sentences aloud to ensure they did not focus only on the last words. Each sentence disappeared a second after the participants had finished reading it aloud. Once all of the sentences were displayed and read, the participants were asked to recall and write down (in the answer sheet) the final words of the sentences in any order. Reading span scores ranged from 0 to 18. If participants scored 1–6, they would have been assigned the average L (for low span capacity). If they achieved 7–12, that would have been considered M (for medium span capacity), and if they were successful in 13–18 correct answers, that would have been given H (for high span capacity). According to the results, only 36 participants were selected to proceed to the next perspective-based test after excluding the surplus participants with M. They were divided equally into one control group and two experimental groups.

4.2 The PRT

To start the following test, the selected 36 participants were divided equally into one control group and two experimental groups. Each group contained three categories of reading spans: 6 participants with low span, 6 with medium span, and 6 with high span. This test was structured into two sessions. In each session, the participants had to read a passage translated from English into Arabic (the participants' native language). The narrative in the passage was about two schoolboys. They go to one of the kids' homes because his mother goes out on Thursdays. The passage was composed to contain almost equal features that would interest a burglar and a homebuyer. The passage (as in was designed by its original

writers) contained 373 words and 72 information units, previously rated for their relative importance to a burglar and a real estate developer. Some information can range from a single phrase to a whole clause. The translated version of the passage contains 56 information units. It was adapted to include 23 units important to a burglar, and another 23 units to a house buyer; five are standard to both perspectives. The remaining information was trivial or unimportant from either perspective.

In the first session, the participants were given written instructions on reading the passage from one of two perspectives or without a perspective. Experimental Group 1 had to assume themselves as persons interested in buying a house for a good deal and then read the passage with that purpose in mind. Experimental Group 2 had to imagine themselves as if they had been burglars and read the passage on that basis. The control group was not given any instructions. After being given five minutes to read the passage, the participants in the three groups were asked to write down as much of the exact story as they could remember. If they could not remember the actual words of any sentence but the meaning, they had to write down the sentences as close to what they had read as possible. After an hour, the second reading and recalling session started. This time, the participants were told that this experiment was being done to determine whether people can remember more information if given a second chance. The three groups were asked to re-read the passage again, with the note: "*Please write down as much of the passage as you can remember. If you do not remember the exact words, write down a sentence as close to the original as possible*."

At this second reading, Experimental Group 1 was asked to re-read the story from the exact first perspective with which they had read previously. Experimental Group 2 was asked to read the story from the reverse perspective (i.e., someone

who wants to buy a house). The control group had to re-read again without being instructed to take any particular perspective.

5. Results and discussion

After collecting the responses from the three groups, the results of the PRT were matched with the text, counted and classified as in Tables 1, 2, and 3. Only the bits of information that were recalled verbatim were counted correctly. The main feature of what was discarded as incorrect bits of information is that they were not literal, containing synonymous meanings and/or alterations in word order. There was missing information, and noticeable inferred additions that do not exist in the text. There was also a shift in the sequence of information. The first and foremost finding of the tests is that reading a narrative passage from a particular perspective increases the reader's tendency to focus their attention on specific aspects of information that are more relevant to the intended purpose of reading, which, in turn, summons and outlines the schematic representation developed for that perspective.

Table 1

The control Group (with no reading perspective in both readings)

Reading Span Capacity	First Reading				Second Reading			
	Bits of info. Relevant to a burglar	Bits of info. Relevant to a buyer	Marginal bits of info.	Total recalled bits of info.	Bits of info. Relevant to a burglar	Bits of info. Relevant to a buyer	Marginal bits of info.	Total recalled bits of info.
Low	6	4	3	13	7	5	3	15
Medium	9	7	3	19	11	9	4	24
High	12	9	3	24	15	11	5	31

Participants in the

control group, who were not given a specific reading perspective, showed a modest improvement in recalling the narrative from the first reading to the second. In the first reading, those with low reading capacity remembered 13 bits of information, while those with medium and high span capacities remembered 19 and 24, respectively. The numbers rose to 15, 24, and 31 in the second reading. This increase suggests that the repeated reading of the passage enabled them to encode and retrieve some extra information literally, regardless of the reading perspective. However, this is a pattern of a relatively slight increase, if compared to the higher corresponding spikes in the scores of the experimental groups.

Table 2

Experimental Group 1 (with a house buyer perspective in both first and second readings)

Reading Span Capacity	First Reading				Second Reading			
	Bits of info. Relevant to a burglar	Bits of info. Relevant to a buyer	Marginal bits of info.	Total recalled bits of info.	Bits of info. Relevant to a burglar	Bits of info. Relevant to a buyer	Marginal bits of info.	Total recalled bits of info.
Low	5	10	2	17	5	12	3	20
Medium	7	12	3	22	7	15	4	26
High	13	16	3	32	14	20	4	38

The participants in Experimental Group 1 were assigned a perspective of a house buyer before both readings. The memory performance of all reading span categories demonstrated a significant increase, more than that shown by the corresponding categories in the control group. Those with low span capacity initially remembered 17 bits of information, and then, this number was raised to 20 bits in the second reading.

Participants with medium and high span capacities remembered 22 and 32 bits in the first reading, then 26 and 38, respectively, in the second. Table 2 makes it clear that the information relevant to the assigned repeated perspective caused the increase in the total recalled bits of information across the three reading span categories. This pattern indicates that assuming the same perspective in both readings resulted in a steady improvement in memory retention for information relevant to the perspective of a house buyer.

Table 3

Experimental Group 2 (with a burglar perspective in the first reading, and a house buyer in the second)

Reading Span Capacity	First Reading				Second Reading			
	Bits of info. Relevant to a burglar	Bits of info. Relevant to a buyer	Marginal bits of info.	Total recalled bits of info.	Bits of info. Relevant to a burglar	Bits of info. Relevant to a buyer	Marginal bits of info.	Total recalled bits of info.
Low	9	6	3	18	9	12	3	24
Medium	12	8	3	23	13	15	4	32
High	17	12	4	33	18	19	5	42

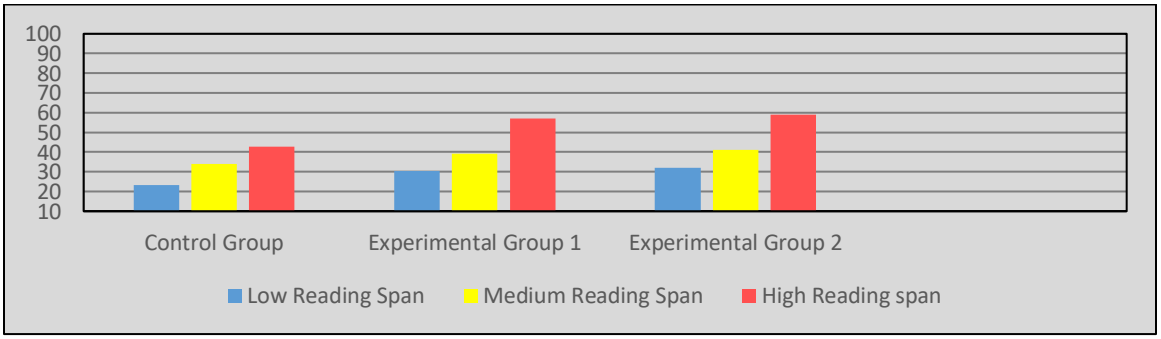
Experimental Group 2 were instructed to switch the perspective between both readings, from a burglar to a house buyer. The pattern of what the different reading span categories recalled revealed a remarkable change in the attentional direction. While the total recall pattern achieved improvement similar to that of Experimental Group 1 in their first

reading, the participants also showed a significant increase in retrieving information relevant to the second perspective (a house buyer), alongside the retention of the information pertinent to the first perspective (a burglar). This pattern highlights the outstanding and efficient memory functioning, especially of those with medium and high reading spans, who retained the information relevant to the first perspective verbatim for more than an hour. Then, with the same efficiency (using the same cognitive strategies), they recalled more literal information relevant to the second perspective. The shift of perspective reveals that high trading span memory can keep freshly coded information and retrieve it quickly, even if it is no longer relevant to the perspective of reading. It also emphasises that the purpose of reading influences memory retrieval by changing the focus of attention to other details.

Figures (3) and (4) show the percentages of the recalled information and the differences among the three groups based on perspective guidance after the first and the second readings. By examining these figures and connecting them with the data in the three tables above, we can reach a more precise graphical explanation of the most prominent patterns of change.

Figure 3

Percentages of the recalled passage in the first reading.



After the initial reading, it is apparent that the control group had the lowest overall literal recall rate compared to the experimental groups, while the experimental groups performed significantly better. The disparities between the low span capacity in the two experimental groups and the medium span capacity in the control group run short. The same happened to the discrepancy between the medium span capacity in the experimental groups and the high span in the control group. This better literal recall performance can be attributed to the selective attention paid by the participants in the experimental groups to the details that are important to the assigned perspectives.

Figure 4

Percentages of the recalled passage in the second reading.

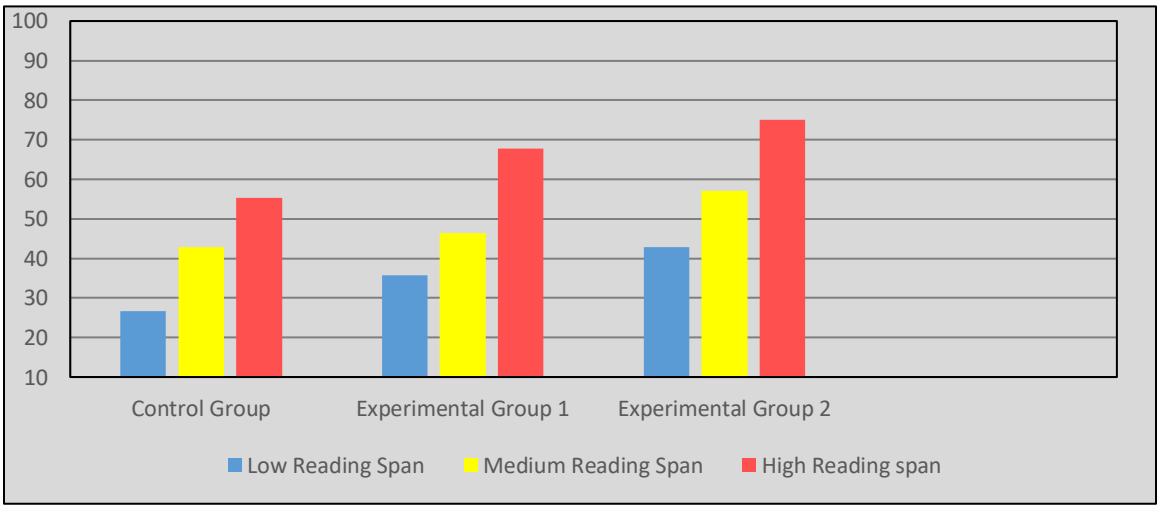


Figure 2 illustrates the percentage of information recalled verbatim by the three groups in the second reading. Overall, it reveals a significant increase in memory retrieval across the three groups. The control group improved the least in recalling information, compared to the other two groups. This insignificant increase suggests

that re-reading without a guiding perspective enhances memory as a natural result of repetition. Still, this enhancement is less considerable than due to purposeful reading. Experimental Group 1, who assumed the same house buyer perspective in the second reading, kept a stable increase in the recalled information relevant to their assigned perspective. This pattern makes it clear that repetition of reading with the same purpose reinforces the schema framework, which promotes memory retrieval. Experimental Group 2, who changed the perspective, retained the previously encoded burglar-relevant information from the first reading. Moreover, they added almost the same amount of buyer-relevant information. This pattern indicates that the working memory is efficient enough to hold information for more than an hour, even if the attention shifts focus. However, this efficiency is positively and directly proportional to the reading span capacity: the higher the capacity, the more information is retrieved.

6. Conclusion

This study is intended to clarify that there is a direct relationship between the reading span capacity of working memory and the assumption of a perspective during reading a text on memory retrieval. The results of the RCT and the PRT provide evidence that purposeful reading (with a specific guiding perspective) enhances memory by directing attention and activating schemas of aspects more connected to the reader's purpose of reading.

Concerning the first research question, it is evident that the participants in the experimental groups across different reading capacities performed better than their counterparts in the control group. The results show that the difference between the low span capacity in the two experimental groups and the medium span capacity in the control group is insignificant. The same applies to the difference between the medium span capacity in the experimental groups and the high span in the control

group. This finding indicates that the reading span can be improved by using the strategy of taking a perspective.

Concerning the second research question, the results showed that the participants who switched the perspective, kept the burglar-relevant information which was already encoded in the first reading, and they stored almost the same amount of buyer-relevant information. This finding refers that the working memory is capable of holding information for more than an hour, even though the attention is shifted to a different perspective.

Concerning the third research question, the participants who read with a repeated perspective encoded more information relevant to that assigned perspective. In contrast, those who switched the standpoint in the second reading could encode and recall information from both perspectives. This suggests that memory retrieval is influenced not only by cognitive capacity but also by cognitive strategies such as attention which selects the most relevant aspects to be encoded and retrieved, and schema activation which outlines and sharpens the mental representation of the experiences relevant to the assigned perspective.

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