



Faculty of Cognitive Sciences and Human Development

**GENDER DIFFERENCES IN WORKING MEMORY
PERFORMANCE**

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Final Year Project Report

Masters

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GENDER DIFFERENCES IN WORKING MEMORY PERFORMANCE

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This project is submitted in partial
fulfilment of the requirements for a
Bachelor of Psychology with Honours

Faculty of Cognitive Sciences and Human Development
UNIVERSITI MALAYSIA SARAWAK
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ABSTRACT

This research is conducted to investigate the gender differences in working memory performance, in terms of both verbal and visuospatial working memory performance based on total number of correct recalled as well as total time taken. Thirty-two undergraduates from University Malaysia Sarawak (UNIMAS) were participated in this study. This study employed quantitative research method through quasi experimental design. Independent sample t-test was then adopted to test the hypotheses of the study. The findings showed that significance gender difference was observed in both verbal and visuospatial working memory performance based on total time taken, which males performed more rapidly than females in these tasks. In terms of accuracy which measured through calculation of total number of correct recalled, females were recalled better than males in verbal task as consistent to numerous previous studies. However, no gender difference was identified in visuospatial task based on total number of correct recalled, with males did not show advantage at visuospatial abilities as revealed by past studies. This study also discussed implications of the findings for a reference to future researchers.

Keywords: gender differences, working memory performance, verbal working memory, visuospatial working memory

ABSTRAK

Kajian ini dijalankan untuk mengkaji perbezaan prestasi ingatan kerja antara lelaki dan perempuan dari segi ingatan kerja lisan dan visuospatial berdasarkan jumlah item yang diingati dengan tepat dan jumlah masa yang diambil. Seramai 32 orang pelajar dari Universiti Malaysia Sarawak (UNIMAS) telah menyertai kajian ini. Kajian ini

menggunakan kaedah kuantitatif dengan mengaplikasikan reka bentuk eksperimen kuasi. Ujian t sampel tidak bersandar telah diaplikasikan untuk menguji hipotesis kajian. Hasil kajian menunjukkan terdapat perbezaan jantina dalam prestasi ingatan kerja lisan dan visuospatial dari segi jumlah masa yang diambil untuk melengkapkan ujian. Dapatan kajian menunjukkan lelaki menggunakan masa yang lebih singkat daripada perempuan untuk menyelesaikan kedua-dua ujian yang dibagi. Manakala dari segi jumlah item yang dapat diingati dengan tepat, peserta perempuan mencatatkan pencapaian yang lebih baik dalam ujian ingatan kerja lisan berbanding peserta lelaki. Dapatan seterusnya menyatakan tiada perbezaan antara jantina dalam prestasi ingatan kerja visuospatial dari segi jumlah item yang dapat diingati dengan tepat. Kajian ini turut membincangkan implikasi-implikasi berkaitan dapatan kajian untuk dijadikan rujukan kepada penyelidik di masa hadapan.

Kata kunci: perbezaan jantina, prestasi ingatan kerja, ingatan kerja lisan, ingatan kerja visuospatial

CHAPTER ONE

INTRODUCTION

1.0 Introduction

In this chapter, background of study, problem statement, research objectives, research questions, research hypotheses, conceptual framework, significance of study and definition of terms are explained.

1.1 Background of Study

Working memory was introduced over 50 years ago and fascinated scholars since its inception from the most prominent model proposed by Baddeley and Hitch during 1974 (Baddeley, 1986; 1992). According to Baddeley (2012), the term ‘working memory’ was coined from the earlier concept of short-term memory found in the modal model of Atkinson and Shiffrin (1968). In order to distinguish working memory from short term memory as both are them are explained to be theoretical different, Baddeley (2012) declared that working memory involved a combination of storage and manipulation processes whereas short-term memory was simply referred to a temporary storage of information.

Sex differences and similarities in cognitive abilities, including neurofunctional study of brain anatomy became a popular topic of major interest as the new findings were gradually contributed to these studies due to the developments over time such as education, technologies invention and more others, indicating that the previous findings in cognitive abilities need to be re-identified (Solianik, Brazaitis & Skurvydas, 2016). Much researches were conducted to examine individual’s cognitive development as well as performance suggested that working memory plays an important role in cognitive function, such as general intelligence (Conway,

Kane, & Engle, 2003), reading comprehension (Daneman & Carpenter, 1980) and ability (Pham & Hasson, 2014), writing ability (Adams, Simmons, & Willis, 2015), mathematics abilities (Raghubar, Barnes, Hecht, 2010) and more. This highlighted how importance the working memory is and facilitated researchers to look into the relevant issues in order to disclose potential gender differences in term of working memory skills in order used to predict and explain different cognitive abilities between sexes.

Moreover, several studies were conducted in measuring the working memory abilities from different perspectives, for instance in the domains of psychology or neurosciences suggested the potential gender differences in terms of working memory performances (Chai, Abd Hamid, & Abdullah, 2018). For instance, sex differences found in the brain anatomy suggested to have potential differences in cognitive functions such as learning (Zaidi, 2010). Besides, the potential factors that might cause an impact towards working memory, resulting in the exploration of gender differences also been identified gradually in this field (Chai, Abd Hamid, & Abdullah, 2018; Jancke, 2018). However, the present studies were regarded as underpowered since there was still lacking of research regarding the working memory and insufficient evidence to support the previous findings (Hill, Laird, & Robinson, 2014).

Since gender differences in working memory play a relatively important role in identifying and explaining the development of other cognitive functions, as well as to reveal some related implications, this study aims to increase better understanding of working memory performances between both gender, males and females among the undergraduates' students.

1.2 Problem Statement

Past studies had revealed that there were some of the researchers started to look into the possible gender differences in terms of working memory, either in visuospatial working

memory or verbal working memory or even both. However, inconsistent findings were identified from those previous studies regarding gender differences in working memory. For instance, some of the experimental and neuropsychological studies disclosed that gender does play a role in working memory (Torres et.al, 2006; Upadhayay & Guragain, 2014). In contrast, some studies revealed the opposite results by stating that there were no gender differences found in working memory (Ishak, et. al., 2012; Robert & Savoie, 2006). The present studies were suggested to be underpowered and not well-established to prove gender difference in working memory performance despite there were certain evidences revealed such difference did exist (Hill, Laird, & Robinson, 2014).

In addition, according to Zaidi (2010), cognitive features were not only correlated with brain structures, the other factors such as environment, education, age also might contribute to the working memory performance. As some of the past studies overlooked such background information, for example, Click (2005) reported that the conditions of participants such as physical and mentally concerns were not known, this might cause the different findings contributed to this study. Hence, this study will focus on measuring both visuospatial and verbal working memory, with the considerations of the participants' background as well.

According to Aben, Stapert and Blokland (2012), short-term memory and working memory are theoretical different. However, since the term of working memory is evolved from the earlier notion of short-term memory and relevant research had not well-established, it made a considerable confusion of both concepts and terms to be used in the recent literatures or even used interchangeably (Cowan, 2008; Aben, Stapert, & Blokland, 2012; Tasnimi, 2017).

Besides, there are differences between the tasks to be used to measure both short-term memory and working memory, for example simple span tasks and complex span tasks respectively. As

referred to Baddeley (2012), the tasks used for short-term memory measure only required the ability of storing information temporarily such as recalling a list of words. Meanwhile, working memory measures required a combination of storage and manipulation, for example, reading span task which required the participants read aloud the sentences (processing) and memorized the last word of each sentence (storage).

However, some of the previous researches applied simple span tasks in measuring working memory. For instance, Harness et.al. (2008) conducted an experimental study with using a list of 20 words and 20 pictures as stimuli to access gender differences in working memory. The participant had only memorizing the stimuli presented and then recalled about those items. As working memory involves both memorizing and processing function concurrently, simple span tasks are not applicable in working memory measures but for shortterm memory. Therefore, this study will apply two complex span tasks with each measure visuospatial working memory and verbal working memory respectively.

Furthermore, there is lacking of research on working memory available in the context of Asian, especially Malaysia. Most of the resources regarding working memory were obtained from Western country, such as United States (Loring-Meier & Halpern, 1999; Click, 2005; Baer et.al, 2006; Reed et.al, 2017; Gunn, 2014; Harness et.al, 2008). As there was evidence that background information such as culture and environment might have an influence towards working memory performance, the findings resulted from the research conducted in foreign country might be not suitable to be generalized on the Asian population. Hence, this study will conduct in the context of Malaysia, among the undergraduates in UNIMAS.

1.3 Research Objectives

1.3.1 General Objective

To investigate gender differences in working memory.

1.3.2 Specific Objectives

- To investigate gender difference in verbal working memory performance based on total number of correct recalled.
- To investigate gender differences in visuospatial working memory performance based on total time taken.
- To investigate gender differences in visuospatial working memory performance based on total number of correct recalled.
- To investigate gender differences in visuospatial working memory performance based on total time taken.

1.4 Research Questions

- Is there any significant gender difference in verbal working memory performance based on total number of correct recalled?
- Is there any significance gender difference in verbal working memory performance based on total time taken?
- Is there any gender difference in visuospatial working memory performance based on total number of correct recalled?
- Is there any gender difference in visuospatial working memory performance based on total time taken?

1.5 Research Hypotheses

H_{a1}: There is significant difference between gender in verbal working memory performance based on total number of correct recalled.

H_{a2}: There is significant difference between gender in verbal working memory performance based on total time taken.

H_{a3}: There is significant difference between gender in visuospatial working memory performance based on total number of correct recalled.

H_{a4}: There is significant difference between gender in visuospatial working memory performance based on total time taken.

1.6 Conceptual Framework

The conceptual framework of this study explains the relationship between independent variables and dependent variables (Figure 1.1). The independent variables are gender and working memory tasks whereas dependent variable is working memory performance. Gender consists of both sexes, male and females while working memory tasks are divided into two, the reading span task which used to measure verbal working memory while the rotation span task which aimed to measure visuospatial working memory. For working memory performance, it measured the total number of correct recalled and total time taken by the participants in respond to the tasks that have been assigned.