

**UNIVERSITI TEKNOLOGI MARA**

**GAIT AND POSTURAL CONTROL  
ALTERATION AMONG OLDER  
ADULTS WITH BENIGN  
PAROXYSMAL POSITIONAL  
VERTIGO**

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## ABSTRACT

Benign Paroxysmal Positional Vertigo is a common peripheral vestibular disorder and is more prevalent in older adults. One of the main subjective complaints among older adults is gait unsteadiness instead of vertigo attack; however, exploration on this area rarely been done. This study aimed to investigate gait performance and spatiotemporal gait characteristics during straight walking and turning in older adults with BPPV (OABPPV) compared to adults with BPPV (ABPPV) and healthy older adults (WBPPV). Sixty-six individuals (22 OABPPV, 22 ABPPV and 22 WBPPV) were recruited in this cross-sectional study design. The spatial temporal gait parameters were captured using a video analysis system during participants performed the Timed Up and Go test. The study setup required a 6 meters walking pathway with a 3-meter width turning area. A digital video camera (30fps) was located 6 meters away in the sagittal plane and 3 meters away in the frontal plane. The gait parameters were analyzed using the Kinovea software. The Kruskal-Wallis test was used to compare gait characteristics. The results of this study showed that the gait performance of OABPPV is more affected compared to the ABPPV and WBPPV. No significant differences in spatio-temporal gait characteristics during straight walking were observed among OABPPV and WBPPV. However, the time and number of steps taken to complete the turn increased among OABPPV compared to WBPPV. Furthermore, this study observed that most OABPPVs completed the turn in absence of pivot, taking  $< 3$  minutes and  $\geq 5$  steps which may indicate that these individuals have turning difficulty. This study concludes that alteration of gait among OABPPV were markedly observed during turning. Therefore, it highlights the need for a specific intervention on gait such as gait assessment during turning and additional vestibular rehabilitation exercises to improve gait.

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# TABLE OF CONTENTS

	<b>Page</b>
<b>CONFIRMATION BY PANEL OF EXAMINERS</b>	<b>ii</b>
<b>AUTHOR'S DECLARATION</b>	<b>iii</b>
<b>ABSTRACT</b>	<b>iv</b>
<b>ACKNOWLEDGEMENT</b>	<b>v</b>
<b>TABLE OF CONTENTS</b>	<b>vi</b>
<b>LIST OF TABLES</b>	<b>x</b>
<b>LIST OF FIGURES</b>	<b>xi</b>
<b>LIST OF ABBREVIATIONS</b>	<b>xii</b>
<b>CHAPTER 1 INTRODUCTION</b>	<b>1</b>
1.1 Study Background	1
1.1.1 Introduction	1
1.1.2 Functional Disability among Individuals with Benign Paroxysmal Positional Vertigo	2
1.2 Problem Statement	4
1.3 Research Objective	6
1.3.1 General Objective	6
1.3.2 Specific Objective	7
1.4 Research Hypotheses	7
1.5 The Significance of The Study	8
1.6 Scope and Delimitation of the Study	8
1.7 Operational Definition of Term	9
<b>CHAPTER 2 LITERATURE REVIEW</b>	<b>11</b>
2.1 Overview of the Vestibular System and Its Function	11
2.1.1 The Peripheral Vestibular System	11
2.2 Effects of Aging	13
2.3 Overview of Benign Paroxysmal Positional Vertigo	15
2.3.1 Benign Paroxysmal Positional Vertigo	15

# CHAPTER 1

## INTRODUCTION

### 1.1 Study Background

#### 1.1.1 Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is a common type of vertigo with estimated 1-year prevalence of 446.35 per 100000 population (Yang et al., 2021). It is highly prevalent in older adults over 60 years old, with peak incidence occurring between 50 to 70 years of age (Akin et al., 2017; Von Brevern, Radtke, Lezius, Feldmann, et al., 2007; West et al., 2016). Furthermore, Figtree et al. (2021) reported that the prevalence of BPPV is about 57% among individuals aged more than 50 years of age with underlying vestibular cause. In the Netherlands, about 1.4% of older adults referred to the outpatient clinic due to dizziness were diagnosed with BPPV (van der Zaag-Loonen et al., 2015). Meanwhile, about 9% of older adults referred to the district geriatric clinic in the USA suffered from BPPV (Oghalai, Manolidis, Barth, Stewart, et al., 2000). Asia, like Japan has reported the incidence of BPPV was 10.7 per 100000 population (Mizukoshi et al., 1988). In Malaysia, although there is a lack of reported on the prevalence of BPPV, most of the dizziness patients referred to a tertiary hospital in Selangor were mainly among individuals with BPPV (Wahat et al., 2013).

BPPV is a disorder of the inner ear characterized by acute, brief, and rotatory vertigo attacks provoked by changes in head position with respect to gravity (Bhattacharyya et al., 2017). BPPV pathogenesis is related to the presence of moving otoconia in semicircular canals. This moving otoconia triggered abnormal stimulation of vestibular receptors, leading to nystagmus, positional vertigo, and postural instability (Abou-Elew et al., 2011). Schucknet was the first individual to discover the pathological concepts of BPPV. In 1969, Schucknet proposed a theory of ‘cupulolithiasis’ that referred to the deposition of otoconia on the cupula in the crista ampullaris. The theory suggests that the cupula, which was heavy due to attachment of the otoconia, would be deflected by changes of position, thus evoked nystagmus (Schucknecht, 1969). Later, in 1979, Hall et al. proposed the theory of ‘canalithiasis’ which stated that otoconia migrate from the utricular macule to the semicircular canal, which causing vertigo and