

THREE DAYS MONITORING OF ACTIVITIES OF DAILY LIVING AMONG YOUNG HEALTHY ADULTS AND PARKINSON'S DISEASE PATIENTS

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ABSTRACT

Parkinson's Disease (PD) is a neurodegenerative disorder affecting the substantia nigra, which leads to more than half of PD patients are considered to be at high risk of falling. Recently, Inertial Measurement Unit (IMU) sensors have shown great promise in the classification of activities of daily living (ADL) such as walking, standing, sitting, and laying down, considered to be normal movement in daily life. Measuring physical activity level from longitudinal ADL monitoring among PD patients could provide insights into their fall mechanisms. In this study, six PD patients (mean age=74.3±6.5 years) and six young healthy subjects (mean age=19.7±2.7 years) were recruited. All the subjects were asked to wear the single accelerometer, DynaPort MM+ (Motion Monitor+, McRoberts BV, The Hague, Netherlands), with a sampling frequency of 100 Hz located at the L5-S1 spinal area for 3 days. Subjects maintained a log of activities they performed and only removed the sensor while showering or performing other aquatic activities. The resultant acceleration was filtered using high and low pass Butterworth filters to determine dynamic and stationary activities. As a result, it was found that healthy young subjects performed significantly more dynamic activities (13.2%) when compared to PD subjects (7%), in contrast, PD subjects (92.9%) had significantly more stationary activities than young healthy subjects (86.8%).

Keywords: Parkinson's Disease (PD), Activity of Daily Living (ADL), Inertial Measurement Unit (IMU), Physical Activity Level, Dynamic activity, Stationary activity

INTRODUCTION

Parkinson's disease (PD) is a neurodegenerative disorder affecting the substantia nigra. The substantia nigra plays a role in controlling the movement of the body, and, in PD, can be related to symptoms such as tremor, rigidity, bradykinesia, and postural instability [1]. These symptoms increase the possibility of falling among PD patients and significantly reduce physical activity in their daily activities [2]. Approximately 2.8 million elderly adults, aged 65 years and older, fall and receive treatment in emergency departments. Hospitalizations due to fall accidents totaled more than 800,000 patients in 2016, of which 95% of patients had hip fractures. The total medical costs of fall related visits exceed \$50 billion annually [3]. In the PD population, 50% to 70% of patients have a fall accident a year, which increases the population's total annual medical cost to almost 27 billion dollars [4]. In addition to economic costs, falls can negatively impact activity level, fear of falling, and quality of life [5]. Past studies indicated that most falls occur within the subject's home environment; therefore, assessment of fall risk should be executed in the subject's normal home environment. Home monitoring also lowers the risk of "white coat syndrome" and the normal authentic Activities of Daily Living (ADL) could be recorded and evaluated [6]. Previously ADL measurement was assessed with a questionnaire or survey, which is considered to be subjective. With this approach, there is a possibility of results being skewed and the outcome could be unreliable [7]–[9].