A Study Protocol for Checking Efficacy of Microsoft Kinect Azure for Evaluation of Spatial Parameters of Gait in Normal Healthy Population

Manpreet Kaur Bhamra[1], Waqar Naqvi[2]

[1] Student, Ravi Nair Physiotherapy College, Datta Meghe Institute of Medical Sciences, Wardha, Maharashtra, India, [2]Head of Department and Professor of Community Health Physiotherapy, Ravi Nair Physiotherapy College, Sawangi (M), Wardha, 442001

Abstract

Introduction: In healthy population, spatial parameters of gait such as stride length and step length are frequently linked with gait cycle but can be obstructive, time taking and difficult to measure. This study is to check theefficacy of kinect azure for evaluating of spatial parameters of gait in normal healthy population. Kinect is accurate, unobstructive, low cost clinical gait analysis systems have many uses like diagnosis, monitoring, management and rehabilitation.

Method: The research has been designed as an observational study.The total of 132 participants will be taken from AVBRH, sawangi Meghe for study as per exclusion and inclusion criteria.With intervention the span of the study will be 6 months. It holds single period, concurrent validity evaluation comparing spatial gait parameters derived from the Kinect system.

Discussion: This study protocol aims to assess the efficacy of Microsoft kinect azure for evaluation of spatial parameters of gait.The study's expected outcome will concentrate on the evaluation of the usability of kinect to assess spatial gait on healthy individuals.

Keywords: *Kinect azure, projector, spatial gait analysis, healthy individuals.*

Introduction

[1]Research has shown the importance of measuring a person's gait and that the parameters describing locomotion.[2] A major rehabilitation goal is recovery of functional and independent community ambulation. A gait analysis can detect deviations, thus this may help in assessing rehabilitation potency. A gait analysis can also use to differentiate between disease and to determine general health and disease and accident threats such as detection of fall and prognosis between the elder individuals.[4] Many indiviuals and the elderly suffer from gait impairments.

Corresponding author:
Dr. Waqar Naqvi,
Head of Department and Professor Of Community Health Physiotherapy, Ravi Nair Physiotherapy College, Sawangi (M), Wardha, 442001
Email: waqar.naqvi@dmimsu.edu.in
Mobile no.: 9021699000
Orchid ID:https://orcid.org/0000-0003-4484-8225
Designation –Vice Principle and Professor

FIGURE 1: MICROSOFT KINECT AZURE

This studies also show that stride-to-stride variation to evaluate velocity, speed and stride length are free of fall detection. Thus, it is convenient for recognizing high risk individuals.[5]Wearable sensors are proposed under recent studies. Such devices are small, portable, less expensive and lightweight(Figure 1). Despite of there superiorties, wearable sensors have few drawbacks. Sensors should be placed securely and precisely, these sensors are obstructive in a way that it require daily routine changes for subject. It also require maintenance of charging battery, uplinking data and sanitary treatment. Accurate, unobstructive, low cost clinical gait analysis systems have many uses like diagnosis, monitoring, management and rehabilitation.

[6]Recent evidence shows that the Kinect azure, which utilize depth and image sensor data merge with AI algorithms to recognize anatomical landmarks without need of sensors attached to the individual's body(Figure 2). Furtherly, research reveals that the Kinect is able to validly evaluate stride dynamics in walking. Present devices are capable of precisely calculating spatial gait variables are much expensive, prolonge and less handy.

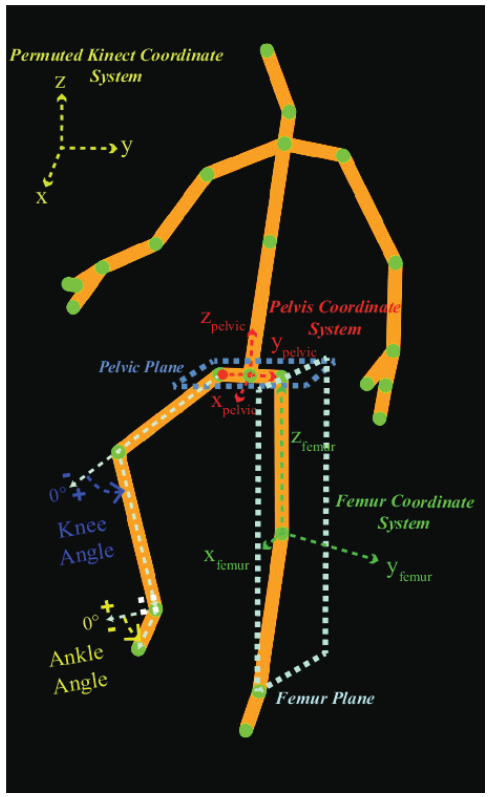

FIGURE 2: CORDINATE SYSTEM WITH KINECT MODEL

[3]The Microsoft Kinect azure is a cheap gaming device that has shown assurance as a clinical assessment tool. Thus, the objective of this study was to evaluate the concurrent validity and inter-day reliability of kinect when assessing spatial parameters of gait.

Aims And Objective

Aim:

To assess stride length and step length in normal individual via Microsoft kinect azure.

Objective:

1) To evaluate stride length in normal individuals by Microsoft kinect azure.

2) To evaluate step length in normal individual by Microsoft kinect azure.

Methodology:

This study will be conducted in the Department of Community Health Physiotherapy at Ravi Nair Physiotherapy College, Sawangi (Meghe), Wardha, India, with the approval of Datta Meghe Institute of Medical Sciences, Institutional Ethics Committee, Deemed to be University.

MATERIAL REQUIRED:

1) Microsoft kinect azure

2) Projector

3) Consent form

Study setting: Ravi Nair Physiotherapy College

study type: observational type

sampling technique: simple random

sample size: 132 participants

study duration: 6 months

study design: This study will be carried out in the HumEn research lab of Ravi Nair Physiotherapy College, Sawangi (Meghe), Wardha, after approval from Institutional Ethics Committee of Datta Meghe Institute Of Medical Sciences, Deemed to be University.

Before inclusion, all the participants will be informed regarding the aim and procedure of research. Figure 3.Show's the flow chart of the study.

Figure :3

Outcome Measure:

1. Spatial parameter of gait

Participant selection:

Exclusion criteria:

1) individual with abnormal gait.

2) Lower limb fracture.

3) Traumatic injuries of lower limb.

4) Neurological problem.

Inclusion criteria:

1) Normal individual without gait impairment.

2) Subjects willing to participate voluntarily.

3) Both male and female patients.

Procedure:

[6]We'll catch recording of 132 subjects (male as well as female) to participate. This study hold single period, concurrent validity evaluation comparing spatial gait parameters derived from the Kinect framework. [7]Ask subject to walk down a line, at normal pace, in front of the Kinect sensor. [7]subject walk along a line , starting from the beginning point and slow down before reaching to the Kinect. The distances are compatible with the guidelines for achieving the highest data quality. [6]This distance allows to record atleast 1 full gait cycle (i.e. complete stride) per walking trial for each limb that does not include the initial step and final step of the pathway.

Besides, age, gender, occupation, weight and height of the individual's is recorded as a supplementary details for better data collection.

Expected Result:

The study's expected outcome will concentrate on evaluation of spatial parameter of gait in healthy individual.After completion of study result will

calculated by systemic data analysis by randamized control trial.

Discussion

Study protocol aim is to evaluate gait parameter in normal individuals using Microsoft azure. Its expected result concentrate on evaluation of spatial gait parameter using kinect azure. This study help to find the efficiency of kinect azure used in evaluating gait parameter in healthy indivuals.

ETHICS AND DISSEMINATION:

The approval of the Committee on Institutional Ethics must be obtained prior to the start of the study. Patients must be treated with respect first. Upon meeting the requirements of inclusion and exclusion criteria, the patients are taken for review.

Source of Funding: There will be no direct support for this research from public and private organization. The department of physiotherapy, at Datta Meghe institute of Medical Science, Deemed to be university will provide material needed for research.

Conflict of Interest: Nil

References

1. Stone EE, Skubic M. Unobtrusive, Continuous, In-Home Gait Measurement Using the Microsoft Kinect. IEEE Trans Biomed Eng. 2013 Oct;60(10):2925–32.
2. Springer S, Yogev Seligmann G. Validity of the Kinect for Gait Assessment: A Focused Review. Sensors. 2016 Feb 4;16(2):194.
3. Mentiplay BF, Perraton LG, Bower KJ, Pua Y-H, McGaw R, Heywood S, et al. Gait assessment using the Microsoft Xbox One Kinect: Concurrent validity and inter-day reliability of spatiotemporal and kinematic variables. J Biomech. 2015 Jul;48(10):2166–70.
4. Stone EE, Skubic M. Passive in-home measurement of stride-to-stride gait variability comparing vision and Kinect sensing. In: 2011 Annual International Conference of the IEEE Engineering in Medicine and Biology Society [Internet]. Boston, MA: IEEE; 2011 [cited 2020 Feb 28]. p. 6491–4. Available from: http://ieeexplore.ieee.org/document/6091602/
5. Gabel M, Gilad-Bachrach R, Renshaw E, Schuster A. Full body gait analysis with Kinect. In: 2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society [Internet]. San Diego, CA: IEEE; 2012 [cited 2020 Feb 28]. p. 1964–7. Available from: http://ieeexplore.ieee.org/document/6346340/
6. Clark RA, Bower KJ, Mentiplay BF, Paterson K, Pua Y-H. Concurrent validity of the Microsoft Kinect for assessment of spatiotemporal gait variables. J Biomech. 2013 Oct;46(15):2722–5.
7. Dikovski B, Madjarov G, Gjorgjevikj D. Evaluation of different feature sets for gait recognition using skeletal data from Kinect. In: 2014 37th International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO) [Internet]. Opatija, Croatia: IEEE; 2014 [cited 2020 Feb 28]. p. 1304–8. Available from: http://ieeexplore.ieee.org/document/6859769/
8. Bilney B, Morris M, Webster K. Concurrent related validity of the GAITRite® walkway system for quantification of the spatial and temporal parameters of gait. Gait Posture. 2003 Feb;17(1):68–74.
9. Dolatabadi E, Taati B, Mihailidis A. Concurrent validity of the Microsoft Kinect for Windows v2 for measuring spatiotemporal gait parameters. Med Eng Phys. 2016 Sep;38(9):952–8.
10. Dubois A, Bresciani J-P. Validation of an ambient system for the measurement of gait parameters. J Biomech. 2018 Mar;69:175–80