A Study Protocol for Checking Validity of Evaluation of Temporal Parameters of Gait Using Microsoft Kinect Azure in Normal Healthy Population

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Abstract

Introduction: [5]In healthy population, temporal parameters of gait like step time and stride time are frequently linked with gait cycle in healthy populations but can be obstructive, difficult and time taking to measure. This study is to check the efficacy of kinect azure for evaluating of temporal parameters of gait in normal healthy people. A kinect based recording application was started & use to detect , tracks human post analytical motions. Kinect is low cost, unobstructive and accurate gait analysis application with various uses like monitoring, diagnosis, rehabilitation & management. The end result of this study is to fed a state system that analysis the present state from which the assessment are withdrawn.

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

Discussion: This study protocol aims to evaluate the Validity of evaluation of temporal parameters of gait using Microsoft Kinect Azure. The study's expected outcome will concert on the evaluation of temporal parameters of gait using Microsoft Kinect Azure in normal healthy population.

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

Introduction

[1]Research has shown the importance of measuring a person's gait and that the parameters describing locomotion. Recovery of functional & independent ambulation is big rehabilitation goal. A complete gait analysis determine deviations & damage underlying decreased functions & so, this may assist in decision making as well as in evaluating rehabilitation usefulness . [2]Gait analysis can be a effective tool to differentiate among disease structure & to determine health & danger of disease and injury like fall detection and prognosis among the elderly individual . [3]Gait impairments prevails in abundant clinical populations and the senior citizen.

[4]Recent studies have shown that the number of stride-to-stride variation in the calculation of stride length, velocity & speed are individual predictors of future falls ,thus can be handy to recognize high risk citizen. [5]Wearable sensors are proposed under recent studies. Such devices are lightweight, small, less expensive & portable (Figure:2). Despite of there superiorties, wearable sensors have few disadvantage. Sensors should be placed securely and precisely, sensors are obstructive in a way that it needs daily routine changes for subject. It also requires service of charging battery, uplinking data & sanitary treatment. Accurate, unobstructive, low cost gait analysis structure have many uses like monitoring,

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diagnosis , management and rehabilitation.

[6]Recent evidence shows that the Kinect , 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:1). [3]Furtherly, research reveals that the Kinect is able to validly evaluate stride dynamics in walking. Present devices that have ability to precisely measuring spatiotemporal & kinematic gait variables are costly, prolong and less handy. [7]Clinicians have lately used commercially accessible gait measurement device to evaluate the temporal & spatial parameters of the footstep pattern. Variables that can be evaluate include walking speed, single and double limb support duration , and stride width, cadence for steps and Step sequence.

[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 assess the validity and reliability of kinect when assessing spatiotemporal parameters of gait. [8]The major limitation for the Kinect azure is that it keep good data quality only in the scale of few meters from the sensor and keep on degrading when goes further . [3]Thus , the purpose of the study was to evaluate the validity and efficiency of kinect when evaluating spatiotemporal and gait parameters.

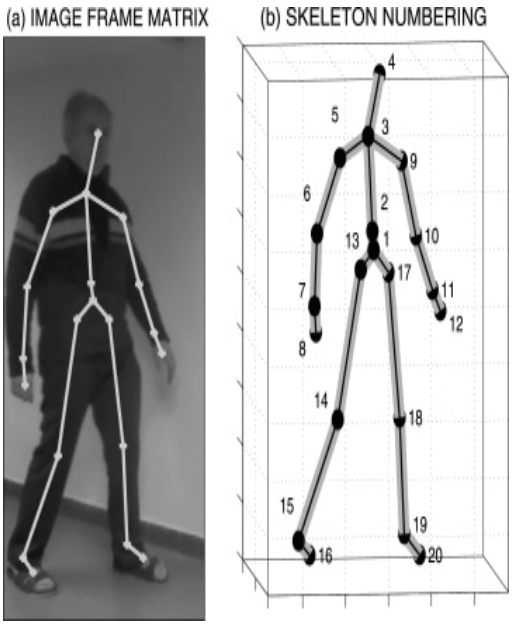

FIGURE 1: CORDINATE SYSTEM WITH KINECT MODEL

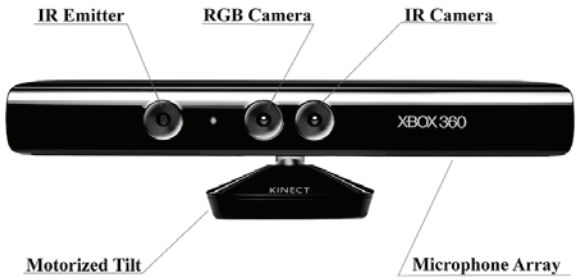

FIGURE 2: KINECT AZURE

AIM AND OBJECTIVE:

Aim:

To assess the validity of stride time & step time in normal population.

Objective:

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

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

Methodology

This study will be managed 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 and Deemed to be University.

Study setting: Ravi Nair Physiotherapy College

study type: observational type

sampling technique: simple random

sample size: 132 participants

study duration: 6 months

Material Required:

1) Consent form

2) Projector

3) Microsoft kinect azure

Procedure:

[5]We were collecting images of 132 subjects (both male and female). Subjects are instructed to walk on straight line. Sensor is place to record the image of the subject. The kinect sensor is mounted at each experiment to capture the subjects image. [8]The distances are compatible with the recommendation for achieving the highest data quality. [6]This distance enable to record 1 full gait cycle (i.e. complete stride) per walking trial for each limb that does not include the initial step and final stage of the pathway.

[9]The Kinect based recording structure is develop and used for follow identification & capture the human pose & post analytical motion. The temporal gait parameters were extracted by kinect: step time (both foot), step length (both foot), stance time (both foot) and velocity. If one limb is in swing phase the other foot is in single limb support phase than limb goes through a double limb support phase during stance phase. A single limb support phase (when the other limb is off the ground), which means another double limb support phase. Fig. 3.Show's the flow chart of the study.

FIGURE 3: flow chart of the study

OUTCOME MEASURE:

Temporal 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.

Discussion

The purpose of the study protocol is to evaluate gait parameters with Microsoft azure in normal individuals. Its expected outcome is based on the temporal gait parameter evaluation using kinect azure. This research helps to assess the efficacy of kinect azure in the assessment of gait parameters in healthy population.

Result

The study's expected outcome will concert on evaluation of temporal parameter of gait in healthy individual. After accomplishment of study result will calculated by systemic data analysis by randomized control trial.

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. 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.
8. 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/
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.