IJCRR
Section: Healthcare
ISI Impact Factor
(2019-20): 1.628
IC Value (2019): 90.81
SJIF (2020) = 7.893

Copyright@IJCRR

Inter-Rater Reliability of Edinburgh Visual Gait Score on Gait Analysis Among Elderly People

Senthil Kumar[1], Sathish Kumar[2], Kotteeswaran K[3], Saravan Kumar[4]

[1]Assistant Professor, MPT (Neuro) Postgraduate Scholar, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai-602105, India; [2]Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai-602105, India; [3]Assistant Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai-602105, India; [4]Professor, Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai-602105, India.

ABSTRACT

Introduction: Chronologically elderly is defined as people aged above 65 years. These elderly people are facing many challenges due to the process of ageing such as neurological problems, systemic disorders, musculoskeletal disorders, psychological problems and gait disorders. All these will increase the risk of fall in that population. So we analyzed the gait within the easiest and convenient Edinburg visual gait score (EVGS).

Aim: We aimed to analyze the responsiveness of Edinburgh visual gait score on gait analysis among elderly people.

Methodology: The 120 subjects will be included by proper evaluation and giving informed consent form. The videos were recorded and collected for all 120 participants. These recorded videos were graded using Kinovea software according to the Edinburg visual gait score format. Rater 1 and rater 2 was graded the same videos. All the scores were analyzed using the Intraclass correlation value.

Results: This study showed the Intraclass correlation excellent reliability for foot component, intraclass correlation good reliability for knee and hip component and intraclass correlation moderate reliability for pelvis and trunk component of Edinburg visual gait score (EVGS).

Conclusion: As this study has shown good inter-rater reliability, this can also be used in the elderly population.

Key Words: Gait, Edinburg visual gait score (EVGS), Elderly, Intraclass correlation

INTRODUCTION

Elderly has been defined as people aged 65 years old, 65 - 74 years old are called as "early elderly" and those over 75 years old are called as "late elderly". [1] The percentage of elderly people in the world population is expected to increase rapidly from 9.5% in 1995 to 20.7% in 2050 and 30.5% in 2150. [2]

The common physical health problems, impairments and disabilities among senior citizens include neurological problems like stroke, Parkinson's disease, dementia, Alzheimer's diseases .psychological disorder Depression and cognitive impairment. Systematic disorder such as diabetes mellitus, rheumatoid arthritis, osteoporosis, hypertension, chest disorder such as COPD, pneumonia, asthma, carcinoma, myocardial infarction, coronary artery diseases, valvular diseases, anaemia, gastrointestinal problems, hypertension, arthritis, visual defects, hearing impairment, functional limitation.

The risk of fall is more among the age group of 65 years and above. [3-6]

Gait is known as a translator progression of the body as a whole, produced by coordinated, rotatory movements of body segments. The gait cycle consists of two phases, the Stance phase which includes heel strike, foot flat, mid stance, heel off and toe-off. Swing phase which includes early swing phase/acceleration phase, mid-swing and late swing /deceleration phase.

Gait analysis by the journal of forensic biomechanics is rated as one among the journals that publish the advanced and top article. Gait analysis according to it, the animal locomotion, in particular the human motion, through observation. Gait analysis can be done in several methods. Observational gait analysis is a kinematic qualitative gait analysis in which the patterns of movement, joint angle, type of gait is analysed. On performing task especially with

mild cognitive impairment (MCI) there will be an increased risk of fall. Hence this analysis can help in identifying the normative value of gait in elderly individuals.

Clinicians require simple and cost-effective outcome measures to analyze the kinematic parameters of gait in their day–to–day practice. Visual diagnosis of a patient's gait in real-time is subjective, lack accuracy and relies on the clinician's training and experience. Visual gait analysis using a structured Performa has been suggested as an alternative to the IGA. [7] Observations gait tools are commonly used as an essential tool for an assessment gait of children with CP. [8-15]

The Edinburgh Visual Gait Score (EVGS) is a comprehensive video assessment tool to assess the gait. EVGS provides 17 gait parameters in the foot, knee, pelvis and trunk in both the stance and swing phase. The EVGS consists of a 5-point scoring system ranging from 2, 1, 0, 1, and 2. Zero is normal, 1 is the moderate deviation in one/either direction, and 2 is the marked deviation in either direction. The higher the score is, the greater the deviation. The total possible score of EVGS per limb is 34. In clinical practice, the scale EVGS has more responsiveness and reliability. The EVGS is simple and easy to apply. It depends on the clinical experience of the examiner. [14]

NEED OF THE STUDY

Many studies are they are regarding 3D-GA prevalent, as the most gold standard method of assessing gait. But it is not always accessible, practical, or feasible. To date there is less published evidence for inter-rater reliability of observational gait analysis (videos) in cerebral palsy but not in elderly peoples. So need of the study is to analyze the interrater reliability of observational gait analysis (EVGS) among elderly people.

METHODOLOGY

120 subjects using a Cross-sectional study design (Convenient Sampling were included from Saveetha Geriatric outpatient department, Saveetha Medical College and Hospital, SIMATIC Chennai. They were included with inclusion criteria of Aged from 65 years to 75 years, Male and female participants, medically stable and without the support of walking aids. The exclusion Criteria was recent fractures of lower limbs, neurological defect, trunk and Lower limb deformity, mental illness, limb length discrepancy; amputate patients, vertigo and audiovisual disturbances.

PROCEDURE

Participants were taken from Saveetha medical college and hospital geriatric outpatients, based on inclusion criteria and exclusion criteria, after the inclusion of participants they were assessed for gait parameters such as stance phase and swing phase. In this study, the videos were recorded and collected for all 120 participants. These recorded videos were graded using Kinovea software according to the Edinburg visual gait score format. Rater 1 and Rater 2 was graded the same videos. All the scores were analyzed using INTRA CLASS CORRELATION value.

STATISTICAL ANALYSIS:

The collected data were tabulated in TABLE – 1 and analyzed using intraclass correlation.

Ethical Clearance: The present study was approved by Institutional Ethics Committee (IEC), Saveetha Medical College and Hospital (IEC No. 041/07/2020/IRB-HS/SIMATIC ON 02-03-2020). The procedure was informed to all the members and higher authorities. The procedure and benefits of the study were well explained to the participants before enrolling on the study. The details from the participants were collected after getting informed consent and the information was maintained confidential throughout the study.

RESULTS

From the statistical analysis made with the inter class correlation values. The intraclass correlation values inter-rater of foot component single measures of intraclass correlation were 0.9103 and single measure 95 % confidence interval was 0.8738 – 0.9366. The average measure of intraclass correlation was 0.9530 and the average measure of 95% confidence interval was 0.9326 - 0.9673. Knee component single measures of intra class correlation were 0.7824 and single measure 95 % confidence interval was 0.7019 – 0.8432. The average measure of intraclass correlation was 0.8779 and the average measure of 95% confidence interval was 0.8249 - 0.9149. Hip component single measures of intraclass correlation were 0.8920 and single measure 95 % confidence interval was 0.8486 – 0.9235. The average measure of intraclass correlation was 0. 949 and the average measure of 95% confidence interval was 0.9181 - 0.9602. Pelvis component single measures of intraclass correlation were 0.525 and single measure 95 % confidence interval was 0.4148 – 0.6654. The average measure of intraclass correlation was 0.7117 and the average measure of 95% confidence interval was 0.5864 - 0.7991. Trunk component single measures of intraclass correlation were 0.5387 and single measure 95 % confidence interval was 0.3984 – 0.6543. The average measure of intraclass correlation was 0.7002 and the average measure of 95% confidence interval was 0.5698 - 0.7911.

DISCUSSION

In general, this EVGS scale is very easy to administer for those with or without gait analysis experience. This tool is also valuable to determine the effect of the clinical intervention on cerebral palsy children gait. [15,16,17] In addition the tool gait score is also a reliable indicator of gait deviation severity. All of our studies showed good inter-rater reliability, foot component is 0.9103, the knee component is 0.7824, the hip component is 0.8920, the pelvis component is 0.525, trunk component is 0.5387.

This is a low cost-effective, advanced technology that is currently emerging. This includes video gait assessment software and also a mobile phone application that can measure joint angles. This hypothesis needs to be done on different patient groups.

The best part of this EVGS was we can assess the all components gait cycle on only one scale and easy to administer at any setup

Heather et al. read the complex gait analysis system is not generally available everyone was and no simple system of assessing gait by observation has been validated specifically for use in patients with Cerebral palsy. All 17 items in the score had positive kappa values. the score demonstrated good intraobserver and inter-observer reliability. [14]

Among et al. investigated the reliability and validity of EVGS for observers inexperienced in gait analysis, they aimed to study the investigation of intra and inter-observer reliability and validity of EVGS when used by the observer who was not specifically experienced in clinical gait analysis. the hypothesis was first that the inexperienced observer would be less reliable than the experienced observer and secondly that there would be a discernible learning effect and improvement of score between the 1st and 2nd viewings. The observations of gait events by the inexperienced observers using the EVGS were reasonably reliable not very accurate when compared to the experienced observer and 3D gait analysis. A positive learning effect for the inexperienced observers, reflected by improved scores, occurring between the 2 sessions that not been confirmed in this study. [15]

E.Viehwega et al. said that there was good reliability were observed in the foot and knee than in the proximal segments with significant differences between stance and swing phase of gait. Significantly very good results in gait analysis trained observers underlines the importance to either be used to clinical gait analysis (or) to benefit of video analysis training before observational studies. Good clinical practice in CP associated with knowledge of clinical gait analysis allows better reliability. [16]

Garza P Bella et al. compared the EVGS, VGAS and OGS to verify whether there is an agreement among the final score of the scales with regards to the degree of deviation from normal gait and to analyze the inter-rater reliability concerning the total score of the scale and to analyze the time and difficulty degree of use of each scale. The VGAS and EVGS seem to be more appropriate for evaluation of subject with diplegic CP as its increase the classification accuracy of gait in their children. [17]

Chandrasekar Rathinam et al. reviewed and identified the variety of pediatric gait analysis tools that have been reported EVGS includes gait data in all three planes and has good reliability and concurrent validity. EVGS is better than other tools which can be used by examiners who possess a variable range of experience but none of the tools is nearly equal to IGA. We suggest that the EVGS is the best scale currently available and it should be considered to assess the gait pattern of children with cerebral palsy. [18]

All the previous studies showed good reliability and validity for EVGS among the cerebral palsy subject. But our study aimed and showed good inter-rater reliability and also intra rater reliability.

CONCLUSION

Our study showed the intraclass correlation excellent reliability for foot component, intraclass correlation good reliability for knee and hip component and intraclass correlation moderate reliability for pelvis and trunk component of EVGS. Of course, EVGS is good to scale in assessing the gait of the pediatric population has proved in various studies.[11-18] It has excellent reliability and validity in the pediatric population. So we have taken the challenge of using this scale in geriatric normal individuals and seen reliability. This study has shown that this scale can also use in the elderly population.

Recommendations and Limitations
This EVGS can be used in any age group for gait analysis and any condition not only specific to cerebral palsy.

Further studies may include more sample size to see the better reliability and validity.

ACKNOWLEDGEMENTS

Conflict of Interest: All the contributing authors declare no conflict of interest.

Author Contribution:

Senthil Kumar and Sathish Kumar conceive and presented the idea. Kotteeswaran K and Saravan Kumar helped in developing the idea. The first and second authors collected the data and analyzed the data. All the authors discussed the results and contributed to the final manuscript.

REFERENCES

1. Orimo H, Ito H, Suzuki T, Araki A, Hosoi T, Sawabe M. Reviewing the definition of "elderly". Geri Geront Int. 2006 Sep;6(3):149-58.
2. Usha VK, Lalitha K. Physical problems of senior citizens: A gender perspective in Kerala Nurs Forum. J Ame Ger Soc. 2011;6: 5-15.
3. Verghese J, LeValley A, Hall CB, Katz MJ, Ambrose AF, Lipton RB. Epidemiology of gait disorders in community-residing older adults. J Ame Ger Soc. 2006 Feb;54(2):255-61.
4. Verghese J, Lipton RB, Hall CB, Kuslansky G, Katz MJ, Buschke H. Abnormality of gait as a predictor of non-Alzheimer's dementia. New Eng J Med. 2002 Nov 28;347(22):1761-8.
5. Verghese J, Ambrose AF, Lipton RB, Wang C. Neurological gait abnormalities and risk of falls in older adults. J Neur. 2010 Mar;257(3):392-8.
6. Corradin M, Schiavon R, Borgo A, Deslandes J, Cersosimo A, Canavese F. The effects of uninvolved side epiphysiodesis for limb length equalization in children with unilateral cerebral palsy: clinical evaluation with the Edinburgh visual gait score. Eur J Orthop Surg Traum. 2018 Jul;28(5):977-84.
7. Carpenter MG, Cleworth TW. Letter to the Editor: On" Advantages and disadvantages of stiffness instructions when studying postural control" by CT Bonnet: Comments on" Advantages and disadvantages of stiffness instructions when studying postural control". Gait Posture. 2016 May;46:214-5.
8. Orozco MD, Abousamra O, Church C, Lennon N, Henley J, Rogers KJ, Sees JP, Connor J, Miller F. Reliability and validity of Edinburgh visual gait score as an evaluation tool for children with cerebral palsy. Gait Posture. 2016 Sep 1;49:14-8.
9. Folle MR, Tedesco AP, NICOLINI-PANISSON RD. Correlation between visual gait analysis and functional aspects in cerebral palsy. Acta Ortop Brasil. 2016 Oct;24(5):259-61.
10. Robinson LW, Clement N, Fullarton M, Richardson A, Herman J, Henderson G, Robb JE, Gaston MS. The relationship between the Edinburgh visual gait score, the gait profile score and gmfcs levels i–iii. Gait posture. 2015 Feb 1;41(2):741-3.
11. Gupta S, Raja K. Responsiveness of Edinburgh Visual Gait Score to the orthopaedic surgical intervention of the lower limbs in children with cerebral palsy. Am J Phys Med Rehab. 2012 Sep 1;91(9):761-7.
12. van Schie PE, Vermeulen RJ, van Ouwerkerk WJ, Kwakkel G, Becher JG. Selective dorsal rhizotomy in cerebral palsy to improve functional abilities: evaluation of criteria for selection. Child's Nerv Syst. 2005 Jun 1;21(6):451-7.
13. Daribayev Z, Bulekbayeva S, Saltychev M, Lysovskyy Y, Lisovska N, Kussainova K. Measuring the change in the functional level of children rehabilitates with cerebral palsy: a brief report. J Ped Orthop 2018 May 7;1(1):4-6.
14. Read HS, Hazlewood ME, Hillman SJ, Prescott RJ, Robb JE. Edinburgh visual gait score for use in cerebral palsy. J Ped Orthop. 2003 May 1;23(3):296-301.
15. Ong AM, Hillman SJ, Robb JE. Reliability and validity of the Edinburgh Visual Gait Score for cerebral palsy when used by inexperienced observers. Gait posture. 2008 Aug 1;28(2):323-6.
16. Viehweger E, Pfund LZ, Hélix M, Rohon MA, Jacquemier M, Scavarda D, Jouve JL, Bollini G, Loundou A, Simeoni MC. Influence of clinical and gait analysis experience on the reliability of observational gait analysis (Edinburgh Gait Score Reliability). Ann Phys Rehab Med. 2010 Nov 1;53(9):535-46.
17. Bella GP, Rodrigues NB, Valenciano PJ, Silva LM, Souza RC. Correlation among the visual gait assessment scale, Edinburgh visual gait scale and observational gait scale in children with spastic diplegic cerebral palsy. Rev Bras de Fisioterapia. 2012;16(2):134-40.
18. Rathinam C, Bateman A, Peirson J, Skinner J. Observational gait assessment tools in paediatrics–a systematic review. Gait Posture. 2014 Jun 1;40(2):279-85.

Table 1: Intra Class Correlation of Inter Rater Reliability

Component	Intra Class(A)			
	Single Measure(Intra Class Correlation) {B}	Single Measure (CI)	Average Measure(Intra Class Correlation) {C}	Average Measure(CI)
FOOT	0.9103	0.8738-0.9366	0.9530	0.9326-0.9673
KNEE	0.7824	0.7019-0.8432	0.8779	0.8249-0.9149
HIP	0.8920	0.8486-0.9235	0.9249	0.9181-0.9602
PELVIS	0.525	0.4148-0.6654	0.7117	0.5864-0.7991
TRUNK	0.5387	0.3984-0.6543	0.7002	0.5698-0.7911

TYPE: Consistency
a-degree of consistency among measurements
b-estimates the reliability of single ratings
c-estimates of the reliability of average of K ratings