Validity and Reliability of Shyam 360⁰ Posture Grid: A Tool for the Assessment of Human Posture

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Abstract: _Background: Posture is defined as the alignment and positioning of the body in relation to gravity, center of mass and base of support. Occurrence of postural defects has become very common now-a-days not only in aging population but also in adult personal. There are various methods which can be used to assess these postural defects. These methods have evolved over a period of many years. This paper is first of its kind to summarize the methods of postural assessment which have been used and which can be used for evaluation of postural abnormalities in college going students. Postural assessment is an important tool which can be used to assess the reasons behind various injuries. A variety of postural assessment methods have been in use. One of the newer method used for postural assessment is by newly developed SHYAM 360⁰ Posture Grid. We recommend more and more postural evaluation studies to be done in future based on the method of Shyam 360 degree postural grid._ _Method: Observational study conducted at Dr. Vitthalrao Vikhe Patil College of Physiotherapy, Ahmednagar. There were healthy individuals (Male/Female) included in the study by convenient sampling method. Consent was obtained and Posture assessment was done on SHYAM 360⁰ Posture Grid in three views and recorded data was analyzed, result was obtained._ _Results: For posture assessment, reliability was moderate to substantial. The percentage of agreement and Kappa coefficients (K) for the visual observation of posture asymmetries for Posture score sheet was k=0. 999 and for Shyam 360⁰ Posture grid was k=0.999. The test for sensitivity and specificity of both the outcome measure was statistically significant._ _Conclusion: SHYAM 360⁰ posture grid is valid when compared with commonly used Posture score sheet assessed on the subjects._

Keywords: Posture alignment, Posturalasymmetries, PostureGrid, Posture analysis, Musclo-skeletal problems, Quantitative measurements

1. Introduction

Correction of posture is an important aim of treatment in physical therapy for persons with orthopedic or neurologic impairments. Posture asymmetries can create modifications in muscular moments which can change joint alignment and cause movement impairment syndrome[1] Posture is defined as the alignment and positioning of the body in relation to gravity, center of mass and base of support. A good posture is a state of musculoskeletal balance that protects the supporting structures of the body against injury or progressive deformity[2]

Assessment of posture forms the very basis of physiotherapy assessment. It helps in identifying the defects in body, which lead to various musculoskeletal problems. Postural assessment is an important tool which can be used to assess the reasons behind various injuries [4]. Posture asymmetries can create modifications in muscular moments which can change joint alignment and cause movement impairment syndromes. These impairments can thereafter affect functional activities and limit participation in active life.[3]

Sahrmann states that the evaluation of posture leads to the understanding of the impact of muscle imbalance on observed posture asymmetries [5]. Thus, physical therapists must work on reducing these imbalances releasing muscle tension and tightness in order to improve posture. Poor posture, negative impact on health may cause aging, anxiety, arthritis, back pain, poor balance, breathing problem, fall risk, reduced flexibility, joint pain, scoliosis and other deformity, stress. Simple actions to build strong posture add up to reduce cumulative postural stress and pain, as well as

boost attitude, improve productivity and maximize the effectiveness of ergonomic and exercise at workplace, at play and throughout life[9]

A variety of postural assessment methods have been in use. Some are conventional, while some are latest and few are those which got modified into latest form from conventional forms i.e. these evolved into better and convenient methods.[10] Only conventional methods were used in the past when advanced methods were not available. These have now been superseded by newer methods.

One of the newer method used for postural assessment is by Posture Grid. The use of a posture grid can make the task of performing a postural analysis a lot more effective and efficient. It provides the assessor with a valuable tool that will assist with the accuracy during the assessment of the subject's posture. The posture grid can be used for all types of postural assessment. The aim of the study is to find the validity and reliability of SHYAM 360⁰ posture grid. The posture analysis can be done in standing position, in three views i.e. anterior view, posterior view and lateral view. Parameters used by the Postural Grid are:
Length x breadth= 80''x 35''
Inter grid distance= 1. 3cm

2. Methodology

Study Design: Observational study
Study Setup: Dr. Vitthalrao Vikhe Patil College of Physiotherapy, Ahmednagar
Sample Technique: Convenient Sampling
Sample Size: 100

Material
1) SHYAM 360° Postural Grid
2) Color Sticking
3) Measuring Tape
4) Posture Assessment Sheet

Inclusion Criteria
1) Subjects willing to participate
2) Male and Female (any age group)
3) Subject standing independently; without external support

Exclusion Criteria
1) Scoliosis in all or part of the spine
2) Discrepancy in the length of the long bones in the upper or lower limbs
3) Extra ribs
4) Extra vertebrae
5) Increased elastin in tissues (decreasing the rigidity of ligaments)

3. Method/Procedure

Ethical Clearance was taken from the institutional ethical committee of DVVPFS college of Physiotherapy. Subjects both Male and Female will be included who were willing to participate and fulfill the inclusion criteria. Before the study began, the subject was explained the nature of the assessment and the purpose of the study. Consent was taken on the consent form for records. The assessment of posture was done with SHYAM 360° posture grid. The subject was asked to stand inside the posture grid without footwear and exposing the anatomical marking of the body to assess the posture in three different views, anterior view, posterior view, lateral view in standing. The posture in anterior view was assessed by comparing the right and left side on the following anatomical marks, -head, shoulder, ASIS, knee and medial malleoli. In Posterior view –inferior angel of scapula, PSIS, medial malleoli. In Lateral view – ear pinna with the perpendicular line from the tip of the nose, head of humerus, through the hip, lateral condyle of femur and lateral malleoli of ankle.

Observation of posture asymmetry was done in the standing position. The marking was done with the sticking color(bindi) and the difference in thelevel were measure with the help of measuring tape and was recorded along with the subjects demographic data. The recorded data was analyzed and result was obtained to check the validity and reliability of 360°posture grid compare to the commonly used posture worksheet.

Outcome Measure
1) Posture Grid (SHYAM 360°Postural Grid)

Shyam 360 degree postural grid device (1) has a rigid aluminum frame of length of 80 inches and breadth of 35 inches with transparent glass from all four sides. (2) It has a door with handle and foot markers for patients to stand on, with foot base width is 10cm (3) The transparent Glass calibrated into 0.5cm squares for accurate postural Analysis (4)The patients is make to stand in the grid and assessment of faulty posture can be done at a glance in all views(anterior, posterior, right lateral and left lateral). (5) Device has caster wheel, of size 7 inches and diameter of 180mm x 50mm and can moved easily. (6) Caster has breaks which allow grid to remain in one place while analysis of posture is being done. (7)Device is very simple to operate and gives accurate assessment of posture, which make analysis easier.
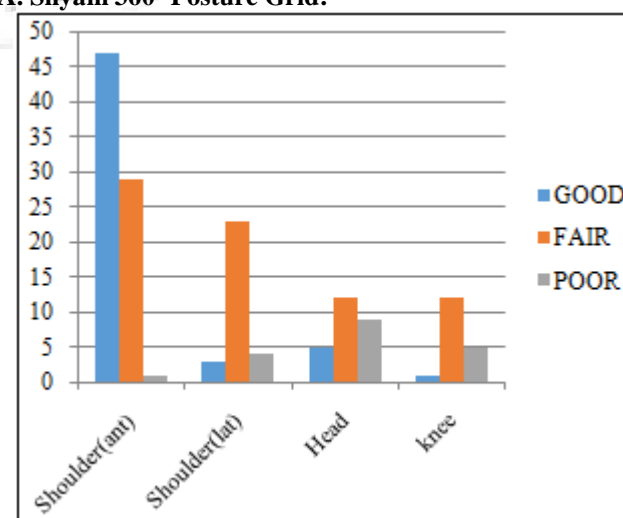
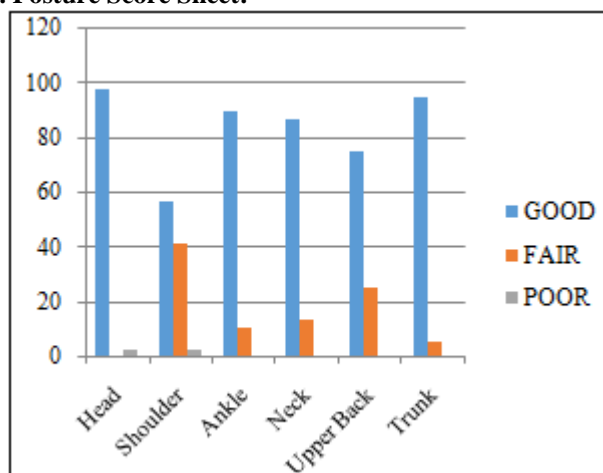2) Posture Score Sheet

4. Result

Inter-rater reliability for percentage of agreement and Kappa coefficients (K) for the visual observation of posture asymmetries for Posture score sheet was k=0.999 and for Shyam 360^0 Posture grid was k=0.999. The percentage of agreement ranged from 0.81 – 1.00% and the level of reliability was moderate to almost perfect agreement

A. Shyam 360^0 Posture Grid:

G.1Body component wise analysis of participants according to SHYAM 360^0 Posture Grid

B. Posture Score Sheet:

G.2Body component wise analysis of participants according to Posture score sheet

Test for Sensitivity and Specificity (McNemar's Test)

The two sided P value is 0.0016, considered very significant. The row/column association is statistically significant.

Sensitivity and Specificity

Variables	Values	95% Confidence Interval
Sensitivity	0.6761	0.5547 to 0.7820
Specificity	0.0333	0.000843 to 0.1724
Positive Predictive Value	0.6234	0.5053 to 0.7316
Negative Predictive Value	0.04167	0.001054 to 0.7316
Likelihood Ratio	0.6994	

Data Analysis

	Column A	Column B	Total
Top row	48 (48%)	27(27%)	76(76%)
Bottom row	23(23%)	1(1%)	24(24%)
Total	71(70%)	30(30%)	100(100%)

5. Discussion

The aim of our study was to investigate the inter-rater reliability and the validity of Shyam 360^0 Posture grid associated with Posture Score sheet. Our results indicate a moderate to Perfect level of agreement for Shyam 360 Posture Grid compared to the standardized method of postural assessment i.e. Posture worksheet which was also moderate to perfect level of agreement. Quantitative measurements allow physicians and researchers not only to make an accurate assessment of postural changes but also to monitor improvement. This suggests that the components used in the assessment are in tune with the broad purpose of the instrument.

The result for Sensitivity and Specificity was statistically significant. The interpretation for sensitivity and specificity by comparing data of two components i.e. Shyam 360^0 Posture Grid and Posture Score sheet was within the 95% confidence interval done by using statistical software. This indicates that the new device is sensitive enough to detect smallest changes in the posture effectively. This has a diagnostic as well as prognostic value. It will help to diagnose the minimal postural defaults which otherwise may go unnoticed and later on may create major postural dysfunctions. Prognostically, this device may help to document the smallest changes in posture due to treatment interventions, thus improving the effectiveness quotient of a treatment protocol.

The newly studied Shyam 360^0Posture Grid has 360^0 view. It can be viewed at an anterior, lateral& posterior view at a glance. It is Transportable. The Patient stands still & therapist moves to check the posture and the deviations can be marked with the help of stickers/markers. The measurements can be quantified and the Grid determines the level of deviation in healthy individual also. The floor/wooden plank is leveled to reduce the error and help measure the angle of deviation. The glass is laminated for durability and longevity. It also gives a standard measure & comparison before & after treatment.

Nevertheless, studies are necessary to validate and estimate the reliability of each of these systems. Furthermost the assessment can be used in healthy as well as people with postural complaints to indicate the accurate posture defects, to prevent and treat the defects on time, to reduce the ill effects in daily life.

6. Conclusion

SHYAM 360^0 posture grid is valid when compared with commonly used Posture score sheet assessed on the subjects. The inter-rater reliability of this kind of evaluation is better to find out quantitative impairments. The results of this study support the use of this type of evaluation in determining postural abnormality even in healthy subjects. Shyam posture Grid methods seem to be the most reliable methods which can be used for obtaining values which are related to posture. Thus, the use of this method is recommended for future studies which will focus on posture evaluation. This kind of assessment may improve physical therapy practice as it may guides the understanding of musculo-skeletal problems associated with posture asymmetries and in the selection of therapeutic exercises to improve posture. However, it may be necessary to clarify some posture concepts and to standardize the assessment of some posture asymmetries as well as associated muscular impairments to increase inter-rater agreement. This research did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors.

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Author Contribution

Dr. Pranali. V. Gaikwad Author and The conception and design of the study, acquisition of data and interpreted and analyzed the data of the study

Dr. Shyam. D. Ganvir, Contribution: Co-author and Drafted the article and Final approval of the version submitted

Dr. Suvarna. S. Ganvir Contribution: Co-author and drafted ad revised the article for important intellectual content.