POSTER 6

Reliability of visual estimation of angles relating to joint ranges of motion in rehabilitation

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Summary
This study investigated the intra- and inter-rater reliability of visual estimation (VE) of angles. It was designed in order to provide evidence as to whether VE is a reliable measure to be used by clinicians involved with physical rehabilitation services.

Aims and Objectives
The study aimed to provide evidence as to whether VE is a reliable measure to be used by clinicians. It also investigated the effect of a number of measures, including years of experience, on reliability of VE. The study was a desk based study looking at VE of angles compared to a gold standard, without the variables introduced in a clinical study, where a 'gold standard' often does not exist.

Background
The accurate prediction of angles between segments of the body is an important measure in rehabilitation services. The angles generated from these assessments can be used as quantifiable data to compare intra-patient ranges of motions (ROMs), for example, as outcome measure after an intervention. They can also be used to evaluate inter-patient ROMs, for example, as a comparison to the average in a normal data set.

The angles are frequently recorded to the nearest 5°, without use of an instrumented measuring device. These VEs are thought to speed up clinical assessment times and reduce the need for an additional clinician to assist with supporting the limb whilst a measuring device is manipulated. Additionally, with patients having profound physical disabilities, bony landmarks are often in a significantly altered position to normal, making use of instrumentation either extremely difficult or invalid.

This study was developed due to a clinical need to test the reliability and validity of using VE when recording the ranges of motion of a patient's limbs. In wheelchair services, inaccuracies may lead to the manufacture or prescription of inappropriate seating, and waste both time and money. There are similar implications for supported lying or standing.

A three part test was designed, and completed by 24 clinicians who use VE as the normal technique for estimating ROMs in clinical assessments.

The first part of the test consisted of a questionnaire, which asked participants about their profession and their experience in measuring ranges of motion. Part B, the second part, consisted of a booklet of twenty five drawn angles, which participants were asked to estimate to the nearest 5°. Part C involved estimating ROM in a set of fifteen photographs of an able bodied subject. Parts B and C were repeated after a minimum two day interval.

Calculations made showed that in part B (drawn angles) 80.3% of the results were within ±5° of the correct predicted angle, whilst in part C (photographs) only 61.5% of the estimations were within ±5°. For part B 95.6% were within ±10°, whilst in part C 81.9% of the estimations were within ±10°. These figures will help define confidence bands for using VE. The accuracy of estimating angles was found to be much lower with acute angles than those near to 90°. Analysis of results from photographs revealed some errors arising due to lapses in using the defined method of notation (neutral-zero), particularly as regards knee flexion

with the hip in flexion. Analysis of the photographs also revealed a tendency for participants to favour ‘0’ end digit estimations, suggesting that ranges were estimated to the nearest 10° not 5°.

In this set of data the cumulative error associated with VE of the set of drawn angles was not shown to correlate with profession, years of experience, or frequency of use of VE.

All data has been collected but analysis of intra-rater and interrater reliability when using VE is on-going.

Discussion

The results of this study have a potential impact on both current clinical practice and the training in the use of VE.

At times, different clinicians examine a patient for appointments before, during and after interventions. Findings relating to the difference between intra-rater and inter-rater reliability will determine whether there are implications for this practice.

The accuracy of estimating angles was found to be much higher with acute angles than those near to 90° but these angles (less than 35°) were consistently overestimated, suggesting the need for further training.

Analysis of results from photographs revealed some errors arising due to lapses in use of the defined method of notation (neutralzero) by at least seven of the participants.

In this set of data the cumulative error associated with VE of a set of drawn angles was not shown to have a correlation with either profession, or frequency of use of VE.

This study is able to give an impression of reliability when the errors involved with carrying out ranges of motion in a clinical setting are taken away. A further study (in progress, and due for data collection in October 2013) will produce data relating the reliability of recording actual ranges of motion.

Reference

Ryf C, Wymann A. Range of Motion - AO Neutral-0 Method. 1st Edition ed.: Thieme Stuttgart, Germany; 1999.

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