



# The Inter-tester Reliability of the SCAT 3

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## Abstract

**Introduction:** The Sports Concussion Assessment Tool 3 (SCAT3) can be used as a baseline concussion screening and standardized tool for evaluating athletes of age 13 or older. Baseline scores are compared to scores after an athlete has suffered a speculated concussion. Comparisons of scores are assessed to determine if an athlete can return to play or not. The purpose of this study is to assess the inter-tester reliability of a subjective section of the SCAT3 Balance Error Scoring System (BESS).

**Methods:** 33 subjects (18F, 15M) completed an informed consent and were familiarized with the SCAT3 training video. Subjects were instructed how to identify the six cited errors: hands lifted off of iliac crest; opening eyes; moving hip into greater than 30 degrees abduction; step, stumble, or fall; lifting forefoot or heel; remaining out of test position for greater than five seconds. Following the familiarization session participants watched a video assessing three models for the three balance stances: double leg stance; single leg stance; and tandem leg stance. Subjects were given 5 seconds to list errors they observed. After completion of the video our subject's final error scores were quantified.

**Results:** Descriptive statistics of the error scores displayed a wide range (R) for each model (M) (M1, R = 1-8; M2, R = 2-14; M3, R = 5-11) that had total average errors (TAE) (M1 TAE = 2.36, M2 TAE = 6.55, M3 TAE = 7.73) with standard deviation (SD) (M1 SD = 1.43, M2 SD = 2.64, M3 SD = 1.55).

**Conclusion:** Error results came back scattered producing a wide range of errors. This wide range may show that the BESS section of the SCAT3 lends itself to a very subjective evaluation system which may implicate issues with inter-tester reliability when the test is being performed clinically. If there is a significant difference in the perception of this portion of the exam, it may make it difficult to rely on this portion of the SCAT 3 when making return to play criteria, especially if the pre and post-concussion exams are performed by different evaluators. Further research may need to be performed to evaluate tester instruction and evaluation in order to determine whether the BESS is reliable enough to keep in the SCAT3 due to the wide disagreement in errors across assessors.

## Methods

Subjects were recruited based on being competent enough to be trained in and assess a person in the BESS. All of our subjects arrived at a designated room at Bethel at a predetermined time to complete an informed consent and begin our study. All of the participants started by watching the SCAT3 training video where they learned the six errors which include: hands lifted off of iliac crest; opening eyes; moving hip into greater than 30 degrees abduction; step, stumble, or fall; lifting forefoot or heel; remaining out of test position for greater than five seconds. The participants then watched a video where they assessed people being given the BESS portion of the SCAT3. The video consisted of three subjects going through the three balance stances: the double leg stance which consisted of the feet together and hands on hip; the single leg stance, raising dominant foot while keeping hands on hips; tandem stance, which consisted of the subject putting their dominant foot in front of their non-dominant with their hands on their hips. The video ran one subject completing one stance at a time. In between each test the participants were given 5 seconds to record the amount of errors they saw. Once the video completed, the participants wrote down their final error score and then turned in their results.

## Results

Descriptive statistics of the error scores displayed a wide range (R) for each model (M) (M1, R = 1-8; M2, R = 2-14; M3, R = 5-11) that had total average errors (TAE) (M1 TAE = 2.36, M2 TAE = 6.55, M3 TAE = 7.73) with standard deviation (SD) (M1 SD = 1.43, M2 SD = 2.64, M3 SD = 1.55).

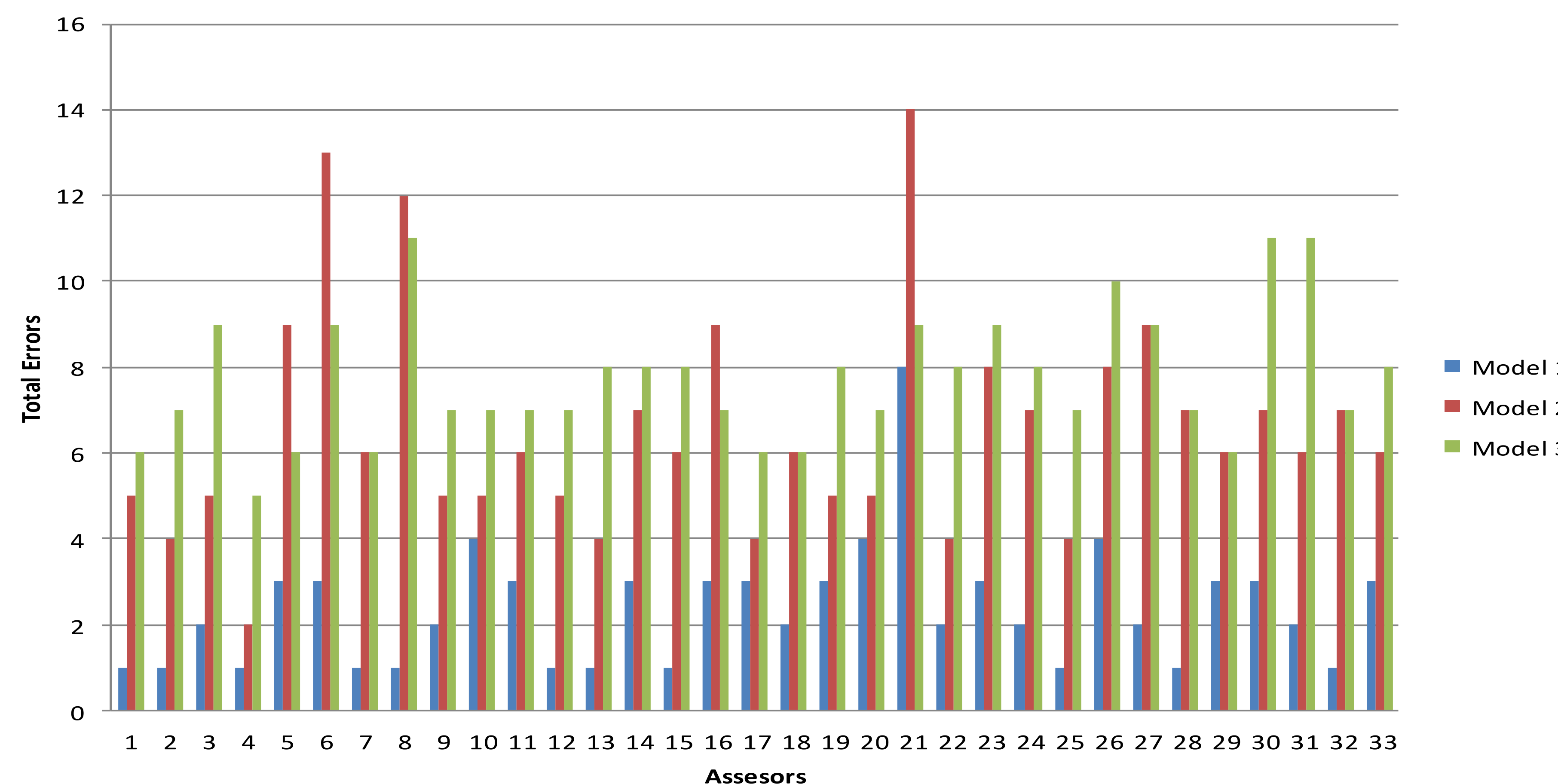
## Introduction

The Sports Concussion Assessment Tool 3 (SCAT3) is used as a baseline concussion screening meaning that the SCAT3 is a standardized tool for evaluating injured athletes for concussion and can be used in athletes aged from 13 years and older (BJSM). When using the SCAT3, an athlete is given the test before the season when they do not have a concussion to get their baseline scores. After an athlete has suffered a concussion the athlete will take the SCAT3 again. If the scores are similar to that person's baseline scores they can then return to practice. If the scores are different they cannot return to their sport. Concussion is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces (Consensus Statement on Concussions Pg. 37). A proper assessment of the SCAT3 is vital in both preseason and at the time of possible concussion. If the assessment is inaccurate, this can skew results of whether or not an athlete is ready to go back to play. This entire test is very objective when it comes to scoring except for one section, the Balance Error Scoring System (BESS). This section does not seem to be objective enough to hold consistent results across assessors. If the assessors were all evaluating the same person at the same time and were not able to spot the same amount of errors that would make the test subjective and unreliable. If the test is subjective and unreliable then patients could possibly return to practice not fully recovered or end up staying out of practice longer than necessary.

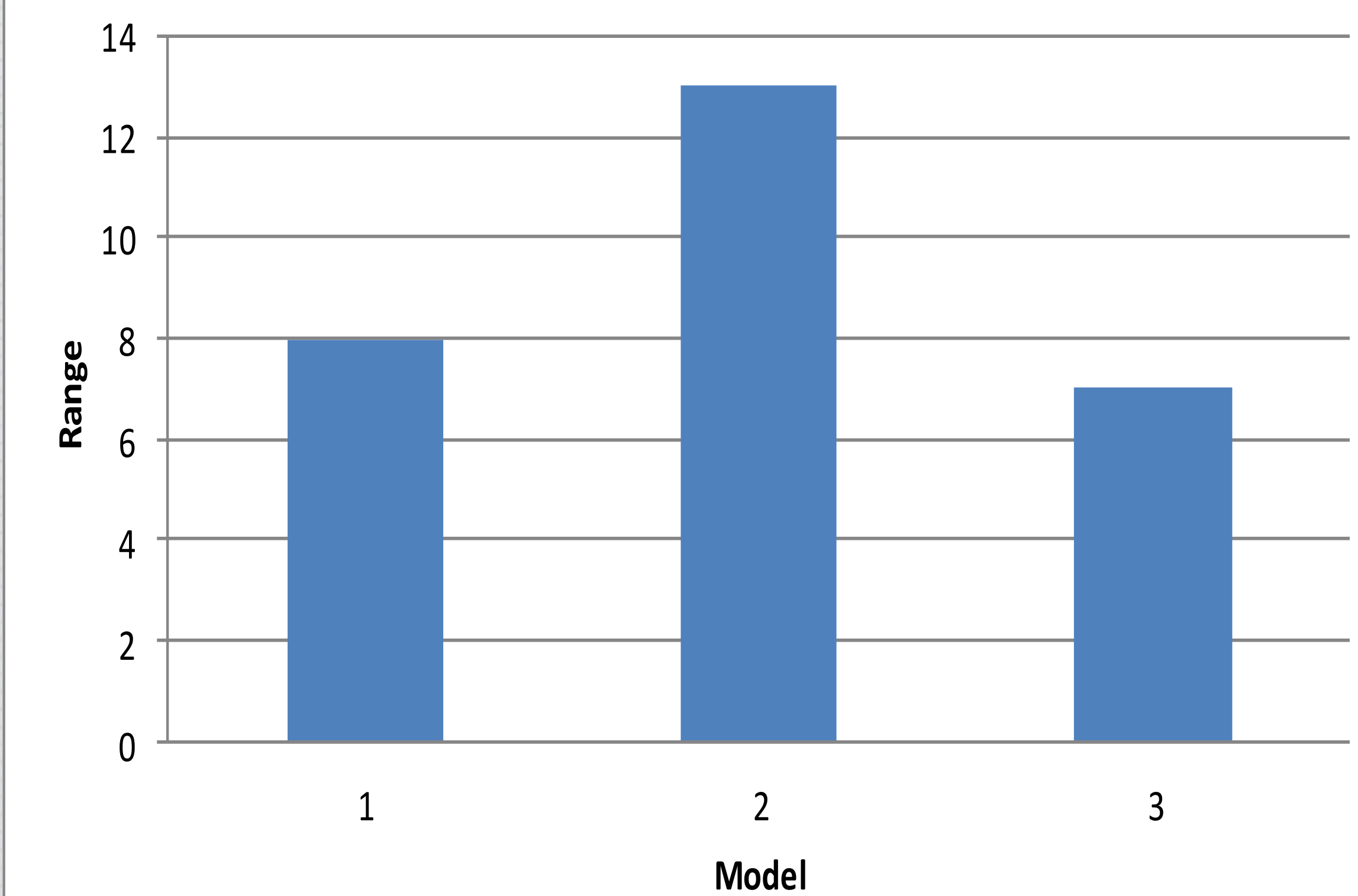
The people assessing the SCAT3 are trained in two hours by a video and are expected to be completely knowledgeable on who is safe to play and who is not. This study is going to look into the inter-tester reliability of the BESS portion of the SCAT3. The BESS is an assessment of balance where the assessor counts errors of the participant. Their are six errors in the BESS which include; hands lifted off of iliac crest; opening eyes; moving hip into greater than 30 degrees abduction; step, stumble, or fall; lifting forefoot or heel; remaining out of test position for greater than five seconds. If the results of the assessor's scores are scattered, this would mean that the BESS is too subjective, giving us low inter-tester reliability.



## Total Errors Counted by Assessors



## Range of Errors from Assessors for Each Model



## References

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## Conclusion

Error results came back scattered producing a wide range of errors. This wide range may show that the BESS section of the SCAT3 lends itself to a very subjective evaluation system which may implicate issues with inter-tester reliability when the test is being performed clinically. If there is a significant difference in the perception of this portion of the exam, it may make it difficult to rely on this portion of the SCAT 3 when making return to play criteria, especially if the pre and post-concussion exams are performed by different evaluators. Further research may need to be performed to evaluate tester instruction and evaluation in order to determine whether the BESS is reliable enough to keep in the SCAT3 due to the wide disagreement in errors across assessors.