

COMPARING USE OF A GONIOMETER AND FUNCTIONAL FOOTPRINT TO MEASURE HIP EXTERNAL & INTERNAL ROTATION IN COLLEGIATE DANCE MAJORS



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INTRODUCTION

Background and Purpose:

The amount of hip mobility is very important to a dancer’s success and musculoskeletal health. Pre-participation screens are used to identify the potential risk for injury¹. It is important that pre-participation screens for dance include dance specific positions, such as hip internal and external rotation^{10,5}. The purpose of this study was to examine the relationship between two different methods of measuring hip mobility (internal and external rotation). The first method uses a goniometer, which is a commonly used tool in Physical Therapy practice to measure joint mobility. The second method is a Functional Footprints®, which is a device created by a Physical Therapist to measure hip internal and external rotation⁸. Research has shown that when used appropriately a goniometer provides accurate range of motion measurements^{7,3,6}. Further research is needed to support or refute the validity and accuracy of the Functional Footprints® device when measuring hip mobility.

CASE DESCRIPTION

Freshman through Senior East Carolina University undergraduate dance majors were used as subjects for this study. Freshman through senior East Carolina University undergraduate dance majors were involved in this study. Each dancer was measured for hip internal and external rotation using a goniometer and a Functional Footprints® tool. To measure the dancer’s rotation using a goniometer, the dancer laid in a prone position while a physical therapy student passively placed his lower extremity into maximal internal and external rotation. In order to measure the dancer’s rotation using a Functional Footprints®, the dancer stood on the foot plate (pictured below) and actively internally and externally rotated his lower extremity. Once the dancer had reached his maximum rotation, a physical therapy student recorded the number printed on the Functional Footprints® (pictured below).



Photo 1: Physical Therapy Student measuring a dancer’s hip external rotation.



Photo 2: Physical Therapy Student measuring a dancer’s hip internal rotation.

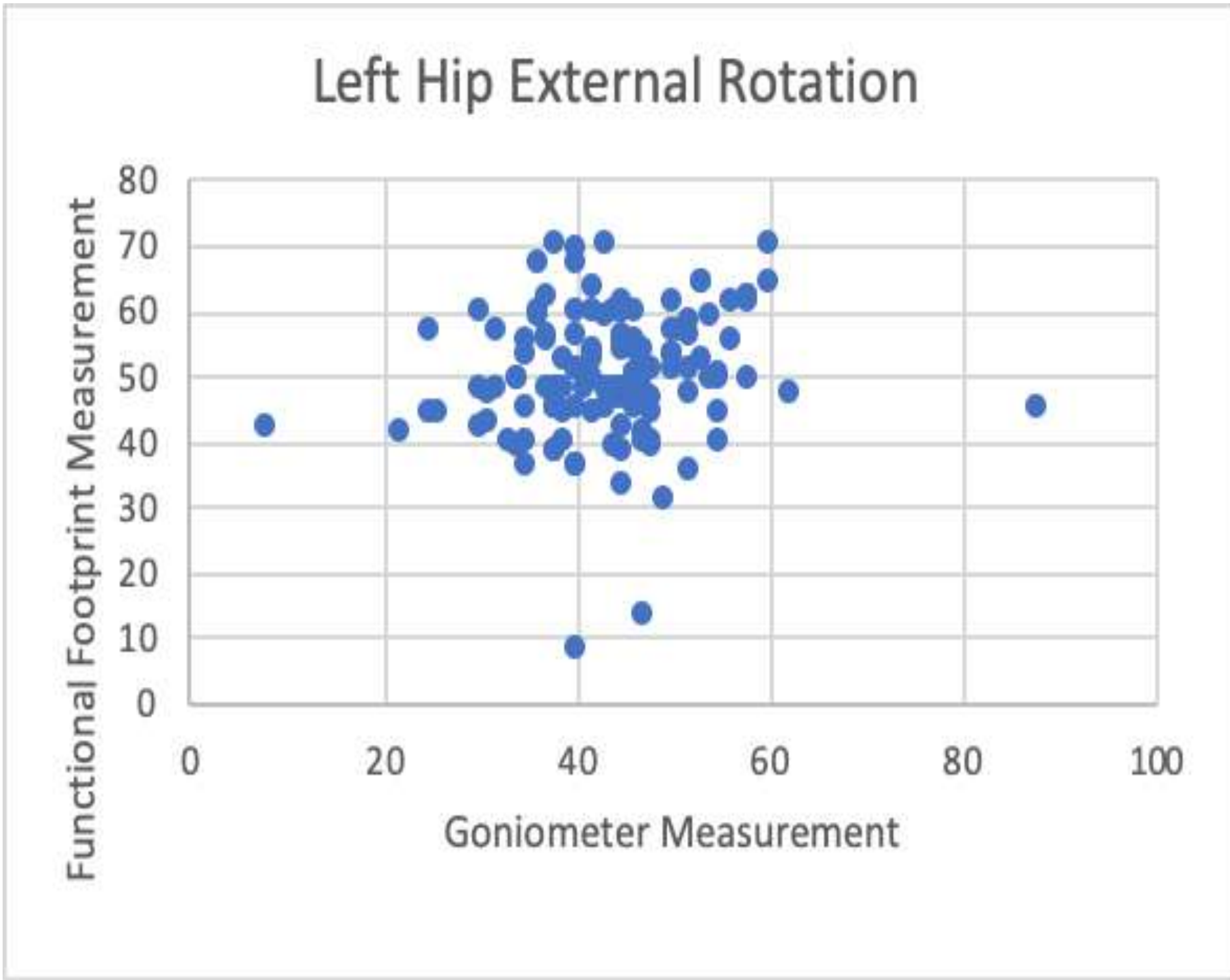


Photo 3: Measuring a dancer’s hip external rotation using a Functional Footprints®.

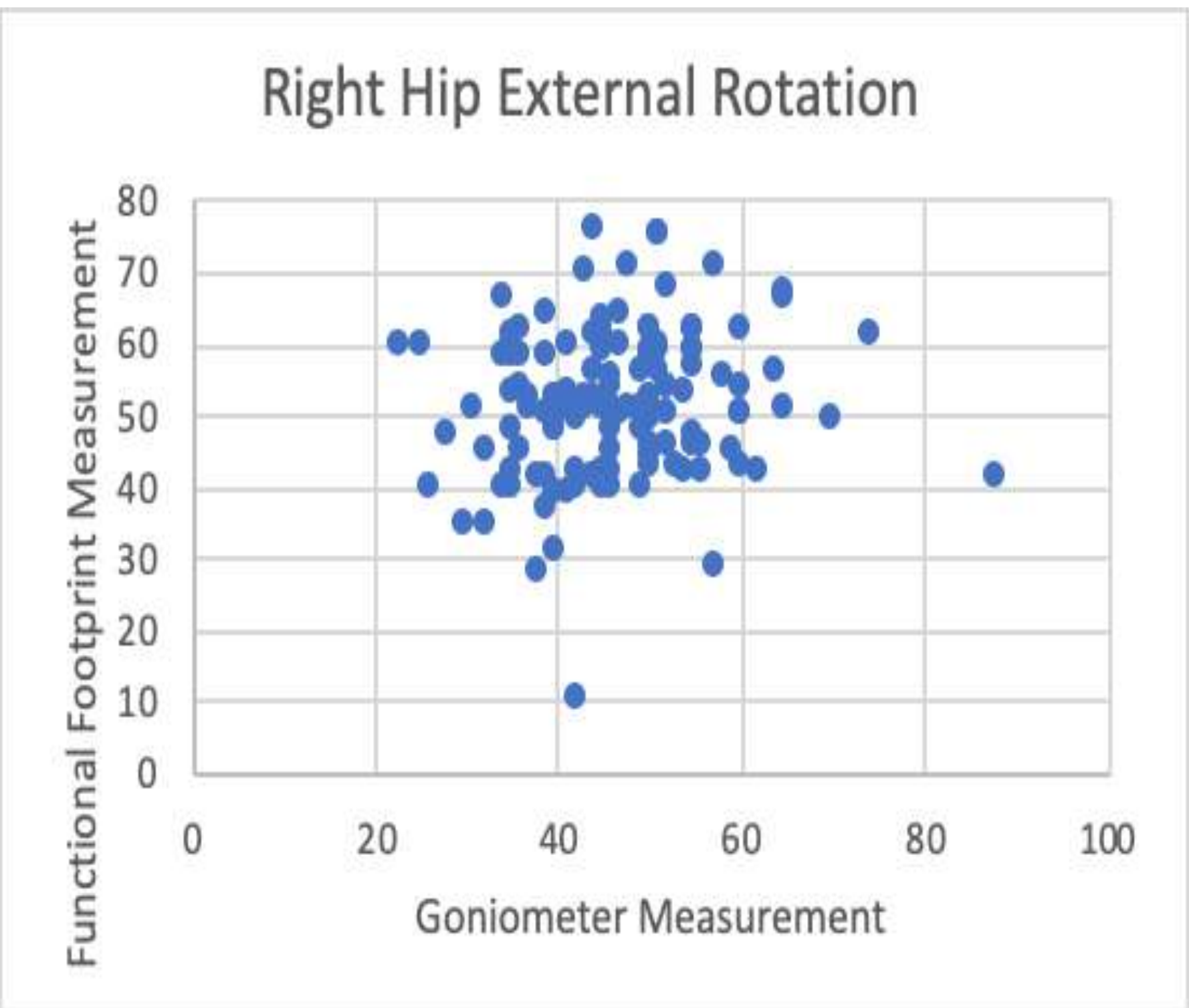


Photo 4: Measuring a dancer’s hip internal rotation using a Functional Footprints®.

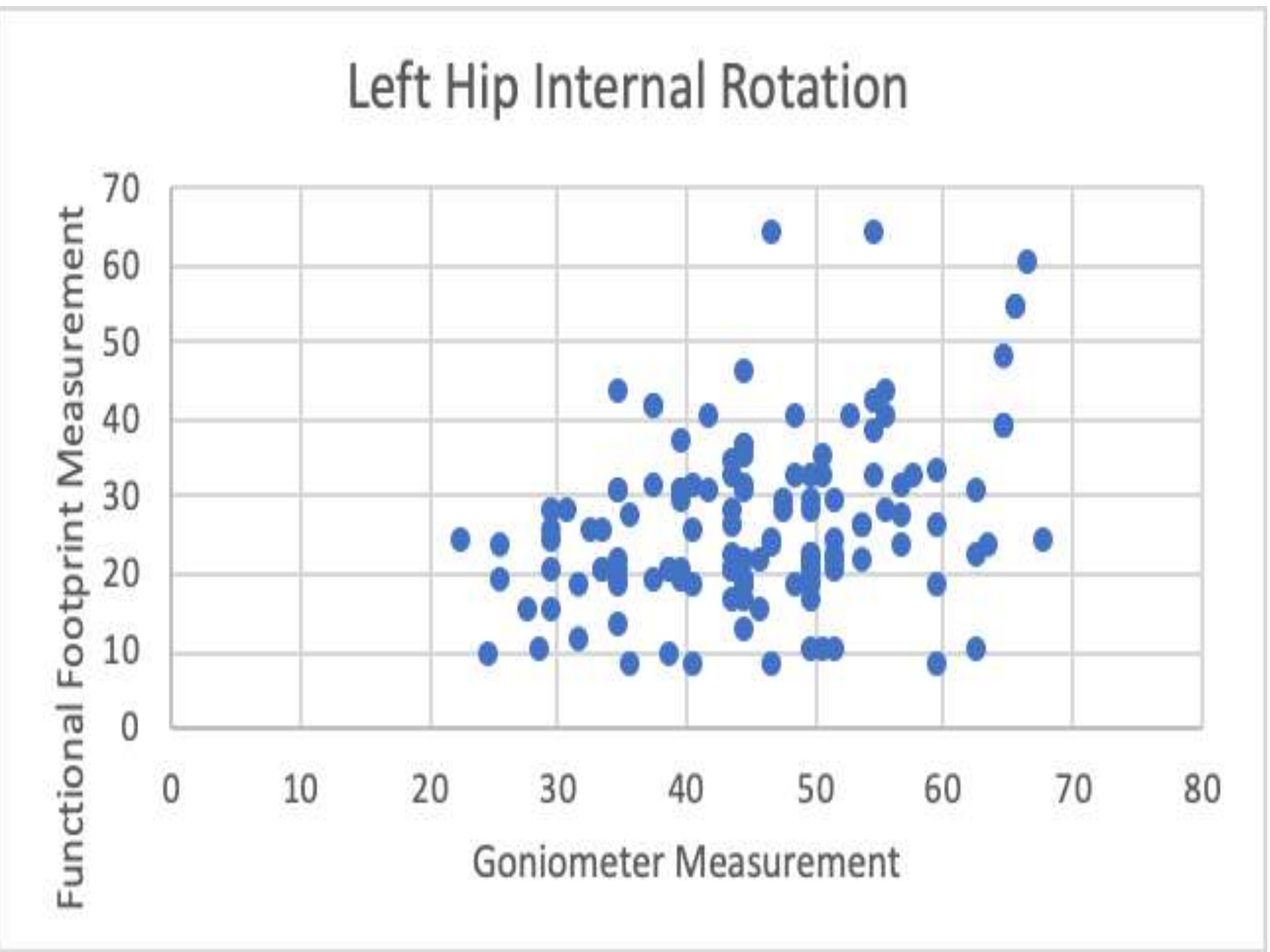
RESULTS and OUTCOMES



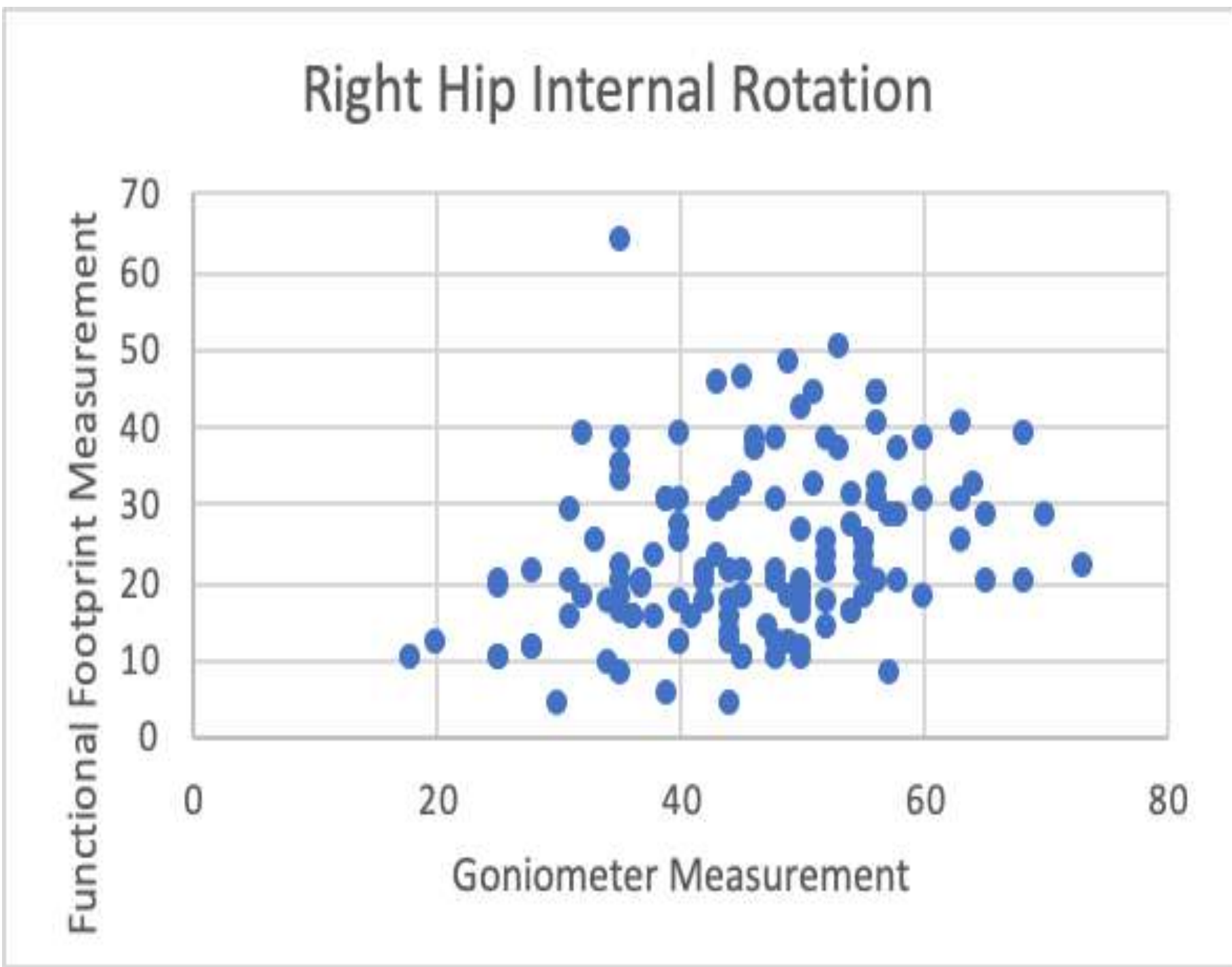
Graph 1: Correlation of left hip external rotation using a Functional Footprint ® versus a Goniometer



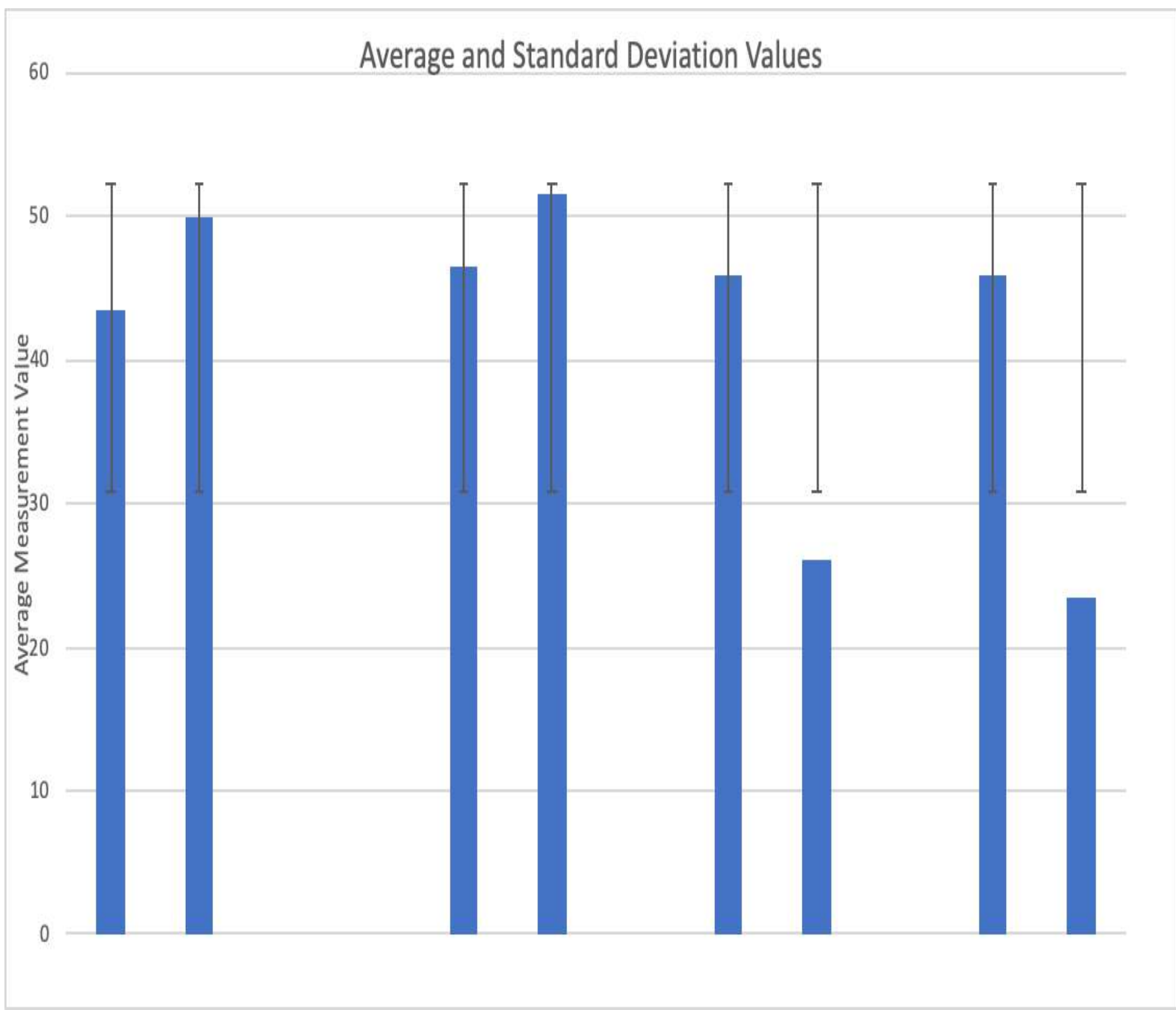
Graph 2: Correlation of right hip external rotation using a Functional Footprint ® versus a Goniometer



Graph 3: Correlation of left hip internal rotation using a Functional Footprint ® versus a Goniometer



Graph 4: Correlation of right hip internal rotation using a Functional Footprint ® versus a Goniometer



Graph 5: Bar graph with average and standard deviation values for all four measurements using a Functional Footprint ® versus a Goniometer

	Mean (in degrees)	Std. Dev.	Correlation	Difference	Difference P-Value
L Hip ER Gon. And L Hip ER FF	43.48	9.34	0.15	-6.47	0.00
	49.95	9.77			
R Hip ER Gon. And R Hip ER FF	46.39	9.99	0.13	-5.17	0.00
	51.57	10.20			
L Hip IR Gon. And L Hip IR FF	45.82	10.18	0.34	19.80	0.00
	26.02	11.11			
R Hip IR Gon. And R Hip IR FF	45.85	10.90	0.29	22.48	0.00
	23.37	10.96			

Chart 1: A chart of the mean, std. dev., correlation, difference and difference p-values for comparing the goniometer and Functional Footprint ®

LIMITATIONS

One of the limitations of this study is inter-rater reliability. Because this study spanned over multiple years and there was an increased quantity dancers to be measured, multiple physical therapy students had to record measurements, which could have led to different measurements between participants. Another possible limitation resulting in different measurements between the two methods of measurement is that goniometer measurements utilized passive hip range of motion, while the Functional Footprints® utilized active hip range of motion. Strength deficits could have contributed to decreased range of motion among the Functional Footprints® range of motion measurements.

DISCUSSION

Research has shown that limited hip rotation, specifically hip internal rotation, is correlated with ACL injury in other sports, such as football and soccer^{2,4}. Given the risks associated with limited hip rotation, it would be beneficial to gather dancers’ hip rotation measurements in order to prevent injury. There is no statistically significant correlation between the goniometer and Functional Footprints® measurement for Left Hip External Rotation (ER), Right Hip ER, Left Hip Internal Rotation (IR) or Right Hip IR. In addition, the difference between the goniometer and Functional Footprints® measurements are statistically significantly different for Left Hip ER, Right Hip ER, Left Hip IR, and Right Hip IR. According to the p values obtained for the correlation and difference between the two forms of measurement, the Functional Footprints® would not be considered a reliable predictor of hip rotation and should therefore not be used in place of goniometry measurements. We recommend measuring hip rotation using traditional goniometry, or in conjunction with the Functional Footprints®, however not relying solely on the Functional Footprint ® for hip mobility measurements.

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