

# QUIET STANDING AND QUIET SITTING IN YOUNG CHILDREN WITH AUTISM SPECTRUM DISORDERS.

Kimberly Fournier, Krestin Radonovich, Jacquelyn Selbst, Hope Benefield and Chris Hass  
The University of Florida, Gainesville, FL  
email: kfournier@hnp.ufl.edu

## INTRODUCTION

Motor control deficits appear to be common co-morbid symptoms in children with autism spectrum disorders (ASD) <sup>[1]</sup>. Specifically, preliminary research indicates that individuals with ASD may have delayed and/or impaired postural control <sup>[2, 3, 4]</sup>. Unfortunately, postural control is typically evaluated with tasks that can be demanding on cognition, communication and attention. Due to these constraints, individuals with ASD may have difficulty performing conventional tasks such as quiet standing due to distractedness. As a result, our ability to further define motor impairments in postural control using standard tasks has proved challenging. Thus, we propose using an alternative task of attention directed quiet sitting. Here in, we evaluated postural control in children with ASD and typically developing (TD) children during both quiet standing and attention directed quiet sitting tasks to assess the potential of using sitting as an alternative measure for postural control in individuals with ASD.

## METHODS

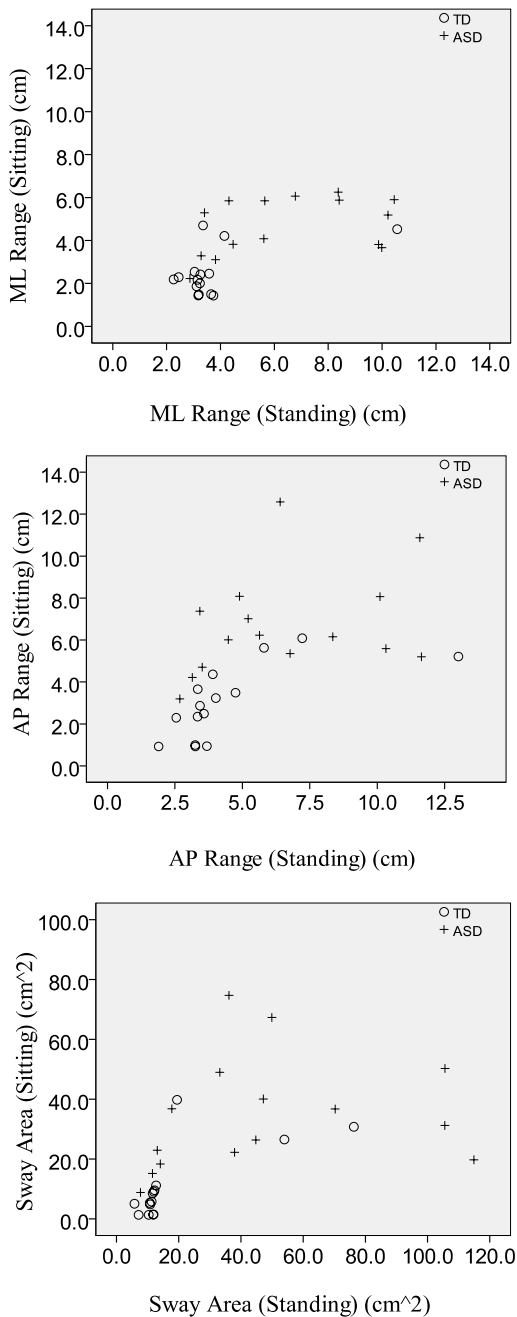
During quiet standing trials, 7 children diagnosed with ASD ( $5.4 \pm 2.2$  yrs;  $1.1 \pm 0.1$  m;  $19.8 \pm 2.7$  kg) and 11 TD children ( $5.4 \pm 2.2$  yrs;  $1.1 \pm 0.1$  m;  $19.8 \pm 2.7$  kg) were asked to stand with their feet comfortably apart (self-selected stance width). Foot positioning was marked on the initial trial and used for all subsequent trials. Children were asked to stand “as still as possible” for 20 s with their arms comfortably at their side. Children performed 4 experimental trials. During quiet sitting trials, children were asked to sit quietly while watching a video segment with engaging images and sounds (Baby Einstein Mozart, The Baby Einstein Company, LLC). Four, 120 s experimental trials were collected and 20 s time intervals were averaged and used in subsequent analyses.

Ground reaction forces were recorded (360 Hz) while children stood on a forceplate (Type 4060–10, Bertec Corp., Columbus, OH) embedded level with the floor. Ground reaction forces and moments collected from the forceplate were processed and the location of the center of pressure (COP) was calculated. Once the COP was calculated, the peak displacements in the mediolateral (ML Range) and anteroposterior (AP Range) directions were determined and the sway area was calculated for all trials. Trials with a COP sway area greater than 200 cm<sup>2</sup> were considered to contain voluntary movements beyond those of typical postural adjustments during quiet standing or quiet sitting and were therefore excluded from statistical analyses.

An individual’s data from the 4 experimental trials in each condition were averaged to provide one representative datum for each dependent variable. The representative datum was then submitted for statistical analyses. In addition, an individual’s data from the 4 standing trials, sorted in ascending order according to the sway area were correlated to sorted data from their 4 sitting trials, as a preliminary assessment of the relationship between the two tasks.

## RESULTS

A one way MANOVA performed for COP measures during quiet standing and quiet sitting revealed a significant multivariate effect of group ( $p=0.01$ ). Follow up univariate tests revealed that children with ASD exhibited significantly larger ML Range, AP Range and Sway Area values during quiet standing ( $p<0.01$ ,  $p<0.01$ ,  $p<0.01$  respectively) and ML Range, AP Range and Sway Area values during quiet sitting ( $p<0.01$ ,  $p<0.05$ ,  $p<0.01$  respectively) when compared to age-matched TD children (Table 1.)



**Figure 1:** Scatter plots for quiet standing and quiet sitting COP measures.

COP measures were observed to be significantly, positively correlated for ML Ranges (Pearson  $r=0.595$ ,  $p<0.00$ ), AP Ranges (Pearson  $r=0.530$ ,  $p<0.00$ ) and Sway Areas (Pearson  $r=0.492$ ,  $p<0.00$ ) for quiet standing and quiet sitting trials (Figure 1).

**Table 1.** Descriptive Statistics (M±SD) for COP measures during quiet standing and quiet sitting.

	Standing			Sitting		
	ML Range (cm)	AP Range (cm)	Sway Area (cm <sup>2</sup> )	ML Range (cm)	AP Range (cm)	Sway Area (cm <sup>2</sup> )
<b>TD (n=11)</b>	3.6 ± 1.0	4.3 ± 1.6	16.7 ± 11.8	2.6 ± 1.4	3.7 ± 2.2	13.3 ± 14.6
<b>ASD (n=7)</b>	7.5 ± 2.1	7.0 ± 2.8	56.9 ± 32.1	5.5 ± 1.9	7.3 ± 1.7	43.9 ± 21.5

## DISCUSSION

Our results support previous reports that children with ASD have deficits in postural control. Children with ASD were observed to have increased COP movements in the ML and AP directions and consequently had larger sway areas during quiet standing when compared to TD children. When using an attention demanding task to assess postural control, it appears differences observed between groups were not reduced. Similarly to quiet standing, children with ASD had increased COP movements for all three measures during quiet sitting. Sway areas for children with ASD were 240% larger during quiet standing and 220% larger during quiet sitting. Therefore, it appears postural control deficits observed in children with ASD during quiet standing may not be due to constraints associated with the task but rather, are indeed representative of altered control of posture during quiet conditions.

## CONCLUSIONS

Preliminary results suggest that postural control during quiet standing and quiet sitting are related and yield similar group differences for postural control assessment of young children with ASD and TD children. Results suggest that quiet sitting may be used as an alternative task when children with ASD are unable to comply with the constraints associated with quiet standing.

## REFERENCES

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## ACKNOWLEDGEMENTS

Autism Speaks #CH/1964/01-201007-065-00-00-01