Motor abilities in individuals with Williams Syndrome

We would like to thank participants for taking part in this research project on motor abilities in Williams Syndrome (WS). The motor system is central to almost everything that we do. We use motor skills to interact socially, to produce language, in handwriting and in activities of daily living (eating, brushing hair). In WS, there is existing evidence that the motor system is impaired. The aim of this study was to better understand the specific strengths and weaknesses in the motor domain in WS.

Testing Motor Ability using the Bruininks-Oseretsky Test of Motor Proficiency (BOT2: SF).

The BOT2-SF was used to determine fine and gross motor skills of children with WS. The test battery includes three fine motor and five gross motor subtests. With reference to the three fine motor sub domains, Fine Motor Precision comprises two tasks. These are: The Crooked Line Task in which participants are asked to draw a line through a path from a picture of a car to a picture of a house; and the Folding Task where a piece of paper had to be folded on the designated line. The Fine Motor Integration task included the Star and Square task. Here participants are asked to copy a picture of a star or square on paper with a red pencil. Manual Dexterity comprised of the Transferring Pennies Task in which participants must pick up plastic pennies using one hand and move transfer them to the other hand to be dropped into a pot (*Figure 1a).*

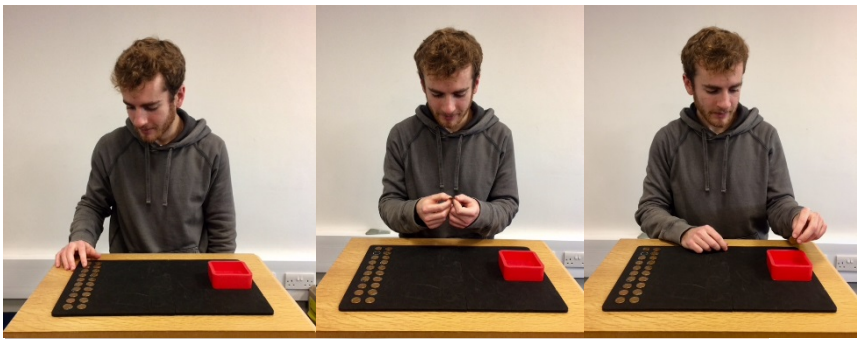

Figure 1: **a) Transferring pennies task**

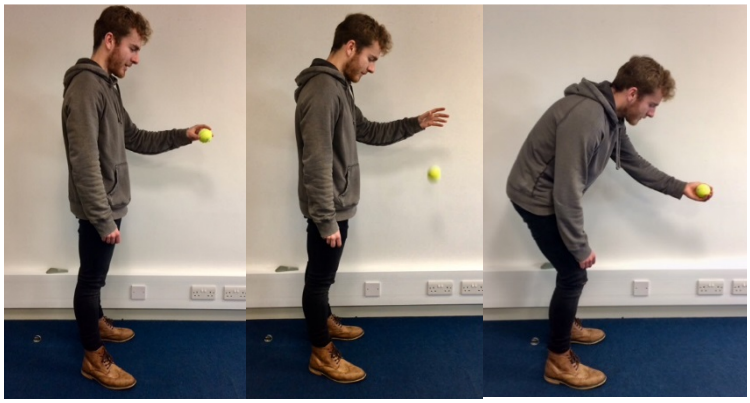

Figure 1: **b) Dropping and catching a tennis ball**

There were five gross motor subtests. In order to measure Bilateral Co-ordination, participants are first required to tap their fingers and feet on the same side of the body at the same time to a rhythm, whilst in the Jumping Task, participants must put the same arm and leg in front/behind them and jump, switching the arms and legs around so the other arm and leg are in front.

Upper Limb Control involves two tests. One is the dropping and catching of a tennis ball five times (*Figure 1b*). In the Dribbling Task, a ball is dropped with one hand, and then dribbled with alternate hands ten times. The subtest of Balance requires participants to balance on a beam on one leg for 10s while looking at a red target at eye level ten feet in front of them. Running Speed and Agility includes the Hopping Task and a Walking on Line Task. Finally, Strength consists of the Sit-Ups Task for 30 seconds and the Knee Push-Up Task, for 30 seconds.

Results.

Individuals with Williams Syndrome displayed a varied profile of motor ability. The BOT2 provides zones of ability. These are labelled: well below average ($\leq 2^{nd}$ percentile); below average (3^{rd} to 16^{th} percentile); average (16^{th} to 83^{rd} percentile); above average (84^{th} to 97^{th} percentile); and well above average ($\geq 98^{th}$ percentile). All of our participants with WS were performing in the well below average of below average zones of the BOT2-SF. (*Figure 3*).

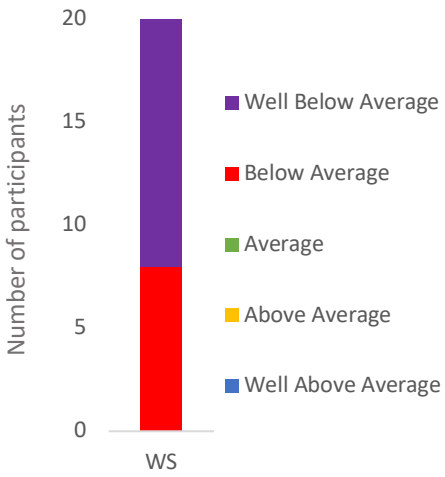

***Figure 3*) Distribution of BOT2-SF "zones" in the WS group.**

Individuals with Williams Syndrome demonstrated a relative strength on the gross motor subtest of Upper Limb Control (drop and catch and dribbling tennis ball tasks), although note that performance remained below the level expected for their chronological age. However, Balancing proved to be the hardest challenge for participants with Williams Syndrome as they were usually unable to balance on one leg for more than a second (*Figure 4*).

This research has implications for everyday activities. For example, daily fine motor activities, such as; the fastening of buttons, jacket zips, getting dressed and tying a shoe lace. Along with this, the action of holding a pen and writing is more challenging for these individuals. This has implications for intervention. Interventions could either train these skills (e.g., training fine motor skill to improve pen grip), and/or provide alternative means to accomplish motor tasks (e.g., velcro shoe fastenings rather than shoelaces). Gross motor ability deficits can be expressed through numerous activities ranging from walking long distances, running, playing football, swimming, to playing instruments and typing on a computer. This might also be compounded by anxiety, brought about by a previous negative experience. As you know, those with WS require a safe and supportive environment to enable the development of their motor skills. Encouragement can be made to prompt these individuals to engage in different forms of exercise and activities to enhance their motivation for example; aiming to walk a bit further than before.

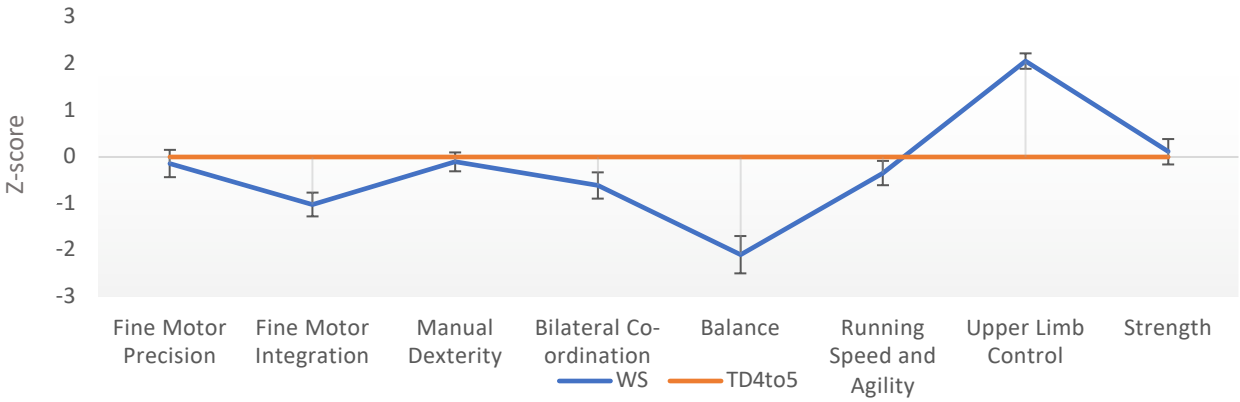

***Figure 4:* Profile of motor abilities in WS: z scores based on the mean and standard error of typically developing children (matched for overall level of motor ability).**

Thanks again to everyone who was involved in our research!

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