

Fencing Pilot One Results

Abbreviations:

N = sample size.

p = significance level, which allows a 5% protection/risk of concluding a difference exists when actually there isn't one.

One-tailed = making a prediction (hypothesis) beforehand about changes that we had expected to see in a particular direction. If no prediction was made, then this would be two-tailed.

> = greater than.

T1 = initial testing.

T2 = second testing.

PBS = Paediatric Balance Scale.

TUG = Time Up and Go.

SLJ = Standing Long Jump.

Descriptives:

Total sample, N = 27 from the three schools (Glebe, St Phillips and Holmewood), however actual sample size, N = 15 (students tested twice for three of the tests [3/6]).

Of the 15 participants, 12 male (80%; mean age = 13.42 years), eight students attending Glebe school; three from St Phillips, and one from Holmewood school.

There were three female participants (20%; mean age = 13 years), all attending Glebe school.

Of the 15 students, only 12 participants were tested twice for the other three tests (3/6). The gender and age breakdown of these 12 students were as follows:

Nine male participants (75%; mean age = 13.22 years), eight students attending Glebe school and one from Holmewood school.

Female participation stayed the same - three female participants (20%; mean age = 13 years), all attending Glebe school.

Six tests were carried out by the Change Foundation coaches:

1. Paediatric Balance Scale (PBS; Franjoine, Gunther & Taylor, 2003) – measures balance.
2. Timed Up and Go (TUG; Podsiadlo & Richardson, 1991; Nicolini-Panisson & Donadio, 2013) – measures mobility and balance.
3. Soda Pop Test (Hoeger & Hoeger, 2004) – measures hand-eye coordination.
4. Reach and Grasp Test (Scharoun & Bryden, 2016) – measures global planning.

5. Standing Long Jump (Harman & Pandorf, 2000; O’Keefee, Donnelley & MacDonncha, 2020; Safrit, 1995) – measures explosive power.
6. Stroop Test (Stroop, 1935; McLeod, 1991) – measures inhibition control.

Paediatric Balance Scale (PBS)

The PBS begins with static balance tests, progressing to more dynamic actions – challenging the child’s balance. In total there are 14 elements to the PBS, which was administered on 15 students.

Six (43%) of which improvements were found from trial one to trial two:

- Standing to sitting
- Sitting with back unsupported and feet unsupported on the floor
- Standing Unsupported with eyes closed
- Pick up object from the floor from a standing position
- Reaching forward with outstretched arm while standing
- Transfers

When further broken down, we can see exactly which tests showed an improvement for the differing genders:

Table 1. Gender improvements for each Paediatric Balance Scale (PBS) element.

PBS Element	Gender		Significant Difference (<i>p</i> ; one-tailed)	
	Male	Female	Male	Female
Standing to sitting		✓		.09
Transfers	✓	✓	.09	.21
Sitting with back unsupported and feet supported by the floor	✓		.17	
Standing unsupported with eyes closed	✓		.17	
Pick up object from the floor from a standing position		✓		.21
Reaching forward with outstretched arm while standing	✓		.17	

Table 1 demonstrates that both male and females improved within the ‘transfer’ element of the PBS. This requires a participant to transfer from one chair to another. Transfers for males was the closest element of the PBS to be significant ($p = .09$), potentially an increase in sample size could in future show a significant difference in balance between T1 and T2. Currently, a deduction of an improvement in performance has been made, but this is not an absolute statement.

Females performance improved over a lesser extent to males, with three out of the 14 elements meliorating. In particular, females showed a greater improvement within the ‘standing to sitting’ element, however this was not a significant result ($p > .05$). A larger sample size may have seen this result become significant.

Timed Up and Go (TUG)

The TUG was performed twice, requiring a person to get up from a chair, walk 3m, turn, and walk back again to the chair to sit down. This process was timed. Fifteen students were tested.

There was not any improvement in either trial – the second time the children were tested they were **all** slower. When looking at the data – the first time the children were tested (T1), 75% of the recordings were below 2seconds. That's 2seconds to get up from a chair, walk 3m, turn, and walk back again to the chair to sit down. Thus, questioning test administration/instructions given by researcher.

Soda Pop Test

The Soda Pop Test was tested on 12 participants. The test requires students to overturn three cans of Coke and place them within a circle (Figure 1, a) and then place them in their original position (Figure 1, b). This test was performed twice through.

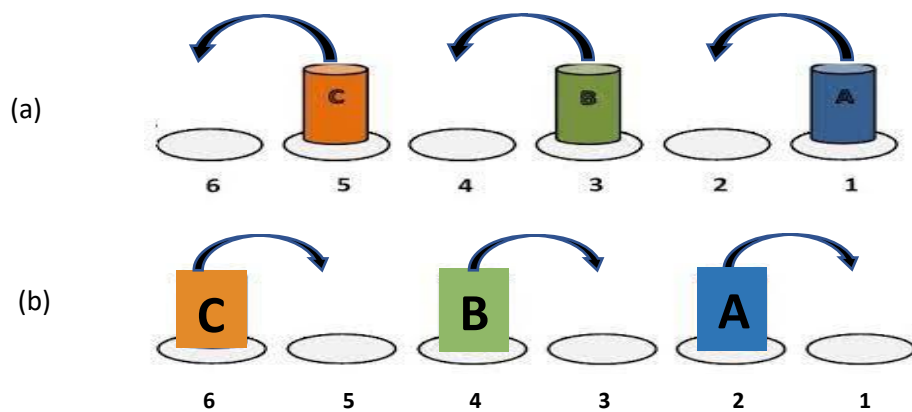


Figure 1. Schematic representation of the Soda Pop Test. (a) initial movement of cans. (b) secondary movement of cans. Both (a) and (b) were performed twice.

When looking overall, no improvements were seen. In fact, mean times increased, which goes against the evidence. Going back through the results, much of the data for T1 was below 2-3seconds. Thus, again questioning the instructions given by the researcher/administration of the test.

When looking further into the data, an improvement emerges within females, trial one. However, all the other results are contrary to the research, see Table 2.

Table 2. Soda Pop Test results for each trial within genders.

Gender	Trial One		Trial Two	
	T1	T2	T1	T2
Male	4.36	7.15	4.71	5.75
Female	7.09	5.30	4.18	6.37

Table 2 denotes the increase in time for each trial from T1 to T2 for both genders. T1 times for males are incredibly quick, raising questions over the timing of the test. Conversely, females in trial one improved in performance over T1 to T2, but not in trial two. Thus, one can only query the reliability of these results. Re-administration of this test is required.

Reach to Grasp Test

The Reach to Grasp test was performed in conjunction with the Soda Pop test, so we had 12 participants. Here we are focusing upon the thumb position of the participant when grasping the can of Coke.

The correct position has the thumb starting off pointing downwards, so when can of Coke is flipped, the thumb finishes pointing upwards (this is a comfortable position to finish in – so shows the person as planned the movements ahead).

The incorrect position means the thumb starts off pointing up, so when can of Coke is flipped, the thumb finishes pointing down (this is not a comfortable position to finish in – so shows the person has not planned the movements in advanced).

Overall, improvements were seen from T1 to T2 in both trials. When looking at gender differences, both male and females improved in their ability to globally plan the movement, demonstrated by reaching and grasping for the can of Coke in the correct position.

Additionally, a significant difference ($p = .040$) was found in males during trial two. Females had the same data, however this was not significant possibly due to having such a small sample size.

Standing Long Jump (SLJ)

The SLJ was used to measure explosive power in the lower limbs and was performed twice with 12 participants.

Overall, improvements were seen, yet these improvements were not significant. However, we can see a trend emerging between T1 and T2, see Figure 3, (a) and (b) and 4, (a) and (b).

(a)

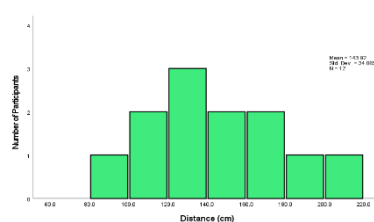


Figure 1. T1 Standing Long Jump, Trial One

(b)

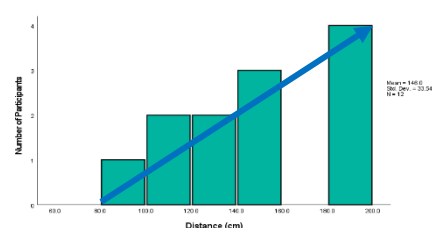


Figure 2. T2 Standing Long Jump, Trial One

Figure 3. Overall results of the SLJ test in trial one. (a) T1 SLJ trial one results. (b) T2 SLJ trial one results.

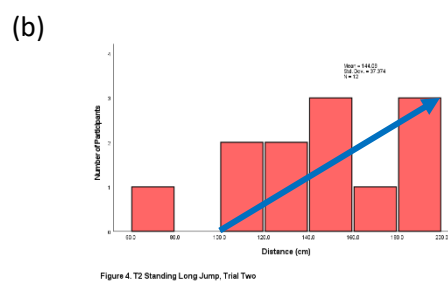
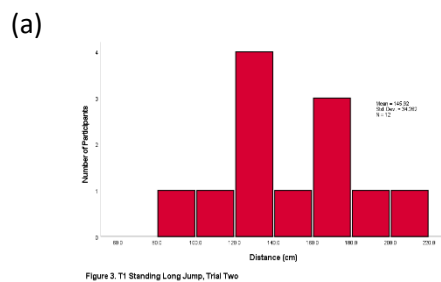


Figure 4. Overall results of the SLJ test in trial two. (a) T1 SLJ trial two results. (b) T2 SLJ trial two results.

As evident in Figure 3, a trend was emerging with participants increasing the distance jumped from a standing position from T1 to T2. The T1 results (Figure 3a) showed a greater propensity to be positively skewed, with a greater number of participants jumping a shorter distance. However, within T2, results (Figure 3b) clearly show participants were jumping further.

Figure 4 demonstrates the same trend, however not as distinct. T1 results (Figure 4a) are distributed more widely, with the highest proportion (4/12; 33%) of participants jumping between 120cm to 140cm. In comparison, within T2 (Figure 4b) the largest percentage of participants were jumping between 140cm to 160cm (3/12; 25%) and 180cm to 200cm (3/12; 25%). Showing an improvement in distance jumped from the highest proportion of participants in T1 (3/12; 33%) to T2 (6/12; 50%).

Stroop Test

The Stroop test measures a person's inhibition control, and by this we mean the ability to stop themselves from performing an action. The Stroop task involves saying the colour of the word, and not the word, please see Figure 5. The naming of the colours in which words are printed is slower, and more error prone, when the words are in conflicting colour words.



Figure 5. Example of the Stroop Task

Results from 15 participants showed there was a slight improvement overall, however this difference between T1 and T2 was not significant. When looking at the data in T1 the children were already very good at this task. Breaking the data down into gender, females were the only participants that improved from T1 to T2. Had we a greater sample size in females, this result may have been significant.

Summary:

- Children's balance improved within six elements of the PBS (trend).
- Reaction time and coordination improved within females within the Soda Pop test (trend).
- Global planning improved for all children using the Reach to Grasp task (significant difference).
- Explosive power improved for males using the SLJ (trend).
- Inhibition control improved for females only when using the Stroop task (trend).

Conclusion:

Running a fencing intervention for 10weeks has shown improvements within core physiological aspects of children with ASD. The majority of these improvements may be trends but would have impacted the child's everyday skills. For example, coordination and balance improved, which research has linked to improvements in walking, posture and reaching for objects. Furthermore, the coordination and balance improvements may be linked to improvements within prospective control – something tested in the second pilot.