Research – Play and Climbing Equipment: Evidence of efficacy as an intervention

Brief	Is there any research based evidence which indicates that play/climbing equipment/swing/trampoline is a recommended intervention? • If so, for what conditions is it recommended? • For which age ranges is it recommended? • What are the intended functional outcomes of the recommended intervention? Is it a long term or short term recommended intervention?
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Please note:

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Delegates have access to a wide variety of comprehensive guidance material. If Delegates require further information on access or planning matters they are to call the TAPS line for advice.

The Research Team are unable to ensure that the information listed below provides an accurate & up-to-date snapshot of these matters.

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2 Related TAB Research

- NED20/381652: RES AAT THER Climbing Therapy for Cerebral Palsy 2020/0122
- NED21/93314 RES THER Play and Climbing Equipment: types, standards, safety, lifespan, price range, maintenance, statistics, public and commercial playgrounds 2021/176

3 Summary

- Literature in support of the provision of play/climbing equipment, swings or trampolines is weak and therefore should not be recommended as an evidence based intervention.
- No studies could be located that investigate these interventions in the home setting

4 Literature Review

Sensory-Based Interventions (SBIs) are often recommended to enable function/participation in children with ASD. Still, there are limited studies to evaluate their effectiveness. In a survey by Peña, Ng [1], parent's perceptions of the uptake and acceptability of SBI's were examined. The use of the trampoline (54.6%) was the most frequently therapist recommended SBI followed by massage and oral-motor tools [1]. It is of concern that some SBI's identified such as trampolines, oral motor tools, weighted backpacks, weighted lap snake, wrist and ankle weights as well as compression vests are being **recommended to parents to manage challenging behaviours without any controlled studies examining the effectiveness of their use** [1].

4.1 Trampolines

The majority of studies investigating trampolines look at the number of injuries sustained at home or at trampoline play centres [2, 3]. There are a handful of studies investigating the use of trampolines as an intervention for children with autism spectrum disorder, intellectual disability, cerebral palsy and developmental coordination disorder. All studies delivered the intervention within a clinic setting using various types of trampolines/adaptive bungee cords. Studies demonstrated mixed results relating to motor ability, balance, leg strength and sensory processing. Larger randomised studies demonstrated improvements following trampoline intervention, however, there were no statistically significant differences between the intervention and the control groups who received no intervention. No studies investigate whether the provision of a trampoline at home improves level of

functioning. The body of evidence around the use of trampolines is weak and should not be recommended.

4.2 Climbing

A single randomised controlled trial on the effects of climbing for children with "special needs" was located. The quality of the study was low and showed mixed results. Self-efficacy ratings improved significantly, however, children's judgments of their athletic and social competence and global self-worth did not change. Not studies investigating at home climbing equipment could be located. The body of evidence around the use of climbing equipment/rock climbing is weak and should not be recommended.

NED20/381652: RES AAT THER Climbing Therapy for Cerebral Palsy 2020/0122 provides information on the efficacy of wall/rock climbing in children with cerebral palsy (CP). In brief, there is not enough high quality evidence to support the use of climbing therapy as an intervention for CP.

4.3 Swings

A single randomised controlled trial has investigated the use of a platform swing to reduce sensory behaviours in children with ASD. Analyses revealed no significant differences in trajectories between the treatment and the control groups before or after intervention on any of the four behaviours: *on-task, engaged, stereotyped/repetitive*, or *out of seat*. Results suggest the platform swing was not an effective intervention for these participants. No studies investigating swings in the home setting could be located. The body of evidence around the use of swings is weak and should not be recommended.

Author	Aim/Objective	Methods	Results	Level & Quality of evidence
Trampolines				
Giagazoglou, Kokaridas [4]	To assess the effect of a 12-week trampoline exercise intervention program on motor and balance ability of school aged children with **intellectual disability**	**Randomised Controlled Trial** Students randomly recruited from a total of 32 Greek students at a special primary school. Randomly assigned into either: experimental group = 12 week trampoline training program or control group = no intervention **Outcome measures** • Standing long jump • Vertical jump test • Sit and reach test • Balance testing: measured on an EPS pressure platform **Trampoline training** Performed daily for 12 weeks. All done individually for approximately 20 minutes. Various exercises performed on the trampoline.	18 school aged children (mean age 10.3 ±1.6 years) with moderate intellectual disability **Physical fitness tests** Experimental group statistically significant improvement in vertical jump (p 0.010), broad jump (p 0.001), sit and reach test (p 0.003). No statistically significant differences were noted **between the two groups** or in the control group between measurements for each skill measured. **Balance tasks** Statistically significant increases in balance for Double leg stance with opened eyes, Double leg stance with closed eyes and One leg stance in pre Vs post-test in the experimental group (p value range from 0.001 to 0.05 no statistical significant differences were noticed as regards pre–post measurements	**Level = 1** **Quality = Low** Methods for randomisation not provided. No power calculation and small sample. No measure of heterogeneity between groups. Large group differences can have any impact on t-tests between groups. Although positives noted for the experimental group further studies are warranted.

Author	Aim/Objective	Methods	Results	Level & Quality of evidence
			of the control group as well as between the 2 groups for each of the above balance ability values mentioned	
Giagazoglou, Sidiropoulou [5]	To investigate the possible effects of a balance training program to those children assessed with **Developmental Coordination Disorder** (DCD).	**Quasi experimental – pre/post-test design** 20 students diagnosed with DCD were equally separated into two groups where each individual of the experimental group was paired with an individual of the control group in terms of gender, age and school. Experiment group = 12-week balance training program Control-group = regular school schedule Participants were tested prior to the start and after the end of the 12-week period by performing • Static balance control tasks • Structured observation of trampoline exercises while videotaping The intervention program included balance exercises in circuit training including a trampoline station. The training program was applied 3 times per week in the intervention group for 12 weeks and each training unit lasted approximately 45 min	20 participants with DCD Independent t-tests indicated non-significant group differences. Movement, body posture, contraction, force, rhythm, balance, side asymmetry, body stability and redundant movements all statistically significantly improved from pre to post test for the experimental group ($p < 0.05$). Approximately 50% of balance measures were statistically significant in the experiment mental group for pre vs post-test. No significant difference between experimental and control groups for pre to post test for motor domains or balance tests.	**Level = 2** **Quality = Low** No power calculation and small sample. Positives noted, however, no difference between experimental and control groups. Effectiveness measured using the trampoline body coordination tests which restricts the effectiveness of the intervention to this outcome measure. Likely inappropriate measure considering control group didn't perform any testing on a trampoline.

Author	Aim/Objective	Methods	Results	Level & Quality of evidence
Germain, Blackmore [6]	To assess effects of **adaptive bungee trampoline training** for children with **cerebral palsy.**	**Case study – A-B-A design** Protocol • 5-week pre-trampoline phase (A) • 12-week intervention phase (B) • Follow-up assessment (A) 3-4 weeks after intervention 2x 30 minutes trampoline sessions per week. All sessions included stretching. Activities included bouncing or being bounced, hopping, heel jumps, jumping with eyes closed, practicing a sequence of jumps within the child's capability, and games such as dodgeball Recruitment via email to participants at disability therapy service provider in Western Australia. Equipment Adapted bungee trampoline included a harness connected to a support frame with 5 bungee cords. Cords can be adjusted to alter level of support. Outcome measures • Canadian Occupational Performance Measure (COPM) • Range of motion	4 children (aged 6-11 years) GMFCS Level 1 = 2, Level II = 1, Level 4 = 1 Lower limb muscle strength improved in 3 children, and balance and functional strength in 2 children. All participants had clinically significant increases on the Canadian Occupational Performance Measure. Adherence and enjoyment were high, with no adverse effects.	**Level = 4** **Quality = Very Low** Small participant numbers, no control group, no blinding of examiners, various outcome measures were subjective, descriptive statistics used

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		• Spasticity • Strength • Balance • Functional Mobility • Gross Motor Function Measure • Enjoyment • Heart rate		
Lourenço, Esteves [7]	To assess the effectiveness of a 20 week trampoline training program, the motor proficiency and body mass index (BMI) of children with **ASD**.	**Quasi experimental – pre/post-test design** Intervention Experimental group participated in weekly trampoline training (1x 45 minute session) for 20 weeks. Session become progressively harder over time, including balls, specific exercises and other stimuli. Control group did not participate in any organised sport during the intervention period. Outcome measures • BMI - Body weight & height • Motor proficiency - Bruininks-Oseretsky battery	17 children with mild/moderate ASD aged 4-11 years. The trampoline program contributed to the improvement of motor proficiency, particularly in some components (bilateral coordination, balance, speed and agility, coordination of the upper body and strength). BMI did not experience any statistically significant improvements	**Level =2** **Quality = Very Low** Small participant numbers making it impossible to generalise to the general ASD population, no randomisation. Further large scale randomised studies needed.
Lourenço, Esteves [8]	To evaluate the effects of a trampoline-based training program, over a period of 32 weeks, on both the muscular strength of inferior limbs	**Quasi experimental – pre/post-test design** Recruitment unclear Experimental group: 32-week program of	16 children (3 girls and 13 boys, 4–10 years-old). 8 in each group. After the training program there was a significant progress in lower limb strength, fine motor integration 2, bilateral	**Level = 2** **Quality = Very Low** Small sample, no randomisation, trampoline not the only piece of equipment

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	and the motor proficiency in children with **ASD**	trampoline training in a gym fully equipped with various types of trampolines (1 session per week lasting 45 minutes) Control group: did not participate in any organized or systematic sport activity. Outcome measures • Motor proficiency - Bruininks-Oseretsky battery • strength of the lower limbs - long jump with both feet together Tests conducted before the intervention program, at week 16 and at the end of the 32 weeks. Specific exercises were carried out through the use of trampolines, mats, balls, bows, chairs, tables, Swedish gymnastic bench, Swedish ladders and ropes.	coordination 1 and balance ($p<0.05$). For the other variables there were clear improvements, but none were statistically significant. **At baseline there is a considerable difference between the experimental and control groups**	used, significant differences between groups at baseline.
Schoen, Einck [9]	Is trampoline group a viable movement activity intervention for children with autism And/or sensory processing challenges? What effects of participation in a	**Quasi experimental – pre/post-test design** 2 studies included in this paper, first was feasibility to inform second study. Only results from second study will be included. Inclusion criteria • Presence of sensory-motor concerns • motororically unable to participate in a community after school program	28 participants (22 males, 6 females, mean age 6.19 years) Motor outcomes showed mixed results. Significant improvement across participants for Broad Jump but not for Balance.	**Level = 2** **Quality = Low** Relatively small sample size making it difficult to generalise to the general ASD population, no randomisation, no

Author	Aim/Objective	Methods	Results	Level & Quality of evidence
	trampoline group can be objectively demonstrated?	• aged 4—10 years Exclusion criteria • Presence of a neurological condition, physical limitations or severe intellectual disability 28 participants from 7 groups. 3-6 participants in each group with 6 neuro typical siblings. <u>Procedures</u> 8 treatment sessions provided once a week for 50 minutes each Each class consisted of 5 to 7 children and was conducted using the Bellicon rebounder. Bungee cord technology to allow for bigger and smoother sensory feedback with each bounce. The class also incorporated pre-selected music choices designed to create a flow through class. Social interaction was intentionally scaffolded as incidental to the shared interest of jumping and children were supported to take turns. <u>Outcome measures</u> • McCarron Assessment of Neuromuscular Development (MAND) • Beads in the Box, Beads on the Rod, Strength, Standing Broad Jump, Heel To	DAP scores from pre to post intervention remained unchanged Parents reported improvements in self-confidence in movement activities, ability to follow rules, interaction with peers, ability to stay calm, participation in daily routine. Social skills and behaviour showed a statistically significant Improvement SP3D Occupational Performance Scale problems showed a statistically significant Improvement related to relationships and daily routines	control group meaning confounding factors not accounted for.

Author	Aim/Objective	Methods	Results	Level & Quality of evidence
		• Draw a Person (DAP) task • Social Skills Improvement System (SSIS) • Sensory Processing Three Dimensions Occupational Performance Scale (SP3D-OPS)		
Swings				
Murdock, Dantzler [10]	To investigate the immediate behavioural impact of one sensory treatment, vestibular stimulation delivered via platform swing, on engagement, on-task behaviour, out-of-seat behaviour, and Stereotyped/repetitive behaviour during independent work tasks for young children with ASD.	**RCT** Inclusion criteria: diagnosis of autism or pervasive development disorder and a score within the range of probable or definite difference in at least one area of sensory processing. Participants engaged in two 5-min intervals of independent work. Between the intervals, participants in the treatment group received 5 min of vestibular stimulation using a platform swing and children in the control group watched a video	30 children (median age 52 months) – 15 in each group. Analyses revealed no significant differences in trajectories between the treatment and the control groups before or after intervention on any of the four behaviours: *on-task, engaged, stereotyped/repetitive*, or *out of seat*. Results suggest the platform swing was not an effective intervention for these participants.	**Level = 1** **Quality = Moderate** No power calculation. Small sample. Sampling was convenience and from one clinic. There are no scientific evidence into the intervention duration. Authors of the study picked a time based experience/opinion.
Climbing				
Erin, Purves [11]	To examine the effect of an existing rehabilitation therapy service climbing	**RCT**	48 agreed to participate. 2 withdrew.	**Level = 1** **Quality = Low**

Author	Aim/Objective	Methods	Results	Level & Quality of evidence
	program on perceptions of self for children with special needs. Specifically, we were interested in the impact of the program on children's efficacy toward climbing; their self-perceptions in the domains of athletic competence, social acceptance, and global self-worth; and perceptions of children's climbing efficacy.	Inclusion criteria: (a) children were receiving services from a physiotherapist and/or an occupational therapist at school, (b) children scored at or below the 15th percentile on the Movement Assessment Battery for Children, (c) children were between the ages of 6–12 years, and (d) children had not previously indoor wall climbed. Instruments Age, BMI, Movement Assessment Battery for Children, Scales of Independent Behaviour, Self-Perception Questionnaire, children's Questionnaire	23 in the intervention group (girls, n = 4; boys, n = 19), and 23 in the control group (girls, n = 5; boys, n = 18). Children's self-efficacy and ratings of children's efficacy improved significantly, $t(21) = 3.9$, $p = .001$, $d = .84$ and $F(2, 44) = 30.03$, $p < .001$, respectively. The children's judgments of their athletic and social competence and global self-worth, however, did not change over time or differ from the wait-listed control group ($p > .05$).	Unclear how randomisation occurred. Recruited from a single school, a priori power calculation showed that the study was underpowered to detect a difference, sample heterogeneous

5 References

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