Do children with disabilities gain physical benefits from participating in an all-abilities organised sports program: 'Starkick'?

Benjamin Kooiman[1], Sîan Williams,[1] Lynn Jensen[1] & Noula Gibson[1,2,3]

Affiliations:

1. School of Physiotherapy and Exercise Science, Curtin University, Perth
2. Ability centre WA
3. Perth Children's Hospital

Corresponding author:

Sîan Williams

School of Physiotherapy and Exercise Science

Curtin University, Kent Street, Bentley, 6102, WA, Australia

Email: sian.williams@curtin.edu.au

Abstract

Aim: To determine whether children with heterogenous disabilities participating in a pre-existing Australian rules football program "Starkick" improve in physical fitness.

Method: Forty Starkick participants (36 males, 4 females; 9 years 1 months, standard deviation: 2 years 3 months) with various disabilities (autism spectrum disorder: 23, cerebral palsy: 8, Down syndrome: 5, vision impairment: 4, other: 8, unreported: 4) were assessed during the first and last three weeks of the 2017 season. The intervention consisted of one weekly 90-minute Starkick session for 10 – 15 weeks depending on the club attended. The modified shuttle run test (SRT) (1 and 2), muscle power sprint test, 10 x 5m sprint test and the functional muscle strength test were used to assess aerobic, anaerobic capacity, agility and strength. Group changes were analysed using Wilcoxon signed rank tests ($p<0.05$) and individual changes were analysed using previously reported minimal detectable change values for each test.

Results: A group increase in anaerobic capacity ($p=0.014$) was observed. Individual minimal detectable improvements were observed for a percentage of participants in: aerobic capacity (SRT-1: 32%, SRT-2: 50%), anaerobic capacity (31%), agility (43%) and functional strength (38%).

Interpretation: Children with disabilities may gain physical benefits from participating in community-based sports programs and should be prescribed by health professionals to improve physical fitness in this population.

What this paper adds:

- Starkick participation increases anaerobic capacity in children with disabilities
- Participants may also show minimal detectable improvements in aerobic capacity, agility and strength

Abbreviations:

DD – Developmental disability

TD – Typically developing

PA – Physical activity

ICF-CY – International Classification of Functioning, Disability and Health for Children and Youth

AFL – Australian Football League

SRT – Shuttle run test

CP – Cerebral palsy

MPST – Muscle power sprint test

FMST – Functional muscle strength test

In Western Australia (WA) it is estimated that 9.1%[1] of children from birth to 15 years have a developmental disability (DD), a rate that is consistent with reported rates in America[2] and the United Kingdom.[3] This comprises a relatively large proportion of children who are reportedly 4.5 times less likely to be physically active compared with their typically developing (TD) peers.[4] This lack of physical activity (PA) is linked to reduced fitness levels predisposing them to poor health profiles, functional dependence and social isolation throughout the lifespan.[5-7] Alongside commonly reported health conditions related to inactivity such as cardiovascular disease, type 2 diabetes and obesity, children with DD are at an increased risk of secondary health conditions such as musculoskeletal deformity, skeletal fragility and chronic pain.[6,8] Participating in physical activity (PA) for children with DD has been shown to control and slow chronic disease progression, foster functional independence and is linked to increased physical, emotional and social wellbeing.[4] Efforts to minimise inactivity and enhance PA participation are therefore, important for the promotion of positive health outcomes for children with DD.

Australian PA guidelines for children recommend at least 60 minutes of moderate to vigorous PA on each day of the week.[9] There is now increasing awareness by clinicians that targeting the impairment and activity levels of the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY),[10] to increase participation in PA of a child with DD does not necessarily result in more active lifestyles.[11] Imms et al.[12], propose intervening at the participation level of the ICF-CY.[10] This proposal is supported by Rosenbaum and Gorter[13] who highlight the need for interventions to include friends, family and fun alongside the function and fitness

components traditionally addressed. Considering this, organised PA programs have gained popularity as cost-effective interventions.[14] Organised PA programs provide opportunities for children to explore activities, and attain physical and psychosocial benefits, while gaining physical literacy which may motivate lifelong participation in PA.[14,15]

In 2010 the Australian government released a report advising PA providers to adopt formal policies to promote inclusion of children of all abilities and backgrounds.[16] Very few inclusive PA or sports programmes exist for children with DD[17] and the research in this area is limited.

"Starkick" is a sporting opportunity based on the Australian Football League (AFL) Auskick program targeted at teaching fundamental sports related motor skills including specific skills required to play 'Australian rules football' to children with DD. Starkick was initiated in WA for children unable to participate in the mainstream children's football program due to disability or social factors. Starkick participants train alongside their TD peers in the Auskick program and games and drills are modified to ensure each activity is challenging yet achievable and family and volunteer support cater for individual player needs. This approach provides an opportunity for participation in an organised sporting program for children with DD.

This study aimed to determine whether participating in a season of Starkick (an organised sports program) improves physical fitness in children with a variety of developmental disorders. It was hypothesised that Starkick participants would have increased aerobic and anaerobic capacity, agility, and functional strength at the end of the season.

METHOD

A pre-test post-test single group research design was conducted at three junior football clubs in Perth, Australia running the Starkick program during the 2017 season (April -September). Children and their parents were recruited for the study via club email, during registration days and during the initial Starkick sessions.

Participants

Children aged five to 14 years participating in the Starkick programme during the 2017 season were included in the study. Participants were excluded from data analysis if they had participated in fewer than five Starkick sessions or if they had not completed at least one outcome measure at both assessment points. One participant was a TD who reported a lack of confidence as a barrier to mainstream participation. The study was approved by the Curtin Human Research Ethics Committee (HREC2016-0072) and parents and participants provided written consent and verbal assent respectively prior to participation in the study.

Procedure

Three separate clubs across the Perth metropolitan area conducted the Starkick program. Participants generally participated at the club most conveniently located. To ensure a minimum of six weeks of Starkick participation between assessment time points, pre-test assessments occurred in the first three weeks of the season and post-test assessments occurred within the last three weeks of the season. The physical assessments were performed at each respective club, with testing stations set up alongside the football oval where the Starkick sessions were run. During pre-test assessments, participant characteristics including gender, age, and diagnoses were recorded as

reported by the participant or their parent. The participants' height and weight were also measured at both assessment points using a stadiometer and digital scales respectively which were placed on a firm surface. All testing was completed on grass with participants wearing their club uniform including studded football boots. Participants were tested at their convenience before, during and after the Starkick sessions to allow participants to participate in their favourite Starkick activities and to avoid interfering with the child and family's schedule. The order of testing was random and determined by participant motivation, preference, and equipment availability. Participants were given a demonstration and a practice attempt of each test which served as both a warm-up and a test familiarisation. In accordance with testing protocols, all participants were given adequate rest prior to the commencement of the actual test.[18-20] If required, participants were paced for all running tests as proposed by Verschuren et al.,[20] and an activity passport with stickers was utilised to increase compliance and motivation. Assessments were performed by the research team and student volunteers from the Curtin School of Physiotherapy and Exercise Science. All assessors were familiarised with the assessment procedures. Participants were not always assessed by the same assessor at pre- and post-intervention phases. This was due to volunteer availability and the flexibility given to participants to complete the field tests at their convenience.

Intervention

Each session ran for approximately 90 minutes on weekend mornings for the duration of the winter season (10 to 15 weeks depending on club). Each training session utilised similar components including running, AFL related drills such as kicking, catching, passing and

tackling (inflatable dummies) which were then incorporated into a modified AFL game. Parents and volunteers assisted players to complete each activity as required. A detailed description of the program is provided in Appendix 1.

Outcome measures

Aerobic capacity

Aerobic capacity was measured using the 10-meter shuttle run test (SRT) validated in children with cerebral palsy (CP).[20] Two tests exist to accommodate children classified as Gross Motor Function Classification System (GMFCS) level 1 (SRT-1) and GMFCS level 2 (SRT-2) with the tests showing intra-class correlation coefficients (ICC) of 0.97 and 0.99 respectively for test-retest reliability.[20] For children who did not have CP, observed performance during the other running tests was used to categorise them to the appropriate SRT resulting in all children without CP completing the SRT-1.[20] The total time spent running until failure to reach the line for two consecutive beeps was recorded for analysis. An increase in time until fatigue, therefore, denotes the child's ability to achieve more shuttles and reflects greater aerobic capacity. Using previously reported test-retest confidence intervals a one level (0.84 minutes) improvement for the SRT-1 and a half level (0.5 minutes) improvement for the SRT-2 are considered minimal detectable changes.[20]

Anaerobic capacity

Anaerobic capacity was measured using the muscle power sprint test (MPST) which requires the child to perform six 15-metre maximal effort sprints separated by a 10 second rest period.[18] The six time measures and the child's weight were then used to calculate peak and mean power output in Watts using the MPST calculator.[18] The MPST

has been validated in children with CP and found to have excellent inter-observer (ICC≥0.97) and test-retest reliability (ICC>0.97).[18] Based on reported test-retest confidence intervals an 18W increase in the MPST is considered a minimal detectable change.[18]

Agility

Agility was measured using the 10x5-meter sprint test. This test requires the child to perform ten continuous five-metre sprints between two lines.[18] This test has been validated in children with CP as a measure of agility due to the quick turnaround required at either end of the course.[18] A decrease in time to complete the test denotes an improvement in agility. As a test of agility, the 10x5m sprint test is proven to be reliable with excellent inter-observer (ICC 1.0) and test-retest (ICC 0.97) reliability.[18] A decrease in time of greater or equal to 3.2 seconds is considered a minimal detectable change for children with CP based on reported test-retest confidence intervals.[18]

Strength

The functional muscle strength test (FMST) requires the child to complete five lower limb functional strength tasks (sit to stand, left and right ½ kneel to stands and left and right lateral step-ups) aiming to achieve maximal repetitions for each task in 30 seconds.[19] Repetitions were summed to derive a total score. Acceptable reliability (ICC = 0.91; coefficient of variation 10.9 - 39.9%) exists for the FMST in children with CP.[19] An increase of greater than 9 repetitions of the summed total of the five tasks between pre- and post-assessment is a minimal detectable change based on previously reported test-retest confidence intervals.[19]

While these outcome measures have not yet been validated in children with disabilities other than CP, it was determined at the time of data collection that these measures would represent the most accurate observation of change in a sample consisting of children with heterogenous disabilities including CP.

Statistical analysis

Statistical analyses were performed using SPSS for Windows (version 25.0, SPSS Inc., Chicago, IL, USA). Missing data were excluded from analysis and graphical interpretation was used to analyse data distribution which identified the data set as non-normally distributed. Results are therefore presented as median, interquartile ranges (IQR) and minimum and maximum scores and significance of the intervention determined via Wilcoxon signed rank tests set at .05. Individual clinical improvements were analysed in accordance with the minimal detectable changes reported for each physical test by Verschuren et al.[18-20]

RESULTS

Fifty-two (61%) of the 85 eligible players consented to participate in the study. Forty-one participants performed both pre- and post-assessments of at least one outcome measure and thirty-five of these completed all outcome measure assessment tasks. One participant did not meet the inclusion criteria and was excluded from data analysis resulting in 40 participants being included in the study. Participant characteristics are reported in Table 1. Participants had various disabilities including autism spectrum disorder (n=18), cerebral palsy (n=8), Down syndrome (n=3), vision impairment (n=1), attention deficit hyperactivity disorder (n=2),intellectual disability (n=1),

tuberous sclerosis complex, spina bifida (n=1), tuberous sclerosis (n=1) and developmental coordination disorder (n=1). Three diagnoses were not reported by the parents and one child was typically developing.

Aerobic capacity

Participants completing the SRT1 showed a median increase of 18.0 sec (IQR 50.0 to 72.0) that was not statistically significant, between the start and end of the season (Table 2). Ten (32%) of the participants showed a minimal detectable improvement between assessment points (i.e., >50.4 sec) (Table 3).

Participants completing the SRT2 showed a median increase of 28.5 sec (IQR -49.8 to 60.3), that was not statistically significant between the start and end of the season (Table 2). Three (50%) of the participants showed a minimal detectable improvement between assessment points (i.e., >30.0 sec) (Table 3).

Anaerobic capacity

Participants completing the MPST showed a median increase of 10.8W (IQR -6.8 to 23.8) that was statistically significant (p=.014). Twelve (31%) of the participants showed a minimal detectable improvement between assessment points (i.e., >18 W).

Agility

Participants completing the 10x5m sprint test showed a median decrease of 1.0 sec (IQR -5.7 to 3.9) that was not statistically significant (Table 2). Seventeen (43%) of the participants showed a minimal detectable improvement between assessment points (i.e., >3.2 sec) (Table 3).

Functional strength

Participants completing the FMST showed a median change of zero repetitions (IQR -11.0 to 14.5), which was not statistically significant. Fifteen (38%) of the participants showed a minimal detectable improvement between assessment points (i.e., >9 repetitions).

DISCUSSION

Our study aimed to identify whether children with disabilities would show physical fitness improvements after participating in an organised sports program (Starkick) for one season. While, the primary focus of the Starkick program is participation and fun, promising physical improvements were observed during our study. A significant improvement in anaerobic capacity was observed for the group and in addition, individual performance indicators also found minimal detectable improvements for a portion of participants across all outcome measures.

While research into the impact of interventions on anaerobic capacity in children with disabilities is limited, our results reflec previous reports of therapeutic interventions targeting anaerobic fitness. Verschuren et al.[21] reported a significant increase in anaerobic capacity in children with CP following a therapeutic exercise program consisting of aerobic, anaerobic and strength exercises. In contrast, Van den Berg-Emons et al.[22] observed no increase in anaerobic capacity following a therapeutic exercise program consisting of predominantly aerobic exercises higlighting the need for interventions to target specific fitness outcomes. In comparison to other organised sports programs for children with heterogenous disabilities, our findings mirror those of Zwinkels et al.[23] who reported improved

anaerobic capacity in participants completing a once a week organised sports program. In contrast, Collins and Staples[24] observed a similar sports program and reported increases in upper limb and core strength as well as aerobic capacity. Our results, along with those of Zwinkels et al.[23] and Collins and Staples,[24] confirm that children with DD gain physical benefits from low dose participation based interventions that are comparable to therapeutic interventions targeting the activity subdomain of the ICF-CY.[10] It is evident, however, that fitness outcomes are dependent on the types of activities that comprise the intervention.

Previous research has reported that high dose interventions targeted at specific impairments or activity limitations run by health professionals increases fitness measures in children with DD.[7,13] While these interventions report physical benefits, maintenance of these types of programs is often not feasible for the general population due to the high cost and time burden placed on families.[7,11,22,25] This may explain why studies commonly report significant losses of fitness at follow up prompting researchers to suggest that participation based interventions, such as, organised sports programs may facilitate better outcomes for children with DD.[7,12,13,25] The advantage of participation based interventions is that they carry the potential to satisfy commonly reported facilitators of PA for children with disabilities.[14] The literature consistently reports that a sense of belonging, opportunities to develop friendships, family involvement, increased motor competence and participating in activities the child enjoys are facilitators of increased PA.[26-28] Starkick satisfies these facilitators as a truly inclusive program bearing the motto: "if you want to play, we'll find a way," where participants form an integral part of the club, play

on the same field, at the same time wearing the same uniform as their TD peers and participate in all club and social events. So while participating in sport once a week may be considered insufficient to gain health benefits according to Australian PA guidelines,[9] the way Starkick is run may encourage participants to engage in PA outside of the intervention. This may also have contributed to the group increase in anaerobic capacity since this is the energy system predominantly utilised by children during recreational play.[25] In addition, personal PA preferences outside of the intervention may also have contributed to the individual improvements identified across the fitness measures.

It is likely that the heterogeneity of disabilities in the participant group influenced individual fitness outcomes. While the group change in anaerobic capacity may reflect the anaerobic nature of Starkick activities, individual improvements may result from different body systems being challenged depending on the child's impairments. Children with CP are reported to have higher energy demands during static and dynamic tasks due to hypertonicity, reduced postural control and a lack of coordination.[7] Starkick activities may, therefore, predominantly challenge body systems related to these impairments resulting in a gradual increase in aerobic, anaerobic capacity and agility. For children with DS or ASD who are reported to have low tone,[29,30] tasks may primarily stress the muscular system resulting in a increased strength. Furthermore, motivation levels, especially those of participants with reduced cognition, may also have influenced results. We observed that in some cases, outcomes of longer duration tests such as the SRT and the FMST may have resulted from a lack of motivation rather than a lack of physical capacity, particularly, during post-test assessments when participants were more familiar with the

test requirements. This may also explain why group increases in these fitness outcomes were not observed.

Strengths of this study include observing a heterogeneous group of disabilities and utilising broad inclusion parameters since much research to date has been conducted on therapeutic interventions, commonly in homogenous disability groups.[7,14] The findings, therefore, will enable health professionals to refer children with any disability to similar programs. Another stength results from observing a pre-existing community-run program which is cost-effective, easy to replicate and comparable results can be expected from similar programs. Furthermore, we used easy-to-use outcome measures that are commonly used in children with heterogenous disabilities which means our study is also easy to replicate.

Limitations of this study include a lack of a control group or ability to analyse PA participation outside of Starkick. A control group would have allowed us to confirm Starkick as the determining factor for the observed changes. An understanding of the participants' PA involvement outside of the intervention (via activity diaries or accelerometers) also would have provided greater clarity regarding the causality of the observed physical fitness changes. While this could be considered in future studies, the primary aim of this study was to establish whether physical benefits could be gained to inform PA recommendations by health professionals. The assessments utilised in this study, have thus far only been validated in children with CP and therefore, may lack sensitivity to change in a heterogeneous population. While testing protocols were strictly followed to ensure standardisation, participants were not always assessed by the same assessor.

Since community-based sports programs such as Starkick have the potential to foster physically active lifestyles a follow-up or measurement of PA levels pre and post-intervention would provide valuable insight into the success of the program. A study to establish a correlation between sports participation and physical activity levels would also provide further insight into the impact of the intervention. While Australian rules football is a popular sporting activity amongst Australian children, future studies may observe alternative sporting programs that reflect other nation's interests.

In conclusion, this study demonstrated that physical benefits may be gained by individual children with DD participating in a community-based organised sports program. Significant improvements in anaerobic capacity may be gained by children with DD from participating in a once-a-week organised sports program and individual improvements in aerobic capacity, agility and strength may also be observed in participants. These findings in addition to previously published literature support a paradigm shift away from interventions targeting the impairment and activity sub-domains of the ICF-CY towards the participation sub-domain. Health professionals should be encouraged to promote community-based sports programs for children with DD as a means of improving physical fitness in a manner that may facilitate lifelong PA participation. Future studies into organised sports programs for children with disabilities are encouraged to include an analysis of PA participation outside of the intervention aswell as a follow-up component.

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Table 1: Participant characteristics

Participant characteristics		All participants *n=40* n (%)
Gender	M	36 (90.0)
	F	4 (10.0)
Age Mean (SD)		9.1 (2.3)
[range]		[5.0-13.9]
BMI Mean (SD)		18.3 (4.3)
[range]		[12.4-30.1]
No. of sessions Mean (SD) [range]		10.9 (2.2) [5-15]

SD = Standard deviation

Table 2: Pre- and post-season comparison between fitness measures.

Outcome measure	n	Pre-season Median (IQR) [min - max]	Post-season Median (IQR) [min - max]	Median change (IQR) [min - max]	*p*-value
Shuttle Run Test 1 (sec)	31	178.0 (83.0, 300.5) [14.0 - 1305.0]	201.2 (78.0, 312.5) [21.0 - 1415.0]	18.0 (-50.0, 72.0) [-661.0, 222.0]	0.708
Shuttle Run Test 2 (sec)	6	294.0 (204.3, 429.6) [99.0 - 812.0]	323.0 (221.0, 375.5) [165.0 - 741.0]	28.5 (-49.8, 60.3) [-183.1 - 115.0]	0.917
Muscle Power Sprint Test (W)	39	47.5 (30.0, 84.4) [1.9 - 237.8]	61.8 (28.1, 98.8) [2.1 - 323.1]	10.8 (-6.8, 23.8) [-27.2 - 133.1]	0.014*
Agility Test (sec)	40	30.8 (24.5, 41.5) [15.1 - 91.4]	31.1 (24.1, 39.2) [18.8 - 81.0]	-1.0 (-5.7, 3.9) [-33.6 - 14.6]	0.569
Functional Muscle Strength Test (Repetitions)	39	55.0 (26.5,79.0) [0-119.0]	58 (34.0, 80.0) [3.0 - 118.0]	0.0 (-11.0, 14.5) [-50.0 - 71.0]	0.606

IQR = Interquartile range

Table 3: Total number (percentage) of participants with minimal detectable improvements

Outcome measure	**n**	**Minimal detectable improvement n (%)**
Shuttle Run Test 1	31	10 (32)
Shuttle Run Test 2	6	3 (50)
Muscle Power Sprint Test	39	12 (31)
Agility Test	40	17 (43)
Functional Muscle Strength Test	39	15 (38)

Description of the Starkick program

Materials:

- 3 x bags of various sized (size: 3 – 5) AFL footballs (including bell balls)
- 30 x sports cones
- 10 x whistles
- 6 x sets of children's plastic AFL goal posts (3m tall)
- Handball targets
- Mini AFL goals
- Ruck bags
- Tackle bags
- Hit shields
- Marking ground spray paint
- 20x Bibs

Coaches and volunteers:

- One head coach per site.
- Between two and three assistant coaches per site.
- Between 10-15 volunteers per site.
- Current Working with children's check.
- Adhere to Auskick coach and volunteer training protocols

Structure:

1. General warm-up group game (5 mins) examples listed below
   - Scarecrow
   - Tag- like games
   - Modified dodgeball (rolling footballs along the ground)
   - Rob the nest
   - Over Under Relay
   - Tug of war
   - Farmer chasing the chickens (chasing and catching game)

2. Football drills (20-40 mins)

Specific skills sessions:

- Kicking practice (from hand or from ground)
- Running between cones
- Handball practice
- Picking up practice
- Tackling practice
- Marking practice
- Tackling practice (tackling bags)

Combined skills practice:

- Running handballs
- Specky/marking practice mid-jump (ruck bags)
- Mark and kick
- Mark and pass
- Mark and dodge (hit shields)

3. Intra-team game (20-40 mins)
   - Played with assistance from coaches, volunteers and parents

Modifiable activities:

Every activity (warm-up, drills and game) was able to be modified for each player's ability with assistance from coaches, volunteers and parents. Examples are listed below:

A volunteer might provide physical support to a child by holding their trunk, allowing the child to kick a ball with their lower limbs.

A volunteer might assist a child to catch a ball by directing their hands to contact the ball.

A volunteer might assist a child during the game by directing the child's attention to the play or reminding them to stay in position.

Children could use any of the supportive equipment they required to be physically active. All supportive equipment including wheelchairs, walkers, standing frames, crutches, ankle foot orthosis etc. was included in Starkick. The activity was modified so each child could participate.

Inclusion:

Each child had the opportunity to score at least one goal per game. If a child was unable to physically score a goal themselves, volunteers would assist the child. For example: a volunteer might assist the child to hold the ball while the child walked the ball through the goals.

Group activities:

Activities were performed by the children in a group environment with other volunteers and children practicing skills with or alongside one another. Occasionally, a child might prefer to practice a skill alone with a volunteer, but they were always encouraged to re-join the group when they felt able to.

Supervision

Children were supervised by the coach or volunteers at all times. Often parents would be on the field physically supporting or verbally encouraging their children.

Motivation strategies:

Parents and volunteers adjust activities and components as necessary for participants to achieve success and provided verbal encouragement to motive children to participate in all games. Additional motivation strategies included high five's, cheers, hugs (from parents) and various certificates and awards such as sponsors vouchers were presented at the completion of each session. At the end of the season each child was given a small trophy to celebrate their participation. A volunteer may demonstrate a task to a child to show the task as achievable.

Progression:

Participant's skills were progressed on a case by case basis. For example, a child might progress from requiring a volunteer to support

the ball while they 'handballed it', to holding their own football while attempting a handball.

Coaches would collaborate with parents of children who consistently achieved all tasks in the Starkick programme to discuss whether the child was ready and desired to join their age appropriate division in the Auskick programme.

Team building

Examples of team-building components were:

- Weekly greetings
- Singing a team song at the end of games
- Presentation of certificates (Combined with the Auskick programme)
- Fremantle Dockers visits
- Gala day (inter-club carnival)
- Playing at half-time during an AFL game
- Social outings
- Buddy days with Year 10 players

Adverse events:

Nil reported in the 2017 season

Location:

In 2017 the Starkick programme occurred at three locations in Perth, Western Australia:

1. Coolbinia Bombers Junior Football Club [JFC] (Coolbinia Reserve, Coolbinia)
2. Joondalup-Kinross Jets JFC (Windermer Park, Joondalup)
3. East Fremantle Sharks JFC (East Fremantle Oval, East Fremantle)

All settings were outdoor grassed ovals of men's standard AFL ovals or smaller temporarily public ovals with ample space. Grounds were maintained by local councils. Lighting infrastructure was not required as Starkick occurred during the day only. There was temporarily

shelters or established football club infrastructure to take shelter during rain, but all events occurred on the allocated grass fields.

Dosage/frequency:

Children attended Starkick once per week.during the football season, April to September. Starkick occurred either on Saturdays or Sundays. Sessions ran between 60-90 minutes and depending on participant engagement and weather conditions.

Coolbinia Bombers JFC: 16 weeks from 30 April – 13 August, 14 sessions, 1x Gala day (1 June), 1x Gala day BYE (2nd July), 1x School Holiday BYE (9th July)

Joondalup-Kinross Jets JFC: 16 weeks from 6 May – 26 Aug, 15 sessions, 1x Gala day (1 June), School holiday BYEs 1 July, 8 July & 15 July

East-Fremantle Sharks JFC: 17 weeks from 7 May - 3 Sep, 12 sessions, 3x School Holiday BYEs 1 July, 8 July & 15 July, 1x Gala day (1 June)

There was no scheduled training throughout the week. See structure for an overview of a typical Starkick session.

Attendance:

Participant attendance was taken by each club. In addition, attendance was taken by a research assistant for this project.