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Does '*Animal Fun*' improve aiming and catching, and balance skills in young children?

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A R T I C L E I N F O

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A B S T R A C T

Aim: The *Animal Fun* program, a universal early intervention program that aims to promote the motor skills and social-emotional development of young children, has shown to improve overall motor proficiency and social and behavioural outcomes. The aim of the current study was to evaluate the program's impact on children's aiming and catching, and balance skills.

Methods: A cluster randomised control trial was employed, with six intervention and six control (following normal curriculum) schools. A total sample of 511 children (257 boys and 254 girls), aged 4–6 years presented at pre-test. Children were tested across three time points, pre-test, post intervention (six months later) and follow-up (18 months after pre-test), using the Movement Assessment Battery for Children-2 Aiming and Catching, and Balance tasks. The study also tested for potential moderators including pre-test motor proficiency, age, gender, and cognitive performance.

Results: Participation in *Animal Fun* improved children's one leg balance at post-test and follow-up compared to control children, regardless of pre-test motor proficiency, age, gender, or pre-test cognitive performance. Participation in *Animal Fun* also improved throwing skills for those children with poorer motor proficiency compared to the controls with poorer motor performance. Interestingly, it was found that the control group's catching skills improved more than the intervention group at follow up.

Conclusions: The study provides some promising results regarding the efficacy of the *Animal Fun* program in improving one-leg balance for all children, and throwing skills for those children with poorer motor proficiency, while also suggesting potential confounding factors, such as maturational issues and other individual factors (e.g., a child's participation in extracurricular activity).

What this paper adds?

The *Animal Fun* program, a universal early intervention program that aims to promote the motor skills and social-emotional

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development of young children, has shown to improve overall motor proficiency and social and behavioural outcomes. The aim of the current study was to evaluate the program's impact on aiming and catching, and balance skills, which are considered categories of fundamental movement skills, and thus important for the complex skills used in organised and non-organised sports, game, and recreational activities (e.g., basketball layup). Findings revealed promising results regarding the efficacy of the *Animal Fun* program in improving one-leg balance for all children and throwing skills for those children with poorer motor proficiency, while also suggesting potential confounding factors, such as maturational issues and other individual factors (e.g., a child's participation in extracurricular activity).

1. Introduction

Over recent years there has been increasing interest in physical activity programs for pre-school aged children, given the importance of this stage in terms of developmental changes as well as representing a significant transitional period from pre-school/ kindergarten to the first year of formal schooling (Piek et al., 2015). Previous programs (e.g., Hands & Martin, 2003) have targeted fundamental movement skills in young children, such as locomotion, object control (manipulative skills) and balance skills, using a task-specific approach ("repeated exposure to a given task, under the right constraints - task and environmental"; Wilson, 2005, p. 816). The approach is based on dynamical systems theory (Thelen, 2005) and aims to promote the development of stable patterns of movement, provided the child is ready in terms of maturational and biomechanical development. However, it appears that such intervention programs and the evaluation of their efficacy for improving movement skills in young children is still limited.

Increasing evidence has shown that difficulties in the acquisition and execution of motor skills, such as those associated with developmental coordination disorder which is reported to affect approximately 5–6% of children (DCD; American Psychiatric Association, 2013), can have a negative impact on the overall development of a child including activities of daily living, interpersonal relationships, and emotional and academic functioning (Alloway, 2007; American Psychiatric Association, 2013; Campbell, Missiuna, & Vaillancourt, 2012; Piek et al., 2007; Piek, Bradbury, Elsley, & Tate, 2008; Van der Linde et al., 2015). Furthermore, DCD commonly co-occurs with other developmental disorders such as attention deficit hyperactivity disorder (Pitcher, Piek, & Hay, 2003), autism (Whyatt & Craig, 2012), reading problems (Martin, Piek, Baynam, Levy, & Hay, 2010), as well as language impairment (Archibald & Alloway, 2008). This has shown to contribute to poorer outcomes, for example greater emotional difficulties, potentially due to the compounding difficulties experienced by these children (Piek et al., 2007).

Research demonstrating the continuing impact of motor difficulties in adulthood (Tal-Saban, Ornoy, & Parush, 2014) also highlights the need for early intervention and prevention in order to address or prevent the possible later negative outcomes. In particular, the reduced physical participation levels demonstrated by children with movement problems points to an important target for intervention given the detrimental impact of reduced participation on overall quality of life, and the associated greater risk for negative health outcomes such as obesity and cardiovascular risk factors (Rivilis et al., 2011). Importantly, a child's self-perceived competence has shown to be crucial when understanding reduced participation patterns (Cairney, Hay, Faught, & Hawes, 2005). It is known that if children are confident about their motor proficiency, they are more likely to engage in activities such as sports, crafts, dance and other physical activity programs outside of the school curriculum, which are also important for psychosocial development (Mandich, Polatajko, & Rodger, 2003). This suggests that targeting motor proficiency may in turn improve a child's sense of self, and ultimately positively impact participation levels and overall social and emotional well-being. Therefore, it appears that early movement intervention is critical to reduce and prevent the associated difficulties that have been identified in children with poor movement proficiency. Further research regarding the development and promotion of movement skills in young children is clearly needed.

Animal Fun (Piek et al., 2010, 2013, 2015) is a universal movement program designed for preschool aged children, involving the imitation of animal movements in a fun and inclusive setting. The program involves all children within the classroom and can be implemented by classroom teachers in order to address fine and gross motor skills, as well as social and emotional development. *Animal Fun* uses a task-specific approach based on dynamical systems theory (Thelen, 2005). Specifically, *Animal Fun* focuses on the ability of the child to perform functional movements within a meaningful context. Rather than breaking down the task into incremental skills that then need to be sequenced back together, these approaches make the whole movement meaningful for the child. By using the imitation of animals as the premise, *Animal Fun* is appealing to children in the pre-operational stage of development where they are practising new skills and behaviours within a pretend play environment where mistakes can happen and the child can try out new skills without inducing anxiety over performance outcomes. If a child has fun and enjoys the *Animal Fun* activities, they are more likely to repeat the activities and incorporate them into their own dramatic play experiences, thereby practising the skills more often and ultimately, leading to increased confidence and competence"

Previous findings have revealed that *Animal Fun* improves children's overall motor proficiency at 18 month follow-up compared to control children, as assessed by the Bruininks-Oseretsky Test of Motor Proficiency short-form (Piek et al., 2013). *Animal Fun* has also been shown to improve social and behavioural outcomes (Piek et al., 2015). However, an examination of the efficacy of the program on specific movement skills is yet to be carried out. Therefore, the aim of this study was to evaluate whether the *Animal Fun* program improves children's balance, and aiming and catching skills, assessed by the Movement Assessment Battery-2 test (MABC-2; Henderson, Sugden, & Barnett, 2007), compared to control children as these are considered categories of fundamental movement skills. Gallahue and Cleland Donnelly (2003) define fundamental movement skills as "an organized series of basic movements that involve the combination of movement patterns of two or more body segments" (p. 52). Fundamental movement skills are commonly categorized as object control or gross manipulative skills (e.g., throwing, catching, kicking) and locomotor skills (e.g., jumping, running, and hopping) (Gallahue, Ozmun, & Goodway, 2012). A further category, according to Gallahue and Ozmun (1998) is stability, which includes balance tasks such as standing on one foot (static balance) or walking on a narrow beam (dynamic balance). Previous research has shown that children who demonstrate performance difficulties on the MABC-2 test also experience difficulties in their performance of fundamental movement skills (Yu et al., 2016; Zimmer, Staples, & Harvey, 2016). Indeed, there is evidence for low prevalence of competency in fundamental movement skills in children (Hardy, Reinten-Reynolds, Espinel, Zask, & Okely, 2012; Hardy, Barnett, Espinel, & Okely, 2013), pointing to a need for early intervention programs that may address these difficulties.

2. Method

2.1. Participants

Participants were recruited from 12 government primary schools in low socio-economic areas, across metropolitan and regional Western Australia. Invitations to participate were extended to all parents/caregivers and their children who enrolled in the pre-primary classes (i.e., the year before Year 1 of formal schooling), resulting in a total sample of 511 children (257 boys and 254 girls) aged from 4 years 10 months to 6 years 2 months (M = 5 years 5 months, SD = 3.58 months) at initial testing. Although only 285 children were rated at all three assessments, data were analysed with a full information estimation procedure that used all the data present at each assessment point. This reduced sampling bias and the need to replace missing data, as described by Piek et al. (2010)

2.2. Materials and measures

2.2.1. Animal fun program

Animal Fun is an inclusive movement program which can be used by the entire class regardless of individual levels of competence. A full description of the program is available in Piek et al. (2010). Activities are grouped into nine modules; The first four involve gross motor development including trunk and lower limb body management, locomotion (walking, jumping, hopping, skipping), object control (throwing, catching, kicking) and body sequencing of the trunk and lower limbs. The second four focus on fine motor development including trunk, shoulder and pelvic girdle stability and upper body strength, sequencing of fine motor activities, object control in manual skills and functional use of hand skills (e.g., use of pencils, scissors, keyboard). The last module targets social-emotional development and includes skills adapted from Aussie Optimism Feelings and Friends Program for year 1 and 2 (Veloso et al., 2010) (promoting laughter, relaxation, and identifying and labelling feelings (see Fig. 1).

Teachers are encouraged to creatively embed *Animal Fun* activities into the learning curriculum. For example, a numeracy lesson of shape recognition can be enhanced by incorporating some movement such as frog jumps. The teacher creates various shaped "lily pads' and asks the children to jump to the triangle, then the square, and then the circle. Teachers are also encouraged to increase the difficulty level of the activities presented according to the level of competence of their class. All activities are rated for difficulty level and therefore teachers are also able to graduate children's learning, group children according to skill level, and challenge those

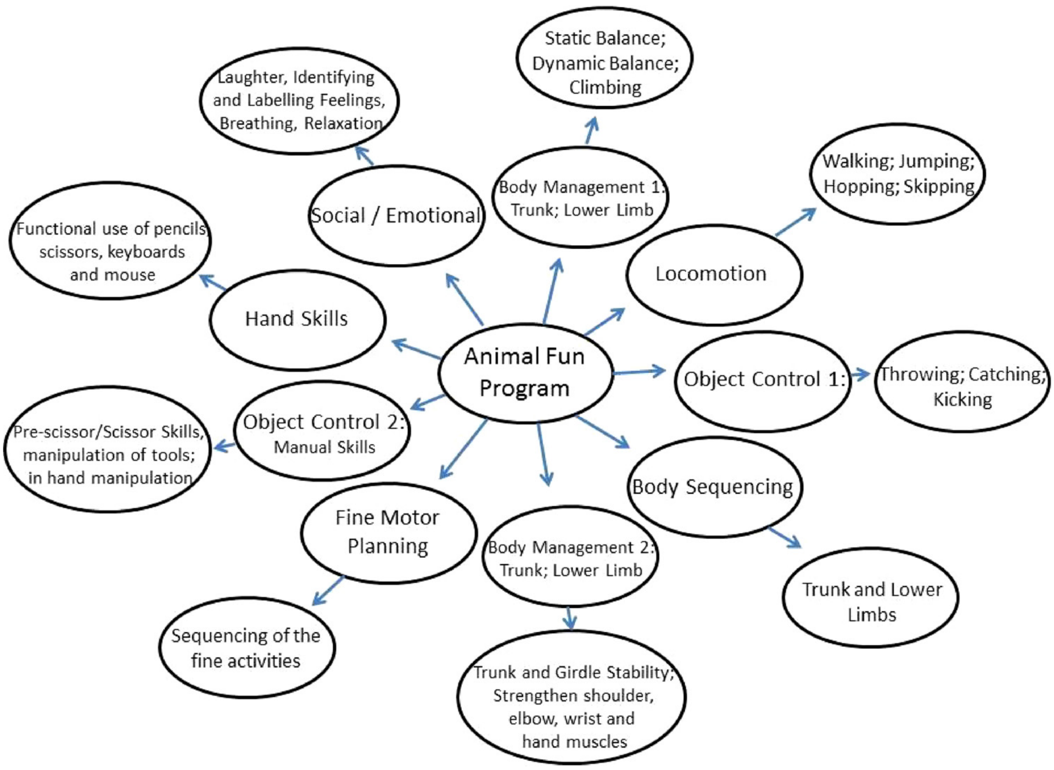

Fig. 1. The *Animal Fun* program modules.

children with better movement competence with tasks that require more difficult and complex movements.

Prior to embedding the program into their normal curriculum teachers were required to participate in a one-day training course. *Animal Fun* was implemented for 30 min a day, four days a week for a minimum of 10 weeks, and dosage sheets were provided to record the times and number of activities implemented each day. All teachers elected to continue the program for the entire period prior to the post-testing.

2.2.2. Movement Assessment Battery for Children- 2 test (MABC-2)

The widely used MABC-2 test (Henderson et al., 2007) was employed to assess the aiming and catching, and balance skills of the participants. This standardized motor performance test is divided into three age bands (age band 1, 3–6 years; age band 2, 7–10 years; age band 3; 11–16 years) and includes 8 items which produce three component scores, namely, manual dexterity, aiming and catching, and balance, as well as a total test score. The aiming and catching (catching beanbag, throwing beanbag onto mat) and balance (one leg balance, jumping on mats, walking heels raised) raw scores were examined for the current study. The MABC-2 age band 1 was used for this study and has previously demonstrated to be a valid tool for 3 to 5 year old children with test–retest reliabilities for the tasks used in the current study ranging range from 0.73 to 0.96 (Ellinoudis et al., 2011).

2.2.3. Bruininks-Oseretsky Test of Motor Proficiency second Edition - short form (BOT-2 SF)

The BOT-2 SF (Bruininks & Bruininks, 2005) is an individually administered, standardized and norm-referenced assessment of motor proficiency for children and youth aged 4 to 21 years. The short form provides a composite score of general motor proficiency using 14 items selected from the BOT2-long form (the long-form comprises 53 items) and was chosen for this study given the young age of the children. The BOT-2 SF has been demonstrated to be reliable for 4 to 7 years old children with test–retest reliability greater than 0.80 (0.86 with knee push-ups and 0.84 with full push-ups) and internal consistency reliability of 0.82. (Bruininks & Bruininks, 2005). Interrater reliability for the short form were reported as 0.98 (with knee push-ups) and 0.97 (with full push-ups) for ages 4 to 21. Fransen et al. (2014) provided evidence for the validity of the BOT-2 SF in children by demonstrating moderately strong correlations between the BOT-2 SF and another movement assessment tool, KörperKoördinationsTest für Kinder (KTK). In the current study, the BOT-2SF test was used as a general assessment of motor proficiency independent of the MABC-2 measures. Individuals scoring below the 17th percentile (BOT-2 SF score of ≤ 40) were considered to have poor motor proficiency in this study (Bruininks & Bruininks, 2005)

2.2.4. Wechsler preschool and primary scale of intelligence—third edition (WPPSI-III)

The WPPSI-III is a standardized test of intellectual functioning for children aged 2 years 6 months to 7 years 3 months (Wechsler, 2002). It comprises 14 subtests to yield a full scale IQ, verbal IQ (VIQ) and performance IQ (PIQ). For the current study, block design and object assembly subscales were administered to calculate a pro-rated PIQ, and receptive vocabulary and information subscales were used to determine a prorated VIQ score. Findings have demonstrated strong evidence on the validity of the WPPSI_III, and internal consistency reliabilities of the subtests of interest range from 0.86 to 0.87 (Wechsler, 2002). Test–retest reliabilities, with a mean interval of 26 days, fall between 0.74 and 0.86 (Wechsler, 2002).

2.2.5. Procedure

This study adhered to the National Health and Medical Research Council of Australia ethical guidelines and was granted ethics approval from the Human Research Ethics Committee of Curtin University and the Western Australian Department of Education. Government schools with more than 50 students in their pre-primary classes were identified in areas of low socio-economic status (SES), schools considered to be most in need of such an intervention. Twenty-four of these schools generated pairs that were matched for geographical location, SES and enrolled student numbers. Of these, six pairs agreed to participate and subsequently, schools from each pair were randomly assigned to the intervention or control condition using a coin toss. The randomisation procedure is outlined in the procedure section, and a full description of the study's protocol for the randomised control trial has been described in Piek et al. (2010). Schools assigned to the control condition were instructed to follow their normal curriculum. For the intervention schools, although all children in the class participated in the *Animal Fu*n program, data were only collected from children and their parents who gave informed consent to participate in the study. The movement assessments (MABC-2 test and BOT-2 SF) were administered to both intervention and control conditions across three time points; pre-test (pre- intervention); post intervention (six months later) and follow-up (18 months after pre-test), whereas the WPPSI-III was only administered at pre-test. The trained assessors were blind to the group division except for a small amount of assessment carried out by the project coordinator. This would have had little impact on the results given the extensive assessment required. Trainers visited intervention schools several times to observe the *Animal Fun* activities and to provide support to teachers as required. Teachers were asked to complete a weekly dosage report to indicate which modules/activities had been completed.

3. Data analysis

A series of Generalised Linear Mixed Models (GLMMs) were tested in order to determine whether the intervention group showed changes in the outcome measures relative to the control group. The GLMMs were implemented through SPSS's (Version 22) GENLINMIXED procedure. The GLMM represents a special class of regression model. The GLMM is 'generalised' in the sense that it can handle outcome variables with markedly non-normal distributions; the GLMM is 'mixed' in the sense that it includes both random and fixed effects. For the present GLMMs, there were three nominal random effects (student, teacher, and school), one categorical fixed effects (group: intervention versus control), one ordinal fixed effect (time: T1, T2, and T3), and the Group x Time interaction. In order to optimise the likelihood of convergence, a separate GLMM analysis was run for each outcome measure. Additional GLMMs were developed in order to determine whether the intervention effects were moderated by pre-test variables such as age, gender, PIQ, VIQ, and motor proficiency (as measured by the BOT-2 SF). A significance value of $p < .05$ was used.

Intra-teacher and intra-school dependencies were controlled by specifying a GLMM in which students were nested within teachers, and teachers were nested within schools. Violations of normality and homogeneity of variance were accommodated by invoking the GLMM 'robust statistics' option. Violations of sphericity were accommodated by changing the covariance matrix from the default of compound symmetry to autoregressive. We also performed the Least Significant Difference (LSD) test to verify the main effects over time that proved to be significant between the pre and post test.

4. Results

Attrition rates were comparable across the two groups. Thirty-nine intervention children and 31 control children were lost at post-test; 110 intervention children and 110 control children were lost at follow-up. The following numbers were identified as having poor motor proficiency across time; 94 intervention children and 57 control (Time 1), 84 intervention children and 49 control (Time 2); 61 intervention children and 28 control (Time 3).

Table 2 shows the Means (M) and Standard Errors (SE) for the 2 (group: intervention, control) x 3 (time: pre-test, post-test, follow-up) design for each of the aiming and catching, and balance skills analyzed in this study. There were no significant between-group differences at pre-test on any of the five MABC-2 subtests.

An inspection of scores for walking heels raised and jumping on mats tasks revealed minimal variance in performance across all children with most achieving the maximum score at all three time points, therefore no further analyses were conducted for these variables.

4.1. One leg balance

4.1.1. Testing for an intervention effect

The Group x Time interaction, which embodies the intervention effect, was significant ($F[2,1227] = 3.05$, $p = .048$) indicating an intervention effect for one leg balance performance.

Least Significant Difference (LSD) contrasts conducted across the simple main effects for time showed a significant pre-post increase in one leg balance scores for both the intervention group ($p < .001$) and the control group ($p < .001$). There was no significant change in one leg balance scores from post-test to follow-up for either the intervention group ($p = .114$) or the control group ($p = .619$). The intervention effect is evident in the comparison between pre-test and follow-up scores which showed a significant increase for the intervention group ($p < .001$) but not for the control group ($p = .200$).

4.1.2. Testing for moderators of the intervention effect

Group x Time did not interact with pre-test motor proficiency ($F[2,1205] = 0.86$, $p = .424$), as measured by the BOT-2 SF, pre-test age ($F[2,1221] = 1.18$, $p = .309$), pre-test PIQ ($F[2,1205] = 0.49$, $p = .615$), pre-test VIQ ($F[2,1200] = 2.34$, $p = .096$) indicating that the intervention was successful at post-test and follow-up regardless of the child's pre-test VIQ. The Group x Time interaction did not interact with gender ($F[2,1221] = 0.60$, $p = .552$).

Group x Time did not interact with either pre-test motor proficiency ($F[2,1207] = 2.12$, $p = .121$), as measured by the BOT-2SF, pre-test age ($F[2,1224] = 1.75$, $p = .175$), or with gender ($F[2,1224] = 2.68$, $p = .069$). Likewise, IQ did not moderate the group x time difference as Group x Time did not interact with either pre-test PIQ ($F[2,1207] = 0.29$, $p = .747$) or pre-test VIQ ($F[2,1202] = 0.32$, $p = .726$).

4.2. Catching beanbag

Table 2 reports means and standard errors for Catching Beanbag.

4.2.1. Testing for an intervention effect

The Group x Time interaction, which embodies the intervention effect, was significant ($F[2,1230] = 4.76$, $p = .009$) indicating an intervention effect.

LSD contrasts conducted across the simple main effects for time showed significant increases in catching scores from pretest to post-test, pretest to follow up, and post-test to follow up for both the intervention and control groups ($p < .001$). The significant Group x Time interaction, however, indicates that the post-test to follow up increase was significantly greater for the control group.

4.2.2. Testing for moderators of the intervention effect

Group x Time did not interact with either pre-test motor proficiency ($F[2,1207] = 2.12$, $p = .121$), as measured by the BOT-2SF, pre-test age ($F[2,1224] = 1.75$, $p = .175$), or with gender ($F[2,1224] = 2.68$, $p = .069$). Likewise, IQ did not moderate the group x time difference as Group x Time did not interact with either pre-test PIQ ($F[2,1207] = 0.29$, $p = .747$) or pre-test VIQ ($F[2,1202] = 0.32$, $p = .726$).

Table 1
Group Means (and Standard Errors) for Age, Verbal IQ, Performance IQ, and BOT-2 SF at Pre-test, and Percentage Females in Each Group at Pre-test.

Group[a]	Age in months	VIQ	PIQ	BOT-2 SF	Percentage female
Intervention (n = 287)	65.05 (0.52)	92.44 (1.49)	96.72 (1.30)	43.42 (1.61)	51.22
Control (n = 224)	65.09 (0.36)	93.50 (1.14)	97.32 (1.90)	46.23 (0.74)	47.77

[a] None of the between-group differences were significant.

4.3. Throwing beanbag onto mat

Table 1 presents the results for Throwing Beanbag onto Mat.

4.3.1. Testing for an intervention effect

The Group x Time interaction, which embodies the intervention effect, was non-significant (F[2,1230] = 0.04, p = .964) contraindicating an intervention effect. The main effect for Group was also non-significant (F[1,1230] = 0.15, p = .702), indicating that the two groups had comparable throwing beanbag onto mat skills at each of the three assessments. The main effect for time, however, was significant (F[2,1230] = 11.40, p < .001). Least Significant Difference contrasts conducted across the main effect for time showed a significant increase in throwing bean bag onto mat skills scores from pre-test to post-test (p = .001), from post-test to follow-up (p = .005), and from pre-test to follow-up (p < .001). The non-significant Group x Time interaction means that the time effect can be generalised across the two groups.

4.3.2. Testing for moderators of the intervention effect

Group x Time interacted with pre-test motor proficiency (F[2,1207] = 15.41, p < .001), as measured by the BOT-2 SF, indicating that the intervention effect was moderated by the child's pre-test motor proficiency. Children in the intervention group with poor motor proficiency (BOT-2 SF score of ≤40) showed an intervention effect, improving their skills from pretest to post test (t[369] = p < .001) and again from post-test to follow-up (t[369] = 4.64, p < .001. Children in the control group with poor motor proficiency showed no significant improvements (p > .100 for all contrasts). Group x Time did not interact with pre-test age (F[2,1224] = 0.06, p = .944), pre-test PIQ (F[2,1207] = 2.91, p = .055) or pre-test VIQ (F[2,1202] = 2.15, p = .117). There was a significant 3-way Group x Time x Gender interaction (F[2,1224] = 5.03, p = .007). There was no Group x Time interaction for the males (F[2,611] = 0.32, p = .724) or the females (F[2,613] = 1.31, p = .271). The significant Group x Time x Gender interaction did not therefore reflect a moderation of the Group x Time interaction by gender. Instead, it reflected a moderation of the Gender x Time interaction by group: The Gender x Time interaction was significant for the control group (F[2,524] = 8.08, p < .001) but not for the intervention group (F[2,700] = 1.68, p = .186). In the intervention group, the pattern of significant increases across time were comparable for males (F[2,700] = 15.12, p < .001) and females (F[2,700] = 54.86, p < .001) with significant increases at both post-intervention assessments. In the control group, although significant pre-post increases were shown by both males (p = .012) and the females (p < .001), only the females showed a significant increase from post-test to follow-up (females: p < .001; males: p = .930) and from pre-test to follow-up (females: p < .001; males: p = .106). It appears that boys with poor motor proficiency in the control group did not improve their throwing skills once they reached year 1 of school unlike the girls.

4.4. Dosage

A total of 14 classrooms took part in the *Animal Fun* program at the six intervention schools. All but one achieved at least 10 weeks of intervention with the range of 9–15 weeks. The average time per week spent on *Animal Fun* in each classroom was 89 min with a range of 45 minutes–150 minutes. Although the requested amount of 120 min was met by most teachers for some of the weeks, school

Table 2
Means (M), Standard Errors (SE) for the 2 (group: intervention, control) x 3 (time: pre-test, post-test, follow-up) for each Fundamental Movement Skill.

FMS		Group Intervention			Group Control		
		Pre-test	Pos-test	Follow-up	Pre-test	Pos-test	Follow-up
One Leg Balance	M	15.38	18.56	19.58	18.12	20.17	19.57
	SE	1.12	1.09	0.65	0.50	0.52	1.12
Walking heels raised	M	14.01	14.23	14.06	14.14	13.88	14.33
	SE	0.38	0.19	0.22	0.34	0.27	0.33
Jumping on mats	M	4.79	4.90	4.74	4.86	4.93	4.78
	SE	0.75	0.01	0.06	0.05	0.02	0.05
Catching beanbag	M	7.22	8.27	8.57	7.52	8.23	9.13
	SE	0.18	0.17	0.10	0.20	0.16	0.14
Throwing beanbag onto mat	M	5.62	6.66	7.20	5.64	6.53	7.12
	SE	0.26	0.18	0.15	0.43	0.15	0.24

activities such as swimming lessons and teacher absences resulted in a smaller average dosage than requested. During the intervention, each classroom on average practiced 75 skills involving the trunk and lower limb. These included skills requiring static and dynamic balance and climbing. On average 42 locomotor skills such as running skipping, hopping and jumping were practiced during the intervention in each classroom. Less throwing, catching and kicking skills were practiced with an average of 30 per classroom. However, of these 59% of skills practiced involved throwing whereas only 29% involved catching.

5. Discussion

Previous research has revealed promising findings regarding the efficacy of the *Animal Fun* program for improving the movement skills of young children. Piek et al. (2013) found an improvement in the overall motor proficiency (measured by the BOT-2 SF) of children who participated in the intervention program compared to control children. While the results of the current study present some inconsistent findings, overall, they provide further support for the efficacy of *Animal Fun* and suggest that the movement program appears to have a positive effect on specific movement skills of throwing and one leg balance. The effective execution of such motor skills may have an important role in predicting the performance of other movements, such as fundamental movement skills and thus, more complex skills that are required to participate in sporting and physical leisure activities, and ultimately engage in an active lifestyle (Clark & Metcalfe, 2002). Children need to be provided with opportunities to learn and practice such skills through developmentally appropriate activities and the results of this study provide preliminary evidence that *Animal Fun* improves important movement skills in young children, using a fun and inclusive approach. Such an approach can also enhance motivation by making a routine task into a fun game of imitation, such as walking to the bathroom for hand washing into a fun game of imitation by pretending to walk like a penguin, or prance like a horse.

The findings revealed that children in the intervention group improved their one-leg balance skills compared to controls, and that this effect occurred regardless of a child's pre-intervention motor proficiency level, cognitive functioning, age and gender. Specifically, it was found that while both groups (i.e., intervention and control) improved on one-leg balance skills from pre- to post-test, the intervention group showed a moderate to large improvement (d = .69) from pre-test to 18 month follow-up, whereas, the control group showed no significant improvement during this interval. It is possible that the findings of an improvement for both groups from pre- to post- test are partly explained by maturational changes in the children during this developmental stage, whereas, evidence for an improvement in balance skills that continues to follow up for the intervention group suggests potential benefits of the *Animal Fun* program for these skills. These results are significant given that balancing ability is an essential pre-requisite for proficient performance in most activities of daily living (including standing and walking), as well as for other sports related motor skills.

Although the results revealed an overall improvement in the throwing performance of both intervention and control groups over time (which may again be partly understood by maturational changes during this time), a closer examination of the results found that *Animal Fun* had an important effect on the throwing skills of children with poorer motor proficiency. Specifically, it was found that the *Animal Fun* program improved the throwing skills of children with poorer pre-intervention motor proficiency, showing a large improvement (d = 1.19) from pre-test to 18 month follow-up. The control children with poorer motor proficiency did not demonstrate an improvement in their throwing skills over time. The current findings are important given that ball skills are the cornerstones of many games and sporting activities and therefore, they play an important role not only in physical activity participation but also in social interaction (Schott & Rhode, 2007). The findings also demonstrated that boys with poor motor proficiency may be more at risk in terms of improving throwing skills than girls in their first year of school. Specifically, it was found that unlike the girls, boys with poor motor proficiency in the control group did not improve their throwing skills once they reached year 1 of school. In their study investigating the fundamental movement skills of preschool aged children, Hardy, King, Farrell, Macniven, and Howlett (2010) found that boys demonstrated better object control skills than girls. It was suggested that this may be associated with socialization and gender differences in games and play interactions (e.g., focus on competitiveness for boys) that result in differing opportunities for skill practice (i.e., less skill practice for girls in this area). It is possible that boys with poor motor proficiency are more likely to withdraw from such games and play interactions that focus on competition and highlight their limitations in this skill area. This would reduce their opportunity for skill practice and development and hence, intervention such as *Animal Fun* would be particularly important for this group.

Interestingly, the catching skills of both the intervention and control groups improved over time, although from post-test to follow-up, the control group improved at a significantly greater rate than the children in the intervention group. It is therefore difficult to attribute the improvement demonstrated by the children in the intervention group to the *Animal Fun* program. It is important to note that *Animal Fun* activities focussing on the skill of catching are limited in the program, with as few as 4 skills available to teachers. This is partly because such activities require an active throwing participant which may be difficult to implement given the teacher-student ratio in the classroom and given the developmental maturity of these skills in young children. Furthermore, potential impacts from confounding individual factors may also explain the results of the study, for example, a parent's interest in playing catching games with their child, children's participation in extracurricular activities, schools comprising specialist physical education teachers, and control teachers potentially practicing more catching-related games. These possible factors influencing the results were not controlled for and therefore present a limitation of the current study.

It is important to note that scores for both walking heels raised scores and jumping tasks demonstrated little variance across all children, that is, most children scored the maximum of 15 steps and 5 jumps at all three test times. This suggests that most children in the current study did not experience difficulties performing these tasks.

The current study used the MABC-2 to assess specific motor skills of aiming and catching, and balance, as these represent categories of fundamental movement skills. Such skills have an important role in the performance of other complex motor activities such as sports. However, the MABC-2 and BOT-2 SF use normative data from a sample from the United States and the United Kingdom respectively. Although both tests are widely accepted and used internationally with good psychometric properties, future research could aim to examine their use in the Australian context.

In conclusion, young children aged 4–6 years engaging in the *Animal Fun* program were found to improve in their balance skills, while throwing skills improved for those children with poorer motor proficiency. Catching improved in both control and intervention groups, which may suggest that an improvement in the *Animal Fun* program would be the inclusion of more skills that target catching. These findings further support the importance of *Animal Fun* which has also been found to improve social and behavioural functioning in young children (Piek et al., 2015).

Conflict of interest

None.

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