Animal Fun: Supporting the motor development of Italian preschoolers

Francesca Policastro [a],[*], Marina Biancotto [b], Stefania Zoia [b]

[a] *Department of Medical Science, University of Trieste, Italy*
[b] *Azienda Sanitaria Universitaria Giuliano Isontina, Italy*

ARTICLE INFO

ABSTRACT

The present literature supports the importance of physical activity from a very early age. However, there is a lack of information about evidence-based motor programs suitable for supporting preschoolers' development in Italy. The Animal Fun program, developed in Australia, might be a valuable tool to promote children's development. The aim of this study was to use Animal Fun to verify the motor improvements in balance, aiming and catching, and the manual skills of Italian preschoolers. One hundred nineteen preschool children (3- to 6-year- olds) from three Italian kindergartens were recruited. The kindergartens were randomly allocated to intervention and control groups. The Movement Assessment Battery for Children - 2 (MABC-2) was administered to all children at the baseline and one-month follow-up. The kindergarten assigned to the control group followed the standard curriculum, involving general physical activity; the kindergartens assigned to the Animal Fun group followed the Animal Fun program activities (thirty minutes, three times a week). Data demonstrated the statistical differences between the scores of the two groups in each domain and total score of the MABC-2 (aiming and catching, balance, and manual dexterity). The results of this study suggest that Animal Fun can support the motor improvements of Italian preschoolers and that it is applicable in the Italian context, where there is a lack of movement programs supporting the development of young children with and without motor difficulties.

1. Introduction

Early childhood settings play a significant role in promoting physical activity and developing motor skills in young children (Oberer, Gashaj, & Roebers, 2017). This time is a crucial period in a child's life because fundamental movement skills are developing at this stage, for both gross and fine motor tasks (Hands, 2012; Zeng et al., 2017). For example, Haugen and Johansen (2018) focused on the effect of physical activity on motor competencies during this stage of development. In their ten-year study, following children from 5/6 years old to 15/16 years old, the researchers showed that children with poor motor skills cannot catch up with their peers and their motor difficulties persist into young adolescence. Despite the priority to improve young children's motor skills, Howie and Pate (2017) demonstrated that most American preschoolers do not practice the recommended amount of daily physical activity.

Indeed, there have been only a small number of studies regarding motor programs for early childhood. One exception is Animal Fun, developed by Piek et al. (2010). This program was designed to provide developmentally appropriate activities that would be fun and engaging for all children aged 3 to 6 years while targeting specific areas of development. It is playful, fun, and imaginative. Animal Fun provides many activity ideas to develop motor planning, fundamental movement skills, and specific muscle groups. Specifically, Animal Fun is an imaginative program of movement in which the children imitate animals' movements. It is flexible and does not provide a rigid structure to follow but adapts to children's interests and abilities (Piek et al., 2013). Thus, Animal Fun is an ecologically valid program that can be used in kindergartens during ordinary activities (Greenberg et al., 2003). The protocol is designed to benefit all children in the group, those with and without motor difficulties (Piek et al., 2015), and thus, by including all the members of a class, Animal Fun avoids the stigma associated with special programs.

Evidence demonstrates that Animal Fun supports the development of overall motor ability, particularly throwing and balance skills (De Oliveira et al., 2019), and significantly improves social skills in young children (Piek, Bradbury, Elsley, & Tate, 2008). Piek et al. (2013) confirmed the efficacy of Animal Fun on motor performance of 4 to 6-year-old children through a randomized controlled trial, which included 511 children aged 4.83–6.17 years. The study of the Australian team followed 12 schools (6 intervention group and 6 control group) for

---

6 months of Animal fun activity, and then they followed up the children at 12 and 18 months. They assessed the changes in motor performance using the Movement Assessment Battery for Children-2 and the Bruininks-Oseretsky Test of Motor Proficiency short form; they found out that the Animal fun group improved in the balance skills, while the throwing skills improved for those children with poorer motor proficiency. Catching improved for both groups.

Children in Italy are typically less active than children in other European countries. Through a parent survey, Caroli, Malecka-Tendera, Bent, and Longo (2011) highlighted that the rate of children practicing sports, walking back and forth from home to kindergarten, or playing outside, was lower compared to Danish and Polish children. The authors identify possible reasons for this pattern, including parents' risk perception and the urban environment. In Italy, even small towns are not built to suit children's needs, and there are few places where the children can actively and safely play outside (Bagordo et al., 2017; Caroli et al., 2011). Moreover, the European Childhood Obesity Surveillance Initiative of the World Health Organisation (WHO) demonstrates that the weekly physical education classes in Italy average 90 min long. These data refer to physical education classes in primary school (for children between 6 and 10 years old), and the Italian classes are shorter in duration than most European countries (Wijnhoven et al., 2014; World Health Organization, 2019).

By considering the peculiarities of the Italian context and the evidence about the efficacy of Animal Fun with Australian children, our aim was to verify the motor improvements of Italian preschoolers using this tool. By integrating this activity into the daily routine of the kindergarten, we expect to introduce a new tool able to support motor development of Italian preschoolers.

2. Method

2.1. Participants

A total of 119 preschool children (63 males and 56 females) aged 3–6 years were included in this study. The children were recruited from three kindergartens in Trieste province (northeast Italy). Two kindergartens were randomly allocated to the intervention (31 males and 28 females) and one to the control group (32 males and 28 females). This project was approved by the Ethics Committee of the University of Trieste. As a clinical trial, this project has been registered with the Clinicaltrials.gov registry with the number: 86-7/3/2018.

2.2. Animal fun

The Animal Fun program consists of nine modules: Body Management, Locomotion, Object Control, Body Sequencing, Body and Kinesthetic Management, Fine Motor Planning, Tool Control, Hand Skills, and Social/Emotional Development. Animal Fun consists of 97 activities related to the animal world, with varying degrees of difficulty (easy, medium, and difficult). The activities are in written form and graphically explained. The details and the critical point of each motor task are highlighted to promote the correct motor performance. For instance, in the 'Bear Walk' (module 4, medium), the starting position and the movement are described: 'Bears walk using a same side arm/leg pattern with the arm moving slightly earlier than the leg'. Moreover, the critical point is underlined: 'The children should use arm/leg on the same side'.

2.3. Procedure

The kindergartens' managers and the parents received a detailed written description of the project's purposes and procedures and the possible risks and benefits of participation. All the parents who were approached gave their informed written consent to allow their children to participate in the study. The kindergarten assigned to the control group followed the standard curriculum, apart from the two assessment sessions. The standard curriculum included thirty-minute sessions of general gross motor activities three times a week, conducted by the teachers without following a structured movement program. For the kindergartens assigned to the Animal Fun group, instead of general gross motor activities, we provided one month of Animal Fun activities (thirty minutes, three times a week), in addition to the two assessment sessions. The assessment was not blinded, and both researchers and teachers knew which group (intervention or control) the children were in. A physiotherapist delivered the Animal Fun activities to the whole class during the regular primary school program. A teacher participated and helped manage the children, especially during the large group activities. During the activities, we guided and corrected the children to make them aware of the correct movements. As suggested in the program, we could also support the children for the more difficult movements using our hands. For instance, in the 'Dog Shaking Water Off' (module 1, difficult), the critical point suggests 'Children who need help to stay in position should be helped at the shoulder or hips'. In order to have precise results about the impact of the Animal Fun activity at kindergarten, at this stage, we did not encourage the parents to do Animal Fun activities at home. Animal Fun was offered to control group teachers after the conclusion of this study. Some teachers from the control group took up the offer and asked for additional information about future training on how to use the program.

2.4. Measures

Following Piek et al. (2013), The Movement Assessment Battery for Children—2 (MABC-2) was used to evaluate motor performance and detect those at risk or with the possibility of Developmental Coordination Disorder (Henderson, Sugden, & Barnett, 2007). This test is suitable for children and adolescents aged 3 to 17 years and assesses the motor skills of children in the following domains: Aiming and Catching (AC), Balance (Bal), and Manual Dexterity (MD). Cluster and total standard scores for children are provided, with higher scores demonstrating better performance. A total test score (Tot MABC-2) at or below the 5th percentile indicates significant movement difficulty, while a score between the 6th and 16th percentile indicates children at risk for motor difficulty. Children were scored by their actual age in this assessment tool, and the referring tables have been corrected for age by considering the exact date of birth of the children. In these tests, the items and the scores were compared to the normative data of the updated version of the Italian MABC-2 (Biancotto, Guicciardi, Pelamatti, Santamaria, & Zoia, 2016).

2.5. Statistical analysis

The analysis of this pre-post intervention-controlled trial was conducted in R (R Core Team, 2017), and graphs were produced using the package Rcmdr and its plug-ins. The normality of the variables was assessed through the Shapiro-Wilk test. Intervention and control groups were compared at the baseline through Fisher's Exact test for the categorial variables (gender and motor difficulties) and the Mann-Whitney U test for the Body Mass Index (continuous non-normally distributed variable).

By examining the MABC-2 scores, the two-tailed Mann-Whitney U test was used to identify whether the improvement in one group was more significant than the other and to determine the difference between the two groups' distributions. For this purpose, the new variable Δt was created to define the difference between the final and the basal scores. This new value (Δt = *final raw score − basal raw score*) consisted of a difference, allowing for the ability to identify the improvement (positive values) and decline (negative values). The Kaplan-Meier estimate of the median and 95 % confidence interval were reported for each variable at Δt.

3. Results

Table 1 reports the baseline characteristics for the control and intervention groups. No significant statistical differences existed

Table 1

Results of the Animal Fun and control group at the baseline.

Baseline		Animal Fun (n = 59)	Controls (n = 58)	p-value
Gender, n (%)	F	31 (52.5)	28 (48.3)	0.71
	M	28 (47.5)	30 (51.7)	
Age (y), median [min, max]		4.77 [2.72–6.24]	4.40 [3.01–5.99]	0.32
BMI, median [min, max]	F	15.77 [13.4–21.4]	15.82 [13.6–22.0]	0.83
	M	15.86 [13.5–21.3]	15.85 [13.7–21.6]	0.97
Motor difficulties, n (%)	No[a]	54 (91.53)	54 (93.15)	1.00
	At risk for[b]	2 (3.39)	2 (3.45)	
	Yes[c]	3 (5.08)	2 (3.45)	

BMI=Body Mass Index, y = years.

[a] No motor difficulties, children with MABC-2 percentile score higher or equal to 16.

[b] Children at risk for motor difficulties with MABC-2 percentile score between 6 and 16.

[c] Children with motor difficulties, with MABC-2 percentile score lower or equal to 5.

between the Animal Fun group and the control group, concerning the gender, the age, the BMI, and the motor difficulties.

Three children in the Animal Fun group had significant motor difficulties (scores lower or equal to the 5th percentile), and two children were at risk for motor difficulties (scores between the 6th and the 16th percentiles included). In the control group, there were respectively two and two children.

In both groups, some children practiced sports in the afternoon outside the kindergarten (33.9 % of the intervention group; 37.9 % of the control group), including all 9 of the children at risk for motor delay. In the intervention group, 20 children practiced sports: six practiced swimming (30 %), six practiced gym or dancing (30 %), four practiced team sports (20 %), while four practiced other activities (20 %). In the control group, 22 children practiced sports: eight practiced swimming (36.4 %), seven practiced gym or dancing (31.8 %), five practiced team sports (22.7 %), while two practiced other activities (9.1 %).

The analysis of the Δt distribution with the Mann-Whitney *U* test (Table 2) confirmed the existence of statistically significant differences between the groups after the intervention for all the domains: aiming and catching, balance and manual dexterity. Moreover, the descriptive data highlighted that the scores of the intervention group at follow-up were always higher than the scores of the control group. For aiming and catching, we report the difference in the means and the standard deviations. For the balance, the manual dexterity, and the total score we report the medians. In the control group, the medians for balance, manual dexterity, and the total score decreased between the baseline and follow-up.

The following boxplots (Fig. 1) show the distributions of the two groups for each variable at Δt by considering the interquartile range and the outliers.

In every task, the median scores of the Animal Fun group ranked higher than the control group. The MABC-2 total score shows the most relevant result, considering that the median score of the Animal Fun group is higher than the third quartile of the control group.

At the follow-up, all the children who demonstrated significant motor difficulties or risk for motor difficulties at the baseline scored in

the normal range (in both the control and intervention groups). To be more specific, we adopted the concept of the Smallest Detectable Change. According to the recent evidence of Serbetar, Loftesnes, and Mamen (2019), a change in the MABC-2 total raw score for this age band larger than 8.75 is needed to ensure 95 % certainty that the change in score is not due to the variability or measurement errors of the tester, but rather a real change in score. In both groups, all the children with motor difficulties and at risk for motor difficulties met the SDC criterion, which identifies their improvement.

4. Discussion

The purpose of this study was to verify the motor improvements of Italian children using the Animal Fun program in kindergarten. Motor ability influences the physical, psychological, and social development of children (Cairney, 2015; Cairney, Rigoli, & Piek, 2013; King-Dowling, Missiuna, Rodriguez, Greenway, & Cairney, 2015; Li, Kwan, King-Dowling, Rodriguez, & Cairney, 2021). Bart, Hajami, and Bar-Haim (2007) affirm that promoting physical activity in the pre-school years supports motor development (Piek et al., 2013). Thus, early childhood is a significant age band for developing all the necessary motor prerequisites and motor skills.

Introducing Animal Fun into Italian kindergartens supports motor skills development.

Despite the national evidence showing low levels of physical activity of Italian children (Bagordo et al., 2017), our sample consisted mainly of healthy and coordinated children with generally high baseline scores in the MABC-2. At the baseline, the two groups demonstrated no differences considering age, gender distribution, BMI, or motor skills. There were also no differences between the groups in the classification based on the MABC-2. Nevertheless, we still found that one month of Animal Fun activities improved children's aiming and catching, balance, and manual dexterity. The great motor improvement of the children in this study is coherent with the previous Australian studies, even if the time course of the Animal Fun activity was shorter for the Italian children.

Table 2

MABC-2 results of the Animal Fun and control group for each domain at the baseline, at follow-up, and at Δt (comparison using the Mann-Whitney *U* Test).

		AC	BAL	MD	MABC-2
Animal Fun	Baseline	9.98 [3.01]	12 (1,16)	13 (1,19)	13 (1,19)
	Follow-up	13.15 [2.04]	14 (6,18)	14 (6,19)	15 (7,19)
	Δt	3 (−6,10)	2 (−1,14)	0 (−5,10)	3 (−1,10)
Controls	Baseline	9.16 [2.78]	11 (6,16)	14 (1,19)	13 (4,18)
	Follow-up	11.38 [2.21]	10.5 (4,16)	13 (5,19)	12 (7,19)
	Δt	1.5 (−5,15)	0 (−6,10)	−1 (−10,12)	0 (−5,7)
p-value (Δt)		0.04	<0.001	<0.001	<0.001
Median, CI 95 % (Δt)		-1,5 (−3,0)	−2 (−3,−1)	-1 (−2,0)	−2 (−3,−1)

For Balance, Manual Dexterity, and Total Score, data refer to median, maximum, and minimum values. For Aiming and Catching, data refer to mean and standard deviation. This difference is related to the normality of this last variable.

AC = Aiming & Catching, BAL = Balance, MD = Manual Dexterity, MABC-2 = Total Score. Significant p-value at p < 0.05. CI = Confidence Interval (controls-Animal Fun).
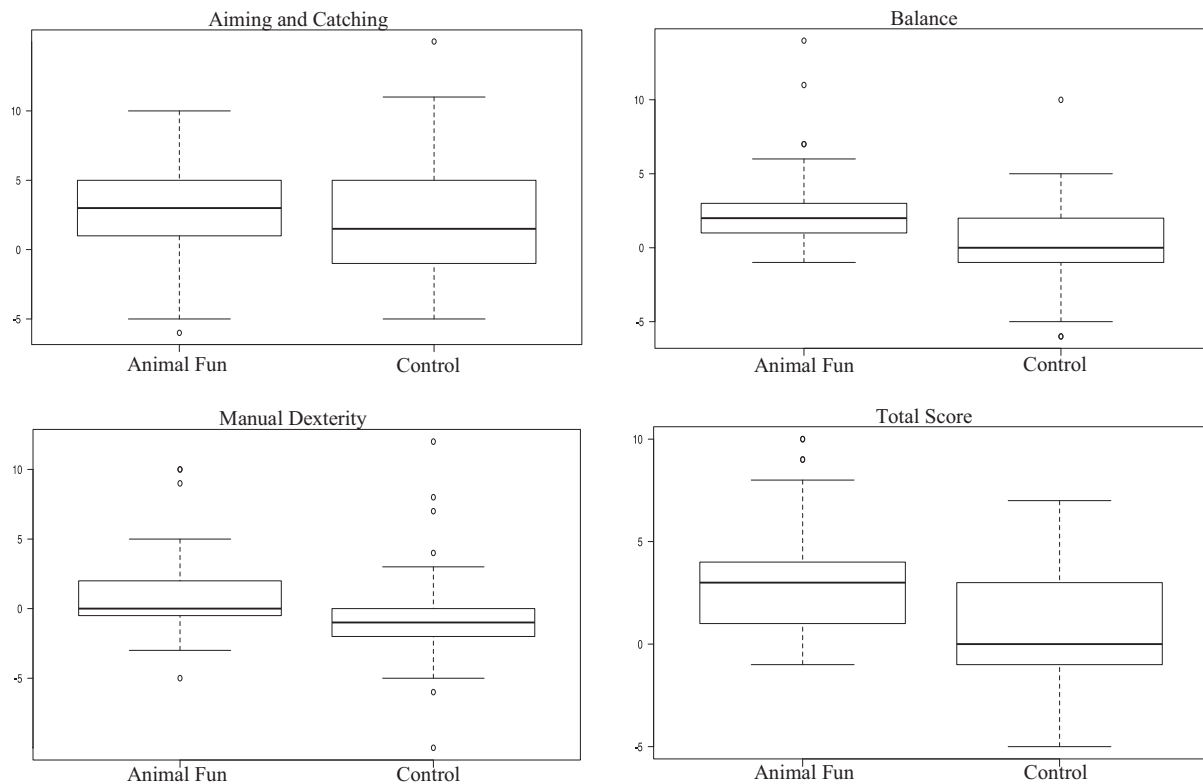
Fig. 1. Boxplots representing the distribution of the results of the Animal Fun and control groups for each domain at Δt (difference between the final and the basal scores).

Moreover, by comparing the actual results to the previous, the positive impact of Animal Fun seems greater in the Italian children. In fact, the present data confirm the Australian improvements in one leg balance task, and in throwing (De Oliveira et al., 2019), by adding also other main motor skills. This could be due to the different baseline scores, which were higher in the Australian children, and to the numerosity of the samples; anyway, the results confirm the importance for the Italian children to introduce in the school such motor program as Animal Fun.

Taking into account the specific context, Italy differs from other countries by not having specific guidelines or directions about recommendations for motor activity in kindergarten. Consequently, each kindergarten decides how, when, and how much physical activity is provided. This may occur due to less emphasis on such skills. In contrast, the introduction of a specific program such as Animal Fun, which emphasizes the development of the core balance needed for manual dexterity, seems to have a positive impact on the distribution of the scores. For example, it is common in Italy to play the 'Animals' game by imitating, for instance, a dog moving. However, Animal Fun does not suggest merely imitating the animal but encourages the teachers to pay attention to the correct position of the legs, back, and the whole body to ensure that the correct muscles are being used to facilitate the development of a particular motor skill. Animal Fun allows the children to try several creative movements, with and without objects. These activities help the child build his appropriate motor background and, in some cases, lead the children to a specific motor improvement. For instance, in the 'Kitten Hit' (module 3, easy), the child should gently tap a ball suspended in a stocking or bag hanging from a climbing frame. This activity trains the child on balance, coordination, reaction, aiming, catching, and many other skills. The 'Dolphin Roll' is another example (module 4, easy); the child lies down with the arms above the head and rolls using only the trunk muscles, not the arms or the legs. During this movement, all the core muscles of the trunk and back are trained in order to provide the appropriate core stability for a preschooler. In this way, the child is not just improving a specific motor skill but is working

on fundamental muscle prerequisites. On the other hand, the 'Bunny Tails' (module 6, easy) works specifically on manual dexterity by asking the children to make bunny tails with cotton wool.

The current study has some limitations. First, the assessment was not blinded, which may have influenced the results because the assessors knew the children of both groups. The children's familiarity with the researchers and vice versa could be a possible bias in post-testing for both groups. Second, the lack of a follow-up to detect long-term changes and improvements is a limitation, and we aim to overcome this problem in future studies with a larger sample.

In conclusion, the present results demonstrate the positive effect of the Animal Fun program on an Italian sample of preschoolers, who significantly improved their motor skills compared to a control group. Animal Fun appears to be a developmentally appropriate motor program that is easy to implement, and it supports motor development above and beyond general free play or sports activities. Teachers can share their knowledge of the importance of motor development with parents and how this can impact a child's self-concept. Parents can support teachers by providing extra opportunities for their children to practice the skills at home, after school, on weekends, and during holidays. The idea of parents and teachers working in partnership on motor activity is also linked to children's need to move as much as possible. The World Health Organisation suggests that preschoolers spend at least 180 min daily in various types of physical activity to promote physical and mental health. Animal Fun could be an asset for this purpose.

Data sharing

The data that support the findings of this study are available from the corresponding author upon reasonable request.

CRediT authorship contribution statement

FP participated in the study design and coordination of the study,

drafted and revised the manuscript; SZ participated in the study design, and revised the manuscript. MB participated in the study design. All authors read and approved the final manuscript.

Declaration of competing interest

The author FP is a certified trainer for Animal Fun in Italy as mentioned on the website www.animalfun.com.au.

Data availability

Data will be made available on request.

Acknowledgements

References

Bagordo, F., De Donno, A., Grassi, T., Guido, M., Devoti, G., Ceretti, E.Gelatti, U., … (2017). Lifestyles and socio-cultural factors among children aged 6–8 years from five Italian towns: The MAPEC_LIFE study cohort. *BMC Public Health, 17*(1), 1–12. https://doi.org/10.1186/s12889-017-4142-x

Bart, O., Hajami, D., & Bar-Haim, Y. (2007). Predicting school adjustment from motor abilities in kindergarten. *Infant and Child Development: An International Journal of Research and Practice, 16*(6), 597–615. https://doi.org/10.1002/icd.514

Biancotto, M., Guicciardi, M., Pelamatti, G. M., Santamaria, T., & Zoia, S. (2016). *Movement assessment battery for children* (2nd ed.). Firenze, Italy: Giunti O.S. Psychometrics.

Cairney, J. (2015). *Developmental coordination disorder and its consequences.* University of Toronto Press.

Cairney, J., Rigoli, D., & Piek, J. (2013). Developmental coordination disorder and internalizing problems in children: The environmental stress hypothesis elaborated. *Developmental Review, 33*(3), 224–238. https://doi.org/10.1016/j.dr.2013.07.002

Caroli, M., Malecka-Tendera, E., Bent, E. M., & Longo, A. (2011). PERISCOPE PROJECT: Proceedings of the workshop on physical activity and indoor/outdoor environment in kindergartens. *International Journal of Pediatric Obesity, 6*(S2), 1. https://doi.org/10.3109/17477166.2011.613650

De Oliveira, J. A., Rigoli, D., Kane, R., McLaren, S., Goulardins, J. B., Straker, L. M. Piek, J. P., … (2019). Does 'Animal Fun' improve aiming and catching, and balance skills in young children? *Research in Developmental Disabilities, 84*, 122–130. https://doi.org/10.1016/j.ridd.2018.07.004

Greenberg, M. T., Weissberg, R. P., O'brien, M. U., Zins, J. E., Fredericks, L., Resnik, H., & Elias, M. J. (2003). Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. *American Psychologist, 58*(6-7), 466. https://doi.org/10.1037/0003-066X.58.6-7.466

Hands, B. (2012). How fundamental are fundamental movement skills? *Active and Healthy Magazine, 19*(1).

Haugen, T., & Johansen, B. T. (2018). Difference in physical fitness in children with initially high and low gross motor competence: A ten-year follow-up study. *Human Movement Science, 62*, 143–149. https://doi.org/10.1016/j.humov.2018.10.007

Henderson, S. E., Sugden, D. A., & Barnett, A. L. (2007). *Movement assessment battery for children-2. Harcourt assessment.* London, UK: Psychological Corporation.

Howie, E. K., & Pate, R. R. (2017). Physical activity and educational achievement: Dose–response relationships. In *Physical activity and educational achievement* (pp. 9–31). Routledge.

King-Dowling, S., Missiuna, C., Rodriguez, M. C., Greenway, M., & Cairney, J. (2015). Co-occurring motor, language and emotional–behavioral problems in children 3–6 years of age. *Human Movement Science, 42*, 344–351. https://doi.org/10.1016/j.humov.2014.10.010

Li, Y. C., Kwan, M. Y., King-Dowling, S., Rodriguez, M. C., & Cairney, J. (2021). Does physical activity and BMI mediate the association between DCD and internalizing problems in early childhood? A partial test of the environmental stress hypothesis. *Human Movement Science, 75*, Article 102744. https://doi.org/10.1016/j.humov.2020.102744

Oberer, N., Gashaj, V., & Roebers, C. M. (2017). Motor skills in kindergarten: Internal structure, cognitive correlates and relationships to background variables. *Human Movement Science, 52*, 170–180. https://doi.org/10.1016/j.humov.2017.02.002

Piek, J. P., Bradbury, G. S., Elsley, S. C., & Tate, L. (2008). Motor coordination and social–emotional behaviour in preschool-aged children. *International Journal of Disability, Development and Education, 55*(2), 143–151. https://doi.org/10.1080/10349120802033592

Piek, J. P., Kane, R., Rigoli, D., McLaren, S., Roberts, C. M., Rooney, R.Straker, L., … (2015). Does the animal fun program improve social-emotional and behavioural outcomes in children aged 4–6 years? *Human Movement Science, 43*, 155–163. https://doi.org/10.1016/j.humov.2015.08.004

Piek, J. P., McLaren, S., Kane, R., Jensen, L., Dender, A., Roberts, C.Straker, L., … (2013). Does the animal fun program improve motor performance in children aged 4–6 years? *Human Movement Science, 32*(5), 1086–1096. https://doi.org/10.1016/j.humov.2012.08.004

Piek, J. P., Straker, L. M., Jensen, L., Dender, A., Barrett, N. C., McLaren, S.Bradbury, G., … (2010). Rationale, design and methods for a randomised and controlled trial to evaluate" animal Fun"-a program designed to enhance physical and mental health in young children. *BMC Pediatrics, 10*(1), 78. https://doi.org/10.1186/1471-2431-10-78

Serbetar, I., Loftesnes, J. M., & Mamen, A. (2019). Reliability and structural validity of the movement assessment battery for Children-2 in Croatian preschool children. *Sports, 7*(12), 248. https://doi.org/10.3390/sports7120248

Team, R. C. (2017). *A language and environment for statistical computing.* Vienna: R Foundation for Statistical Computing. A Language Environment for Statistical Computing.

Wijnhoven, T. M., van Raaij, J. M., Spinelli, A., Starc, G., Hassapidou, M., Spiroski, I. Breda, J., … (2014). WHO european childhood obesity surveillance initiative: Body mass index and level of overweight among 6–9-year-old children from school year 2007/2008 to school year 2009/2010. *BMC Public Health, 14*(1), 1–16. https://doi.org/10.1186/1471-2458-14-806

World Health Organization. (2019). To grow up healthy, children need to sit less and play more. 2019. Available at: https://www.who.int/news/item/24-04-2019-to-grow-up-healthy-children-need-to-sit-less-and-play-more. (Accessed 4 March 2021).

Zeng, N., Ayyub, M., Sun, H., Wen, X., Xiang, P., & Gao, Z. (2017). Effects of physical activity on motor skills and cognitive development in early childhood: A systematic review. *BioMed Research International.* https://doi.org/10.1155/2017/2760716