2017

Promoting ball skills in preschool-age girls

Sanne L.C. Veldman
University of Wollongong

Kara K. Palmer
University of Michigan

Anthony D. Okely
University of Wollongong, tokely@uow.edu.au

Leah Robinson
University of Michigan

Publication Details

Veldman, S. L.C., Palmer, K. K., Okely, A. D. & Robinson, L. E. (2017). Promoting ball skills in preschool-age girls. Journal of Science and Medicine in Sport, 20 (1), 50-54.

Promoting ball skills in preschool-age girls

Abstract
Objectives: Evidence supports that girls are less proficient than boys at performing ball skills. This study examined the immediate and long-term effects of a ball skill intervention on preschool-age girls' ball skill performance. Design: Randomized controlled trial. Methods: Girls (Mage = 47.24 ± 7.38 months) were randomly assigned to a high autonomy, mastery-based 9-week motor skill intervention (the Children's Health Activity Motor Program; CHAMP, 540 min; n = 38) or a control group (free-play; n = 16). Ball skill proficiency was assessed at pretest, posttest, and retention test(after 9 weeks)using the object control subscale ofthe Test of GrossMotor Development - 2ndEdition. Treatment efficacy was examined using linear mixed models. Two models were fit: one for short-term changes (pretest to posttest) and one for long-term changes (pretest to retention). Results: Linear mixed models revealed a significantly time*treatment interaction for both models. Post hoc analysis confirmed that girls in CHAMP experienced significant gains in ball skills from pretest to posttest ($p < .001$) and pretest to retention ($p < .001$). Moreover, girls in CHAMP were no different from the control group at pretest($p > .05$) but had significantly higher ball skills scores at both posttest($p < .001$) and retention ($p < .001$). Conclusions: This study demonstrates the positive effects of a ball skill intervention (i.e., CHAMP) on improving girls' ball skills both short- and long-term. Findings suggest that early childhood interventions that focus on the development of ball skills in young girls might be an avenue to improve girls' ball skill performance.

Disciplines
Education | Social and Behavioral Sciences

Publication Details
Veldman, S. L.C., Palmer, K. K., Okely, A. D. & Robinson, L. E. (2017). Promoting ball skills in preschool-age girls. Journal of Science and Medicine in Sport, 20 (1), 50-54.

Promoting object control skills in preschool-aged girls

Veldman, S.L.C., Palmer, K.K., Okely A.D. & Robinson L.E. (2016)

Introduction

Gross motor skills involve using the large muscles in the body and develop across childhood ,[1]. Gross motor skills serve as the foundational building blocks for future and advanced motor behaviors ,[2]. Often gross motor skills are divided into two categories: (1) locomotor skills, that propel the body through space (e.g. run, jump, and skip) and (2) object control skills (also known as manipulative or ball skills), that propel an object through space (e.g. throw, kick, and strike). Gross motor skills do not solely develop through maturation ,[3 4]. The literature supports that gross motor skills are not innate but rather must be "taught, practiced, and reinforced" through developmentally appropriate motor opportunities ,[4]. This view aligns with the extant literature where gross motor skill interventions have been successful at promoting skill development across the childhood years ,[5-7].

Recent reviews support the critical role of gross motor skills in promoting and maintaining healthy developmental trajectories ,[8 9]. Robinson et al. (2015) found that gross motor skill competence is positively related to physical activity engagement, physical fitness, and perceived motor competence while being inversely related to weight status ,[8]. Logan et al. (2015) concluded that increased motor skill competence during childhood is related to physical activity ,[9]. Additionally, several empirical studies provide evidence that gross motor skills are important for cognitive, social, and language development ,[10 11]. A recent systematic review on the relationship between cognition and motor skills in typically developing children supports that weak to strong

relationships may exist between motor skills and underlying components of higher order cognition ,[12]. This relationship appears to be strongest in pre-pubescent children ,[12]. These findings support that gross motor skill competency has a cascading effect on a child's health and development.

With the importance of motor skills, deficiencies in gross motor skills could have widespread consequences such as poorer cognitive performance, language and social skills, and limited opportunities to participate in sports or other types of physical activity. Currently, children and especially preschoolers demonstrate low levels of motor skill competency ,[5 13]. The literature also shows that sex differences exist in motor skill competence where girls experience deficiencies in object control skills compared to their male counterparts. Historically, these sex differences in throwing performance can be seen in the Michigan State University Motor Performance Study ,[14]. At age 63 months, 60% of the boys had reached a mature one-handed overarm throwing pattern, while in girls this percentage was not reached until 102 months of age. These trends continue in the present literature with boys outperforming girls in preschool ,[15-17], elementary school ,[18], and high school ,[19]. Barnett et al. (2010) also found that boys were significantly more competent than girls in object control skills (i.e., kicking, catching, and throwing) during the childhood and adolescence years in Australian children ,[19].

It is clear that sex differences are present in object control skills. Barnett et al. (2008) found that the development of object control skills during childhood appears to be an important predictor of physical activity during adolescence ,[20 21]. This study examined gross motor skills and physical activity longitudinally across seven years in 276 children. Results indicated that time spent in MVPA and organized physical activity during

adolescence years (mean age = 16.4 years) was positively associated with childhood object control competence at age 10 ,[21]. Spessato et al. (2012) also noted gross motor skill sex differences in over 1200 Brazilian children ,[17]. Specifically, boys exhibited superior object control and locomotor skills compared to girls which support the need for interventions and developmentally appropriate gross motor skill programs that target girls.

As object control skill competence during childhood may be an important predictor of physical activity during adolescence, intervening at a young age to improve object control skills might therefore be critical in preventing the decline in MVPA and organized physical activity during adolescence. Robinson and Goodway (2009) examined the effect of a nine-week motor skill intervention on object control skills in Head Start preschoolers (n = 117), who often demonstrate developmental delays in gross motor skills ,[4]. They found significant improvements in object control skills in the intervention group over time, while there were no differences observed in the control group. Authors also found that these improvements remained significant at a retention test nine weeks after the cessation of the original intervention. Sex differences were not reported so the effects of an object control skill intervention in girls is not understood. As girls tend to have poorer object control skills, there is a need to target interventions to improve these skills in girls. The purpose of this study was to examine the immediate effects of an object control skill intervention in preschool girls and to assess the retention of these skills over a nine-week period. We hypothesized that the intervention will be effective in promoting object control skills in girls and that these positive changes will be maintained over time.

Methods

All aspects of this study took place in an accredited Head Start center located in a large city in the United States. Head Start programs are funded through the United States government to provide comprehensive early childhood education, health, nutrition, and services to low-income children and families. The goal of Head Start is to promote healthy development in United States children ages three to five years from families whose income is at or below the national poverty level (i.e., a family of four's annual income $\leq$ $23,550 USD).

Prior to the start of the study, Institutional Review Board approved all procedures and both parental consent and child assent were obtained. After obtaining permission, girls were randomly assigned to one of the groups (CHAMP or control). Girls in the control condition made no changes to their daily routines; girls in the CHAMP condition replaced two of their outdoor free play sessions with CHAMP two days each week. The intervention lasted for a total of nine weeks (18 lesson, 540 minutes of skill intervention). Object control skill competence of all participants was assessed three times: prior to the start of the intervention (pre), immediately following the cessation of the intervention (post), and nine weeks after the cessation of the intervention (retention). Changes in motor skill competence from the pre- to post-test represent immediate effects; changes in motor skill competence from pre- to retention represent maintenance effects.

Participants

Fifty-four girls (n = 54; mean age = 47.24 ± 7.38 months) served as participants. Race and ethnicity of the girls were 77.8% African American, 5.6 % Caucasian American, 11.1% Hispanic, 5.6% other and represents the demographics of individuals living in the proximity of the center (i.e., 24 – 32 km radius). Girls within the center were randomly assigned to one of two treatment groups: (1) a motor skill intervention group (CHAMP, mean age = 45.74 ± 7.72, n = 38) or a (2) control group (mean age = 50.81 ± 5.10, n = 16).

Intervention

Participants were assigned a random number and divided to either the intervention or control group. Thus, one preschool class included both intervention and control participants. Participants in the motor skill intervention were exposed to the Children's Health Activity Motor Program (CHAMP). CHAMP is a high quality, evidence-based program that has been shown to improve gross motor skill competence in preschool aged children ,[4 5] The intervention was implemented two times per week for nine weeks and targeted six object control skills - *throw, catch, strike off a tee, kick, dribble,* and *roll*. The program consisted of 2.5 minutes of skill introductory activity, followed by 25 minutes of object control skill instruction and activity, and concluded with a 2.5 minutes closing activity. Two of six different object control skills were taught daily, resulting in 30 minutes of motor skill instruction and activity per session, with each object control skill being taught six times across the intervention. The total time for the motor skill intervention was 540 minutes with 423-468 minutes of pure motor skill instruction. Two Ph.D. students in Motor Behavior with extensive experience in implementing

developmentally appropriate motor programs served as the instructors (i.e., 1 lead instructor and 1 assistant) for all CHAMP sessions.

Control

Participants in the control condition were exposed to the standard movement opportunities of the preschool (i.e., outdoor recess/free play). All children enrolled in the Head Start center were provided a 30-minute outdoor free play session for each day, totaling 540 minutes. This time was predominately self-directed and did not incorporate specific instruction, feedback, and practice in motor skills from an instructor. During outdoor recess/free play, the preschoolers had access to open space with typical playground equipment such as swings, slides, and various play structures and toys. No data were collected on the preschoolers' engagement during the outdoor recess/free play session.

Measurements

Object control skill competence was assessed using the object control subtest of the Test of Gross Motor Development-2nd edition (TMGD-2) ,[22]. The TGMD-2 is a reliable, valid assessment used to measure motor skill competence in children ages three to 10 years. This process-oriented assessment measures performance on six object control skills: throwing, catching, striking off a tee, kicking, dribbling, and rolling. Each of the six skills is divided into three to five specific performance criteria. During test trials, a child receives a score of one when correctly executing a performance criterion whereas failure to correctly execute a criterion results in a score of zero. The TGMD-2 was administered so that a child watches a demonstration of a correctly executed skill and then performs the skill three times: one practice trial and two test trials. Only test trials were scored. If a child was unable to demonstrate skill understanding during the practice trial a re-demonstration of a correctly executed skill was provided. No additional demonstrations were given. In the present study, all trials were video recorded and test

trials later coded by a single researcher blinded to the study who had 98% inter-rater reliability with an expert in the field. The object control skill subtest of the TGMD-2 is worth a total of 48 raw points. All raw score values were used in subsequent analysis.

Data analysis

Descriptive statistics (means and standard deviations) were used to describe object control skill levels in girls of both CHAMP and control group. To eliminate concerns regarding differences in samples sizes, linear mixed models were fitted to determine the effect of the intervention both immediately following the intervention (post-test) and nine-weeks after the intervention (retention-test). If there was a significant time*treatment interaction, independent *t*-tests were used as post-hoc analysis. All data analyses were conducted in SPSS v. 21 ,[23] and significance was set at $p = 0.05$ for all analyses.

Results

In total, 54 girls aged three to five years completed all three measurements (mean age = 47.24 ± 7.38 months, n = 38 intervention, n = 16 control). Results of object control skill scores at pre-test, post-test and retention are presented in Table 1.

The linear mixed model fit to describe changes from pre- to post-test found that girls exhibited significantly lower object control skill scores at pre-test compared with post-test (-23.98, $t_{(53.612)} = -23.224$, $p < 0.001$). This model also revealed a significant effect of treatment where the control group scored significantly lower compared to the CHAMP group, (-0.58, $t_{(98.14)} = -12.62$, $p < 0.001$) as well as a significant time*treatment interaction (23.05, $t_{(53.18)} = 12.00$, $p < 0.001$). Independent *t*-test were used as post hoc

analysis *t*-test to examine between group differences. These tests revealed that at pre-test the CHAMP and the control group did not significantly differ in regards to object control skills (10.32 ± 3.63 vs 12.56 ± 4.12, $t_{(52)}$ = -0.199, $p > 0.05$), but at post-test, girls in CHAMP had significantly better object control skill scores (32.18 ± 7.67 vs 13.50 ± 4.12, $t_{(53)} = 10.23$, $p < 0.001$, $d = 3.35$). Lastly, within group differences were explored using a post hoc paired samples *t*-test. The tests showed that girls in CHAMP significantly improved their object control skills (10.32 ± 3.63 vs 32.18 ± 7.67, $t_{(37)} = -19.46$, $p < 0.001$) whereas the control group did not change (12.56 ± 4.12 vs 13.50 ± 4.12, $t_{(15)} = -1.43$, $p > 0.05$). Changes in object control skill scores for each group over time are displayed in Figure 1.

The linear mixed model fitted to describe longer term object control skill change (i.e. pre to retention) found that girls' scores were significantly lower at the pre-test compared to the retention test (-19.01, t(53.67) = -18.74, p < 0.001). This model also found that girls in the control group scored significantly lower than girls in the CHAMP group (-14.92, t(96.04) = -9.16, p < 0.001). Lastly, this model revealed a significant time*treatment interaction (17.39, t(52.81) = 9.27, p < 0.001). Post hoc *t*-tests were used to explore the significant interaction effect. These tests found that at retention, girls in the CHAMP group scored significantly higher than girls in the control group (10.32 ± 3.63 vs 29.18 ± 7.50, t(45.06) = -9.00, p < 0.001). Further, girls in the CHAMP group significantly increased in object control skills (10.32 ± 3.63 vs 29.18 ± 7.50, t(37) = -16.20, p < 0.001) whereas the control group did not (12.56 ± 4.12 vs 14.19 ± 4.55, t(15) = -1.43, p > 0.05).

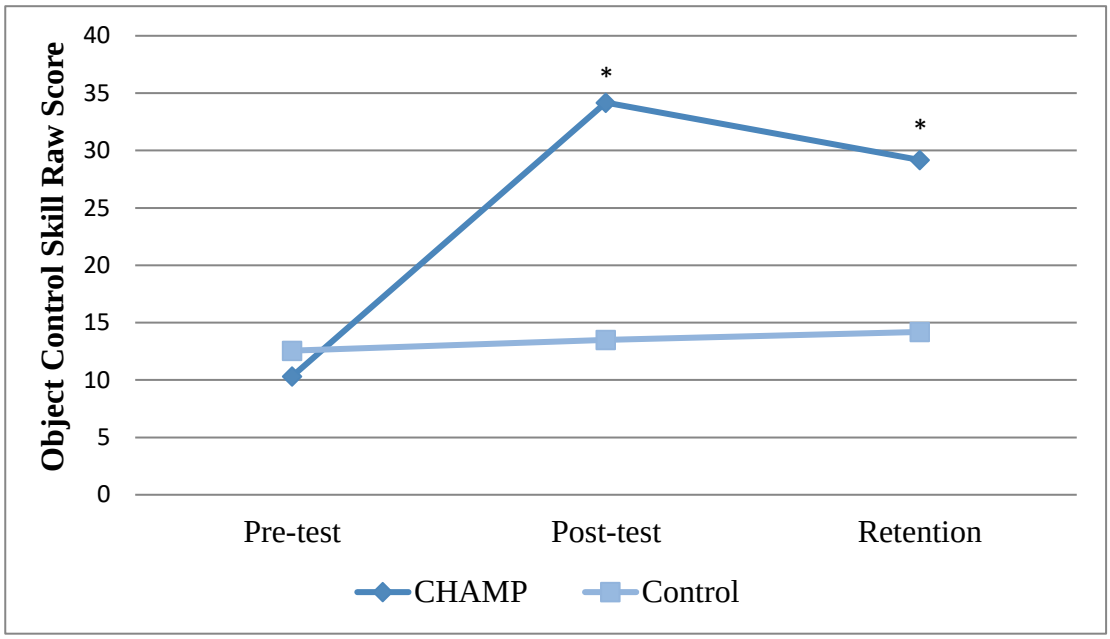

Figure 1 Mean changes in object control skill raw scores over time.

* $p < .001$

Table 1 Mean object control skill raw scores (range 0-48).

	Pre-test		Post-test		Retention	
	Intervention (n=38)	Control (n=16)	Intervention (n=38)	Control (n=16)	Intervention (n=38)	Control (n=16)
Strike (range 0-10)	2.34 ± 2.29	2.75 ± 1.39	8.42 ± 1.27	2.88 ± 1.41	5.79 ± 2.24	2.75 ± 1.18
Dribble (range 0-8)	0.11 ± 0.38	0.94 ± 1.29	4.26 ± 2.69	0.94 ± 1.29	3.08 ± 2.61	1.31 ± 1.45
Catch (range 0-6)	2.39 ± 1.37	2.56 ± 0.89	4.79 ± 1.19	2.75 ± 1.00	4.16 ± 0.44	2.94 ± 1.12
Kick (range 0-8)	2.53 ± 1.61	2.69 ± 0.87	5.68 ± 0.90	2.88 ± 0.96	5.58 ± 0.86	2.94 ± 1.00
Throw (range 0-8)	0.26 ± 1.06	0.38 ± 0.89	4.97 ± 2.82	0.50 ± 0.97	4.29 ± 2.71	0.63 ± 1.15
Roll (range 0-8)	2.68 ± 1.73	3.19 ± 1.52	6.05 ± 1.93	3.50 ± 1.63	6.29 ± 1.83	3.25 ± 1.53
Overall Score (range 0-48)	10.32 ± 3.63	12.56 ± 4.12	34.18 ± 7.67	13.50 ± 4.18	29.18 ± 7.50	14.19 ± 4.55
Total (n = 54)	10.98 ± 3.88		28.06 ± 11.70		24.74 ± 9.64	

Discussion

Object control skill competence in young children may be an important predictor of physical activity during adolescence and adulthood. However, current levels of competence in these skills are low and show that girls are less competent than boys. This study aimed to examine the effect of an object control skill intervention on preschool-aged girls and to assess the maintenance of these skills over time.

Results from this study show that girls significantly improved their object control skills after a nine-week CHAMP intervention program and thus confirm the first hypothesis. Since there are no other known studies looking at object control skill interventions in girls, these results will be compared to gross motor skill interventions in both boys and girls in the same age group. Bellows et al. (2013) implemented an 18-week physical activity intervention in child-care centers ,[24]. Motor skills were assessed pre- and post-intervention using the PDMS-2. Girls demonstrated greater improvements in object control skills compared to boys ,[24]. However, this study did not examine the retention of these specific skills (e.g., throwing, catching, and kicking) and it is difficult to compare the two assessments (i.e., PDMS-2 and TGMD-2).

In this current investigation, the researchers were able to address change from a developmental standpoint with the use of a control group. The findings support that over 18 weeks, object control skill performance in girls who did not receive any type of formalized instruction did not change. Specifically, control participants engaged in 30 minutes of outdoor recess/free play that is typical in most preschool settings. Recess and play are extremely important in

promoting healthy development during the preschool years ,[25]. However, recess opportunities should not be used as a replacement for developmentally appropriate motor programs.

Specific gross motor skill experiences are needed for the acquisition of these skills because motor skills do not "naturally" progress over time. Gross motor skills are learned because despite popular belief gross motor skills do not develop as part of normal growth and maturation. These skills, like many skills learned in preschool, (e.g., reading, writing, and arithmetic) must be "taught, practiced, and reinforced" ,[4]. The motor development literature demonstrates that little to no developmental changes are seen in gross motor skills of children who serve as control participants or receive no instruction ,[5]. In the current study, CHAMP improved girls' object control skills after 540 minutes of intervention, but it is unclear how these improvements will compare to boys. Could girls 'catch-up' to boys and stay on a similar developmental trajectory? There is a need for further research to examine object control skill interventions in girls and the ability to 'catch up' to boys.

A second aim of this study was to examine the maintenance of object control skill improvements over time. Results showed that girls in the intervention group maintained a significant improvement in object control skills over time compared to the control group. This is an important finding given the relationship between object control competence and physical activity during the adolescent years. One other known study examined the maintenance of movement skills after a preschool intervention ,[26]. Children aged eight years were assessed on their gross motor skills three years after participating in a movement skill intervention. Zask et al. (2012) found that girls in the intervention group had maintained their object control skill advantage

compared to the control group, but boys in the intervention group had not ,[26]. To the best of our knowledge, few have examined this in a preschool population. Robinson and Goodway (2009) found that preschoolers maintained positive changes following an object control skill intervention and a nine-week retention ,[4]. Robinson (2011) also found that no developmental changes occurred in control participants and positive changes resulted following the implementation of an object control skill intervention ,[27]. For both of these studies, no sex differences were examined nor was there a longer-term assessment of performance. With the emerging evidence supporting the relationship of object control skills in young children and physical activity during the adolescent years, it would be fruitful for future studies to track children's motor skills and physical activity behaviors longitudinally. This will provide vital information as to the cascading effect of object control skills on developmental trajectories.

Strengths and limitations

To the best of our knowledge, this was the first study to examine intervention effects in girls. This is a strength of the study. Another strength of this study is the administration of a retention test. It is rare in intervention work to assess the motor skill learning and short-term maintenance of an intervention. This study used a documented and evidence-based intervention, CHAMP ,[4 5]. However, limitations of the present study exist. First, this study used unequal number of participants in the intervention and control groups (38 versus 16), this was due to physical constraints that created child safety concerns for the preschool outdoor recess/free play space. The statistical analyses employed is not highly sensitive to differences in sample size and helped to mitigate this limitation. Equal numbers between the intervention and control groups would help strengthen these findings. Regardless, across 18 weeks (i.e., nine-week intervention and

nine-week retention) there were no improvements or positive outcomes/changes in the control participants which aligns with Logan et al.'s (2015) meta-analysis ,[9]. Additionally, the study lacked racial-ethnic diversity among the sample. The study also lacked the comparison of boys and girls and did not include a measurement of physical activity. However, these were not aims of the current study.

Future research

Recommendations for future research include examining the 'catch-up' effect of girls to boys following a ball skill intervention. These results would contribute to a better under-standing of object control skill changes and could provide information that enhances the design and implementation of tailored interventions for young children. It would be beneficial to examine the immediate and long-term effects of motor skill interventions on physical activity. As noted previously, more longitudinal studies are needed to understand this relationship.

Conclusions

Physical inactivity is a public health concern ,[28]. Girls and women tend to be less active than boys and men and show the greatest decline in physical activity across the lifespan ,[29]. Historical and current data support that sex differences are present in object control skills ,[19 30]. Findings from Barnett et al. (2008; 2009) support that object control skills during childhood is an important predictor of physical activity during adolescence ,[20 21]. The current study found that a nine-week object control skill intervention (CHAMP) was effective in improving object control skills in preschool-age girls and these improvements were maintained overtime.

Findings suggest that early childhood interventions that focus on the development of object control skills in young girls might be a necessary avenue to address physical inactivity.

References

1. Payne VG, Isaacs LD. Human Motor Development: A Lifespan Approach. 8th ed: McGraw-Hill Education 2011:11-21.
2. Gallahue DL, Donnelly FC. Developmental Physical Education for All Children. 4th ed: Human Kinetics 2003:24-77.
3. Goodway JD, Branta CF. Influence of a Motor Skill Intervention on Fundamental Motor Skill Development of Disadvantaged Preschool Children. *Res Q Exerc Sport* 2003;74(1):36-46.
4. Robinson LE, Goodway JD. Instructional climates in preschool children who are at-risk. Part I: object-control skill development. *Res Q Exerc Sport* 2009;80(3):533-42.
5. Robinson LE, Webster EK, Logan SW, et al. Teaching Practices that Promote Motor Skills in Early Childhood Settings. *Early Child Educ J* 2011;40(2):79-86.
6. Riethmuller AM, Jones RA, Okely AD. Efficacy of interventions to improve motor development in young children: a systematic review. *Pediatrics* 2009;124(4):e782-92.
7. Veldman SLC, Jones RA, Okely AD. Efficacy of gross motor skill interventions in young children: an updated systematic review. *BMJ Open Sport Exerc Med* 2016;2(1):e000067.
8. Robinson LE, Stodden DF, Barnett LM, et al. Motor competence and its effect on positive developmental trajectories of health. *Sports Med* 2015;45(9):1273-84.
9. Logan SW, Webster EK, Getchell N, et al. The relationship between fundamental motor skill competence and physical activity during childhood and adolescence: a systematic review. *Kinesiol Rev* 2015;4(4):416-26.
10. Leonard H, Hill E. Review: The impact of motor development on typical and atypical social cognition and language: a systematic review. *Child Adolesc Ment Health* 2014;19(3):163–70.
11. Niederer I, Kriemler S, Gut J, et al. Relationship of aerobic fitness and motor skills with memory and attention in preschoolers (Ballabeina): a cross-sectional and longitudinal study. *BMC pediatrics* 2011;11:34.
12. van der Fels IM, Te Wierike SC, Hartman E, et al. The relationship between motor skills and cognitive skills in 4-16 year old typically developing children: A systematic review. *J Sci Med Sport* 2015;18(6):697-703.
13. Hardy LL, King L, Farrell L, et al. Fundamental movement skills among Australian preschool children. *J Sci Med Sport* 2010;13(5):503-8.
14. Seefeldt V, Haubenstricker J. Patterns, phases, or stages: An analytical model for the study of developmental movement. In: Kelso JAS, Clark JE, eds. The development of movement control and coordination. New York: John Wiley & Sons, Ltd. 1982:309-18.
15. Goodway JD, Robinson LE, Crowe H. Gender differences in fundamental motor skill development in disadvantaged preschoolers from two geographical regios. *Res Q Exerc Sport* 2010;81(1):17-24.

16. Vameghi R, Shams A, Dehkordi PS. The effect of age, sex and obesity on fundamental motor skills among 4 to 6 years-old children. *Pak J Med Sci* 2013;29(2):586-89.
17. Spessato BC, Gabbard C, Valentini NC, et al. Gender differences in Brazilian children's fundamental movement skill performance. *Early Child Dev Care* 2012;183(7):916-23.
18. Hardy LL, Reinten-Reynolds T, Espinel P, et al. Prevalence and correlates of low fundamental movement skill competency in children. *Pediatrics* 2012;130(2):390-8.
19. Barnett LM, Beurden van E, Morgan PJ, et al. Gender differences in Motor Skill Proficiency from Childhood to Adulthood: A Longitudinal Study. *Res Q Exerc Sport* 2010;81(2):162-70.
20. Barnett LM, Beurden van E, Morgan PJ, et al. Does childhood motor skill proficiency predict adolescent fitness? *Med Sci Sports Exerc* 2008;40(12):2137-44.
21. Barnett LM, van Beurden E, Morgan PJ, et al. Childhood motor skill proficiency as a predictor of adolescent physical activity. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine* 2009;44(3):252-9.
22. Ulrich DA. Test of Gross Motor Development. Austin, TX: Pro-ed Publishers 2000.
23. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp, 2012.
24. Bellows LL, Davies PL, Anderson J, et al. Effectiveness of a physical activity intervention for Head Start preschoolers: a randomized intervention study. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association* 2013;67(1):28-36.
25. Milteer RM, Ginsburg KR, Mulligan DA, et al. The importance of play in promoting healthy child development and maintaining strong parent-child bond: Focus on children in poverty. *Pediatrics* 2012;129(1):204-13.
26. Zask A, Barnett L, Ros L, et al. Does a movement skill intervention in preschools result in movement skill and physical activity outcomes three years later? *The international journal of behavioral nutrition and physical activity* 2012;15:S61.
27. Robinson LE. Effect of a mastery climate motor program on object control skills and perceived physical competence in preschoolers. *Res Q Exerc Sport* 2011;82(2):355-59.
28. WHO. Physical Activity: World Health Organization; 2015 [Available from: http://www.who.int/topics/physical_activity/en/
29. Hallal PC, Andersen LB, Bull FC, et al. Global physical activity levels: surveillance progress, pitfalls and prospects. *Lancet* 2012;380(9838):1247-57.
30. Thomas JR, French KE. Gender differences across age in motor performance: a meta-analysis. *Psychol Bull* 1985;98(2):260-82.