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Sex Differences in Perceived Motor Competence After the Children's Health Activity Motor Program Intervention

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Abstract

This study examined the effects of a motor-skill intervention on children's perceived motor competence (PMC; object control, locomotor, and combined [total]) and explored if effects differed between the sexes. Preschoolers (N = 274; 47.96 months) completed either a motor-skill intervention (the Children's Health Activity Motor Program [CHAMP]) or recess. PMC was measured with the Digital Scale of PMC before and after each condition. Controlling for pretest scores, recess girls had lower posttest object-control PMC scores than CHAMP boys, CHAMP girls, and recess boys (all $p < .05$). CHAMP children had significantly higher posttest locomotor and total PMC (all $p < .001$) compared with children who engaged in recess. CHAMP partially eliminates sex differences in PMC, particularly for object-control skills. Girls who participated in recess did not increase PMC like children in CHAMP and boys who engaged in outdoor recess.

Keywords

preschoolers; self-perceptions; high autonomy; motor-skill intervention

Perceived motor competence (PMC) refers to a child's perceptions of their movement skills (i.e., how well a child *thinks* they move) and is an important factor in the development of a child's actual motor competence (MC; Stodden et al., 2008). High PMC is associated with physical activity and proficiency in fundamental motor skills (Robinson, 2011; Visser et al., 2020). Fundamental motor skills are essential building blocks of movement that develop during early childhood and are the foundation for greater MC (Goodway et al., 2019; Payne & Isaacs, 2020). Locomotor and object control skills are two components of fundamental motor skills. Locomotor skills transport the body from one place to another (e.g., running, galloping, leaping, etc.), and object control skills involve receiving and

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projecting objects (e.g., throwing, catching, striking, etc; Ulrich, 2019). Unfortunately, children with fundamental motor skill difficulties tend to have comparatively low levels of PMC (Noordstar et al., 2017; Piek et al., 2006), which are both associated with increased health issues, such as decreased physical activity and unhealthy weight status (DeMeester et al., 2016).

Typically, younger children have high PMC, but studies have reported declines in PMC after early childhood (Jacobs et al., 2002; Noordstar et al., 2016a; Wigfield et al., 1997). The decrease in PMC is partly because young children tend to overestimate their PMC. Children at this age do not yet possess the cognitive ability to accurately distinguish between effort and ability (Harter, 1999; Stodden et al., 2008). As cognitive abilities increase, children's perceptions of their motor skills begin to decline toward more realistic levels that align with their actual MC (Marsh & Craven, 1997; Noordstar et al., 2016b). This veridicality is important, with researchers suggesting that the accurate alignment of PMC and MC may be crucial in forming consistent physical activity participation (Philpott et al., 2021; Utesch et al., 2018). PMC may further decrease as children become increasingly aware of their peers' motor skills and compare their skills to those of their peers (Harter, 2006). Considering that PMC may be naturally fated to decline, it is increasingly crucial for motor skill interventions to facilitate opportunities for children to gain high levels of PMC early in childhood.

Another variable affecting PMC in young children is the child's sex. PMC differences between boys and girls mirror sex differences in MC, where boys have higher PMC than girls (Robinson, 2011). While the decline in PMC over time is similar for both boys and girls, boys' initial higher perceived competence cascades whereby boys routinely display higher perceived athletic competence than girls in every grade from elementary through high school (Cole et al., 2001; Jacobs et al., 2002). These differences are seen explicitly for overall PMC and PMC of object control skills (Barnett et al., 2018; Lopes et al., 2020). The differences in object control skills could also be attributed to girls underestimating their object control skills while boys overestimate the same skills (Pesce et al., 2018). Object control PMC is particularly important because these perceptions are routinely associated with increased athletic and physical participation over time (Barnett et al., 2008, 2009). Sex differences in PMC are noteworthy because research suggests that children's PMC and not MC is more responsible for motivating children to participate in physical activity (Bardid et al., 2016).

Indeed, both Bardid et al. (2016) and DeMeester et al. (2016) showed that children with high PMC had higher motivation to participate in physical activity, and the level of motivation remained even when paired with low levels of MC. If higher PMC can lead to increased motivation to participate in physical activity despite low MC, children with higher PMC would have increased opportunities to develop better MC over time. Regarding sex differences in PMC, a recent systematic review and meta-analysis did not find significant differences between the sexes; however, the authors acknowledge that methodological inconsistencies across studies could contribute to their overall findings (DeMeester et al., 2020). Therefore, interventions that bolster PMC in young children must be cognizant of these potential sex differences and should strategically and purposefully aim to improve PMC overall and possibly mitigate differences seen in PMC.

One intervention approach that seems to positively affect PMC in young children is a high-autonomy, mastery climate motor skill intervention (Logan et al., 2013; Robinson et al., 2009; Valentini & Rudisill, 2004). A mastery climate grants children autonomy to self-select many elements of each intervention session, including peer grouping, task engagement, level of difficulty for each task, and timing spent engaging in different tasks (for a more detailed review of a high-autonomy, mastery climate motor skill intervention, please see Palmer et al., 2017).

The benefits of interventions that use mastery motivational climates for promoting PMC are logical, as children's PMC is positively associated with autonomous motivation (Bardid et al., 2016). A systematic review of 29 studies found that fundamental motor skills (FMS) interventions that encouraged autonomy were likely to increase PMC, physical activity, and MC (Tompsett et al., 2017). Likewise, the learner's autonomy has been highlighted as an essential component to creating successful FMS interventions (O'Brien et al., 2023). High-autonomy, mastery climate motor skill interventions effectively support PMC by vitalizing that psychological need for autonomy (Reeve & Cheon, 2021) and may be an ideal intervention approach to promote PMC in young children, especially girls. However, few have examined the effects of these interventions on mitigating the sex differences in PMC. This study aimed to examine the effects of a high-autonomy, mastery climate motor skill intervention on boys' and girls' PMC (object control, locomotor, and combined object control and locomotor [total]) and explored if those effects differed between boys and girls. We hypothesized that, regardless of the study group, all boys would have higher PMC than girls at baseline. We also hypothesized that boys and girls in the intervention would have similar gains in PMC across the intervention period. This hypothesis is grounded in research that supports boys and girls have equitable gains across a mastery climate intervention (Palmer et al., 2010). Finally, we hypothesized that at posttest, boys in the intervention and recess groups would have higher PMC than girls in the intervention and recess groups, respectively.

Materials and Methods

Participants and Setting

A total of 274 preschoolers from three Head Start Centers in the Midwestern United States served as participants in this study. All children enrolled in Head Start come from households with an annual income at or below the federal poverty line (i.e., less than $26,200 for a family of four) and were predominantly African American (67%). Children were recruited in two cohorts a year apart, in alignment with the beginning of the preschool school year (2017–2018 or 2018–2019). Children in each cohort were randomly assigned by class to either the Children's Health Activity Motor Program (CHAMP) intervention (n = 139; girls = 78)or the recess (n = 135; girls = 66) for 19–20 weeks. From this total, 247 preschoolers (90.1% retention rate; M_{age} = 47.90 months, SD = 3.59 months) completed all assessments for analysis. The final sample comprised 131 girls (M_{age} = 47.82 ± 3.66 months) and 116 boys (M_{age} = 48.00 months, SD = 3.54 months).

Measures

PMC was measured using the Digital Scale of PMC (DSPMC; Robinson & Palmer, 2017, 2021). The DSPMC is a digital-based assessment that allows individuals to view motor skills in four dimensions—height, width, depth, and time. The ability to view movement in four dimensions is critical, since movement is dynamic rather than a static action (Ulrich, 2019). The DSPMC assesses PMC on 12 motor skills—six locomotor skills (run, gallop, hop, leap, jump, and slide) and six object control or ball skills (throw, catch, kick, dribble, roll, and two-handed strike). These skills align with one of the most commonly used motor skill assessments, the Test of Gross Motor Development-second edition (Ulrich, 2000). Children are presented with two, 3–6 s of digital clips (one skilled and one unskilled) of a model performing each skill on a small touchscreen tablet (9.5 × 7.3 in.). A research team member sat down with each child and gave the following verbal prompts: “Watch the following videos and touch the circle under the video where the person moves like you.” Each child was provided with an initial view, and, if requested, could receive one additional view. The clips were randomly ordered so that half of the skills children saw were the skilled performance first, and the other half had unskilled performances first. The presentation and order of skills were identical to other PMC pictorial scales (Barnett et al., 2022a). After watching both clips, children selected the clip in which the person moved most like them. Afterward, the selected circle disappeared and was replaced by a smaller and larger circle. Follow-up questions were dependent on the initial selection. If a child touched the circle under the unskilled motor performance, they were asked, “Are you not too good at [insert name of skill]? [large circle] OR Are you sort of good at [insert name of skill]? [smaller circle].” If a child touched the circle under the skilled motor performance, they were asked, “Are you pretty good at [insert name of skill]? [smaller circle] OR Are you really good at [insert name of skill]” [larger circle]. After the final selection was made, that final circle flashed red. Each response corresponded with a numerical value ranging from 1 (*not too good at this skill*) to 4 (*really good at this skill*). The entire assessment took approximately 5–7 min to complete.

Scores were divided into three categories based on skill type: locomotor, object control, and total (combination of locomotor and object control). Face validity of the DSPMC has been established with both experts in the field as well as children (Robinson & Palmer, 2017), and research supports that the DSPMC has acceptable validity and reliability in both preschool (internal consistency, $\alpha = .78$; test–retest reliability, intraclass correlation coefficient = .84; 95% confidence interval [.76, .89]; Robinson & Palmer, 2021) and elementary-aged children ($\alpha = .78$; intraclass correlation coefficient = .80; 95% confidence interval [.76, .894]; Robinson & Palmer, 2017). Please refer to Robinson and Palmer (2017, 2021) for full reliability and validity metrics.

Children’s Health Activity Motor Program

Children in the intervention group participated in the Childrens Health Activity Motor Program (CHAMP), a high-autonomy, mastery motivational climate motor skill intervention grounded in achievement goal theory (Ames, 1992; Ames & Archer, 1988). CHAMP improves children’s motor skills (Robinson & Goodway, 2009; Robinson et al., 2017), physical activity (Palmer et al., 2017, 2019; Robinson et al., 2018), perceived (physical/

motor) competence (Robinson, 2011), and aids in self-regulation (Robinson et al., 2016). All children completed an average of 1,988 min of CHAMP. Due to variations in school schedules outside of the researchers' control, Cohort 1 classes completed 47–48 CHAMP sessions that were administered 3 days a week (totaling 1,880–1,920 min of total intervention time with an average of 40 min/session), and Cohort 2 classes completed 61–64 CHAMP sessions that were administrated 4 days a week (totaling 2,013–2,112 min of total intervention time or an average of approximately 33 min/session). CHAMP was implemented by two trained Ph.D. students in motor development. The lead instructor had 5 years of previous CHAMP experience, and the secondary instructor had a degree in physical education. A fidelity log that included exact start and end times for the entire CHAMP session, and each component of the lesson was completed daily. Further information regarding the CHAMP intervention is detailed here (Robinson et al., 2020).

Outdoor Recess

Children in the recess group participated in the school-provided daily free play session (i.e., recess), which was supervised by their regular teachers. Depending on the weather, these sessions took place on either the outdoor school playground or inside a large, ample indoor open space. The playground included an open grassy area, fixed playground equipment, swings, basketball hoops, and so on, while the indoor play areas included balls, hoppy balls, scooters, and so on. The outdoor and indoor play areas and equipment were designed for gross motor play and appropriate physical activity engagement, but no formalized motor skills instruction was provided. A full description of the school playgrounds in this study, including drawings, can be found elsewhere (Palmer et al., 2022).

Study Procedures

This study is a secondary analysis from the Promoting Activity and Developmental Trajectories of Health Study (Registered Clinical Trial Number: NCT03189862, www.clinicaltrials.gov; Robinson et al., 2020). The Promoting Activity and Developmental Trajectories of Health Study was a two-cohort randomized control trial that examined the immediate and long-term effects of the CHAMP program on children's motor skills, physical activity, and perceived competence. The Institutional Review Board at the University of Michigan approved this study (HUM00133319) and the study procedures have been fully described and published in the protocol paper (Robinson et al., 2020). DSPMC measurements were administered before the intervention (pretest) and again after the intervention ended (posttest).

Data Analyses

Descriptive (means, *SD*s, and percentiles) and normality (skewness/kurtosis) statistics were calculated across all measures to ensure normal distribution of the data. The effectiveness of the randomization was tested by examining pretest differences between groups. Analyses of variance were used to examine if there were group differences (CHAMP boys, CHAMP girls, recess boys, recess girls) in pretest locomotor, object control, or total DSPMC score. Simple linear regressions were used to examine the effects of the intervention on posttest PMC for boys and girls. Models were fit with predictors of pretest scores, sex, treatment, and a Sex × Treatment interaction. Significant Sex × Treatment interactions were

decomposed using analyses of covariance with a Bonferroni post hoc test whereby we examine the difference among the four groups (CHAMP boys, CHAMP girls, recess boys, recess girls) controlling for pretest scores. Analyses were completed in SPSS, and alpha levels were set to .05 a priori.

Results

Descriptive Data and Pretest Differences

A total of 247 children (53% girls with an average age of 47.90 ± 3.59 months) were included in the analysis. Table 1 displays the pre- and posttest mean differences in PMC between all four groups (CHAMP boys, CHAMP girls, recess boys, recess girls). Randomization appeared to be successful as there were no significant differences among the groups for locomotor, object control, or total DSPMC scores at pretest.

Sex × Intervention Effects

There was a significant Sex × Treatment interaction in the linear model for object control skills (see Table 2). Post hoc analyses of covariance showed that, controlling for pretest scores, recess girls had lower posttest object-control DSPMC scores compared with CHAMP boys, CHAMP girls, and recess boys (all ps < .05). No other between-group differences were reported.

Treatment or Sex Effects

Controlling for sex and pretest PMC, children who completed CHAMP had higher posttest locomotor (β = 0.29, SE = 0.07; p < .001) and total DSPMC scores (β = 0.27, SE = 0.07; p < .001) compared with children who engaged in recess (see Table 2). There was a trend whereby boys scored higher on total DSPMC scores compared with girls (β = 0.15, SE = 0.08; p = .05; see Table 2).

Discussion

Low PMC may promote a negative spiral of disengagement to where low PMC affects children's motivation to engage in physical activity, thereby decreasing opportunities to develop MC, which promotes further inactivity—resulting in an unhealthy weight status (Stodden et al., 2008). Furthermore, research has shown sex differences in children's PMC, with boys generally demonstrating higher PMC than girls (Barnett et al., 2008; True et al., 2017). However, this research has predominantly focused on older children and does not fully capture early divergences between girls' and boys' PMC (Clark et al., 2018; Noordstar et al., 2016b; Slykerman et al., 2016). Hence, there is a need for research to examine changes in PMC in early childhood and to evaluate how movement-based programming might impact this PMC with special considerations for sex differences. This study examined the effects of a motor skill intervention on children's PMC (object control, locomotor, and total) and explored if the effects differed between boys and girls. We hypothesized that, regardless of the study group, all boys would have higher PMC than girls at baseline. We also hypothesized that boys and girls in the intervention would have similar gains in PMC across the intervention. Finally, we hypothesized that at posttest, boys in the intervention

and recess groups would have higher PMC than girls in the intervention and recess groups, respectively.

Initially, there were no significant differences between boys' and girls' PMC at pretest regardless of their study group. While we did anticipate sex difference at pretest based on the literature (Barnett et al., 2008; Robinson, 2011), there has been other literature where no sex differences were found (Goodway & Rudisill, 1997; True et al., 2017). We argue that the age of the participants (M_{age}: 47.90 months) promotes similar PMC across sexes because they are too young to develop the cognitive ability to perceive their abilities accurately, nor have they had enough exposure to gender-normed physical activities that may promote that difference in PMC. Therefore, our work aligns with this research of Goodway and Rudisill (1997) and supports that at the start of preschool, sex differences in PMC may not exist. Both boys and girls had baseline PMC between a two to three on the scale, which relates to interpreting their skills as "sort of good" or "pretty good." These values align with other research with a similar population in terms of age and family socioeconomic status (Robinson et al., 2009), but are lower than other, more recent, reports of preschoolers in the United States (Brian et al., 2018).

In terms of sex by treatment effects, our hypothesis on sex differences over time were only partially supported. Linear regression models only found a sex by treatment interaction for posttest object control PMC. Decomposition of this interaction showed that girls who only participated in recess had lower perceived object control skills compared with all other children at posttest. These differences were due to both a decrease in score for girls in recess coupled with an increase in scores for all other groups. One potential explanation for these differences could be children's activity preferences. Niemisto et al. (2019) reported that children's object control PMC is associated with their participation in organized sports and that boys typically engage in physical activities that involve object control skills. In contrast, girls are less likely to participate in organized sports (Hyde et al., 2020) and prefer physical activities that do not involve object control skills (Slykerman et al., 2016). Other researchers have suggested that boys receive more encouragement, reinforcement, and stimulation for activities that involve object control skills (Barnett et al., 2010), which may be due to the heteronormative culture and patriarchy that organizes sports as a whole (Spaaij et al., 2015). Therefore, it is possible that girls in recess simply did not engage in many activities involving object control skills, but boys in recess and both boys and girls in CHAMP did engage in these activities.

Considering that object control skills predict involvement in adolescent physical activity (Barnett et al., 2009) and that object control PMC mediates the translation of MC into health outcomes (Barnett et al., 2008), it is critical to not only increase young girls' opportunities to practice object control skills but also to provide an environment that encourages accurate interpretations of their object control competence. Girls underestimate their object control competence, while boys overestimate their competence (Pesce et al., 2018), which may naturally push girls to practice activities in which they feel more competent and that do not require object control skills. The push toward activities that do not require object control skills may be compounded by parental gender stereotypes, which Dechrai et al. (2022) captured by reporting negative correlations between girls' gender-stereotyped attitudes and

their overall and object control PMC. Over- versus underestimation of PMC has implications for children's engagement in physical activities. Pesce et al. (2018) reported that children who overestimate their skills engage in more sports than those who underestimate their PMC; therefore, it is beneficial when they overestimate their PMC because it can increase physical activity and opportunities to gain MC. Though a recent systematic review found either "no evidence" or "indeterminate" evidence supporting the mediating effect of PMC on the relationship between physical activity and MC, several studies within the larger review reported some evidence of mediation (Barnett et al., 2022b). Therefore, it is possible that the relationship between PMC and physical activity trajectories may represent the positive spiral of engagement promoted by Stodden et al. (2008), thereby demonstrating the need for structured movement opportunities to promote object control PMC, especially for girls.

Outside of a sex by treatment interaction, we found that children in CHAMP had higher posttest locomotor and total PMC compared to the control group controlling for sex and pretest scores. This finding supports that high-autonomy, mastery climate motor skill interventions provide children with opportunities and support to increase their PMC. These results replicate and expand on findings from previous studies of increases in PMC after a high-autonomy, mastery climate motor skill intervention (Logan et al., 2013; Palmer et al., 2021; Valentini & Rudisill, 2004). To the best of our knowledge, none of these earlier studies examine sex differences in changes across the intervention. These results, therefore, expand on this extant knowledge and show that both boys and girls equitably benefit from CHAMP regarding their PMC, whereby girls with lower PMC than boys experience a "catch-up" effect that eliminates that initial difference.

The question remains: What about the CHAMP intervention is promoting these changes? While there is limited data on children's behaviors during CHAMP, this environment has several theoretical and practical factors that could be contributing to children's promotion of PMC. First, CHAMP is a high-autonomy, mastery climate intervention. High-autonomy, mastery motivational climates are unique in that children have the freedom to self-navigate the program and select which station to engage in, how long to spend in an activity, what level of difficulty to practice, and the peers they want to engage with during their play. In CHAMP, children are provided with three to four motor skill stations daily. Each station has at least three levels of difficulty, and children are taught how to make the station "easy," "in the middle," or "hard." Throughout the autonomy-based motor skill engagement, children are fully and freely allowed to engage in the environment as they choose and with whom they choose. For example, if throwing, catching, running, and skipping were all taught on the same day, one child could play by themselves and engage in 2 min of running, 15 min of catching, and 5 min of throwing. A second child could play in a group of three children where all three children spent 10 min of throwing, 10 min of running, and 3 min of catching. Both are "successful" CHAMP programs. There is some initial evidence that CHAMP engagement varies based on the child's sex and skill level at the start of the intervention (Palmer et al., 2022). There is additional support that the way instructors interact with children in response to child behaviors changes across mastery motivational climate interventions (Hastie et al., 2019). Therefore, it appears that children use the freedom granted in high-autonomy mastery motivational climates to design an individualized CHAMP experience.

There is support that both autonomy and competence are important human needs (Deci & Ryan, 2000). Therefore, the autonomy granted in CHAMP meets the autonomy need and likely subsequently bolsters competence. CHAMP is designed with both autonomy in the choice of activity as well as difficulty. Younger children tend to give maximal effort to learn complex tasks, and CHAMP's high-autonomy, mastery climate reinforces that effort by creating an environment where a child can gravitate toward motor skill activities that naturally incline that child to use their total effort (Hastie et al., 2019). Therefore, it is logical that engagement in this program impacts children's competence. Second, CHAMP is a motor skill intervention. DeMeester et al. recently reported a low–moderate relationship between PMC and MC, so it is logical that interventions that improve MC may inadvertently develop a child's PMC (DeMeester et al., 2020). The relationship between PMC and MC is particularly important as children age and can better align their perceptions of their motor ability with their actual ability (Harter, 1999). Compared to boys, girls receive few opportunities to experience a variety of skills, which researchers have argued may affect how a child perceives their MC (Barnett et al., 2010; Trecroci et al., 2021). Robinson et al. (2017) argue that girls may need more instruction or be placed in more scenarios where they develop better object control perceptions of themselves. This phenomenon seems to have been observed in our current study, with girls that participated in recess reporting lower object control PMC than at pretest. Implementing a high-autonomy, mastery climate motor skill intervention such as CHAMP may give girls the opportunity to practice motor skills and fuel their intrinsic motivation to perform mastery attempts of various skills—improving their MC and PMC in the process, particularly object control. It is also beneficial for children to participate in such an intervention during early childhood because it is easier to access a large group of young children early without stigmatizing those (girls) who need it (Wick et al., 2017).

Notably, the locomotor PMC scores of both boys and girls in recess were similar, suggesting that absent an intervention, both preschool boys and girls develop similar locomotor PMC but not object control. Our findings align with a previous longitudinal study that found similar locomotor PMC between girls and boys over time (Van Veen et al., 2020). Similarly, actual locomotor skills have been shown to be similar between girls and boys (Zask et al., 2012). Intriguingly, current literature is unclear regarding whether locomotor or object control skills are more important in promoting physical activity. Longitudinal research has shown that a child who is more skilled in object control than locomotor skills is more likely to become physically active (Gu et al., 2017). However, Pesce et al. (2018) reported that children who overestimated their locomotor competence practiced sports more than those who underestimated themselves. Increased sports practice of those who overestimate their locomotor competence is likely because locomotor skills are more phylogenetic than object control skills and can usually be practiced without special equipment. Unfortunately, despite reporting comparable scores in actual locomotor and object control MC, girls underestimate their PMC (Clark et al., 2018). More research is needed that explores other factors, particularly individual and societal constraints, which may affect and differentiate the development of boys' and girls' locomotor and object control PMC.

This study included several strengths. Namely, this was a secondary analysis of a larger clinical trial that used an evidence-based, theory-driven CHAMP intervention (Robinson

& Goodway, 2009; Robinson et al., 2020). In terms of methodology, there were several strengths. For instance, we used a validated and reliable assessment tool that measures PMC (DSPMC; Robinson & Palmer, 2017, 2021) in young children. The alignment of the PMC measure with a widely established, process-oriented measure is beneficial in that it ensures more accurate inferences of the effects of PMC on MC. The study also randomly assigned children through intact classrooms to one of two conditions, CHAMP motor skill intervention versus recess (Robinson et al., 2020), and an additional strength was the adequate sample size. However, there were some limitations. This study did not address the sustained effects of CHAMP on PMC in boys and girls. Therefore, we cannot ascertain if, once the CHAMP intervention ended, girls who participated in the intervention maintained similar PMC levels to boys. Longitudinal data concerning sex differences after a motor skill intervention would be beneficial in evaluating the long-term effectiveness of an intervention in mitigating sex differences in PMC. Another limitation is the generalization of our findings because most of our participants were minorities and from a low socioeconomic status. However, this population does represent a large portion of the U.S. population who are often at risk of engaging in less movement and physical activities. Future research should focus on providing longitudinal data across childhood regarding sex differences in PMC and expand the population to include a more diverse community.

Conclusion

Based on the importance of evaluating sex differences in perceived motor competence (PMC) development, this study examined the effects of a high-autonomy, mastery climate motor skill intervention, CHAMP, on children's PMC and explored if those effects differed between boys and girls. Results show that all children, regardless of sex, who engaged in CHAMP improved their PMC. Unfortunately, girls in recess reported significantly lower PMC than all the other groups at the end of the intervention period. Specifically, these results show that girls who participate in recess do not increase their object control PMC like children in CHAMP and boys who engage in outdoor recess do. Our results also show that a high-autonomy, mastery climate motor skill intervention may effectively mitigate those differences between the sexes while increasing their respective PMC levels. Additional research is needed to determine why differences in girls' and boys' PMC arise and how specific motor skill interventions may improve girls' participation in physical activities that require object control skills.

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Table 1

PMC Scores (Locomotor, Object Control, and Total) at Pre/Posttest, *M* (SD)

		Locomotor PMC		Object-control PMC		Total PMC	
Intervention	***N***	**Pretest**	**Posttest**	**Pretest**	**Posttest**	**Pretest**	**Posttest**
Recess							
Boys	60	2.82 (0.46)	2.96 (0.48)	2.89 (0.53)	3.09 (0.41)	2.85 (0.44)	3.03 (0.36)
Girls	59	2.85 (0.47)	2.96 (0.43)	2.82 (0.49)	2.71 (0.51)	2.84 (0.38)	2.87 (0.38)
CHAMP							
Boys	56	2.97 (0.45)	3.1 (0.54)	2.87 (.0.5)	3.12 (0.5)	2.92 (0.39)	3.11 (0.46)
Girls	72	2.85 (0.44)	3.17 (0.58)	2.76 (0.47)	3.07 (0.54)	2.81 (0.39)	3.12 (0.51)

Note. PMC score range: 0–4. CHAMP = Children's Health Activity Motor Program; PMC = perceived motor competence.

Table 2

Results of Linear Regression Examining the Effects of Treatment Group and Sex on Posttest PMC Controlling for Pretest PMC

	Locomotor PMC			Object control PMC			Total PMC		
	b	***SE***	***p***	***b***	***SE***	***p***	***b***	***SE***	***p***
Intercept	2.12	0.21	<.001	2.45	0.19	<.001	2.1	0.2	<.001
Pretest	0.29	0.07	<.001	0.12	0.06	.07	0.27	0.07	<.001
CHAMP	0.21	0.09	.02	0.3	0.09	<.001	0.26	0.07	<.001
Sex	0.01	0.09	.9	0.31	0.09	<.001	0.15	0.08	.05
CHAMP × Sex	−0.12	0.13	.34	−0.27	0.13	.03	−0.2	0.11	.07
R^2		.10			.08			.11	

Note. CHAMP = Children's Health Activity Motor Program; PMC = perceived motor competence.