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Sex Differences in Motor Competence of Children in Kindergarten and Grade One: Considering Parent and Teacher Views

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Abstract

Purpose: Understanding where deficits exist in young childhood is critical to addressing gaps in motor competence. The purpose of this study was to evaluate if there were differences in motor competence between males and females, as well as to examine parent and teacher perspectives of the children's motor competence.
Methods: 99 children in kindergarten and grade one had their motor competence assessed using PLAYfun. PLAYparent, and PLAYcoach assessments were completed by parents and teachers to examine their respective perspectives on the children's motor competence. Sex differences were evaluated using independent *t*-tests.
Results: Males had significantly greater motor competence for object control motor skills, while females had greater locomotor motor competence. Sex differences were not perceived by parents or teachers.
Conclusion: Sex differences in motor competence were found; however, it appears that parents and teachers do not perceive any differences. Without intervention at an early age, sex differences may persist as children age.

Keywords: motor competence; young childhood; gender; physical literacy

Résumé

Objectif: Comprendre les déficits moteurs chez les jeunes enfants est essentiel pour combler les lacunes en motricité. Cette étude visait à évaluer s'il existe des différences de motricité entre les garçons et les filles, et à examiner le point de vue des parents et des enseignants sur la motricité des enfants.
Méthode: La motricité de 99 enfants de maternelle et de 1re année a été évaluée à l'aide de l'outil PLAYfun. Les évaluations PLAYparent et PLAYcoach ont été effectuées par les parents et les enseignants afin d'examiner leur point de vue respectif sur la motricité des enfants. Les différences entre les sexes ont été évaluées à l'aide de tests t.
Résultats: Les garçons présentaient une motricité significativement supérieure pour les habiletés motrices de manipulation d'objets, tandis que les filles présentaient une meilleure motricité locomotrice. Aucune différence entre les sexes n'a été perçue par les parents ni par les enseignants.
Conclusion: Des différences de motricité entre les sexes ont été observées ; cependant, il semble que les parents et les enseignants ne les perçoivent pas. Sans intervention précoce, ces différences pourraient persister avec l'âge.

Mots-clés: motricité; petite enfance; genre; littératie physique

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Introduction

It is well known that engagement in physical activity is beneficial to the lifelong health and wellness of children (Bar-Or, 1995; Carson et al., 2017; Loprinzi et al., 2012). Despite this knowledge, it has been reported that only 49% of Canadian children 5 to 11 years of age attain the daily guideline of 60 minutes of moderate-to-vigorous physical activity (MVPA; ParticipACTION, 2024). For children 3 to 13 years of age, motor competence has a proven relationship with greater time spent physically active (De Meester et al., 2016, 2018), higher perceived motor competence (O'Brien et al., 2018), lower sedentary time (L. Lopes et al., 2012), and lower body weight (Barnett et al., 2022). Additionally, children with high motor competence are more likely to attain the physical activity guidelines for MVPA (Belanger et al., 2018; De Meester et al., 2016, 2018). Since it is unlikely that motor competence develops alongside normal growth and maturation (Hands, 2008; Hardman, 2011), teachers and parents must be aware of potential deficiencies in motor competence.

For this manuscript, the terms male and female will refer to biological sex, while boys and girls will refer to gender. The World Health Organization (n.d.) defines sex as physical and biological features, while gender is socially constructed characteristics which include norms, behaviours, and roles. Additionally, for reviewed research, the terms sex and gender will be reported as they are stated in the original article. In children and adolescents 8 to 16 years of age gender differences in motor competence are well-established. Boys have been found to have higher general motor competence when compared to girls 8 to 15 years of age (Longmuir et al., 2015; O'Brien et al., 2018). When looking at different motor skills, boys have greater motor competence for running (Caldwell et al., 2021) and object control motor skills (Barnett et al., 2008, 2010; Bolger et al., 2018; Cairney et al., 2018; Caldwell et al., 2021; O'Brien et al., 2018). For younger children 3 to 6 years of age, gender seems to have the same influence; however, evidence is controversial. Some studies have reported that boys have greater object control (Cliff et al., 2009; Goodway et al., 2013; Iivonen & Sääkslahti, 2014; Spessato et al., 2013; Zheng et al., 2022) while girls have greater balance (Iivonen & Sääkslahti, 2014) and locomotor motor competence (Cliff et al., 2009; Iivonen & Sääkslahti, 2014; Zheng et al., 2022). In contrast, other studies have found no gender differences for locomotor skills (Spessato et al., 2013) or general motor competence (Venetsanou & Kambas, 2016) in young childhood. While gender differences have been examined in young children, studies examining sex differences are sparse. Similar to gender differences, one study examining sex differences reported that males may have greater object control compared to females (Slykerman et al., 2016).

Parents play a significant role in their child's development, including their motor competence (Agard et al., 2021; Horn & Horn, 2007). Additionally, parents can impact their child's motor competence through role modelling (Agard et al., 2021; Bois et al., 2005; Fredricks & Eccles, 2005), coaching (Fredricks & Eccles, 2005), and participating in physical activity (Agard et al., 2021; Edwardson & Gorely, 2010; Fredricks & Eccles, 2005). However, parents also believe that motor competence develops naturally as children age (Agard et al., 2021), despite the opposite being reported in the literature (Hands, 2008; Hardman, 2011). These findings, in combination with the importance of parents' belief in their child's ability to perform motor skills (Jarvis et al., 2020), emphasizes the importance of understanding parental perspectives of children's motor competence.

Physical education (V. P. Lopes et al., 2017; Lorås, 2020) and in turn teachers, as facilitators, play an essential role in a child's development of motor competence and improving

physical activity participation. The feedback physical educators give their students can affect a child's perception of their motor competence, especially for girls (Nicaise et al., 2006). Additionally, a longitudinal study found that teachers have the potential to foster positive motor development throughout childhood (Estevan et al., 2023). Given the influence that parents and teachers have on children's motor development, examining their perceptions can provide insight into where early intervention could be beneficial.

Given the limited research evaluating sex differences in young children, it leaves room to evaluate if a sex comparison differs from previously reported gender differences, as well as assess if parents and teachers perceive sex differences in motor competence. Therefore, the purpose of this investigation was to: (1) assess sex differences in motor competence between males and females, (2) assess parental perspectives of children's motor competence, and (3) assess teachers' perspectives of children's motor competence. We hypothesized that males would have higher object control and running motor competence, while females would have greater locomotor motor competence. Secondly, we believed there would be differences in teachers' but not parents' perspectives. Since teachers regularly interact with children, they are more likely to notice any motor competence differences between males and females.

Methods

Research Design and Participants

We chose to focus on sex differences since previous research has focused on gender in young childhood. However, it is impossible to isolate the influence of sex and gender, and the discussion will present how gender norms may influence sex differences. Teachers reported student biological sex using a dichotomous question on the PLAYcoach.

Parent and child dyads were recruited from two elementary schools in one small Canadian prairie city that participated in a physical literacy intervention. Schools with similar socioeconomic status and no physical education specialists were recruited with the help of the local School Division's physical education and an early years consultant. Once schools were selected, teachers of kindergarten and grade one classes were approached and provided written consent before study initiation (n=6 females). Then, 99 (n=55 male and n=44 female) kindergarten and grade one students provided verbal assent while their parent provided written informed consent prior to data collection. This study is a sub-sample from a larger intervention study (Chapelski et al., 2023). The current analysis is reporting the baseline data prior to the intervention for individuals who had complete motor competence, parent, and teacher data. Therefore, all participants in this sub-sample had valid data from the PLAYfun, PLAYparent and PLAYcoach tools. The study received ethical approval from the University of Saskatchewan's Behavioural Ethics Review board (BEH#16-66) as well as approval from the participating school divisions.

Motor Competence Assessment

To assess motor competence three measures developed by Sport for Life: PLAYfun, PLAYparent, and PLAYcoach were utilized. These tools were designed to measure physical literacy (i.e. motor competence, confidence, and knowledge); however, only the motor competence sections of each assessment were included in our methodology, as determined by the tools' workbooks (Sport for Life Society, 2014a, 2014b, 2014c). PLAYfun was used to assess motor competency for running, locomotor, object control, and balance motor skills (Sport for Life Society, 2014b). PLAYparent was used to examine a parent's perception of their children's motor competence (Sport for Life Society, 2014c). Finally, PLAYcoach was used by teachers to

determine their perception of the child's motor competence (Sport for Life Society, 2014a). For all tools, a higher score indicates greater motor competency.

PLAYfun is a validated tool (Cairney et al., 2018; Caldwell et al., 2021; Stearns et al., 2018) designed for children aged 7 and up (Sport for Life Society, 2014b); therefore, modifications were made to make the tool age appropriate. The skills: run, jump and land on two feet, crossovers (grapevine), strike with stick, hand dribble, foot dribble, drop to the ground, and lift and lower were removed because they were not age appropriate based on the Saskatchewan Physical Education curriculum for kindergarten and grade one students (Saskatchewan Ministry of Education, 2010). Additionally, two skills were adapted to make them age appropriate. One-handed catch became two-handed catch and balance walk became stationary balance. The tool was not validated after the alterations. However, to reduce the risk of invalidating the tool only the criteria for balance was altered from the initial version created by Canadian Sport for Life. Since the tool criterion was not altered (except for balance), we believe the adapted version of PLAYfun remained effective at measuring motor competence for children in kindergarten and grade one. To facilitate the PLAYfun assessment, a team of individuals (n=5) experienced in movement assessment were trained on the evaluation criteria for this tool by an individual (AS) with expertise in the field. The assessment team was blinded to the study purpose and evaluated the same skills (i.e. only running motor skills). After a child performed a motor skill, they were given a score between 0 and 100 for each skill, based on the grading criteria developed by Sport for Life (2014b). A total motor competence score was then calculated by taking the average of 10 skills. For PLAYfun, a score less than 50 suggests the child is developing their motor competence, while a score greater than 50 means the child has acquired this motor skill.

PLAYparent is a valid measure that is moderately associated with PLAYfun (Caldwell et al., 2021) and was completed by a parent or guardian to evaluate their assessment of their child's level of physical literacy. PLAYcoach was completed by teachers and evaluates their perception of a child's level of physical literacy. We included the following questions from PLAYparent: coordination when moving, safety while moving in the environment relative to others, number of movement skills acquired, ability to balance during movement, ability to run, ability to start stop and change direction, ability to use hands to throw, catch, and carry objects, ability to use feet to kick or move objects, and the ability to use left and right sides equally (Sport for Life Society, 2014c). For PLAYcoach we included the statements: possesses a diverse movement skill set, ability to select and sequence skills suitable to setting, balance, avoid collisions, stumble recovery, start and stop, running, agility, ability to use hands to throw catch and carry objects, ability to use feet to kick or move objects, and ability to use left and right sides equally (Sport for Life Society, 2014a).

It should be noted that PLAYcoach and PLAYparent were not designed to directly assess perceptions of PLAYfun, although small-to-medium correlations have been found (Caldwell et al., 2021). In other words, we are not proposing to examine the relationship between PLAYfun, PLAYcoach, and PLAYparent, but rather we are examining differences between males and females for children's motor competence, parental perspective of children's motor competence, and teachers' perspective of children's motor competence.

Statistical Analysis

Any missing data was interpolated using the parameters set by Tabachnick and Fidell (2007). In short, if questionnaires had less than 20% of the data missing, then the average of the other scored skills or questions were calculated and used to fill in the blank. Missing data from

PLAYfun (n=5), PLAYparent (n=1), and PLAYcoach (n=9) were filled in using Tabachnick and Fidell (2007) methodology. In total, 15 single questions were filled in for 15 different participants. Independent sample *t*-tests were used to evaluate the differences between males and females for PLAYfun, PLAYparent, and PLAYcoach. Also, Levene's Test for Equality of Variances was conducted to detect differences in the variance between males and females. All statistics were performed using SPSS version 28 (IBM Corp. Armonk, NY) and *p*-value was set at 0.05.

Results

Ninety-nine parents of children from kindergarten and grade one gave consent for their child to participate in the study and have their motor competence measured. However, not all parents returned the PLAYparent questionnaire. In total, 75 (76%) PLAYparent and 99 (100%) PLAYcoach measurements were returned and included in this study.

Participants

The participant sample size for each of the PLAYfun, PLAYparent and PLAYcoach measurements is presented in Table 1.

Table 1
Participant Breakdown by Grade and Sex for Each PLAY Tool (n)

	Kindergarten	Grade 1	Total
PLAYfun			
Male	29	26	55
Female	19	25	44
Total	48	51	99
PLAYparent			
Male	21	20	41
Female	15	19	34
Total	36	39	75
PLAYcoach			
Male	29	26	55
Female	19	25	44
Total	48	51	99

PLAYfun

Sex comparison of each PLAYfun motor skill is presented in Table 2. Males had significantly higher motor competence for the object control domain (p=0.003), specifically the skills throw (p=0.004) and kick (p=0.034) compared to females. In contrast, females had significantly higher skip (p=0.001), gallop (p=0.039), and locomotor domain (p=0.010) motor competence. All other skills and total motor competence displayed no difference between sexes (p>0.05).

Table 2

Comparison of Sex Differences for Each Domain and Skill at Baseline (PLAYfun)

	Male (n=55)	Female (n=44)	*p*-value	Cohen's d
Run Domain (0-200)	95.9±42.7	83.6±36.4	.131	.308
RaS	49.7±23.1	44.4±19.6	.234	.242
RTB	46.2±20.7	39.1±18.6	.079	.360
Loco Domain (0-400)	**42.2±18.5**	**52.2*±18.9**	**.010**	-.532
Skip	**12.2±9.7**	**19.2*±10.3**	**.001**	-.707
Gallop	**12.2±8.1**	**15.7*±8.7**	**.039**	-.423
Hop	5.9±8.9	5.1±6.5	.602	.106
Jump	12.0±7.4	12.2±7.5	.885	-.029
Obj Ctl Domain (0-300)	**65.0*±19.6**	**53.2±18.3**	**.003**	.623
Throw	**19.5*±8.1**	**14.8±7.9**	**.004**	.587
Catch	19.2±8.4	16.1±8.2	.056	.391
Kick	**26.3*±8.9**	**22.4±9.0**	**.034**	.436
Balance	21.3±9.9	21.8±10.1	.806	-.050
Total	22.4±5.1	21.1±5.3	.190	.267

Displayed as mean ± standard deviation. Scoring range for each skill is 0-100, unless noted in brackets.
***** denotes a significant difference between males and females.
Abbreviations: locomotor (Loco), object control (Obj Ctl), run a square (RaS), run there & back (RTB).

PLAYparent

Sex differences for PLAYparent are displayed in Table 3. Parents of males reported their children to have greater balance than parents of females (p=0.009). All other questions demonstrated no differences between males and females (p>0.05). It should be noted there were significant differences in the variance for balance (F=8.065; p=0.006), the use of hands (F=10.636; p=0.002), and the use of feet (F=12.358; p=0.001).

Table 3

Comparison of Sex Differences for Each Domain and Skill at Baseline (PLAYparent).

	Male (n=41)	Female (n=34)	*p*-value	Cohen's d
Loco Domain (0-12)	9.6±1.8	9.1±2.0	.280	.252
Coordination	1.6±0.5	1.4±0.6	.115	.370
Safety	1.3±0.6	1.2±0.6	.721	-.083
Number	1.4±0.6	1.4±0.5	.434	.039
Balance[1]	**1.7*±0.5**	**1.4±0.6**	**.009**	.642
Run	1.9±0.3	1.9±0.3	.892	-.032
Stop Start	1.7±0.4	1.8±0.4	.748	-.075
Obj Ctl Domain (0-6)	4.8±1.1	4.2±1.5	.053	.456
Use Hands[1]	1.7±0.5	1.5±0.7	.084	.422
Use Feet[1]	1.8±0.4	1.6±0.6	.079	.430
Use Both Sides	1.3±0.6	1.2±0.6	.338	.224

Displayed as mean ± standard deviation. Scoring range for each skill is 0-2, unless noted in brackets.
***** denotes a significant difference between males and females.
[1] denotes significant differences in the variance between groups.
Abbreviations: locomotor (Loco), object control (Obj Ctl).

PLAYcoach

Sex differences for PLAYcoach are shown in Table 4. Teachers reported females to have fewer collisions when engaging in physical activity than males (p=0.044). No differences existed between males and females for any other question (p>0.05). It should be noted there were significant differences in the variance for the general motor competence domain (F=7.772; p=.006), diverse movement skill set (F=5.784; p=.018), sequence of skills (F=9.553; p=.003), balance domain (F=5.959; p=.016), avoidance of collisions (F=16.498; p<.000), instances of stumbling (F=10.474; p=.002), and ability to start stop (F=4.335; p=.040).

Table 4

Comparison of Sex Differences for Each Domain and Skill at Baseline (PLAYcoach)

	Male (n=55)	Female (n=44)	p-value	Cohen's d
Diverse[1]	1.7±0.7	2.0±0.6	.086	-.350
Skills[1]	1.7±0.7	1.9±0.5	.152	-.281
Bal Domain[1] (0-12)	5.6±2.0	6.2±1.4	.093	-.330
Balance	1.9±0.8	2.1±0.8	.346	-.191
Collisions[1]	**1.8±0.7**	**2.1*±0.5**	**.044**	-.392
Stumble[1]	1.9±0.7	2.1±0.5	.116	-.309
Obj Ctl Domain (0-12)	6.0±1.9	5.8±1.8	.629	.098
Hands	2.1±0.7	2.0±0.6	.187	.180
Feet	2.1±0.7	2.0±0.6	.397	.172
Sides	1.8±0.7	1.9±0.6	.708	-.472
Loco Domain (0-12)	6.1±2.2	6.2±1.6	.833	-.043
Start Stop[1]	2.1±0.9	2.1±0.6	.879	-.030
Running	2.1±0.8	2.2±0.6	.718	-.073
Agility	1.9±0.7	1.9±0.5	.939	-.015
Total MC[1] (0-44)	32.8±10.6	34.1±8.3	.504	-.136

Displayed as mean ± standard deviation. Scoring range for each skill is 0-4, unless noted in brackets.
***** denotes a significant difference between males and females.
[1] denotes significant differences in the variance between groups.
Abbreviations: balance (Bal), locomotor (Loco), motor competence (MC), object control (Obj Ctl).

Discussion

The primary aim of this study was to examine sex differences in motor competence in kindergarten and grade one students. Based on the literature studying older children, we hypothesized that males would have greater running and object control motor competence, while females would have higher locomotor motor competence. Our PLAYfun findings support our hypothesis. Additionally, for our second and third hypotheses, we found that parents and teachers perceived no overall sex differences in children's motor competence, respectively. This is a key finding as parents (Agard et al., 2021; Horn & Horn, 2007) and teachers (Cowley et al., 2021; Estevan et al., 2023) play a significant role in the development of children, which includes their motor competence.

We found differences between males and females that are similar to previous research completed on boys and girls from young childhood to adolescence (3 to 14 years of age). Others have reported boys having higher motor competence for running (Caldwell et al., 2021) and object control skills (Bolger et al., 2018; Cairney et al., 2018; Caldwell et al., 2021; Iivonen & Sääkslahti,

2014), while girls have also been previously found to have higher locomotor motor competence (Bolger et al., 2018; Caldwell et al., 2021; Iivonen & Sääkslahti, 2014). Additionally while not significant in this sub-sample, we found significant differences in the running domain (i.e., run a square or run there and back) in the larger cohort who did not have PLAYparent and PLAYcoach evaluations (Chapelski et al., 2023; data not shown). Our findings suggest that differences are the same when young children are grouped by sex or gender. Furthermore, our findings regarding young children have also been reported in studies focused on older children and adolescents, suggesting there are factors that influence motor development from a young age that need to be understood and addressed to close this gap as it appears to persist into adolescence and potentially beyond. Additionally, young childhood is a unique time to evaluate sex differences in motor development since there are no differences in children's biological development yet (Malina et al., 2003). Suggesting that differences observed in young childhood should not be from physical differences such as differences in lean mass, fat mass, or center of gravity.

Parents' lack of perception regarding sex differences is not overly surprising, as many parents would not be aware of the differences between their child and their child's peers at this young age. Additionally, research has found that parents are often unaware of their child's motor deficiencies. We only found one parental difference in perception for balance, which favoured males. This is surprising as objective measurements of balance tend to favour females (Iivonen & Sääkslahti, 2014). This could be because parents of children still have a high perception of their child's abilities (Fredricks & Eccles, 2002). Parental influence has been suggested to be the most important factor impacting a child's sport and physical activity engagement because the family has the longest influence on a child's development, especially in the early years (Horn & Horn, 2007). However, research is conflicted whether parental perception of gender-stereotypes influence (Bois et al., 2002, 2005; Jacobs & Eccles, 1992; Pellett & Ignico, 1993) or have no effect (Dechrai et al., 2022) on their children's perception of social norms.

It has been reported that support from parents is associated with childhood engagement in physical activity (Edwardson & Gorely, 2010; Wallhead & Buckworth, 2004) which in turn improves motor development. Additionally, females may receive inadequate support as males receive more support from parents to participate in sports (Fredricks & Eccles, 2005; Welk et al., 2003). Some other ways parents can support motor development include setting realistic expectations, purchasing sports equipment, and encouraging their children to be active (Fredricks & Eccles, 2005). Since our parental data displays only one difference, it is possible that parents are not viewing one sex as more proficient in their motor competence and that they provide equal opportunities for physical activity engagement.

Teachers only perceived the ability to avoid collisions (spatial awareness) as being higher in females. This might be unsurprising as males tend to participate in more contact or collision sports (i.e. hockey and football) than females (Tuero et al., 2014) or that contact sports tend to be viewed as more masculine (Plaza et al., 2017; Schmalz & Kerstetter, 2006). This could suggest that young males may view collisions with others as fun. A factor that could be influencing our PLAYcoach data is teaching style, as teachers that provide children with autonomy during physical education lessons (i.e. choose their level of challenge or warm-up; de Bruijn et al., 2022; De Meester et al., 2020), and give positive feedback (Nicaise et al., 2006) have a greater influence on the children's motor competence development. Also, gender-stereotypes could have an impact as teachers' stereotypes have an impact on other subjects (i.e. math competency; Tiedemann, 2002). However, we found no differences in the teachers' perception of motor competence between males and females. Physical education teachers not being aware of sex differences could be a more pressing concern since the curriculum is focused on equitable motor development. We may have

found different results if the teachers were physical education specialists trained in assessing and developing movement in children. Since the teachers in our study were generalists, they may lack the training or confidence to accurately develop (Stanec & Murray-Orr, 2011; Truelove et al., 2021) and evaluate (Invernizzi et al., 2020) the children's motor competence in alignment with the curriculum. However, in Saskatchewan, the majority of teachers providing physical education at the elementary level (kindergarten to grade 8) are generalist teachers; therefore, professional development may need to be provided to assist teachers in evaluating motor competence and addressing sex differences.

To summarize, our study has found sex differences in children in kindergarten and grade one, which aligns with previous research evaluating gender differences in older children. In addition, we found no differences in the teacher and parent perspectives of children's motor competence. These findings are essential for those looking to develop more equitable physical education experiences for all students.

Potential Influence of Gender Stereotypes

Although the purpose of the current study was to examine sex differences, as mentioned earlier, it is impossible to isolate just the influence of sex or gender. Thus, it is possible and probable that sex differences we perceived were influenced by the effect gender-stereotypes have on motor competence of children (Chalabaev et al., 2013; Gentile et al., 2018; Plaza et al., 2017). Unsurprisingly, negative stereotypes have a harmful impact on motor skill acquisition, especially for females (Dechrai et al., 2022; Heidrich & Chiviacowsky, 2015; Mousavi et al., 2021). Additionally, sport gender-stereotypes are dependent on the social perception of masculine (i.e. aggression and strength) and feminine (i.e. rhythm and flexibility) characteristics that remain consistent as children age (Chalabaev et al., 2013). These stereotypes could explain the motor competence differences seen in our study, since males are more likely to engage in sports like hockey and rugby (Tuero et al., 2014), which involve running and object control skills, while more females participate in sports like gymnastics and dance (Tuero et al., 2014), which involve locomotor skills. Children are aware of and influenced by gender-stereotypes, like attitudes and norms, as early as 3 to 5 years of age (King et al., 2021), and these can persist into adolescence (Cowley et al., 2021). Understanding the parent and teacher perspectives of sex differences is important since they potentially influence the effect of gender-stereotypes as children age (Cowley et al., 2021; Fredricks & Eccles, 2002, 2005).

Designing Physical Education for Diverse Movement Activities

Given the differences we found between males and females, we want to give suggestions to physical educators on potential ways to provide diverse movement activities. Factors such as positive messaging, reducing competition, and promoting physical activity rather than sport during physical education have been suggested to create more equitable physical education spaces (Solmon, 2014). Additionally, teachers should work to have lesson plans giving both males and females equal opportunity to develop their motor competence. In other words, females need time to develop their running and object control motor competence, while males need time to develop their locomotor motor competence. However, the structure of the lessons can also have an influence.

For some children, the design of the activities may be more beneficial to their motor development than others, since children who are very active during free play engage in less physical activity during structured play (Frank et al., 2018). Therefore, it may be valuable to provide some children with more unstructured time to develop their motor competence. For

example, providing free play opportunities when developing object control motor competence may be more beneficial for children who lack the confidence to participate in structured activities. Additionally, this may be more important for females since they have higher perceived motor competence during free play when compared to males (Tsuda et al., 2020). However, equipment must be provided during these times to allow for engagement in sending and receiving. For males, social relationships with peers have been reported by teachers and parents as important to their motor development, but this relationship is weaker for females (Herrmann et al., 2021). Thus, when developing locomotor competence, it may be beneficial for the lesson to have males complete activities in groups. For those interested in learning more, we recommend reading the A-Z of social justice physical education (Landi et al., 2020; Lynch et al., 2020).

Finally, prioritizing enjoyment when children are active is a key factor to motor skill development, as it has a positive relationship with physical activity (Haas et al., 2021; Ramer et al., 2021). Thus, enjoyment and variety could pose as solutions to close the sex gap in motor competence. It should be noted that enjoyment is an aspect of the Saskatchewan Physical Education curriculum (Saskatchewan Ministry of Education, 2010).

Limitations

A limitation of the current study is the lack of alignment of our motor competence assessments. In other words, PLAYparent and PLAYcoach were not designed to assess perceptions of the children's ability to complete the PLAYfun. Although PLAYparent and PLAYfun have been found to have a moderate association with each other (Caldwell et al., 2021). Furthermore, the domains of motor skills between PLAYfun, PLAYparent, and PLAYcoach are similar, which leads to our speculation on perceived sex differences. However, we are not claiming any alignment between the tools.

Another limitation is that children's gender was not collected for this study. We chose to focus on sex due to previous research's focus on gender. Additionally, PLAYcoach only asks for the child's sex. It would have been beneficial to collect information on children's gender; however, tools that evaluate gender are very limited, as most assess gender on a binary scale. Those interested in doing sex and gender research may want to consult the current limitations and considerations for gender research in early childhood (Olezeski et al., 2020). Finally, sex and gender can interact, referred to as "sex and gender interaction", which could be influencing our outcomes (Canadian Institute of Gender and Health, 2012; Heidari et al., 2016).

Conclusion

Observed motor competence sex differences were similar to previous research involving older children, with males displaying higher object control, while females were found to have higher locomotor competence. If children with low perceived motor competence, especially females, are not improving their motor competence, it could have an impact on physical activity participation throughout their life. The sex differences were not perceived by parents or teachers. Teachers and parents play pivotal roles in supporting the development of children's motor competence. By providing diverse, equitable opportunities for physical activity and reinforcing motor skills development, teachers and parents can help children build the confidence and competence needed for lifelong health and well-being.

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