Are Parental Perceptions of Risk and Attitudes Toward Risk-Taking During Play Associated with Preschoolers' Physical Activity and Physical Literacy?

Michelle R. Stone, Dalhousie University, Natasha Webber, Queen's University, Jane Cawley, Dalhousie University, Natalie E. Houser, University of Saskatchewan, & Sara F.L. Kirk, Dalhousie University, Canada

Abstract

Purpose: *To explore whether parental perceptions of risk and attitudes toward risk-taking during play are associated with preschoolers' physical activity (PA) and physical literacy (PL).* Methods: *Nova Scotia preschoolers (35 boys, 17 girls; mean age = 3.8 years, range = 3–5 years) and parents (n = 52 pairs) provided data. Linear regressions assessed associations of risk perceptions and attitudes with children's PA and PL, controlling for children's age (cross-sectional analysis; $p < 0.05$).* Results: *Perceptions of risk were significantly associated with preschoolers' PA ($r = 0.24$, $p = 0.05$), and predicted 11.6% of the variance in PA. Findings revealed a significant positive relationship between attitudes toward risky play and PL ($r = 0.21$, $p = 0.05$), explaining 14.7% of the variance in PL.* Conclusion: *This evidence supports growing literature on the value of risky play to children's development and parents' influence in risk-taking behaviour.*

Resumé

Objectif : Explorer l'association possible entre, d'une part, les perceptions parentales du risque et l'attitude envers la prise de risques pendant le jeu et, d'autre part, l'activité physique et la littératie physique des enfants d'âge préscolaire. Méthodologie : Les données ont été recueillies auprès d'enfants d'âge préscolaire (35 garçons, 17 filles; âge moyen = 3,8 ans, intervalle = 3 à 5 ans) et de parents (n = 52 paires de parents) de la Nouvelle-Écosse. Par régressions linéaires, on a évalué l'association entre, d'un côté, les perceptions du risque et l'attitude envers la prise de risques et, de l'autre côté, l'activité et la littératie physique chez les enfants en fonction de leur âge (analyse transversale; $p < .05$). Résultats : Il existe un lien significatif entre les perceptions du risque et l'activité physique des enfants d'âge préscolaire ($r = .24$, $p = .05$), qui permettait de prédire 11,6 % de la variance de l'activité physique. Les résultats ont révélé une relation positive significative entre l'attitude envers les risques dans le jeu et la littératie physique ($r = .21$, $p = .05$), ce qui expliquait 14,7 % de la variance au niveau de la littératie physique. Conclusion : Ces données corroborent les études de plus en plus nombreuses sur la valeur de la prise de risques dans le jeu pour le développement des enfants et l'influence des parents sur la tendance des enfants à prendre des risques.

Keywords: children, fundamental movement skills, outdoor, play, risk

Mots clés : enfants, habiletés motrices fondamentales, plein air, jeu, risque

Introduction

The establishment of healthy physical activity (PA) behaviours in early childhood is critical for optimal growth and development (Carson et al., 2017*a*; Timmons et al., 2012). Play, particularly unstructured, self-directed, and/or free play, dominates early childhood and affords children numerous physical, cognitive, and social health benefits (Brussoni, Olsen, Pike, & Sleet, 2012; Pellegrini, 2009). Play is so essential for childhood development that it is recognized in the United Nations Convention on the Rights of the Child (Office of the UN, 1989) and is promoted internationally by organizations such as the International Play Association (http://ipaworld.org/).

Outdoor play has particular health benefits for children (Gray et al., 2015) and has been endorsed through a position statement geared toward key influencers of children (e.g., parents, educators, caregivers, media, government) (Tremblay et al., 2015). The position statement on active outdoor play was developed based upon accumulating evidence that children today play outside less than previous generations and that play has become more structured, with indoor time replacing outdoor time (Active Healthy Kids Canada, 2012; Bassett, John, Conger, Fitzhugh, & Coe, 2015; Veitch, Bagley, Ball, & Salmon, 2006). This shift from time spent outdoors to time indoors coincides with increasing rates of childhood chronic disease, low levels of PA, increasing time spent sedentary, and heightened parental concerns about childhood safety (Tremblay et al., 2015). The position statement highlights that the difference between danger and risk must be recognized and that healthy childhood development relies on access to active outdoor play with its associated risks (Tremblay et al., 2015).

Increasing attention has been focused on changing the perception of "risk" as being synonymous with "danger" (Brussoni et al., 2015), differentiating between "risk" and "hazard" (Canadian Public Health Association, 2018), and raising awareness about the necessity of risk-taking during play—particularly in the outdoors—to children's optimal growth and development (Brussoni et al., 2015). Risk, in the context of play, is identified as, "the challenges and uncertainties within the environment that a child can recognize and learn to manage by choosing to encounter them while determining their own limits" (Canadian Public Health Association, 2018, p. 1), with risky play being defined as, "thrilling and exciting forms of play that involve a risk of physical injury" (Sandseter & Kennair, 2011, p. 258). Six types or categories of risky play have been developed based on observational research with children. These are: play at great heights; play at high speed; play with harmful tools; play near dangerous elements; rough and tumble play; play in which there is a chance for disappearing/getting lost (Sandseter, 2007, 2009). Risky play is universal and part of children's normal and healthy development (Sandseter & Kennair, 2011; Brussoni et al., 2015). It mostly takes place during free play, as opposed to adult organized play (Sandseter, 2007). The many positive health benefits of risky, outdoor play—including

greater PA, less sedentary time, and greater social health (e.g., social competence, creativity, and resilience)—have been documented (Brussoni et al., 2015). Moreover, efforts to promote outdoor play, with its risks, are increasing (Tremblay et al., 2015).

Children have an evolutionary need to take risks during play (Brussoni et al., 2015; Sandseter & Kennair, 2011). The non-associative theory (Sandseter & Kennair, 2011) argues that children innately develop fears of certain stimuli (such as heights), which protect them from experiences they are not mature enough to manage. Risky play provides children with exposure to these stimuli, and is associated with pure exhilaration. Through repeated exposures to risky play, children become more sensitized and habituated to stimuli they previously feared. Children enjoy challenges and are motivated by curiosity to explore their environment and experiment with limits. When given opportunities to take risks, children discover, invent, initiate activities, assert themselves, and become independent; they learn through their mistakes and achievements and develop perseverance (Nikiforidou, 2017). These attributes are critical for developing resilience and maintaining optimal health and wellness throughout life. Risk-taking (moving out of comfortable, secure situations) is fundamental to growth (Dweck, 2000) and is a natural part of preschoolers' psychological development (Erickson, 1959). Risky play also provides children with exhilarating positive emotion, which can contribute to optimal mental health.

By taking risks, children learn how to cope with uncertainty and novelty, and they develop a better understanding of their capacities and limitations (Nikiforidou, 2017). Through taking risks in play, children test their physical limits and learn how to avoid or adjust to dangerous environments (Jambor, 1998). As they gain more experience, they develop perceptual motor skills and spatial-orientation abilities. These skills and abilities allow children to master situations that they had previously feared and permit them to take on age-appropriate challenges (Sandseter & Kennair, 2011). Engaging in these challenges helps to build self-confidence, self-awareness, perseverance, resilience, and independence (Sandseter & Kennair, 2011). These physical challenges also contribute to the development of fundamental movement skills (FMS), that is, the basic movements (e.g., running, jumping, catching, throwing, kicking, rolling) that provide a foundation for PA participation and good health throughout the lifespan (Barnett, Van Beurden, Morgan, Brooks, & Beard, 2008; Gallahue, Ozmun, & Goodway, 2012; Jaakkola, Yli-Piipari, Huotari, Watt, & Liukkonen, 2016). FMS are one component of physical literacy: "the motivation, confidence, physical competence, knowledge and understanding to value and take responsibility for engagement in physical activities for life" (Tremblay et al., 2018). Previous literature suggests that FMS can influence the amount of active play a child will engage in, and that active play also improves FMS development (Johnstone, Hughes, Janssen, & Reilly, 2017), highlighting the bidirectional relationship between the two components.

To advance outdoor play and risk taking in play, it is important to look broadly at the interconnected elements, or ecosystem, that influence children's outdoor play experiences. Some have argued that we have become an excessively risk-averse society (Tremblay et al., 2015), and that increasing safety concerns and regulations have led to restrictions on children's risk-taking during play, which could be limiting children's normal development (Brussoni et al., 2012; Tremblay et al., 2015). The absence of opportunities for outdoor risky play could lead to children's disengagement from PA (Brussoni et al., 2015) and quite possibly adversely affect physical literacy development, given the strong association between physical activity and physical literacy (Barnett et al., 2008). Parental concerns about children's safety have the greatest influence on children's independent play (Tandy, 2002; Valentine & McKendrick, 1997), particularly with regards to traffic hazards and child abduction by strangers. These fears have influenced a shift from active, outdoor, free play to structured activities, many of which often take place indoors (Brussoni et al., 2012). Parents play a crucial role in the early years, acting as a role model to develop and shape their children's PA and sedentary behaviours (Xu, Wen, & Rissel, 2015), and there is evidence to support that parenting styles (e.g., overprotective or hyper-parenting) can negatively impact children's PA (Janssen, 2015) and opportunities for risky play (Cevher-Kalburan & Ivrendi, 2016). Parental beliefs about risk and safety can impact the support and/or encouragement of children's risk-taking (Little, 2010), as well as the response to children's risk-taking behaviours (Backett-Milburn & Harden, 2004).

To date, most of the research on the relationship between parental attitudes toward risky play and children's PA has included school-aged children and youth; very little research has included preschoolers (aged 3 to 5 years). Furthermore, to the authors' knowledge, no study has investigated whether parental perceptions of risk and attitudes toward outdoor, risky play are associated with children's FMS (as one component of physical literacy). Given the established positive relationship between PA and physical literacy, and the evidence that parental safety concerns negatively impact children's PA levels, one might hypothesize that parental perceptions of risk and attitudes toward risk-taking during play would also be associated with children's physical literacy. Therefore, the purpose of the present study is to explore whether parental perceptions of risk and attitudes toward risk-taking during play are associated with PA and PL in a sample of Nova Scotia preschoolers aged 3 to 5 years.

Methods

Participating children and parents were part of a larger project, the Physical Literacy in the Early Years (PLEY) study (Houser et al., 2019), a mixed-methods, randomized controlled trial focused on improving children's physical literacy through the introduction of a "loose parts" (Houser, Roach, Stone, Turner, & Kirk, 2016) intervention into regulated child care centre outdoor environments.

A total of 19 regulated child care centres across Nova Scotia (spread over 240 km) from diverse geographical settings (urban, suburban, rural) took part in the larger PLEY study (see Houser et al., 2019 for study protocol). The study took a staggered approach to the recruitment of child care centres. A general inquiry of interest was sent to regulated child care centres across Nova Scotia that served children between the ages of 3 and 5 years with an enrolment greater than 20 children. A total of 21 sites expressed interest; those meeting eligibility requirements were included in the study (see Houser et al., 2019). Analyses are based on pre-intervention (baseline data) collected from March to July of 2017 (n = 16 centres; cross-sectional analysis). The study was granted ethics approval from Dalhousie University's Research Ethics Board.

All preschoolers (children aged 3 to 5 years) from participating child care centres were invited to take part in the PLEY study. Demographic data including age, sex, and physical characteristics (e.g., height, weight) were taken by trained personnel at child care centres. Height was assessed using a portable stadiometer (SECA, Hamburg, Germany) and taken to the nearest 0.1 cm. Weight was assessed using a digital scale (A&D Medical, Milpitas, CA, USA) and taken to the nearest 0.1 kg. Children's height and weight were measured while children were wearing light clothing and no footwear. The height and weight of each child were used to calculate Body Mass Index (kg/m^2).

Children were asked to wear an accelerometer (ActiGraph wGT3X + ; https://www.actigraphcorp.com/) during waking hours for nine consecutive days. In order to improve compliance and ensure data quality, parents were given an instruction sheet that explained how to attach the accelerometer over their child's right hip and when the device was to be removed (nighttime sleep, bathing/swimming). Parents and educators were also informed of the importance of consistent accelerometer wear to generating information on typical physical activity behaviour. Accelerometer wear and data reduction decisions were based upon previous literature. Accelerometer data were collected in 15s epochs, and non-wear time defined as ≥20 minutes of consecutive zero counts (Carson, Rahman, & Wiebe, 2017*b*). To be included in analyses, children were required to have ≥4 days with ≥6 hours of wear time each day (Hinkley et al., 2012). Sedentary time was defined as ≤100 counts/min, light physical activity (LPA) as 100–1679 counts/min, and MVPA as ≥1680 counts/min (Janssen et al., 2013). Accelerometer data were classified into minutes per day and percentage of day spent sedentary, in LPA, in MVPA, and in activity of any intensity (total PA; TPA). Accelerometer wear (number of days, minutes per day) and steps per day were also calculated.

Children's physical literacy was based on an assessment of FMS, using the Test for Gross Motor Development-3 (TGMD-3; Ulrich, 2016). The TGMD-3 is a validated tool that measures gross motor ability of children aged 3 to 11 years through a qualitative process-oriented approach. Thirteen skills, including seven object control skills (one-hand strike, two-hand strike, dribble, catch, kick, underhand throw, overhand throw) and six locomotor skills (run, hop, gallop,

skip, horizontal jump and slide) were observed. A trained research assistant first demonstrated to the child how to perform the skill correctly. The child was then given one practice trial. This was followed by two test trials, which were scored. Each skill contained multiple performance criteria; these were given a score of "1" if performed correctly or a score of "0" if performed incorrectly. A sum of all locomotor skills (possible score of 70) and object control skills (possible score of 68) was created, along with a total FMS score (possible score of 138).

Parents of participating children were asked to complete a survey, including information on parent demographics, parent and child physical activity participation, parent sedentary behaviour, child sleep, and parent perceptions of their child's physical literacy. Survey questions were created for the purpose of the larger PLEY project (Houser et al., 2019). Parent perceptions concerning the level of risk associated with children's physical activity/play behaviour and attitudes toward risk-taking during play were assessed (Questions #19–22; see Appendix A). The majority of questions were reverse scored so that a higher score reflected a more positive perception of risk and a lower score a more negative perception of risk. A summary score was created for each question.

Descriptive statistics (mean, SD, range, frequencies, and percentages) were used describe: child and parent demographic data; child body composition, physical activity, and physical literacy data; and parent perceptions of risk and attitudes toward risk-taking during play. Linear regression models were used to assess associations of parent perceptions of risk and attitudes toward risk-taking during play with children's PA (Model 1) and physical literacy (Model 2), while controlling for age (child). All statistical analyses were conducted using SPSS (Statistical Package for the Social Sciences, Version 25, IBM, Inc., Chicago, USA). Statistical significance was set at $p < 0.05$.

Results

Complete data were available for a total of 52 matched parent–child pairs (children: boys, n = 35; girls, n = 17). Participant characteristics are provided in Table 1. The average age of participating children was 3.8 years old (SD = ±0.79 years), with 67.3% of the sample being boys. Children wore accelerometers for, on average, 8.8 days (range = 6.0 to 9.0 days); average accelerometer wear time per day was 11.3±4.3 hours. Children spent, on average, 194.0±50.5 minutes per day sedentary, and accumulated 257.7±32.7 minutes of LPA, 223.4±40.9 minutes of MVPA, and 481.1±56.5 minutes of total PA per day. Children were active for the vast majority of their day (71.3% of total wear time), with 38.18% of that time spent in LPA, and 33.15% of that time spent in MVPA; 28.7% of their day was spent sedentary. Children accumulated, on average, 8,186.9±2021.1 steps/day. There was a wide range in locomotor skills scores (range = 5 to 37), object control skills scores (range = 6 to 44), and total FMS scores (range = 14 to 81) (see Table 1).

Characteristics	Mean	SD	Range
Age (years)	3.81	0.79	3.00-5.00
Height (cm)	104.63	6.33	92.60-120.00
Weight (kg)	17.34	2.47	13.60-23.90
BMI (kg/m²)	16.56	1.95	11.83-22.36
Physical activity (accelerometry)			
Sedentary time (min/day)	193.96	50.54	95.22-301.75
Light physical activity (min/day)	257.72	32.71	199.44-356.08
Moderate-vigorous physical activity (min/day)	223.40	40.90	147.47-320.36
Total physical activity (min/day)	481.12	56.50	386.00-651.33
Steps/day	8186.85	2021.06	4470.89-15507.78
Valid days of accelerometry	8.80	0.52	6.00-9.00
Wear time (min/day)	675.08	51.84	553.69-808.86
Sedentary (%)	28.67	6.89	14.03-41.00
Light physical activity (%)	38.18	4.11	29.63-49.46
Moderate-vigorous physical activity (%)	33.15	5.68	21.22-47.53
Total physical activity (%)	71.33	6.89	59.00-85.97
Physical literacy (TGMD-3)			
Locomotor skills score (0-70)	24.46	8.23	5.00-37.00
Object control skills score (0-68)	23.92	8.11	6.00-44.00
Total fundamental movement skills score (0-138)	48.19	14.15	14.00-81.00

Abbreviations: BMI = Body Mass Index; % = % of wear time (note: accelerometers worn during waking hours only)

Table 1. Descriptive statistics for children (n = 52; boys n = 35; girls n = 17)

Parent demographic data, including household structure, ethnicity, level of education, and income, were derived from the parent survey. The structure of almost all families was a "couple with a child/children" (96.2%). Most families were of European descent (84.6%). The majority of parents had obtained a graduate or advanced university degree (59.6%) and had an annual household income of more than $100,000 (69.2%).

Figure 1 illustrates the frequencies of parent responses to Question 19. The vast majority of parents (≥85%) rated most activities (walking, rolling, sliding, running, reaching, swinging) as either not risky at all or somewhat risky. Biking and climbing were perceived to be more risky than other activities (15.4% of parents perceived biking to be "risky," and 13.4% perceived climbing to be "risky" or "very risky") (see Figure 1).

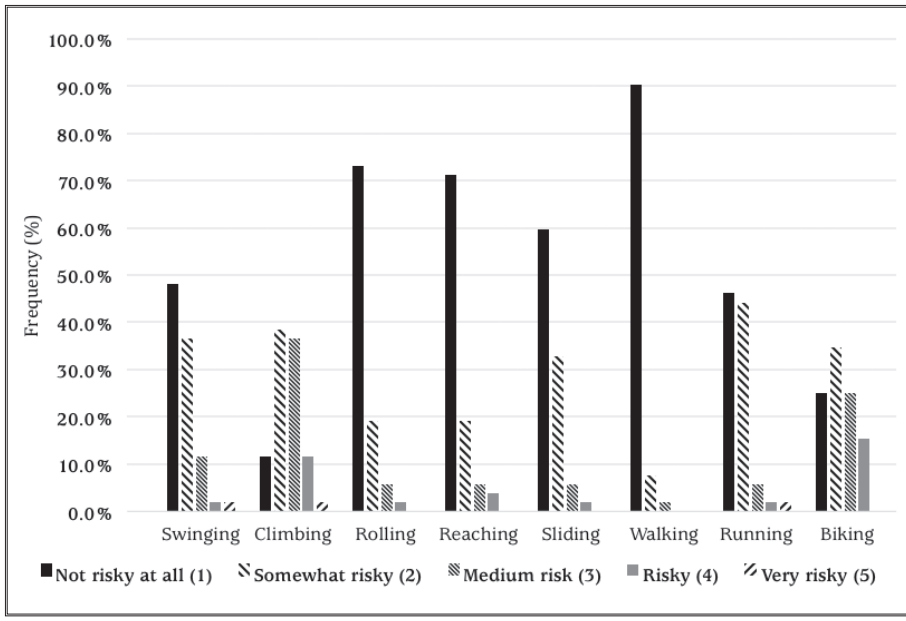
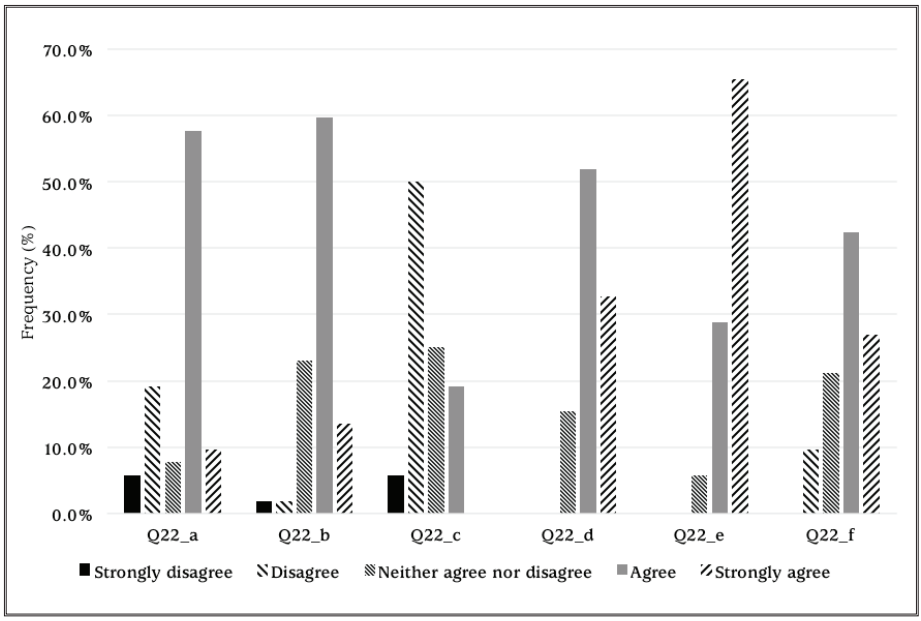


Figure 1. Frequency of parental responses to Question 19 (rating of risk for activities their child participates in).

Question 20 asked parents to rate how much risk influences what activities they allow their child to participate in, from 1 (very little) to 10 (very much). Almost half (46.2%) of parents had a score of 4 or below; the most frequent response was "3" (26.9%). Question 21 asked parents to rate how much risk influences what activities their child chooses to do, from 1 (very little) to 10 (very much). The majority (61.5%) of parents had a score of 4 or below; again, the most frequent response was "3" (25.0%).

Figure 2 illustrates the frequencies of parent responses to Question 22, which asked parents to indicate their level of agreement or disagreement with statements related to attitudes toward risk-taking during play. Most parents (67.3%) agreed or strongly agreed that they permit their child to use equipment and materials in ways other than what they are designed for. Most parents (73.1%) also agreed or strongly agreed that they take their child to places where there are opportunities for risk-taking. Only 19.2% of parents agreed that they limit what their child does out of fear that they might injure themselves. The majority of parents (84.6%) agreed or strongly agreed that risk-taking is an important part of their child's development. Finally, the vast majority (94.2%) of parents encourage their child to play outside in good weather, and 69.2% encourage their child to play outside in rain or snow.



Note: Q22_a = "I permit my child to use equipment and materials in ways other than what they are designed for"; Q22_b = "I take my child to places where there are opportunities for risk-taking"; Q22_c = "I limit what my child does, as I worry that he/she may injure themselves"; Q22_d = "I feel that risk-taking is an important part to my child's development"; Q22_e = "I encourage my child to play outside in good weather"; Q22_f = "I encourage my child to play outside in rain or snow"

Figure 2. Frequency of parental responses to Question 22 (agreement or disagreement with statements related to attitudes toward risk-taking during play).

Direct entry hierarchical regression analyses were performed to examine the association of children's total PA and total FMS score (dependent variables) with, parent perceptions of risk and attitudes toward risk-taking during play, and child demographic data (independent variables). Only those independent variables that were significantly correlated with dependent variables ($p < 0.05$) and/or illustrated a trend for significance ($p < 0.1$) were included in the models. Parental perception of risk for activities their child participates in (Question 19) and age (child) were both significantly correlated with children's total PA ($r = 0.24$, $p = 0.05$; $r = 0.21$, $p = 0.08$, respectively). Parental attitudes toward risk-taking during play (Question 22) and age (child) were significantly associated with children's total FMS score ($r = 0.21$, $p = 0.1$; $r = 0.31$, $p = 0.02$). Each independent variable was entered in one block at a time to determine the unique contribution of the variable to the model.

Dependent variable	Independent variables	B	95% CI (LB, UB)	t	p	Correlations	Partial correlations	r^2 change
Children's total PA (min/day)	Age	0.24	-20.22, 323.51	1.77	0.08	0.21*	0.25	0.04
	Parent risk perception of activities	0.27	0.00, 6.94	2.01	0.05	0.24**	0.28	0.07

Note: **p≦0.05. *p≦0.1. PA = physical activity. CI = confidence interval. LB = lower bound. UB = upper bound.

Table 2. Summary of coefficients, confidence intervals, t-values, p-values, correlations, partial correlations and r2 change for child age, parent perceptions of risk for activities their child participates in (Question 19), and children's physical activity (total PA)

Table 2 illustrates the hierarchical direct entry regression analysis of children's total PA with parent perceptions of risk and child age. This model explained 11.6% of the variance in children's total PA and was statistically significant ($F(2,49) = 3.20$, $p = 0.049$). Age explained 4.3% of the variance, and parental perception of risk for activities their child participates in explained 7.3% of the variance in children's total PA (see Table 2).

Dependent variable	Independent variables	B	95% CI (LB, UB)	t	p	Correlations	Partial correlations	r^2 change
Children's total FMS score	Age	0.32	8.90, 92.90	2.43	0.02	0.31**	0.33	0.10
	Parental attitudes toward risk-taking during play	0.22	-0.19, 2.16	1.68	0.1	0.21*	0.23	0.05

Note: **p≦0.05. *p≦0.1. FMS = fundamental movement skills. CI = confidence interval. LB = lower bound. UB = upper bound.

Table 3. Summary of coefficients, confidence intervals, t-values, p-values, correlations, partial correlations and r2 change for child age, parent attitudes toward risk-taking during play (Question 22), and children's physical literacy (total FMS score)

Table 3 illustrates the results of hierarchical direct entry regression analysis of children's total FMS score with parental attitudes toward risk-taking during play and child age. This model explained 14.7% of the variance in children's total FMS score and was statistically significant ($F(2,49) = 4.22$, $p = 0.020$). Age explained 9.8% of the variance, and parent attitudes toward risk-taking during play explained 4.9% of the variance in children's total FMS score (see Table 3).

Discussion

The purpose of this study was to determine whether parental perceptions of risk and attitudes toward risk-taking during play were associated with preschoolers' PA and physical literacy. While there is evidence that parents' attitudes toward risk-taking during play may influence their children's PA behaviour (Cevher-Kalburan & Ivrendi, al., 2016; Janssen, 2015), there is no evidence to indicate whether parents influence their children's physical literacy by imposing limits on risk-taking during play. Furthermore, previous research exploring relationships of parent risk perceptions and/or attitudes with children's PA has focused on school-aged children and youth, leaving a gap in the understanding of how these perceptions and attitudes relate to the PA behaviour and physical literacy of young children.

The results of this study revealed that parents' perceptions of risk related to children's play-based activities (e.g., swinging, climbing, rolling, reaching, sliding, walking, running, biking) were significantly associated with preschoolers' total PA and predicted (along with child age) 11.6% of the variance in PA behaviour. Lower risk scores were associated with greater levels of PA (inverse relationship). The majority of parents perceived these activities to be of minimal risk, suggesting that they may be more likely to permit and/or encourage their children to engage in these types of activities. Parents may also see the majority of these activities as developmentally appropriate for their children and perceive the benefits (e.g., increases in children's confidence, competence, and enjoyment) as outweighing the risks (e.g., potential injury). Two activities—climbing and biking—were perceived to be more risky than others. A child's ability to ride a bike depends on their balance and coordination. By age 5, children typically have the appropriate balance and coordination to ride a bike without training wheels, yet they might not fully understand the dangers associated with riding a bike at speed, or navigating traffic, which would increase their risk for injury. Consequently, it is not surprising that parents rated biking to be more risky than other play-based activities.

Climbing poses the risk of falling from height, which increases the level of risk for more serious injury and is typically the most commonly restricted type of play (Sandseter & Sando, 2016). Climbing is one of the most fundamental movement skills, improving various physical skills (e.g., balance, hand and foot coordination, agility) and contributing to enhanced spatial and directional

awareness as well as proprioception (body awareness) (Frost, 2013). When children climb, they have to adapt to new and/or unknown environments; they also have to solve problems and make decisions while concentrating on maintaining balance and safety, and they have to develop resiliency (Frost, 2013). Together, these skills enhance a child's overall motor development and provide the foundation to be physically literate and physically active. Gull, Goldstein, and Rosengarten (2017) examined the benefits and risks of tree climbing on child development and resiliency, and considered how parents influenced tree climbing. Parents reported allowing their children to climb trees because of their recognition of the enjoyment and joy it gave their kids, their understanding of the physical benefits (e.g., exercise, balance, strength, proprioception skills, hand–eye coordination, body awareness, dexterity), and their awareness of the emotional benefits (development of confidence, achievement and accomplishment, perseverance, and self-awareness; problem solving, planning and strategizing, decision making, independence, and character building; the understanding of limits, and conquering of fear, the sense of empowerment and perspective taking). The vast majority (82%) of parents agreed or strongly agreed that benefits of tree climbing outweigh the risks. Many parents had common sense guidelines for children to climb, such as testing the physical safety of the tree, letting their child know to "use good judgment" or "pay attention," and having height restrictions; and many parents had no restrictions, trusting their children to know their own body and limits after seeing their skills. Future research is needed to explore the perspectives of Canadian parents on the benefits of climbing, and the facilitators/barriers to supporting this form of outdoor play as a key activity for preschoolers' physical, cognitive, and socio-emotional development (including physical activity and physical literacy).

The present study also found an association between parent attitudes toward risk-taking during play and preschoolers' FMS. More positive attitudes toward risk-taking during play were associated with higher total FMS scores. Most parents (67.3%) agreed or strongly agreed that they permit their child to use equipment and materials in ways other than what they are designed for. This suggests that parents were supportive of child-led play, which is unstructured and has no specific outcome or rules in mind (Houser et al., 2016). Child-led play has been associated with greater physical activity (Houser et al., 2016), and physical activity is important for the development of FMS in the early years (Johnstone et al., 2017). More supportive attitudes toward allowing children to engage with equipment or materials in ways other than they are designed for (e.g., loose parts) (Nicholson, 1971, Houser et al., 2016) could lead to more physically complex and/or demanding play experiences, which could enhance perceptual-motor skill development. Most parents agreed or strongly agreed (73.1%) that they take their child to places where there are opportunities for risk-taking. This suggests that the majority of parents in the sample brought

children to environments where they could engage in risky play. However, there is no indication of how much risky play the parents would actually permit once in these environments, which is a limitation of the study; direct observation would have provided more insight into this. Just 19% of parents agreed that they limit what their child does, as they worry their child might injure themselves, and the majority (85%) agreed or strongly agreed that risk-taking is an important part of their child's development. Together, these findings suggest that the present sample of parents was not very risk-averse and understood that risk-taking is important for their child's development.

While the vast majority (94%) of parents reported that they encourage their child to play outside in good weather, fewer (69%) encouraged their child to play outside in less desirable weather (e.g., rain or snow). Previous research has indicated that poor and/or extreme weather is a barrier to PA in the early years (Hesketh, Lakshman, & van Sluijs, 2017). The misconception that children can get sick while going outside in cold weather, for example, has been cited as one barrier, which, interestingly, has also been voiced by children themselves (e.g., children reporting that their parents don't want them to go outside because of a fear that they will get sick) (Hesketh et al., 2017). Furthermore, prevailing attitudes/policies on weather in child care facilities could influence parents' attitudes (e.g., parents might feel less comfortable in allowing their child outside in poor/extreme weather if this is restricted at the child care centre). Informing parents and educators alike about the widespread benefits of outdoor activity and play, in all weather, and dispelling myths (e.g., increased chance of sickness in rainy weather) is critical for changing societal norms regarding physical activity and play in poor weather.

Strengths

The results presented in this paper provide the first exploration of how parental perceptions of risk and attitudes toward risk-taking during play are associated with preschoolers' physical literacy, revealing a significant positive relationship between parental attitudes toward risk-taking and preschoolers' FMS competence. The finding that parental perceptions of risk was significantly associated with preschoolers' accelerometry-measured physical activity behaviour supports previous literature, indicating that parenting styles (e.g., overprotective or hyper-parenting) can negatively impact children's PA (Janssen, 2015) and opportunities to engage in risky play (Cevher-Kalburan & Ivrendi, 2016). Our findings are strengthened by the use of objective, scientifically validated measures of children's physical activity (ActiGraph wGT3X+ accelerometer) as well as FMS (TGMD-3), a component of physical literacy. Findings are based on baseline data of a randomized, mixed methods, controlled study design, and probability sampling of a moderate sample size of parent-child pairs ($n = 52$).

Limitations

Observed relationships between parental perceptions of risk and children's PA, as well as between attitudes toward risk-taking during play and physical literacy, may have been influenced by the limited diversity of the sample. Most parents in the present study were well-educated, with high annual household incomes and are thus not representative of most Canadian households (Garriguet et al., 2016), which limits the generalizability of results. Most parents were not risk averse and recognized risk-taking as important for their child's development. Certain demographic characteristics of participating parents that may have influenced perceptions of risk and attitudes toward risk-taking during play (e.g., gender) were not recorded, limiting an examination of whether parent perceptions and attitudes varied by gender; this presents an important avenue for future research. Our study is also limited by the use of a survey of parental perceptions of risk and attitudes toward risk-taking during play, which may not directly correlate with actual practices, beliefs, and/or responses to children's risk-taking during play behaviours. Little, Wyver, and Gibson (2011) did find, however, that parents who expressed strong opinions about risk in children's play supported children's exploratory risk in practice, providing encouragement, praise, and physical support, which may suggest that there is little bias in our survey results. Like the present study, parents included in Little et al.'s (2011) study were predominantly from well-educated backgrounds. More research is needed to examine the beliefs of parents from diverse socio-economic and cultural backgrounds and how these factors influence children's opportunities for risk-taking during play.

The present study focused specifically on exploring relationships of parental perceptions of risk and attitudes toward risk-taking during play with children's total physical activity and total fundamental movement skills score, limiting an understanding of whether these perceptions and attitudes are more strongly associated with certain intensities of physical activity (e.g., moderate-vigorous physical activity) or with specific FMS (e.g., running or jumping). Preschoolers' physical literacy was defined as FMS competence, which is only one component of physical literacy. At the time of this study, a validated measurement tool that could adequately capture other components of physical literacy (e.g. motivation and confidence) in preschool-aged children did not exist; progress has been made on this since (Cairney et al., 2018). Future work is needed to examine whether parent perceptions of risk and attitudes toward risk-taking during play are associated with these other components of physical literacy.

Finally, our sample of preschoolers spent the vast majority of their day active, which contradicts previous literature (Chaput et al., 2017); this may limit the generalizability of our findings. All of the children who were part of this study were in regulated child care, where there are requirements for

the amount of physical activity/outdoor time that children receive each day. Moreover, these children were assessed in the spring/summer. Both of these factors could explain these findings.

Conclusion

The findings from the present study contribute to, and build upon, previous literature supporting a relationship between parent attitudes toward risk-taking during play and children's physical activity behaviour. More positive parental attitudes toward risk-taking during play were associated with greater fundamental movement skill competence in preschoolers, a novel finding that extends the literature and signifies the importance of providing young children with opportunities to take risks during play for optimal physical development. Data from a larger, more diverse sample of parents are needed to understand the perspectives of parents who are less risk permissive and less likely to allow children opportunities to take risks during their play, and to understand how these factors relate to young children's physical activity and physical literacy. Future research is needed to tease out the barriers and/or facilitators for providing young Nova Scotia children with opportunities to take risks during play, particularly in the outdoors and in various early years settings (e.g., home, childcare, school, community), using an ecosystems lens approach that addresses multiple interrelated factors. Building relationships among key research, policy, and practice stakeholders in Nova Scotia will allow for collective sharing about and knowledge mobilization around barriers/facilitators of risk-taking during outdoor play, and will provide a mechanism for devising strategies to ensure Nova Scotia children have more opportunities for risky play.

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Conflicts of interest

The authors have no conflicts of interest to report.

Appendix A

Survey Questions

Survey questions on parent perceptions concerning the level of risk associated with children's physical activity/play behaviour and attitudes toward risk-taking during play (from PLEY project parent survey).

Question 19: How risky would you consider each of the following activities for your child to participate in? Rate each of the activities from 1- "not risky at all" to 5- "Very risky"

	Not risky at all				**Very risky**
Swinging	1	2	3	4	5
Climbing	1	2	3	4	5
Rolling	1	2	3	4	5
Reaching	1	2	3	4	5
Sliding	1	2	3	4	5
Walking	1	2	3	4	5
Running	1	2	3	4	5
Biking	1	2	3	4	5

Question 20: On a scale of 1 to 10, how much does risk influence what activities you allow your child to participate in?

Very Little **Very much**

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Question 21: On a scale of 1 to 10, how much does risk influence what activities your child chooses to do?

Very Little **Very much**

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**

Question 22: How much do you agree with each of the following statements about your child?

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I permit my child to use equipment and materials in ways other than what they were designed for.	1	2	3	4	5
I take my child to places where there are opportunities for risk-taking.	1	2	3	4	5
I limit what my child does as I worry that he/she may injure themselves	1	2	3	4	5
I feel that risk-taking is an important part to my child's development	1	2	3	4	5
I encourage my child to play outside in good weather	1	2	3	4	5
I encourage my child to play outside in rain or snow	1	2	3	4	5

Notes on Contributors

Michelle Stone is an Associate Professor in the School of Health and Human Performance, Faculty of Health, at Dalhousie University. Her expertise is in pediatric physical activity and health. Her research focuses on the benefits of unstructured, outdoor loose parts play to children's development, health and wellness. Contact: michele.stone@dal.ca

Natasha Webber is currently completing her Master's degree in Physical Therapy at Queen's University. She conducted research in the area of pediatric physical activity and physical literacy at Dalhousie University while obtaining her Bachelor of Science degree in Kinesiology. She is passionate about preventative healthcare and hopes to carry this into her future career as a Physical Therapist. Contact: 19nmw1@queensu.ca.

Natalie Houser is a PhD Candidate in the College of Kinesiology at the University of Saskatchewan. Her research focuses on children's physical activity experiences, the development of physical literacy, and the role that children's growth, maturation, and development play in these opportunities. Contact: natalie.houser@usask.ca

Jane Cawley is a Research Scholar in the Healthy Populations Institute at Dalhousie University. Her expertise is in children's behaviour and the connection to outdoor play. She teaches early childhood education at Mount Saint Vincent University and the Nova Scotia College of Early Childhood Education. Contact: janescawley@gmail.com

Sara F. L. Kirk is a Professor of Health Promotion in the School of Health and Human Performance, Faculty of Health, and Scientific Director of the Healthy Populations Institute at Dalhousie University. Her expertise is in population health research. Her research focuses on the creation of supportive environments for chronic disease prevention. Contact: Sara.Kirk@dal.ca.

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