Original research

Early life factors are associated with trajectories of consistent organized sport participation over childhood and adolescence: Longitudinal analysis from the Raine Study

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ABSTRACT

Objectives: The purpose of this study was to identify early life factors that were associated with childhood and adolescent organized sport participation trajectories.
Design: Participants were in the Raine Study, a pregnancy cohort in Western Australia recruited from 1989 to 1991.
Methods: Three organized sport trajectories over ages 5–17 years were previously identified for girls (n = 824: consistent participators, dropouts, and non-participators in sport) and boys (n = 855: consistent participators, dropouts, joiners — those who joined sport in adolescence). Physical, psychological and social factors were measured from birth to age 5.
Results: For girls and boys, children who were breastfed, were taller, did not have behavior problems, and attended childcare were more likely to consistently participate. Girls who had a previous injury (Relative risk ratio 1.55: 95% confidence interval 1.05, 2.29 vs never been injured) or who had parents who had worries about their child's health (1.56: 1.00, 2.42 vs no worries) were more likely to be in the dropout trajectory. Boys born preterm (2.00, 2.06, 3.76 vs full-term), did not have a previous injury (0.72, 0.53, 0.97 those with injury vs never been injured), had more difficult temperament (1.63, 1.02, 2.60 vs easy temperament), and higher family dysfunction (1.49, 1.06, 2.08) were more likely to be in the dropout trajectory.
Conclusions: Early life factors were associated with membership in sport trajectories. Physical, psychological, and social factors may serve as early warning signs for parents and practitioners that children may be at higher risk of dropping out of sports.

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Practical implications

- Children with one or more of the identified early childhood predictors of higher risk of dropping out of sport may need additional encouragement or alternative physical activity opportunities such as dance or organized fitness opportunities.
- Parents who may be over-protective of their children, particularly of girls, should be counseled on the benefits of sports participation and how to appropriately reduce and manage risk for their child.
- Parents may match sporting opportunities to their child's temperament and behavior for sustained participation such as

enrolling children with a difficult temperament in less regulated sports (i.e. cross-country running) or children with more internalizing problems in individual sports (i.e. tennis).

1. Introduction

Sport participation is beneficial for children's physical, mental and social health both during childhood and into adulthood.[1,2] Unfortunately, not all children participate in sports during childhood through adolescence.[3] To ensure benefits of sport participation for all children it is important to better understand patterns of organized sport participation in order to intervene at critical periods or with at-risk populations. Thus, the recent Australian Physical Activity Report Card called for a better understanding of retention rates,[4] which can be informed by examining longitudinal patterns of sport participation. However, few longitudinal studies

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have examined sports participation from childhood to adolescence to help understand reasons why children stay in sports, drop out of sports or never participate.[5]

The Western Australian Pregnancy Cohort (Raine) Study is a longitudinal study that has collected a broad array of lifespan variables and is well suited to investigating factors associated with sport participation. From these data, three unique trajectories of sports participation (for both boys and girls separately) have been identified and these trajectory classes were associated with differential health outcomes in young adulthood.[6] Identifying early predictors of these trajectories may help to identify those most at risk of dropout, late joining, and non-participation and the ability to target interventions so that all children can receive the benefits of sports participation. If children at-risk of not participating or dropping out of sports can be identified at an early age, strategies can be designed to help these children join or maintain sports participation and receive the benefits.

Several factors may influence physical activity and sports participation, including physical, psychological and social factors.[7] Physical factors such as being born preterm or being breastfed have been shown to have implications for poorer cardiorespiratory fitness which may lead to less success in sports, but more research is needed to better understanding these complicated associations.[8,9] Examination of what month a child is born in, i.e. relative age effects, has shown that children born early in the year (with a January 1st cutoff for sports participation) are more successful in sports because they are more mature and physically developed for their age group. These early life physical developmental factors may contribute to height and weight, suggesting that taller and heavier children are more successful in sport and more likely to continue participating and less likely to dropout. Poor early motor skills, or physical competence, have been associated with dropout from sports as have previous injuries or illness.[7] Psychological factors have also shown to be associated with physical activity and sport including temperament[10] and behavior,[11] but studies have been inconclusive. Finally, several social factors may contribute to sports participation including family structure[12] and function, parental relationships,[7] and childcare attendance, though again research has been inconclusive.[12]

No studies to our knowledge have examined how these multiple early life factors predict later sports participation throughout childhood and adolescence. Early identification of children who are at risk of non-participation, dropout or joining late may help to target these children for extra intervention or approaches to encourage a lifetime of meaningful sport participation. Thus, the purpose of this study was to identify early life factors that were associated with childhood and adolescent organized sport participation trajectories.

2. Methods

Participants in the current study were part of the Western Australian Pregnancy Cohort (Raine) Study. Expecting mothers were recruited into the study between May 1989 and November 1991 from which 2868 children entered the study. Participation in organized sport was assessed at ages 5, 8, 10, 14, and 17 by a parent-reported single item. Physical activity, body composition, and self-rated physical and mental health were assessed at age 20. Latent class analysis was used to identify patterns of sport participation for girls and boys separately.[6] To be included in the latent class analysis, participants needed organized sport information for at least 4 out of 5 assessments (girls n = 824, boys n = 855). Three trajectory classes of participation were identified for girls (consistent sport participators, sport dropouts, and non-participators) and boys (consistent sport participators, sport dropouts, and joiners).[6]

Physical, psychological and social early life predictors used for the current study were assessed through physical assessments and parent questionnaires at ages 1, 2, 3, 5. The assessment protocols and questionnaires are available at rainestudy.org.au. Written, informed consent was obtained from the mother of each child, with follow-ups approved by ethics committees at King Edward Memorial Hospital, Princess Margaret Hospital for Children, the University of Western Australia, and/or Curtin University.

Potential early life factors were selected from the literature based on factors that have been previously shown to associate with children's physical activity and/or sport participation, and were available within the Raine database. They included physical, psychological, and social factors as seen in Fig. 1. Due to limited environmental factors available in the Raine Study these were not considered in the current study, despite the acknowledged role they play in influencing children's behaviors.

Physical predictors were assessed by the following. Preterm status was determined as less than 37 weeks gestation and birthdates were divided into quartiles based on month of birth (1: Jan–Mar, 2: Apr–Jun, 3: Jul–Sept, 4: Oct–Dec). Parents reported on previous injuries/illnesses of the children requiring at least one visit to hospital or doctor and duration of breastfeeding (none, 0–6 months, more than 6 months), and ages at first crawl and walk in months. The Denver Developmental Screening Test[13] was administered at ages 1 and 3. Height and weight were measured by trained research staff and used to calculate Body Mass Index (BMI) at ages 1, 3 and 5.

Psychological predictors were assessed via questionnaire. Parents completed the Child Behavior Checklist (CBCL) to assess problem behaviors for the child at ages 2 and 5. The CBCL is a highly used parent questionnaire to identify problem behaviors within the past 6 months.[14] It includes 113 items which are answered as not true, somewhat true or very true. Parents also completed the Toddler Temperament Tool at age 1[15] to assess child temperament. Toddler Temperament Tool consisted of 97 items on child activities and behaviors in the past few weeks i.e. "Your child is pleasant (smiles, laughs) when first arriving in unfamiliar places" (Likert scale 1–6 with 1 being almost never and 6 being almost always). Child temperament is categorized as easy (regular, adaptable and positive mood), difficult (high sensory threshold, reactive to new situations, not approachable), or slow-to-warm (low activity, not approachable, not adaptable).

Social predictors included parents reported on family composition including siblings and father living at home (age 5), family income (age 5), whether the child attended childcare (ages 1, 2, 3, 5), and family functioning on the Family Assessment Device[16] (age 3).

To test the association between early life factors (binary, categorical, or continuous independent variables) and membership in the sport trajectory classes (categorical dependent variable) multinomial logistic regression was used in Stata/IC 14.1 (StataCorp LP, College Station TX, USA). Models were adjusted for family income at age 5 and probability of trajectory class membership and results are presented as relative risk ratios (RR) with 95% confidence intervals. P-values were not adjusted for multiple testing.

3. Results

Descriptive information and sample sizes for each potential predictor can be seen in Supplemental material Table A.

In girls, of the physical predictors, being breastfed, height at age 5, and having an injury were associated with sport trajectories of girls (Table 1). Of the psychological predictors (Table 2), internalizing behaviors (e.g. depression, anxiety) were associated with later sport trajectories. Of the social predictors (Table 2), parent worry
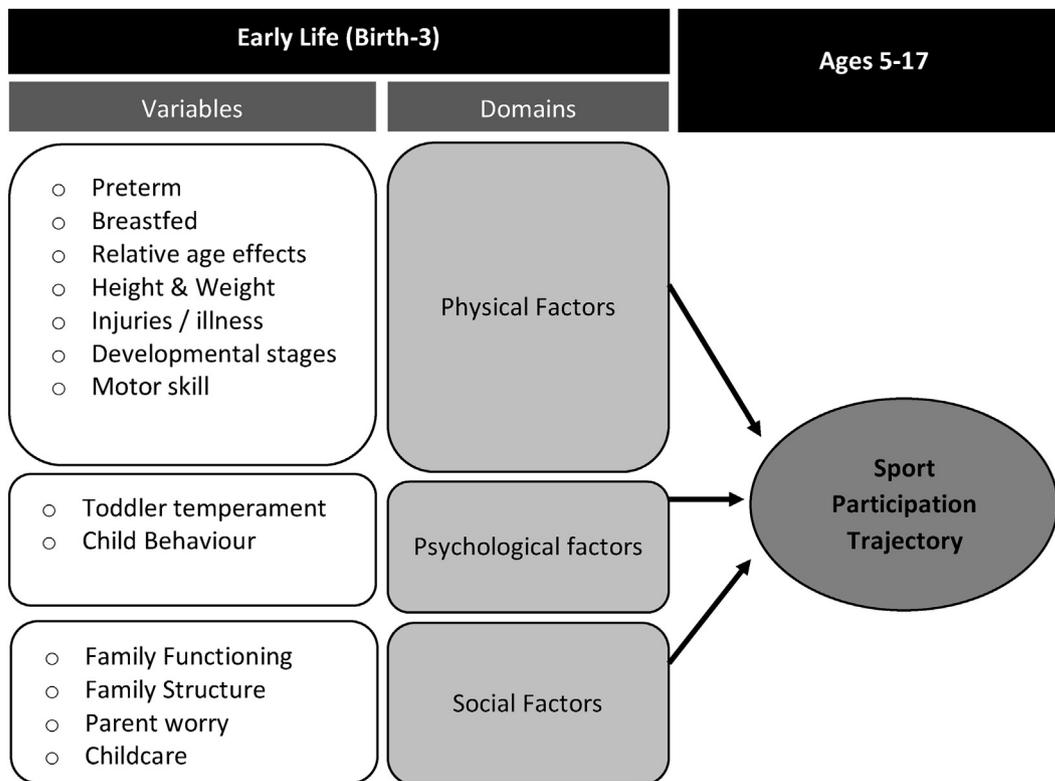
Fig. 1. Conceptual framework of early childhood predictors of organized sport participation in the Raine Study.

at age 5 and childcare at age 1 were associated with later sport trajectories.

In boys, of the physical predictors, preterm status, being breastfed, relative age effects, height at age 5, having an injury/illness, and gross motor skills at age 1 were associated with later sport trajectories of boys (Table 1). Of the psychological predictors (Table 2), child temperament and externalizing behaviors (e.g. aggression, bullying) were associated with later sports trajectories of boys. Of the social predictors (Table 2), family functioning and childcare were associated with later sport trajectories.

4. Discussion

This study identified several physical, psychological, and social early life factors from birth to age 5 years that were associated with organized sports participation trajectories in girls and boys. These early life factors included breastfeeding, height, previous reported injuries, child behaviors, and childcare for both girls and boys. For girls, they also included parent worries and for boys and preterm status, relative age effects, temperament, and family functioning.

Being born preterm was associated with a higher risk of being in the dropout trajectory, but only for boys. This was consistent with other research showing preterm status association with less sports participation[8] and less leisure time physical activity as young adults.[17] It was expected that this difference would be due to delayed development including a smaller stature that would result in poorer sporting performance. It is also possible that being born preterm results in parents having poorer mental health[18] and stress[19] resulting from the experience of having a child born early that may influence whether or not they enroll their child in sport.

Children who were breastfed were more likely to be in the consistent participator trajectory. Similarly to preterm status, it was expected that children who were breastfed longer would have greater development including bigger size and more advanced motor skills. Breastfeeding has also been associated with a reduced

risk of obesity in childhood, reduced risk of illness and higher intelligence[20] which may all contribute to better performance and ability to participate in sport. Higher socioeconomic status has been associated with breastfeeding[4] and higher sports participation,[21] although the current analyses were adjusted for family income.

Relative age effects were inconclusive in the current study. There were relative age effects evident in boys, but not girls, and not in the expected direction. Boys who were born in April–June (Q2) or October–December (Q4), were less likely to be joiners compared to consistent participators. We found no differences in BMI, height or weight between birth quartiles to suggest differences in physical status between the age groups. However, in the current study only a broad question on whether or not their child participated in sports was used and it did not capture the level or seasonality of specific sports. Children who are "smaller" or underdeveloped because they are younger may elect to participate in recreational vs competitive sports, while someone who is born earlier in the year may participate in elite sport.

The only anthropometric factor that was associated with sport trajectory was height. Shorter height was associated with the dropout trajectory in both girls and boys. There were no differences, however, in weight or BMI between trajectories. The relationship between sports participation and weight is likely to be non-linear, as both children with high BMI and low BMI may be less adept at certain sports. Additionally, BMI is not a true measure of body composition and whilst higher body mass in childhood may be associated with greater development, it may also be associated with obesity and decreased fitness.[22] Similarly, different body types are more suited to different sports.

There were interesting gender differences in associations between previous injury or illness and sport trajectory. In girls, those who had a serious injury/illness prior to age 5 had an increased risk of being in the dropout trajectory. This may be related to parent worries or protectiveness for fear of re-injury or a negative experience with activity, which has historically been

Table 1
Relative risk ratios from multinomial logistic regression predicting sports participation trajectories with physical factors.

	Girls (vs "Consistent Participators")		Boys (vs "Consistent Participators")	
	"Dropouts"	"Non-Participators"	"Dropouts"	"Joiners"
Preterm Status (vs not preterm)	.53 (0.26, 1.11)	1.41 (0.76, 2.63)	**2.00 (1.06, 3.76)**[a]	2.41 (0.92, 6.34)
Breast Fed (vs not breastfed)				
0–6 months	.95 (.43, 2.11)	.56 (.27, 1.17)	.71 (.40, 1.27)	.68 (.26, 1.77)
More than 6 months	.81 (.37, 1.76)	**.40 (.20, .83)**[a]	**0.55 (0.31, 0.98)**[a]	0.50 (0.19, 1.28)
Relative age effects (vs Jan-Mar)				
April–June	.84 (.45, 1.56)	.77 (.41, 1.45)	1.10 (.73, 1.65)	**.26 (.10, .64)**[a]
July–Sept	1.49 (.88, 2.53)	.997 (.57, 1.74)	1.40 (.92, 2.14)	1.33 (.71, 2.50)
Oct–Dec	1.47 (.90, 2.41)	1.14 (.69, 1.89)	.87 (.58, 1.29)	**.42 (.20, .88)**[a]
Height (cm)				
Age 1	.97 (.90, 1.04)	1.02 (.95, 1.10)	.98 (.93, 1.03)	1.04 (.95, 1.14)
Age 3	.94 (.88, 1.00)	.96 (.90, 1.03)	.96 (.91, 1.00)	.98 (.90, 1.07)
Age 5	**.96 (.91, 1.00)**[a]	.98 (.93, 1.02)	**.96 (.94, .99)**[a]	.99 (.94, 1.05)
Weight (kg)				
Age 1	.92 (.77, 1.10)	1.04 (.87, 1.24)	.93 (.83, 1.06)	1.02 (.82, 1.27)
Age 3	.94 (.82, 1.07)	.92 (.80, 1.06)	.92 (.83, 1.02)	.93 (.77, 1.12)
Age 5	.98 (.92, 1.05)	1.00 (.94, 1.06)	.97 (.93, 1.02)	.98 (.90, 1.06)
BMI (kg/m^2)				
Age 1	.97 (.84, 1.13)	.99 (.85, 1.15)	.94 (.84, 1.05)	.93 (.76, 1.14)
Age 3	1.00 (.85, 1.18)	.94 (.78, 1.13)	.95 (82, 1.08)	.89 (.69, 1.16)
Age 5	1.03 (.92, 1.15)	1.03 (.92, 1.16)	1.00 (.92, 1.09)	.95 (.55, 1.93)
Injuries (vs no injury)				
Age 2	.91 (.53, 1.55)	.85 (.48, 1.51)	1.00 (.70, 1.44)	.67 (.33, 1.34)
Age 3	1.17 (.72, 1.91)	1.07 (.64, 1.81)	1.39 (.99, 1.96)	1.44 (.81, 2.54)
Age 5	1.35 (.90, 2.02)	**.83 (.53, 1.28)**[b]	**.72 (.53, .97)**	.71 (.41, 1.21)
Injury ever (vs never)	**1.55 (1.05, 2.29)**[a]	**.89 (.59, 1.33)**[b]	.93 (.68, 1.26)	1.24 (.72, 2.16)
Total Count	1.15 (.97, 1.36)	**.93 (.76, 1.13)**[b]	1.02 (.90, 1.14)	.98 (.80, 1.20)
Developmental Stages (months)				
Age first crawl	1.00 (.99, 1.02)	1.00 (.99, 1.02)	1.00 (.99, 1.01)	1.01 (1.00, 1.02)
Age first walk	.99 (.98, 1.01)	1.01 (1.00, 1.02)	1.00 (.98, 1.01)	1.00 (.98, 1.02)
Motor Skill (Denver) (Fail/suspect vs Normal)				
Gross Age 1	.78 (.19, 3.23)	1.78 (.49, 6.47)	2.61 (.94, 7.25)	**4.49 (1.05, 19.09)**[a]
Age 3	.70 (.25, 1.94)	1.78 (.69, 4.61)	.97 (.44, 2.15)	1.92 (.59, 6.22)
Fine Age 1	2.76 (.65, 11.7)	3.11 (.71, 13.5)	.48 (.18, 1.27)	1.15 (.25, 5.90)
Age 3	.12 (.00, 28.20)	Insufficient sample size	1.06 (.16, 7.06)	Insufficient sample size

All models adjusted for family income at age 5 (as categorical variable) and probability of class membership, all ages in years unless specified.
Bold is significant difference (p < .05).

  [a] Difference from consistent participators.
  [b] Difference between dropouts and non-participators in girls and dropouts and joiners in boys.

stronger for females.[23] Conversely, boys who had a parent report an injury/illness at age 5 were less likely to be in the dropout trajectory compared to the consistent participator trajectory, which may flow from the idea of "boys being boys" and violence and its consequences being accepted for boys.[24] Future studies may look at resilience as a possible target of intervention.

Interestingly there were limited differences in developmental stages (first age at crawling and walking) or motor skills between sports trajectories in girls or boys. This is different to previous research suggesting a positive relationship between motor skill performance and physical activity.[25] Children who have better motor skills are more likely to succeed or find sport participation easier and more enjoyable.[26] Other research suggests that it is perceptions of motor performance that are more likely to influence participation in physical activity and sports,[27] rather than actual performance. The lack of evidence in the current study between motor skill development might be interpreted as encouraging for parents, as delayed development need not inhibit children's later sports interpretation. However, this outcome may have been due to a lack of measurement precision or specificity as only composite scores were used. In addition, only composite scores of gross and fine motor skills were used from the Denver Developmental Screening Test. More specific sport related motor skills may more predictive of sports participation.

Boys who had intermediate high levels of difficult temperament were more likely to be in the dropout trajectory, consistent with a prior study which also found the association only in boys

and not girls.[10] Parents or coaches may remove "difficult" or non-cooperative children from sport. However, this was not the same pattern for those children with a "difficult" temperament. This may be due to fewer participants in this category, or because the boys with the most difficult temperament at age 1 may have more temperament issues that led to their parents to never starting them in sports. Previous studies examining associations with physical activity have found positive associations where boys with higher temperamental difficulty had higher levels of physical activity,[10] but sports is an organized activity which has different social expectations that may be less suitable for a more temperamental child.

Child behavior was associated with sports trajectories in girls and boys. For girls it was higher internalizing behaviors whereas for boys it was higher externalizing behaviors that were associated with increased risk of being in the dropout trajectory. This may be explained by different gender stereotypes. Parents of girls who have fearfulness, withdrawal or somatic complaints may be less likely to encourage participation of their girls. Boys who have externalizing behaviors, such as aggression, may be removed from sport by parents or coaches. There may be differential associations between organized and unorganized physical activity.

Poorer family function was associated with an increased rate of boys being in the dropout category. Families with poorer function may be less likely to support boys in sport as they get older due to emotional or financial constraints as literature has suggested boys with parents of lower socioeconomic status are less likely to participate in sport due to both actual and perceived barriers.[28]

Table 2
Relative risk ratios from multinomial logistic regression predicting sports participation trajectories from psychological & social factors.

	Girls (vs "Consistent Participators")		Boys (vs "Consistent Participators")	
	"Dropouts"	"Non-Participators"	"Dropouts"	"Joiners"
Psychological				
Toddler Temperament (Y1) (vs Easy)				
Difficult	1.67 (0.85, 3.31)	1.83 (0.93, 3.61)	0.78 (0.47, 1.31)	0.76 (0.30, 1.94)
Intermediate High	1.72 (0.91, 3.24)	1.07 (0.53, 2.14)	**1.63 (1.02, 2.60)**[a]	0.92 (0.38, 2.25)
Intermediate low	0.96 (0.60, 1.55)	0.78 (0.47, 1.29)	0.84 (0.58, 1.23)	1.26 (0.70, 2.26)
Slow to warm up	1.57 (0.66, 3.74)	1.64 (0.67, 4.06)	1.19 (0.58, 2.45)	Insufficient sample
Child Behavior Checklist (t-scores)				
Total Age 2	1.01 (.99, 1.04)	1.01 (.98, 1.03)	1.01 (.99, 1.02)	**.97 (.94, .995)**[a]
Age 5	1.02 (1.00, 1.04)	1.00 (.98, 1.02)	**1.02 (1.01, 1.04)**[a]	.99 (.96, 1.02)
Internalizing Age 2	1.00 (.98, 1.03)	1.01 (.98, 1.04)	1.01 (.99, 1.02)	**.97 (.94, .99)**[a]
Age 5	1.02 (1.00, 1.04) [a]	1.00 (.98, 1.02)	1.01 (.999, 1.03)	.98 (.96, 1.01)
Externalizing Age 2	1.00 (.98, 1.03)	1.01 (.98, 1.03)	1.01 (.99, 1.02)	**.97 (.94, .995)**[a]
Age 5	1.01 (.99, 1.03)	.99 (.97, 1.01)	**1.02 (1.01, 1.04)**[a]	.99 (.96, 1.01)
Social				
Family Functioning (scale 1–4, higher scores = poorer function)	1.02 (.65, 1.62)	1.17 (.72, 1.90)	**1.49 (1.06, 2.08)**[a]	1.12 (.62, 2.02)
Father living at home Age 1	1.50 (0.77, 2.91)	1.74 (0.86, 3.53)	0.73 (0.44, 1.20)	0.77 (0.34, 1.72)
Age 2	1.56 (0.77, 3.16)	1.25 (0.61, 2.57)	0.99 (0.58, 1.69)	0.74 (0.32, 1.71)
Age 3	0.90 (0.49, 1.66)	1.20 (0.62, 2.31)	0.81 (0.51, 1.28)	1.02 (0.47, 2.22)
Age 5	0.82 (0.48, 1.41)	1.13 (0.64, 2.01)	0.61 (0.40, 0.93)	0.74 (0.36, 1.50)
Parent Worries				
Any worry (vs none) Age 1	1.08 (.70, 1.67)	1.20 (.77, 1.89)	.91 (.66, 1.24)	.57 (.31, 1.03)
Age 2	1.19 (.74, 1.91)	.89 (.54, 1.47)	.91 (.65, 1.26)	.75 (.41, 1.38)
Age 3	1.16 (.75, 1.82)	1.23 (.77, 1.97)	.81 (.57, 2.02)	1.01 (.58, 1.77)
Age 5	**1.56 (1.00, 2.42)**[a]	**1.71 (1.09, 2.69)**[a]	1.19 (.87, 1.61)	.90 (.53, 1.55)
Siblings				
Any siblings (vs none)	.91 (.54, 1.53)	.74 (.43, 1.26)	.93 (.60, 1.43)	.59 (.31, 1.14)
Any older siblings (vs no older siblings)	1.02 (.65, 1.60)	.84 (.52, 1.37)	1.05 (.75, 1.49)	1.17 (.64, 2.16)
Childcare (vs no childcare)				
Age 1	.61 (.37, 1.01)	**.55 (.31, .96)**[a]	.80 (.55, 1.15)	1.09 (.60, 1.99)
Age 2	.98 (.61, 1.57)	.74 (.44, 1.25)	**.68 (.47, .98)**[a]	.92 (.51, 1.67)
Age 3	1.09 (.74, 1.61)	.70 (.46, 1.06)	**.58 (.43, .79)**[a]	**1.04 (.62, 1.74)**[b]
Age 5	.87 (.53, 1.41)	.69 (.43, 1.13)	**.62 (.42, .92)**[a]	.70 (.36, .76)

All models adjusted for family income at age 5 (as categorical variable) and probability of class membership.

[a] Difference from consistent participators.

[b] Difference between dropouts and non-participators in girls and dropouts and joiners in boys.

Parent worries were associated with an increased likelihood of girls being in both the dropout and non-participator trajectories. This may be the result of over-protective parents feeling that girls, compared to boys, are vulnerable and involvement in sports may lead to increased risk of injury. Research on patients with chronic pain have found that parental protectiveness is associated with parental behaviors and child function.[29] Similarly, "helicopter parenting" may lead to risk-aversive children.[30] Interventions that identify parents with high worry, whether justified or not, may help them to understand the benefits and risks of sports participation and devise plans to help them minimize the risks to maximize the benefits for their daughters.

The current study found no relationship between siblings and sports trajectories. However, this study did not collect information on whether the siblings participated in sports. Children with siblings who participate in sport may be more likely to participate in sport,[12] but a greater understanding of the role of siblings in sport participation is needed (Authors *In Press*).

Finally, boys who were in childcare at ages, 2, 3, and 5 were less likely to be in the dropout trajectory compared to the consistent participator trajectory. Organized sports can be extension of childcare and used as a "baby sitter" or alternative afterschool care. Children may also further develop physical and social skills in childcare environments through structured instruction in motor skills and social interactions with children that makes them more successful in sports later on and less likely to drop out. It is also important to consider socioeconomic factors that may contribute to early life childcare. A low income family may need both parents to work thus sending a child to childcare. Conversely, parents of higher socioeconomic status may choose to put their child in childcare for early socialization and instruction.

While the current study did provide a comprehensive analysis of multiple domains that may influence organized sport participation, several factors were not measured in this sample, such as peer participation and support which are also known to influence participation.[31] However, before age 5, family influences are likely to be more influential than peer influences. Future studies, especially of older children should examine the peer influences on sport participation (Authors *In Press*). The current analyses did not determine which factors may be more important by including all variables in a single model but did include assessments across multiple time points. The multiple models increased the risk of Type 1 error, thus the predictors identified in the current study should be replicated in more robust analyses. Thus practitioners can use these findings on what early life factors may be important to assist more children into sustained sports participation.

5. Conclusions

Overall, the early life factors predicting sports participation may be indices of other factors that impair or enable consistent participation or direct mechanism factors. Regardless of the nature of the association, being able to identify a child who is not in childcare, is shorter than their peers, and displays externalizing behaviors may be an early warning sign for parents and practitioners that they are at high risk of dropping out of organized sports and need education or intervention to encourage the child to participate or potentially to help identify other opportunities for physical activity. Many health practitioners screen for these early indicators and

may be able to counsel, with education, to connect parents and their children with sports as a method of physical activity promotion.

Acknowledgments

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.jsams.2018.11.006.

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