Childhood Sports Participation and Adolescent Sport Profile

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abstract

OBJECTIVES: We aimed to increase understanding of the link between sport specialization during childhood and adolescent physical activity (PA). The objectives were as follows: (1) describe the natural course of sport participation over 5 years among children who are early sport samplers or early sport specializers and (2) determine if a sport participation profile in childhood predicts the sport profile in adolescence.

METHODS: Participants (n = 756, ages 10–11 years at study inception) reported their participation in organized and unorganized PA during in-class questionnaires administered every 4 months over 5 years. They were categorized as early sport samplers, early sport specializers, or nonparticipants in year 1 and as recreational sport participants, performance sport participants, or nonparticipants in years 2 to 5. The likelihood that a childhood sport profile would predict the adolescent profile was computed as relative risks. Polynomial logistic regression was used to identify predictors of an adolescent sport profile.

RESULTS: Compared with early sport specialization and nonparticipation, early sport sampling in childhood was associated with a higher likelihood of recreational participation (relative risk, 95% confidence interval: 1.55, 1.18–2.03) and a lower likelihood of nonparticipation (0.69, 0.51–0.93) in adolescence. Early sport specialization was associated with a higher likelihood of performance participation (1.65, 1.19–2.28) but not of nonparticipation (1.01, 0.70–1.47) in adolescence. Nonparticipation in childhood was associated with nearly doubling the likelihood of nonparticipation in adolescence (1.88, 1.36–2.62).

CONCLUSIONS: Sport sampling should be promoted in childhood because it may be linked to higher PA levels during adolescence.

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Mr Gallant conceptualized the objectives of the analyses, conducted all analyses, and drafted the manuscript; Drs O'Loughlin, Brunet, and Sabiston contributed to the formulation of the objectives, conceptualization of the analytical plan, and interpretation of results, and critically reviewed the manuscript; Dr Bélanger designed the main study, contributed to the formulation of the objectives and conceptualization of the analytical plan, assisted in conducting the analyses and interpreting the results, and critically reviewed the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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WHAT'S KNOWN ON THIS SUBJECT: On the basis of theoretical models, sport specialization is associated with lower likelihood of sustaining physical activity over time compared with sport sampling. In addition, sport specialization is linked to poorer health outcomes compared with sport sampling.

WHAT THIS STUDY ADDS: Sport sampling in childhood is positively associated with recreational sport participation and negatively associated with not participating in sports during adolescence. Early sport specialization does not protect against future nonparticipation. Children who are sport nonparticipants typically remain nonparticipants during adolescence.

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Physical activity (PA) is essential for healthy development,[1,2] but internationally, only 9% of boys and 2% of girls between the ages of 5 and 17 years meet current PA recommendations to accumulate 60 minutes or more of moderate-to-vigorous PA daily.[3] Leisure time PA generally represents the most important component of volitional PA in children and youth[4] and often involves sport participation.[5] Approximately 70% of young Canadians take part in organized sports,[6] which have become increasingly competitive and demanding over the last several decades.[7,8] This shift toward competition increased the ratio of time spent in organized physical activity (OPA) relative to unorganized physical activity (UPA), or free-play,[7,9,10] which stems in part from the pressure to win and the desire to attain top status even at an early age.[7,8,11] This may lead some children to become early sport specializers.

With both the Developmental Model of Sport Participation (DMSP)[12,13] and empirical evidence, it is suggested that compared with early sport specializing, participating in a variety of sports at a young age (ie, early sport sampling) is linked to greater motivation, less emotional stress, lower chances of burnout,[14] better motor skill development,[10,15] greater enjoyment of sports and PA,[16,17] a greater likelihood of maintaining PA participation throughout the lifespan,[13,18] and a lower risk of overuse injuries.[19–21] However, longitudinal studies are needed to address the limitations of these primarily cross-sectional studies, including the recall bias from retrospective recall in studies of elite athletes[22–24] conducted in small samples.[25–27]

Adolescence represents the life period with the most marked decline in sport participation.[28,29] Because of this decline and the increasing competitive nature of modern day youth sport, clarification is needed on whether early sport specialization affects PA participation in adolescence. More specifically, with a comparison of the natural course of early sport specializers and samplers, we can provide evidence to inform interventions to increase PA targeting youth. The aims of this longitudinal study were as follows: (1) describe the natural course of sport participation over 5 years among children who are early sport samplers and specializers and (2) determine if childhood sport profile predicts sport profile (ie, nonparticipation, recreational participation, or performance participation) in adolescence.

METHODS

Participants

Data were drawn from the Monitoring Activities of Teenagers to Comprehend their Habits (MATCH) study. MATCH is an ongoing longitudinal study of youth attending 1 of 17 rural or urban schools in New Brunswick, Canada. A total of 802 students (51% of those eligible) in grades 5 or 6 (ages 10–11 years) were recruited in year 1 (2011). Self-report data are collected by questionnaire every 4 months during the school year during class time. At the time of analysis, 5 years of data (15 cycles) were available. MATCH methods are reported in more detail elsewhere.[30] Ethics approval was obtained from the Université de Sherbrooke ethics committee. All participants provided written informed assent and their parents provided written informed consent.

Measures

At each cycle, participants reported all free-time PA (ie, outside gym class) in the past 4 months using a checklist of 36 activities. This questionnaire is similar to other self-report questionnaires used at this age.[31–33] Participants indicated the frequency (ie, never, once a month or less, 2–3 times per month, once a week, 2–3 times per week, 3–4 times per week, or almost every day), with whom (ie, alone, with friends, with parents and/or siblings, or with an organized group or team), and where (ie, at school; at home or in a neighborhood; at an arena, gym, or pool; outside; or other) they most often participated in each activity. Each PA was categorized as OPA or UPA by using the method validated by MacKenzie et al[34]. Seven PAs (home exercises, trampoline, games, skipping rope, weight lifting, and indoor and outdoor chores) were categorized as UPA. The other 29 PAs were also categorized as UPA if participants took part in the PA alone, with friends, or with parents and/or siblings. If they reported involvement with an organized group or team, the activity was categorized as OPA.[34] For the analyses, indoor and outdoor chores were excluded, which can be viewed as nonleisure and/or nonvolitional.[4] Walking was also excluded because it was reported by nearly all participants at every cycle.

After participants' activities in each survey cycle were categorized as UPA or OPA, sport profiles for year 1 (childhood) and for years 2 to 5 (adolescence) were created on the basis of the DMSP, in which it is suggested that children (ages 6–11 years) can be characterized as early sport samplers (ie, high UPA level and low OPA level) or early sport specializers (ie, high OPA level, low UPA level, and participation in 1 sport only) (Fig 1).[12] At age 12, early sport samplers can become sport performance participants (ie, specializing in 1–2 sports), recreational participants (ie, high UPA level and participation in numerous sports), or sport nonparticipants. Early sport specializers either retain a performance-based participation or

become nonparticipants. There are no standard methods for categorizing early sport specialization and performance profiles, but they can be distinguished from sampling and recreational participation by year-round participation in only a few (ie, typically 1) sports.[7,8,10]

By using data from year 1 of MATCH (ie, cycles 1–3), participants with data in at least 2 cycles were categorized as early sport specializers, early sport samplers, or sport nonparticipants (Fig 2). Specifically, to represent year-round participation in 1 OPA and relatively low participation in UPA, early sport specializers were defined as those who reported participating in the same OPA at least once a week at every cycle in year 1 and participated in no more than 1 other OPA per cycle in year 1. The remaining participants were categorized as samplers if they reported the following: (1) participating in >1 of the same OPA at least once per week at every cycle of year 1 or (2) participating in >1 OPA or UPA at least once per week at every cycle of year 1. Otherwise, they were categorized as sport nonparticipants (ie, <2 activities at least once per week per cycle in year 1). Coinciding with the DMSP point of transition at age 12, we used data from years 2 to 5 to categorize participants into performance, recreational, or nonparticipant profiles in each year. The performance profile included participants who reported the same OPA at least once per week but no more than 1 other OPA per cycle in that year. The recreational profile included participants who reported the following: (1) participating in >1 of the same OPA per cycle in that year or (2) participating in >1 OPA or UPA at least once per week per survey in that year. Nonparticipants reported <2 activities per cycle in that year. In a sensitivity analysis, we used a more stringent frequency criterion (ie, a minimum frequency of 2–3 times per week rather than once per week) with no substantial differences in the findings (not presented).

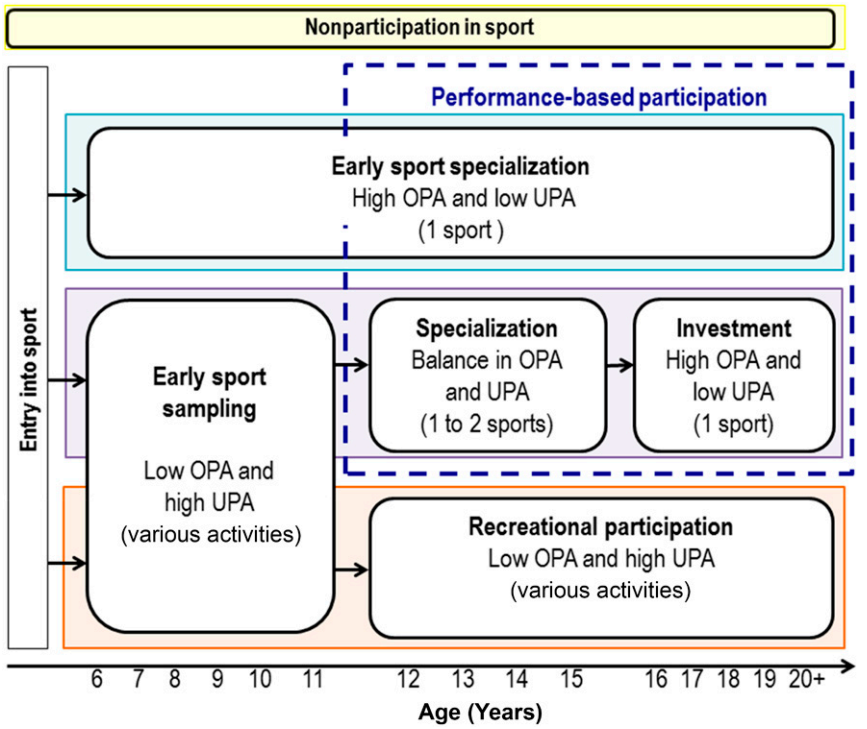

FIGURE 1

Depiction of the DMSP. Adapted from Côté J, Baker J, Abernethy B. Practice and play in the development of sport expertise. In: Eklund R, Tenenbaum G, eds. *Handbook of Sport Psychology*. 3rd ed. Hoboken, NJ: John Wiley & Sons; 2007:184–202.

Face validity of the profiles was ascertained by 3 researchers with expertise in sport and PA research. In addition, because a subsample of MATCH participants take part in annual qualitative interviews, 10 transcripts were randomly selected to verify whether the categorization scheme converged with the sport profiles of participants qualitatively. In all cases, the quantitative and qualitative categorizations coincided, providing evidence of concurrent validity.

Age, sex, income, and pubertal status were accounted for because researchers in previous studies suggested that differences in these characteristics may explain differences in the decline of PA during the transition between childhood and adolescence.[28,35–37] Participants reported their age and sex in each cycle. Neighborhood income was determined by matching participants' self-reported 6-digit postal codes with the 2011 mean income of individuals (ages ≥15 years) in their neighborhood, as per the National Household Survey census data. Income was grouped on the basis of tertiles. Puberty was measured by using the Pubertal Development Scale, which correlates strongly with physician assessments and self-rating scores (r = 0.868–0.841) and has Cronbach's α internal consistency coefficients of 0.67 to 0.70.[38]

Data Analysis

Proportions, means, and SDs were used to describe participants in each sport profile over the 5 years. The likelihood that participants in year 1 retained a similar sport profile in years 2 to 5 was assessed with relative risk ratios. In these analyses, the reference group was participants not categorized in the given profile

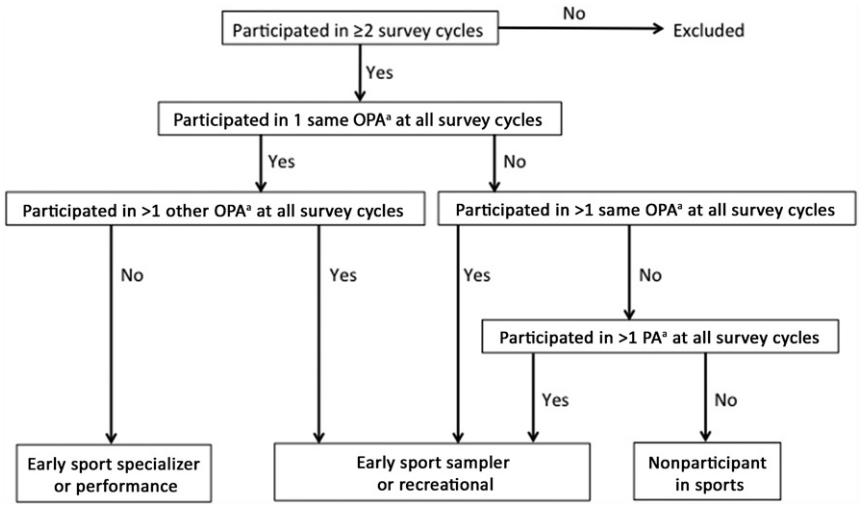

FIGURE 2

Categorization of sport participation profiles in a given year, MATCH 2011 to 2016. In the following example, we describe a female participant who was a sampler in year 1 and a performance participant in year 4. In year 1 (cycles 1–3), she reported involvement in ringette and gymnastics (OPA) and street hockey, biking, tennis, dance, and trampoline (UPA) in cycle 1. In cycle 2, she reported involvement in ringette and team handball (OPA) and aerobics, downhill skiing, trampoline, and games (UPA). In cycle 3, she reported involvement in ringette and team handball (OPA) and biking, football, soccer, volleyball, dance, trampoline, and games (UPA). Because she played ringette in each cycle and at least 1 other OPA per cycle in the year (ie, team handball in 2 cycles and gymnastics in 1 cycle), she was categorized as an early sport sampler in year 1. In year 4 (cycles 10–12), the same participant reported involvement in ringette and swimming (OPA) and jogging and home exercises (UPA) in cycle 10. In cycle 11, she reported involvement in ringette (OPA) and no UPA. In cycle 12, she reported involvement in ringette (OPA) and jogging (UPA). Because she was involved in ringette in all cycles and participated in <1 other OPA each cycle in year 4 (ie, swimming, cycle 10), she was categorized as a performance participant. [a] OPA and PA must be performed ≥1 time per week to be considered.

of interest in the given year. Changes within sport participation profile distributions were analyzed by using the Cochran-Armitage trend test. Trends in PA participation within and between groups were analyzed by using multiple regression. Odds ratios were computed by using polynomial logistic regression within a generalized linear mixed model framework (GLIMMIX procedure in SAS University Edition version 3.5 [SAS Institute, Inc, Cary, NC]) to identify whether childhood sport profile, sex, age, pubertal status, or income predicted sport profiles in years 2 to 5 while accounting for clustering because of the repeated structure of the data. In these models, because it was the largest group, the recreational sport profile was the reference category. Interaction terms to assess whether the relationship between initial and future sport participation profile differed by sex or by pubertal status were tested but were not significant. Therefore, the analyses were not stratified by sex or pubertal status.

RESULTS

A total of 756 participants (55% girls) initially aged 10.7 (0.7 SD) years on average provided data in at least 2 data collection cycles in year 1 and were categorized by sport profile. In years 2, 3, 4, and 5, n = 636, 608, 459, and 420 participants, respectively, were categorized by sport profile, representing 84%, 80%, 61%, and 56% of the year 1 sample, respectively. The median income of adults in the participants' neighborhoods was 34 733 Canadian dollars. Compared with the analytic sample, those excluded lived in neighborhoods with a similar mean income (P for t test = .34) and were at similar stages of pubertal development (P for χ^2 = .70), but they participated less frequently in OPA (P for t test: <.001) and in UPA (P for t test: <.001). Those who participated for <3 years were similar to those retained longer in regards to OPA (P for t test = .98) and UPA (P for t test = .21) participation, neighborhood income (P for t test = .26), and pubertal development (P for χ^2 = .94) in year 1.

In year 1, 147 (19%) participants were early sport specializers (54% girls), 506 (67%) were early sport samplers (56% girls), and 103 (14%) were sport nonparticipants (58% girls). Age and average neighborhood income were similar across profiles. Early sport specializers spent a greater proportion of their time in OPA than participants in other profiles (P < .001) (Table 1). In years 2 to 5, the relative proportion of time spent in OPA increased for performance sport participants (P < .001). Performance and recreational sport participants were involved in OPA approximately twice a week; sport nonparticipants reported less OPA (P < .001). Recreational sport participants engaged in more UPA than participants with other profiles. The number of UPA days decreased over time in all profiles (P < .001).

Relationship Between Childhood and Adolescence Sport Profiles

Early sport samplers were >50% more likely to have a recreational sport profile over time than other participants (Table 2), and they were less likely to become sport nonparticipants. Early sport specializers were nearly twice as likely to have a performance-based profile in adolescence, but the likelihood decreased over time. In general, early sport specializers were 10% to 30% less likely to have a recreational profile in follow-up years than other participants. Being an early sport specializer in year 1 was associated with a reduced likelihood of nonparticipation in

TABLE 1 Characterization of PA Participation Among Youth According to Sport Participation Profile

		Sport Participation Profile		
		Early Sport Sampler or Recreational Participant	Early Sports Specializer or Performance Participant	Sport Nonparticipant
Participants (%)	Year 1, *n* = 756	66.9	19.4	13.6
	Year 2, *n* = 636	61.8	20.3	17.9
	Year 3, *n* = 608	53.0	18.4	28.6
	Year 4, *n* = 459	43.4	21.8	34.9
	Year 5, *n* = 420	44.0	27.1	28.8
	P for trend[a]	<.001	<.001	<.001
Sex (% female)	Year 1	55.5	55.5	58.2
	Year 2	57.5	57.4	54.4
	Year 3	56.5	61.6	50.6
	Year 4	49.3	69.0	60.0
	Year 5	52.4	58.8	61.2
	P for trend[a]	.09	.06	.17
Pubertal status (mean [SD]) (categories ranging from 1 to 5)	Year 1	2.92 (1.06)	2.67 (1.07)	2.82 (1.02)
	Year 2	3.36 (0.90)	3.19 (0.93)	3.20 (1.03)
	Year 3	3.61 (0.78)	3.48 (0.86)	3.68 (0.77)
	Year 4	3.77 (0.72)	3.77 (0.74)	3.90 (0.71)
	Year 5	3.97 (0.63)	3.98 (0.65)	4.10 (0.68)
	P for trend[b]	<.001	<.001	<.001
Mean neighborhood income (CAD$) (mean [SD])	Year 1	37 225 (7711)	38 652 (9693)	36 500 (8368)
	Year 2	36 415 (7633)	39 229 (9048)	37 078 (8155)
	Year 3	37 568 (8862)	38 877 (8613)	35 833 (7110)
	Year 4	38 747 (8535)	39 685 (8550)	38 167 (9304)
	Year 5	39 009 (8439)	41 094 (9936)	36 531 (7474)
	P for trend[b]	<.001	.05	.52
Proportion of PA time spent in OPA (%)	Year 1	31.9	52.2	28.9
	Year 2	33.4	56.7	36.6
	Year 3	34.1	58.4	37.2
	Year 4	37.4	62.6	43.6
	Year 5	36.1	70.8	36.3
	P for trend[b]	.01	<.001	.10
No. d per wk spent in OPA (mean [SD])	Year 1	1.76 (1.84)	1.70 (1.01)	0.27 (0.48)
	Year 2	1.75 (2.05)	1.94 (1.00)	0.34 (0.47)
	Year 3	1.75 (2.46)	2.11 (1.05)	0.34 (0.56)
	Year 4	1.86 (3.49)	2.11 (1.07)	0.36 (0.58)
	Year 5	1.57 (1.89)	1.94 (0.97)	0.28 (0.55)
No. d per wk spent in UPA (mean [SD])	Year 1	3.96 (3.36)	2.59 (2.84)	0.69 (0.78)
	Year 2	3.82 (3.78)	2.27 (2.39)	0.64 (0.63)
	Year 3	3.46 (4.11)	2.21 (2.50)	0.60 (0.75)
	Year 4	3.24 (3.91)	1.91 (2.44)	0.50 (0.80)
	Year 5	2.77 (3.68)	1.29 (1.67)	0.46 (0.73)

CAD$, Canadian dollars; OPA, organised physical activity; PA, physical activity; UPA, unorganised physical activity.

[a] Cochran-Armitage test for trend.

[b] Multiple regression test for trend.

TABLE 2 RR and 95% CIs of Adolescent Sport Participation Profiles in Years 2, 3, 4, and 5 of the MATCH Study, According to Childhood Sport Profile

Childhood Sport Profile	Adolescent Sport Profile	RR Year 1 vs 2 (95% CI), n = 636	RR Year 1 vs 3 (95% CI), n = 608	RR Year 1 vs 4 (95% CI), n = 459	RR Year 1 vs 5 (95% CI), n = 420
Early sport sampler	Recreational	1.71[a] (1.44–2.03)	1.46[a] (1.21–1.76)	1.71[a] (1.29–2.26)	1.55[a] (1.18–2.03)
	Performance	0.63[a] (0.47–0.84)	0.78 (0.57–1.08)	0.88 (0.63–1.24)	0.85 (0.62–1.16)
	Nonparticipant	0.40[a] (0.29–0.56)	0.69[a] (0.54–0.89)	0.69[a] (0.54–0.88)	0.69[a] (0.51–0.93)
Early sport specializer	Recreational	0.72[a] (0.59–0.88)	0.89 (0.73–1.09)	0.80 (0.60–1.08)	0.66[a] (0.48–0.93)
	Performance	2.85[a] (2.13–3.81)	2.05[a] (1.46–2.87)	1.90[a] (1.34–2.71)	1.65[a] (1.19–2.28)
	Nonparticipant	0.53[a] (0.31–0.91)	0.67[a] (0.46–0.97)	0.78 (0.55–1.12)	1.01 (0.70–1.47)
Nonparticipant	Recreational	0.51[a] (0.37–0.69)	0.50[a] (0.35–0.72)	0.36[a] (0.20–0.66)	0.73 (0.49–1.10)
	Performance	0.28[a] (0.12–0.65)	0.59 (0.31–1.12)	0.49 (0.23–1.06)	0.62 (0.34–1.15)
	Nonparticipant	5.17[a] (3.87–6.89)	2.51[a] (1.99–3.18)	2.39[a] (1.91–2.99)	1.88[a] (1.36–2.62)

CI, confidence interval; RR, relative risk.
[a] Represents an RR with $P < .05$.

years 2 and 3, but it did not protect against nonparticipation in years 4 and 5. Early nonparticipants were more than twice as likely to remain nonparticipants over time compared with other participants.

Predictors of Adolescent Sport Profile

Childhood sport profile was a statistically significant predictor of adolescent sport profile (Table 3). Samplers and specializers were less likely than nonparticipants to be classified as nonparticipants in adolescence. Compared with nonparticipants, specializers were more likely to have a performance than a recreational profile in adolescence. Being older was associated with nonparticipation and with being classified in the performance profile. Girls were more likely than boys to be classified in the performance profile. Compared with children living in higher-income neighborhoods, those in low- or middle-income neighborhoods were less likely to have a performance profile. Puberty status did not predict sport profile.

DISCUSSION

With the current study, we are the first to describe the natural course of sport participation from childhood into adolescence and to show that sport participation profiles in childhood predict adolescent profiles. Early sport specialization was associated with the performance profile in adolescence, but it did not protect against future nonparticipation. Early sport samplers were less likely to later become nonparticipants. Given the importance of PA at all life stages,[1,39,40] these results raise concerns about the current trend whereby more children specialize early in sports.[15,20] In addition, we found that sport nonparticipants were at increased risk of remaining nonparticipants in adolescence. In accordance with previous findings,[4,41,42] this highlights the importance of intervening early to promote an active lifestyle during childhood because it is a robust determinant of future PA level.

With this study, we are the first to provide longitudinal support for the DMSP tenet that early sport sampling increases the likelihood of long-term involvement in PA and that early sport specialization leads to a higher risk of dropping out of sports.[16,18,26] Similar to these findings, Russell and Limle[43] found that compared with specializing, sampling before age 15 increased the likelihood of sport participation at age 20. Using a longitudinal cohort study design, Mäkelä et al[44] found that greater diversity of sport activities at age 17 predicted participation in PA in adults during their mid-30s. It is possible that sampling promotes long-term sport participation through the development of motivation,[45] fundamental movement skills,[45,46] or autonomy by engaging the individual in decision-making regarding involvement in sport.[45]

With the results of this study, we diverge somewhat from the DMSP, in which it is suggested that early sport sampling is associated with a higher likelihood of attaining an elite sport status.[13,18] Early sport specializers were more likely to have a performance sport profile in midadolescence than early sport samplers. Early sport specialization necessitates many hours of deliberate practice to achieve the high level of performance sought with this type of sports participation. These high demands in physical effort and time may translate into improved fitness as well as time management skills.[47] It is possible that acquisition of these benefits help youth become performance oriented. Nevertheless, although early sport specialization can produce successful elite athletes,[8,17] retrospective data support the DMSP in that many successful elite athletes began

TABLE 3 ORs and 95% CIs for Potential Predictors of Adolescent Sport Participation Profiles

Predictor	Recreational[a]	Performance	Nonparticipant
	OR	OR (95% CI)	OR (95% CI)
Childhood sport profile			
Early sport sampler	1.00	0.90 (0.53–1.52)	0.16 (0.11–0.25)[b]
Early sport specializer	1.00	2.66 (1.50–4.72)[b]	0.21 (0.12–0.35)[b]
Sport nonparticipant[a]	—	—	—
Sex			
Girls	1.00	1.58 (1.12–2.22)[b]	1.00 (0.71–1.42)
Boys[a]	—	—	—
Pubertal status			
Postpubertal	1.00	0.47 (0.19–1.17)	1.35 (0.52–3.54)
Late puberty	1.00	0.65 (0.31–1.37)	0.83 (0.35–1.97)
Midpuberty	1.00	0.74 (0.35–1.58)	0.79 (0.33–1.89)
Early puberty	1.00	0.93 (0.40–2.14)	0.98 (0.38–2.56)
Prepubertal[a]	—	—	—
Age (y)	1.00	1.24 (1.10–1.39)[b]	1.40 (1.24–1.58)[b]
Neighborhood income			
Low	1.00	0.60 (0.42–0.84)[b]	1.16 (0.81–1.67)
Medium	1.00	0.67 (0.48–0.92)[b]	1.16 (0.82–1.64)
High[a]	—	—	—

Values are from polynomial logistic regression, adjusting for all variables in the table and for the repeated measures design. CI, confidence interval; OR, odds ratio; —, reference category.
[a] Represents reference category.
[b] Represents OR with $P < .05$.

as early sport samplers and only specialized in their main sport after age 16.[22–24,48,49] The discrepancy between the current results and those of retrospective studies may relate to the follow-up ending in midadolescence herein, whereas the DMSP proposes elite status at an older age.[13,18] Longer prospective follow-up is needed to assess the influence of childhood sport profile on late adolescent and adult profiles and whether early sport specializers maintain a performance-based sports participation profile. Researchers conducting future studies should also assess whether performance in different sports is preceded by different childhood sport participation profiles. For example, past researchers suggested that sport sampling is a precursor to performance participation in most sports[22,23,48] but that performance in sports such as gymnastics, figure skating, and diving may require early sport specialization.[15]

Participation in PA generally decreased over time in this study, corroborating data from multiple studies in which PA levels decreased during adolescence.[28,29] Although OPA participation remained constant over time (contrary to findings in slightly older individuals),[5,41] UPA participation generally decreased, regardless of sport profile. This aligns with results from longitudinal studies, wherein children decreased their time spent in UPA as they aged.[50,51] Therefore, encouraging maintenance of OPA throughout adolescence may be important because sport participation at younger ages predicts later leisure time PA levels.[44,52]

Consistent with most literature,[53,54] the likelihood of sport nonparticipation increased with increasing age. Also, consistent with researchers suggesting that performance sport participation is not accessible to all given its cost,[7,14,21] low household income was associated with a lower probability of performance sport participation in our study. However, household income was not associated with a lower probability of recreational sports. With these findings, we provide insight into previous contradictory findings on the relationship between socioeconomic status and general PA levels in adolescents.[37,55,56] It is possible that only certain types of sport participation profiles are affected by socioeconomic status. Although puberty status has been linked to PA,[35,36,57] it did not predict sport profile in this study. Girls were more likely to have a performance profile, which may relate to the age range covered in this study or to the fact that girls often participate in sports associated with early specialization (ie, gymnastics, diving, and figure skating).[58] In a recent review article, researchers indicated that early-maturing boys are overrepresented on elite sports teams, whereas late-maturing girls are overrepresented on elite sports teams.[59] Although we found no relationship between pubertal and sport participation profiles, researchers conducting future studies should investigate whether the timing of maturation is associated with specialization in specific sports.

If confirmed, the current study has 2 main implications. First, pediatricians, parents, and other people working with children should understand that if children do not participate in sports during

childhood, they are at increased risk of being nonparticipants in adolescence. Strategies are needed to find ways to involve children in developmentally appropriate sporting activities. As suggested researchers in previous studies, such strategies could include after school programs[60] and an increase in inclusive and noncompetitive intramural activities in school,[61] which are associated with long-term PA participation.[62] Second, although early sport specialization is associated with a higher likelihood of a performance profile in adolescence, sport sampling is preferable because it reduces the probability of dropping out of sport. Sports diversification during childhood should therefore be promoted by pediatricians, sport administrators, and parents.

The strengths of this study include the number of data collection cycles over 5 years. In this study, we are the first to describe the natural course of sport participation from childhood into adolescence, and we provide operational definitions of early sport specializers, early sport samplers, performance sport participants, recreational sport participants, and sport nonparticipants. In addition, in this analysis we focused on the crucial transition years from childhood to adolescence when behavioral patterns form and begin to consolidate. Although this important transition was captured, it is possible that earlier sports participation could have influenced sports participation before the initiation of follow-up. In addition, the length of follow-up did not permit an assessment of whether childhood sport profile is associated with sport participation in late adolescence or adulthood. Our definitions do not incorporate level of competition. Finally, because there are no objective measures of sport participation, this study is subject to overestimation typically associated with self-report PA measures.

CONCLUSIONS

Youth sports are becoming more competitive and demanding[7,11] such that many children specialize in a specific sport early on.[63] By describing in this study the natural course of early sport participation, we demonstrate that, in contrast to children who participate in a variety of sports, the trend to specialize in a sport may increase the risk of sport nonparticipation in adolescence. With this study, we also highlight that children who do not participate in sports are unlikely to participate in adolescence. In line with current clinical recommendations[8] and supported by our results, we suggest that to promote continued PA participation, it is necessary to encourage children to participate in a variety of sports early on. Beyond encouraging children to be physically active and until other evidence proves otherwise, pediatricians should advocate against early sport specialization and promote early sport sampling.

ABBREVIATIONS

DMSP: Developmental Model of Sport Participation
MATCH: Monitoring Activities of Teenagers to Comprehend their Habits
OPA: organized physical activity
PA: physical activity
UPA: unorganized physical activity

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