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To cite this article: Gabriel Desroches, François Poulin & Anne-Sophie Denault (2019): Sports participation patterns throughout high school and their antecedents, Applied Developmental Science, DOI: [10.1080/10888691.2019.1687297](https://doi.org/10.1080/10888691.2019.1687297)

To link to this article: <https://doi.org/10.1080/10888691.2019.1687297>



Published online: 13 Nov 2019.



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## Sports participation patterns throughout high school and their antecedents

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### ABSTRACT

This study aimed at identifying and describing patterns of sports participation during high school among a general population of students and examining individual, social, and environmental predictors of pattern membership. A sample of 287 high school students (61% girls) from Quebec (Canada) annually reported all the organized sports in which they had participated over the school year during five consecutive years (from Grade 7 to 11; in the Quebec school system, high school is comprised of five years). The predictors were assessed at the end of elementary school (Grade 6). Latent class analyses brought out four different patterns (specialized, moderate-sports, low-sports and no-sport participation). Multinomial logistic regressions revealed that adolescents' sex, parental involvement, best friends' participation in sports and family income were significant predictors of pattern membership. Parental involvement and family income significantly predicted membership in the specialized pattern relative to other patterns, suggesting that tangible support from parent is necessary for youth to maintain their long term commitment in a single sport. Findings highlight that efforts aimed at promoting sport participation during adolescence should target girls and encourage parents to get involved in their children's organized sports.

Over 70% of Canadian high school students participate or have participated in organized sport (Barnes et al., 2016). Sports participation is a source of many learning experiences for youth, contributing to their personal development and providing many psychological and social benefits (Biddle & Asare, 2011; Eime, Young, Harvey, Charity & Payne, 2013). Sports participation can vary according to different parameters such as the type of sports engaged in (e.g., team or individual sports), and the breadth or duration of participation. This variability is illustrated in the Developmental Model of Sport Participation (DMSP; Côté, Baker & Abernethy, 2003, 2007), which suggests that different patterns of participation exist from childhood through adolescence. This model has been validated among elite athletes, in order to gain insight into how their expertise is developed, but has never been investigated among a general population of high school students. Moreover, although prior studies have investigated predictors of sport participation (Knight, Dorsch, Osai, Haderlie & Sellars 2016; Randall, Travers, Shapiro, & Bohnert, 2016), very little is known regarding the factors that might specifically predict adolescents' commitment in specialized or

sampling sport patterns. The goals of this study were thus to verify whether the patterns suggested by the DMSP emerge in a non-elite general athlete population during the high school years and identify psychological, social, and environmental predictors of group membership assessed just prior the transition to high school.

### Conceptualizing the variability of sports participation during the high school years

In the scientific literature on sports and athlete development, two different patterns have emerged with respect to the breadth and duration of participation (Côté et al., 2007). The early specialization pattern is characterized by involvement in a single sport, generally starting between 6 and 12 years of age and continuing through adolescence. Youth who specialize in one sport do so with the goal of developing expertise in this sport and achieving high performance. This pattern is thus marked more by deliberate practice and repetitions of movements than by free play (Côté, Horton, MacDonald, & Wilkes, 2009). The sampling pattern, on the other hand, is defined by participation

in a variety of sports between 6 and 12 years of age, with an emphasis on motor development and enjoyment (Strachan, Côté, & Deakin, 2009). Children following this pattern can also reach a level of elite performance but do so by specializing in a single sport at a much later age. Between the ages of 13 and 15, they continue to participate in a more limited number of sports, focusing more intently on one particular sport toward the age of 16 (Strachan et al., 2009).

The early specialization and sampling patterns have been studied by surveying former elite athletes retrospectively. However, it is possible that these patterns also exist among youth who do not necessarily excel in a sport at the elite level. Among the rare studies seeking to identify patterns of sports participation in adolescence (Agans & Geldhof, 2012; Agans, Johnson & Lerner 2017), none have considered the notion of specialization. For example, Agans et al. (2017) collected data on the breadth (number of different sports), frequency (time spent on all sports combined) and depth (number of days per week) of sports participation each year from Grades 7 through 12 (ages 13 to 18). Latent class analyses brought out four different groups: nonparticipation, low involvement (low scores for all three dimensions), moderate involvement (mixed scores for breadth, moderate to high scores for depth and moderate scores for frequency) and high involvement (high scores for all three dimensions). In another study, Agans and Geldhof (2012) collected data on the frequency of participation and type of sports engaged in among 3000 students in Grades 10 to 12 (ages 16 to 18). Each sport engaged in by the youth was classified under one of three categories: team sports, individual sports or dance. These authors then performed a cluster analysis of these data. Five profiles of sports participation were identified: team sports only, individual sports only, a combination of team and individual sports, dance, and no participation.

Although these studies provide relevant insight into the different patterns of sports participation, they do not reveal whether the adolescents participated persistently in a single sport over the years or chose to get involved in a new one from year to year. Thus, although these studies were longitudinal, they do not allow to test for the presence of the specialization and sampling patterns proposed in the DMSP (Côté et al., 2007). These studies also tell us very little regarding the factors that may have contributed to the youths' membership in these patterns of sports participation. From a practical standpoint, this knowledge would be

useful in guiding youth toward patterns characterized by greater sports participation, given the benefits associated with such participation (Agans & Geldhof, 2012; Agans et al., 2017).

## Antecedents of patterns of sports participation

To better understand the factors contributing specifically to youths' participation in physical activity, the *Youth Physical Activity Promotion* (YPAP) model has been put forward as a social-ecological framework (Welk, 1999). A unique feature of this model is that key influences are categorized under psychological attributes (predisposing factors), social influences (reinforcing factors) and environmental influences (enabling factors). The model also includes demographic characteristics that directly influence how an individual will assimilate these various influences.

Among the psychological attributes, two factors appear particularly likely to come into play during early adolescence, namely underlying motivations for sports participation and the absence of problem behaviors. The motivation to participate in sports can take various forms. For example, youth who follow a specialization pattern may do so to develop skills that will boost their performance and allow them to engage in a high level of competition (Gould, 2010), whereas those who follow a sampling pattern may be more motivated by having fun in the activity (Côté et al., 2007). Moreover, adolescents who show problem behaviors (e.g., aggression, delinquency) tend to avoid activities that are supervised and monitored by adults, generally choosing less structured contexts in which to spend their leisure time (Mahoney, Stattin, & Lord, 2004). The presence of problem behaviors is thus likely to be associated with a pattern characterized by low sports participation.

Parents and peers represent two major social influences to sport participation among adolescents (Harwood, Knight, Thrower & Berrow, 2019; Denault & Poulin, 2009). One mechanism through which these influences can be exerted is social modeling (Bandura, 1977). Adolescents whose parents are active and have participated in organized sports tend to be more physically active and more involved in sports themselves (Brown, Salmon, & Pearson, 2014; Seabra et al., 2011). This influence can also operate through the involvement of parents who, for example, encourage their children's participation in sports, thus fostering a positive perception of the latter's physical abilities, making physical activities more appealing to them (Brustad, 1996). Moreover, parents who have positive

attitudes regarding their children's sports participation are more likely to provide positive encouragement and support rather than pressure (Knight, Berrow, & Harwood 2017). As a result, in this study, parental influence was operationalized as parents' attitude toward organized activities and parents' involvement. As for peers, adolescents often choose to become friends with peers who engage in the same types of activities as them (Marsh, Craven, & Debus, 1999) and will sometimes decide to get involved in a sport to join a friend who is already involved in it (Denault & Poulin, 2009; Seabra et al., 2011). Consequently, peer influence was operationalized in this study as peers' driven motivation and friends' sport participation.

Concerning environmental influences, access to equipment and sports facilities appear to be particularly determining factors. Such access often depends on family income. Youth from wealthier families have greater opportunities to participate in organized activities, including sports, because their families can afford to cover the costs of the registration fees, equipment and transportation (Pedersen, 2005). With regard to demographic characteristics, sex must be taken into account given that a greater number of boys than girls participate in organized sports and physical activities in general (Van Der Horst et al., 2007). From a young age, boys appear to be more attracted by activities demanding a greater expenditure of energy (Brustad, 1996).

## The current study

The first goal of this study was to identify patterns of sports participation during the high school years. To do so, adolescents reported on their sport participation each year during five consecutive years. Two dimensions of sports participation included in the DMSP (Côté et al., 2007), namely specialization and sampling, guided our analyses: (a) the length of longest involvement in a single sport over the course of the high school years (specialization) and (b) the number of different sports practiced over the course of the high school years (sampling). Based on both prior research (e.g., Agans et al., 2017) and theory (DMSP), we expected at least three patterns to emerge from our analyses ("specialized," "sampling," and "no/low participation"; H1).

The second goal was to examine the factors predicting membership in these different patterns of sports participation. Based on the YPAP (Welk, 1999), psychological attributes (motivations for sports

participation and problem behaviors), social influences (friends' sports participation, parental sports participation, parental involvement and attitude toward organized activities), environmental factors (family income) and demographic characteristics (sex) were examined. Based on prior research, if the three expected patterns indeed emerged from our analyses, we expected performance-driven motivation to predict membership in the "specialized" pattern compared to the other patterns (H2). We also expected pleasure-driven motivation to predict membership in the "sampling" pattern compared to the other patterns (H3). In addition, we expected higher levels of problem behaviors to predict membership in the "no/low participation" patterns compared to the other patterns (H4). Finally, we expected that identifying as a male and reporting higher levels of positive social and environmental influences would predict membership in patterns characterized by higher levels of sports participation (e.g., "specialized" or "sampling") relative to patterns characterized by lower levels of sports participation ("no/low participation"; H5).

## Methods

### Participants and procedures

This longitudinal study began with 390 Grade 6 pupils (mean age = 12.38 years; 58% girls). The sample was recruited in eight French-speaking schools in Quebec (Canada). Most of the participants were Canadian-born (90%), lived with both biological parents (72%) and came from middle class families (mean family income = \$45,000–\$55,000). In the school system where the study was conducted, after elementary school (Grades 1 to 6), students transition to high school (Grades 7 to 11), where they spend the next five years in the same school (i.e., no junior/senior distinction). Participants were followed annually over a six-year period. Antecedents were assessed in Grade 6 using self, parent, teacher and peer reports and sports participation was assessed each year from Grades 7 to 11 using self-report. Like any longitudinal study, this study had missing data. Because the information used to create the sports participation variables were nominal in nature (i.e., the name of the sport), the usual methods of estimating missing data could not be applied. The sub-sample used to identify the sports participation patterns thus included only those who had participated in at least four out of the five annual waves of data collection over the five years of high school. In all, 287 participants (61% girls) met this criterion. Compared to the group of non-retained

participants ( $n=103$ ), the retained participants ( $n=287$ ) were more likely to come from intact families ( $p < .001$ ) but did not differ on sex ( $p=.09$ ).

In Grades 6 and 7, the students completed questionnaires at school under the supervision of trained research assistants. From Grade 8 onwards, each year, they took part in a structured phone interview conducted by trained research assistants. In Grade 6, parent questionnaires were sent home with a stamped self-addressed return envelope, teachers completed questionnaires at school and peer nominations were collected in the classroom. Parents provided written consent for their child's participation each year. This study was approved by the Internal Review Committee for Research Ethics with Humans at the authors' university.

## Measures

### Sports participation during high school

Each year from Grades 7 to 11, the participants identified all the organized sports in which they had participated during the current school year (from September to May). This was done using a free recall procedure. They were given the following definition of organized sports: voluntary and regular participation, presence of a coach, and rule-guided activities (Kjønniksen, Anderssen, & Wold, 2009; Larson, 2000). Based on these data, four variables were computed.

**Number of different sports practiced.** The number of different sports reported by the youth over the five years was computed. The value of this variable could range from 0 to X.

**Length of longest involvement in a single sport.** The length of the longest involvement in a single sport was operationalized as the highest number of years in which the youth reported participating in the same organized sport (e.g., if a youth reported playing ice hockey in Grades 7, 8 and 9, and badminton in Grades 10 and 11, they were assigned a score of 3). The value of this variable could range from 0 to 5.

**Length of total sports participation.** The number of years in which the youth reported participating in at least one sport was computed. The value of this variable could range from 0 to 5, with higher scores showing a higher length of participation.

**Participation in a competitive sport.** For each reported sport, the youth were asked to specify

whether the activity was recreational or competitive. This question was only asked from Grade 9 onwards. The number of years in which the youth reported participating in at least one competitive sport was computed. The value of this variable could range from 0 to 3. Higher scores reflect a higher number of years in which youth participated in a competitive sport.

### Antecedents assessed at the end of elementary school

**Types of motivation.** A questionnaire developed for this study was used to assess types of motivation. Youth were asked to report on their motivation to participate in organized activities using 15 items on a 1 (*not at all true*) to 5 (*absolutely true*) response scale. A principal component factor analysis revealed the presence of three factors ( $KMO = .81$ ,  $p < .001$ ). The first factor, labeled *development and performance-driven motivation*, included six items (e.g., "I participate in this activity because I want to be good at it";  $\alpha = .71$ ). The second factor was labeled *pleasure-driven motivation* and comprised three items (e.g., "I participate in this activity because I really like it";  $\alpha = .71$ ). The third factor was labeled *peer-driven motivation* and comprised six items (e.g., "I participate in this activity because it allows me to spend time with friends";  $\alpha = .76$ ). A score was calculated for each of these factors by computing the mean of the items.

**Problem behaviors.** A composite score was calculated by standardizing and averaging three scores based on teacher ratings, peer nominations and self-reports. The correlations between these three scores varied from .38 to .51 with an acceptable internal consistency ( $\alpha = .69$ ). The teacher rating score consisted of the mean of 10 items (1 = *never* to 5 = *almost always*;  $\alpha = .95$ ), including six items (e.g., "This pupil uses force to dominate other peers") from the *Proactive/Reactive Aggression Scale* (Dodge & Coie, 1987) and four other items of problem behaviors (e.g., "This pupil is bad-tempered, he/she gets upset easily"). Peer nominations were collected using five items from the *Revised Class Play Scale* (Masten, Morison, & Pellegrini, 1985), with youth being asked to select up to three classmates who best fit each behavioral descriptor (e.g., "Hits and pushes others around"). The participants' scores for each item were obtained by summing up the nominations they received from their classmates. These scores were then transformed into z-scores within each classroom, and a mean score was computed for the five items ( $\alpha = .90$ ). The self-report score consisted of the mean of 16 items (e.g., "Intentionally hit or threatened



to hit someone at school) from Metzler, Biglan, Ary, & Li (1998) rated on a five-point Likert scale (1 = *never* to 5 = *more than 10 times*;  $\alpha = .83$ ).

**Parental sports participation.** Parents were asked to identify all the organized sports in which they had participated during their youth. This was done using a free recall procedure. A score was calculated by computing the total number of different organized sports (range: from 0 to X).

**Parental attitude toward organized activities.** Using a scale developed by Denault and Poulin (2009), parents were asked to report their attitude toward organized activities using eight items rated on a 5-point Likert scale ranging from 1 (*not at all true*) to 5 (*absolutely true*). Sample items include “I value my child’s participation in organized activities” and “Participation in organized activities helps develop my child’s full potential.” A score was calculated by computing the mean of the items ( $\alpha = .88$ ).

**Parental involvement.** Parental involvement was assessed using 8 items developed for the purposes of the present study. Parents were first asked to identify their child’s most important organized activity. After identifying this activity, they were asked to rate on a 5-point Likert scale ranging from 1 (*not at all true*) to 5 (*absolutely true*) their interest and involvement in the activity, for example, “I encourage my child to pursue his/her participation” and “I drive my child to this activity.” A score was calculated by computing the mean of the items ( $\alpha = .85$ ). In Grade 6 when the parents completed this scale, the most important organized activity was a sport for 50% of the youth.

**Friends’ sports participation.** An indicator of friends’ sports participation was created. Participants were asked to report whether they had participated in any organized sports in Grade 6. They were also asked to report the names of their best friends (maximum three) in their classroom. Using this information we were then able to compute the number of best friends participating in at least one organized sport in Grade 6 (range = 0 to 3).

**Family income.** Total family income before taxes was used as an indicator of the parents’ economic situation. Parents responded to a single item: “Which of these categories corresponds to your total family income before taxes last year?”, using a 13-anchor scale ranging from CAD\$5,000 to CAD\$60,000 or more.

## Data analysis plan

The analyses were conducted in two steps: 1) identifying and validating patterns of sports participation, and 2) predicting membership in these patterns of sports participation based on Grade 6 antecedents. To identify patterns of sports participation, two variables (number of different sports practiced and length of longest involvement in a single sport) were submitted to a latent class analysis (LCA, Mplus). This person-oriented analysis was used since even though a sample is heterogeneous, homogeneous sub-groups of participants, usually expected by theory (i.e., DMSP), can still be identified (Von Eye & Bogat, 2006). Latent class analysis uses multiple iterations to calculate a model. The optimal model in terms of the number of classes in the sample is determined by using fit statistics. In this study, the optimal model was chosen based on Vuong-Lo-Mendell-Rubin likelihood ratio test values, the Bayesian Information Criterion (BIC) and entropy (Muthen & Muthen, 2012). In order to compare the sport patterns identified by the latent class analysis, a MANOVA with Bonferroni post hoc analyses was performed on the two variables used to identify these patterns. This analysis was conducted to identify the differences between the patterns with regard to the number of different sports practiced and length of longest involvement in a single sport.

The discriminant validity of the classes solution was also examined by comparing the classes on theoretically and empirically related external variables other than those used to identify them, namely length of total sports participation and participation in a competitive sport. These variables represent prominent characteristics of specialization and sampling. For instance, youth often specialize in one sport in order to perform at competitive level (Gould, 2010) and sampling is usually determined over multiple years. Patterns were compared using a MANOVA with Bonferroni post hoc analyses.

In the second step, differences between the patterns of sports participation with respect to the Grade 6 antecedents were first examined using ANOVAs and Bonferroni post hoc analyses. Only significant antecedents were then entered into a sequential multinomial logistic regression computed in Mplus (Muthen & Muthen, 2012). In this final analysis, which calculated the odds of being associated with a given pattern compared to another pattern, Full Information Maximum Likelihood (FIML) was used to handle missing data and a robust estimator (MLR) was used to handle non-normality.

**Table 1.** Fit statistics for latent class analysis.

Number of classes	LL	AIC	BIC	SSA-BIC	Entropy	Bootstrap
2	−990.47	1994.94	2020.56	1998.36	.84	.000
3	−944.35	1908.71	1945.30	1913.59	.85	.098
<b>4</b>	<b>−908.51</b>	<b>1843.01</b>	<b>1890.59</b>	<b>1849.36</b>	<b>.96</b>	<b>.003</b>
5	−889.31	1810.62	1869.17	1818.43	.97	.011
6	−856.64	1751.27	1820.80	1760.55	.99	.85
7	−845.59	1735.18	1815.69	1745.93	.96	.002

Note. LL, log-likelihood; AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; SSA-BIC, sample-size adjusted BIC, Bootstrap Vuong-Lo-Mendell-Rubin likelihood ratio test.

Boldface type indicates the selected model.

## Results

### Identifying patterns of sports participation

Models ranging from two to seven classes were tested. Table 1 presents the fit statistics obtained for each model. As can be seen in this table, the BIC began to decrease more slowly as of the four-class model. Nevertheless, the other fit statistics, namely the entropy and Vuong-Lo-Mendell-Rubin likelihood ratio test values, suggested that a five- or seven-class model could also be retained. In this ratio test, significant  $p$  values indicate that a solution with a given number of classes provides a better fit compared to a solution with one less class (e.g., 4 is better than 3). Entropy values closer to 1 indicate better classification. However, in the present study, all the models consisting of five classes or more contained at least one group of fewer than five participants, which did not meet the minimum 5% of the sample needed for model acceptability (Kline, 2015). For all these reasons, we retained the four-class solution. Entropy and Vuong-Lo-Mendell-Rubin likelihood ratio test values also supported this choice. The means and standard deviations for the two grouping variables for the four classes are presented in Table 2. A MANOVA comparing the four classes with respect to these two variables revealed significant differences between them (Wilks'  $\lambda = .03$ ,  $F(3,287) = 427.71$ ,  $p < .001$ ). These differences concerned the number of different sports practiced ( $F(3,287) = 79.59$ ,  $p < .001$ ) and the length of longest involvement in a single sport ( $F(3,287) = 2199.74$ ,  $p < .001$ ). The post hoc analyses revealed that all the classes differed from one another with respect to the number of different sports practiced ( $p < .001$ ), except for the second and third classes, which had the highest scores and did not differ from one another ( $p = .34$ ). The first class had the lowest score for this variable. The post hoc analyses also revealed that all the classes differed from one another with respect to the length of longest involvement in a single sport ( $p < .001$ ). For this variable, the second class

had the highest score, followed by the third, fourth and first classes.

The classes were also compared to one another with respect to the two external variables, using a MANOVA and post hoc analyses. Means and standard deviations are reported in Table 2. This analysis revealed that the four classes differed significantly from one another (Wilks'  $\lambda = .08$ ,  $F(3,287) = 230.03$ ,  $p < .001$ ) with respect to participation in a competitive sport ( $F(3,283) = 119.17$ ,  $p < .001$ ) and the length of total sports participation ( $F(3,283) = 857.57$ ,  $p < .001$ ). The post hoc analyses revealed that all the classes differed from one another with respect to participation in a competitive sport ( $p < .001$ ), with the exception of the first and fourth classes, which had the lowest scores and did not differ from one another ( $p = .21$ ). The post hoc analyses also revealed that all the classes differed from one another with respect to the length of total sports participation ( $p < .001$ ).

To sum up, the participants in the first pattern ( $n = 70$ ; 24.4%) did not practice any sports. The term “no-sport” was used to refer to this pattern. The participants in the second pattern ( $n = 64$ ; 22.3%) were characterized by the longest involvement in a single sport and a moderate number of different sports practiced overall. They were also the most involved in competitive sports. The term “specialized” was used to label this pattern. The participants in the third pattern ( $n = 83$ ; 28.9%) were characterized by a moderate length of involvement in a single sport and a moderate number of different sports practiced overall. They also reported a moderate length of total sports participation and had the second highest score for participation in a competitive sport. The term “moderate-sports” was used to label this pattern. The participants in the fourth pattern were characterized by a short length of involvement in a single sport and few different sports practiced overall ( $n = 70$ ; 24.4%). The term “low-sports” was thus used to refer to this pattern.

### Univariate analyses for grade 6 antecedents

Correlations among the antecedents ranged between .01 and .34. Descriptive statistics for each antecedent as a function of sports patterns are reported in Table 3. Several significant group differences were found and are reported in Table 3. These differences mainly concern the “specialized” pattern compared to the other three patterns. More specifically, boys were overrepresented in the “specialized” and “moderate-sports” patterns compared to girls. Participants in the

**Table 2.** Identification of sports participation patterns and validation variables: estimated means and standard deviations.

Variables	Sports participation patterns			
	No-sport ( <i>n</i> = 70)	Specialized ( <i>n</i> = 64)	Moderate-sports ( <i>n</i> = 83)	Low-sports( <i>n</i> = 70)
<i>Latent class analysis</i>				
Number of different sports practiced	0.00 (0.00) <sup>a</sup>	2.40 (1.32) <sup>b</sup>	2.24 (1.28) <sup>b</sup>	1.60 (0.92) <sup>c</sup>
Length of longest involvement in a single sport	0.00 (0.00) <sup>a</sup>	4.60 (0.49) <sup>b</sup>	2.35 (0.51) <sup>c</sup>	1.02 (0.08) <sup>d</sup>
<i>External</i>				
Length of total sports participation	0.00 (0.00) <sup>a</sup>	4.67 (0.47) <sup>b</sup>	2.88 (0.80) <sup>c</sup>	1.33 (0.58) <sup>d</sup>
Participation in a competitive sport	0.00 (0.00) <sup>a</sup>	2.00 (1.05) <sup>b</sup>	0.63 (0.79) <sup>c</sup>	0.14 (0.35) <sup>a</sup>

Note. Means with different subscripts within a row are significantly different from one another ( $p < .05$ ).

**Table 3.** Means and standard deviations for antecedents, with comparisons by sports participation patterns.

Antecedents	Sports participation patterns				Group comparisons Wald, $\chi^2$	Post hoc
	No-sport	Specialized	Moderate-sports	Low-sports		
Dev. and perf. motivation	3.52 (0.83)	3.92 (0.80)	3.79 (0.84)	3.58 (0.88)	F(3,272) = 10.02*	S > N
Pleasure-driven motivation	4.70 (0.52)	4.77 (0.60)	4.84 (0.34)	4.84 (0.30)	F(3,272) = 4.58	
Peer-driven motivation	3.20 (0.82)	3.49 (0.83)	3.31 (0.91)	3.31 (0.74)	F(3,269) = 4.00	
Problem behaviors	-0.10 (0.73)	-0.00 (0.88)	-0.07 (0.88)	-0.12 (0.72)	F(3,285) = 0.75	
Friends' sports participation	1.40 (1.07)	2.17 (0.99)	1.83 (1.03)	1.51 (1.02)	F(3,287) = 23.17**	S > N, L
Parental sports participation	1.26 (1.53)	2.30 (1.96)	1.53 (1.74)	1.28 (1.17)	F(3,197) = 11.01*	S > N, L
Parental attitude	3.92 (0.83)	4.45 (0.57)	4.17 (0.82)	4.14 (0.55)	F(3,197) = 15.43**	S > N, L
Parental involvement	3.54 (0.87)	4.44 (0.66)	3.92 (0.78)	3.79 (0.90)	F(3,190) = 36.32**	S > N, L, M
Family income	9.94 (2.97)	11.96 (2.12)	10.64 (3.22)	10.51 (3.17)	F(3,215) = 19.37**	S > N, L, M
Sex (total % male)	15.9	27.4	33.6	23.0	$\chi^2(3, N = 287) = 9.25^*$	

Notes. N = no-sport; S = specialized; M = moderate-sports; L = low-sports.

\* $p < .05$ .

\*\* $p < .01$ .

“specialized” pattern had a greater number of best friends involved in sports than those in the “no-sport” and “low-sports” patterns. They also had higher scores for development and performance-driven motivation than youth in the “no-sport” pattern. They had parents who reported having been involved in more sports and had higher scores on the attitude scale compared to youth in the “no-sport” and “low-sports” patterns. Participants in the “specialized” pattern had the highest family income and higher scores for parental involvement than those in the other three patterns. No group differences were found for behavior problems, pleasure-driven motivation or peer-driven motivation.

### Multinomial logistic regressions

Variables that were significant at the univariate level were included in this analysis. The same model was computed three times using a different pattern as the reference group each time, allowing every possible comparison to be examined. The results are reported in Table 4. In the first regression, the “no-sport” pattern was used as the reference and compared to the other three patterns. The results revealed that being a boy, having a greater number of best friends involved in sports and having highly involved parents predicted membership in the “specialized” or “moderate-sports” patterns compared to the “no-sport” pattern. Higher

family income also increased the likelihood of belonging to the “specialized” pattern compared to the “no-sport” pattern. No variables predicted membership in the “low-sports” pattern compared to the “no-sport” pattern.

The second model compared the “specialized” pattern to the “low-sports” and “moderate-sports” patterns. Youth who had a greater number of best friends involved in sports and whose parents reported a higher level of sports participation in their youth were more likely to belong to the “specialized” pattern compared to the “low-sports” pattern. Also, parental involvement increased the odds of belonging to the “specialized” pattern compared to both the “moderate-sports” and “low-sports” patterns. In the final model comparing the “moderate-sports” to the “low-sports” patterns, no antecedents were significant.

### Discussion

Few studies have investigated the patterns of participation in organized sports during adolescence. Using the DMSP developed for elite athletes (Côté et al., 2007), we tested the hypothesis that patterns characterized by specialization in a single sport, sampling of several sports, and no (or low) sports participation would also emerge in a non-elite sample of adolescents. Different variables that could help predict membership in these patterns, identified using the YPAP



**Table 4.** Main effects (odds ratio) from the multinomial logistic regression analysis.

Antecedents	Comparisons					
	No-sport vs.			Specialized vs.		Moderate-sports vs. Low-sports
	Low-sports	Moderate-sports	Specialized	Low-sports	Moderate-sports	
1. Dev. and perf. motivation	1.02	1.30	1.51	0.68	0.86	0.79
2. Friends' sports participation	1.11	1.46*	2.02**	0.55**	0.72	0.76
3. Parental sports participation	0.91	1.00	1.18	0.77*	0.85	0.91
4. Parental attitude	1.38	1.27	1.72	0.80	0.74	1.08
5. Parental involvement	1.39	1.65*	3.69**	0.38*	0.45*	0.84
6. Family income	1.03	1.03	1.22*	0.84	0.84	1.00
7. Sex	1.95	2.59**	2.43*	0.802	1.07	0.75

\* $p < .05$ .\*\* $p < .01$ .

model (Welk, 1999), were also explored. A person-oriented analysis revealed the existence of four patterns. Moreover, several variables predicted membership in the various patterns.

### **Patterns of sports participation**

According to our first hypothesis (H1), three patterns were expected, namely the “specialized,” “sampling” and “low-sports” patterns. This hypothesis was partially supported. First, one of the patterns identified corresponded to the specialization pattern proposed in the DMSP (Côté et al., 2007). This pattern included youth who participated and focused on a single sport during almost the entire five years of high school. Alongside their specialization in this sport, these adolescents, on average, also participated for a short period in at least one other sport. Second, the pattern that most closely resembled the sampling pattern of the DMSP was the “moderate-sports” pattern. Youth in this pattern participated in more than one sport and, on average, reported participating in sports during three out of the five years of high school, without focusing their involvement on any particular sport. However, this pattern did not correspond exactly to the sampling pattern proposed in the DMSP as these youth did not participate in a greater variety of sports than those in the specialized pattern. It is possible that the sampling pattern is mainly observed at a younger age (between 6 and 12 years old), as stipulated in the DMSP and reported by Strachan et al. (2009), and is less often observed during the high school years. In fact, in general, the older adolescents are, the less they tend to participate in organized activities, particularly sports (Denault & Poulin, 2018; Denault, Poulin, & Pedersen, 2009). Other activities take up their time, such as holding a part-time job or spending more time on their studies (Arnett, 2014). In our study, this appeared to be the case in particular for the youth in the “moderate-sports” pattern,

whereas those in the “specialized” pattern maintained their sports participation throughout the adolescent years.

Rather than a single pattern including adolescents presenting little and no sports participation, as stipulated in H1, this pattern was split in two in the latent class analysis: a pattern characterized by a lack of sports participation during the high school years (“no-sport”) and a pattern including adolescents who reported some sports participation but no sustained participation in any particular sport and no great variety of sports participation (“low-sports”). The “no-sport” pattern represents youth who never tried organized sport throughout high school years and may or may not have focus on other types of organized activities. Youth in the “low-sports” pattern presented characteristics similar to the “low involvement” pattern identified by Agans et al. (2017).

### **Associations with individual, social and environmental antecedents**

Our examination of the antecedents yielded a better understanding of what led the adolescents to engage in different patterns of sports participation. Given the number of antecedents and comparisons made between the patterns, several significant findings emerged from our regression analyses. The most important findings are discussed in light of our hypotheses.

The psychological attributes (i.e., performance-driven motivation, pleasure-driven motivation, and problem behaviors) did not predict membership in any of the patterns, contrary to what was expected in H2, H3, and H4. Although the univariate analysis showed that adolescents in the “specialized” pattern reported higher levels of performance-driven motivation compared to those in the three other patterns, this variable was no longer significant in the final multivariate model. In addition, youth in all the

patterns reported similar level of pleasure-driven motivation, suggesting that adolescents who participate in sports are generally motivated by enjoyment of the game. According to Jakobsson (2014), youth enjoy organized sports because these activities provide a space in which they can socialize, develop a sense of belonging, experience new learning, be exposed to important challenges and develop physical abilities. These unexpected findings may have to do with the use of a unvalidated questionnaire to assess youths' motivations and with the fact that motivations were assessed in relation to participation in organized activities in general and not in relation to participation in sports specifically. Also, contrary to what was expected (H4), the presence of problem behaviors did not predict membership in the "no/low participation" patterns compared to the other patterns. Even though counterintuitive, this is in line with a recent meta-analysis revealing no overall significant association between sports participation and delinquency (Spruit, van Vugt, van der Put, van der Stouwe, & Stams, 2016).

Yet, our last hypothesis (H5) received strong support, as the social and environmental antecedents proved to be the most significant in predicting pattern membership. Specifically, having several friends who participated in organized sports at the end of elementary school increased the likelihood of membership in the "specialized" pattern compared to the "no-sport" and "low-sports" patterns and membership in the "moderate-sports" pattern compared to the "no-sport" pattern. It is plausible that the importance of peer acceptance and approval in early adolescence (LaFontana & Cillessen, 2010) may encourage youth to participate in the same sports activities together or to join a friend who is already involved in a sport or practicing physical activity (Maturo & Cunningham, 2013; Seabra et al., 2011). Once they are involved, they may benefit from encouragement from friends who are also involved in it (Hohepa, Scragg, Schofield, Kolt, & Schaaf, 2007; Maturo & Cunningham, 2013).

Several significant effects concerned the parents. In the final model, parental involvement and parents' own participation in sports in their youth predicted membership in the different patterns, especially the "specialized" pattern, suggesting that parents' behavior had a greater impact than their attitude toward organized activities. More specifically, having parents who were involved increased the likelihood of membership in the "specialized" pattern compared to the other three patterns and the "moderate-sports" pattern

compared to the "no-sport" pattern. In other words, adolescents whose parents were involved were not only more likely to participate in organized sports during high school, but were also more likely to specialize in a single sport. Parents' contribution to their adolescent's specialized sports participation was also reflected in their own sports participation in their youth, as this variable increased the likelihood of belonging to the "specialized" pattern compared to the "low-sports" pattern in the final model.

Parental involvement likely had a particular influence on membership in the "specialized" pattern. Encouragement provided by autonomy-supportive parents foster confidence and a sense of competence among adolescents, which in turn can foster enjoyment, motivation, and long-term participation (Harwood et al., 2019). Moreover, youth who specialize in a single sport often do so to develop expertise in this sport (Côté et al., 2003). When adolescents reach a higher level of competition, they are encouraged to train with their club several hours a week and participate in competitions in different towns. Parental involvement, particularly the fact of driving the adolescent to such competitions, thus becomes necessary to ensure that the latter can continue to participate in the club's activities (Harwood et al., 2019). Parental support also helps young specialized athletes overcome the challenges that come up along the way (injuries, losses, fatigue), thus lowering the likelihood that they will drop out of the sport (Côté, 1999).

Our results also show that higher family income fostered membership in the "specialized" pattern of sports participation. There are two possible explanations for this. First, Côté (1999) reported that adolescents manage to maintain their sports participation from year to year particularly when they do not have to hold a part-time job. When parents give adolescents an allowance to cover their personal spending needs (leisure activities, clothes), this allows them to continue participating in their sport instead of getting a job (Côté, 1999). Second, long-term participation often involves recurrent registration fees and equipment costs, especially when it comes to participating in sports at the competitive level (Pedersen, 2005).

As expected, boys were more likely than girls to belong to the two patterns characterized by higher sports participation ("specialized" and "moderate-sports"). Recent studies suggest that girls are still socialized away from physical activities. Coaches provide more encouragement to boys and parents tend to perceive their sons as having higher ability in sports

than their daughters (Deaner, Balish & Lombardo, 2016; Fredricks & Eccles, 2005). This, in turn, can affect girls' beliefs in their sports ability and their involvement in sports.

Overall, our findings indicate that the social factors related to friends and family predicted membership in the sports participation patterns during adolescence to a greater extent than the youths' psychological attributes, suggesting that these resources are central to maintaining sports participation over time. In addition, it is important to highlight that half of the adolescents in our sample participated very little or not at all in sports during the high school years. A chronic lack of physical activity and sedentary behavior are important risk factors for cardiovascular disease, obesity and the development of chronic diseases (Gonzalez, Fuentes, & Marquez, 2017). Thus, according to our results, efforts to promote sports participation during adolescence should target girls in particular, but also aim to encourage parents to get involved in their children's organized sports.

### Limitations, strengths and future research

This study is not without limitations. First, in the assessment of their involvement and attitude, parents were asked to refer to their child's most important organized activity. Although 50% of these activities were sports, some parents also identified performance and arts or clubs and associations. We assumed here that parental involvement and attitude toward organized activities could be generalized across activity types, but a measure specific to sports activities would have been preferable. Second, participants' reports on the competitive (versus recreational) nature of their sport were not available for the first two years of high school. Third, the subsample used in this study include an overrepresentation of intact families. Further studies with adolescents from various family configurations should be conducted as this could impact parental involvement in youth's sports. Fourth, this study used a relatively homogeneous sample of youth from a single geographical area. These findings should be replicated with a more diverse sample or in other countries for external validation. Fifth, this study focused only on promoting factors without investigating any constraints to sport participation. Further research should include sport participation constraints (e.g., lack of facilities near the house) to get a better insight into the antecedents of sport participation patterns.

These limitations are counterbalanced by some of this study's strengths. First, a longitudinal design

extending over 6 years (Grades 6 to 11), with yearly assessments of sports participation, was used. Second, instead of simply reporting each year whether they were participating in organized sports (yes or no) or using general categories of sports (i.e., team vs. individual sports), the youth were asked to specifically identify all the sports in which they had participated during the year. Such detailed information is essential when it comes to studying the specialization and sampling patterns of sports participation. Third, data were collected using a multi-source and multi-method procedure (self-report questionnaires, phone interviews, teacher ratings, a parent report questionnaire and peer nominations) reducing the risk of shared method bias.

As outlined in the DMSP (Côté et al., 2007), the specialization and sampling patterns of sports participation may begin earlier in children's development. Future studies should thus include a detailed longitudinal assessment of sports participation from school entry onward. Because the experiences of youth in different types of sports can differ (Agans & Geldhof, 2012; Denault & Poulin, 2016), future studies should also investigate whether those in the specialized group had greater involvement in team versus individual sports. Nevertheless, this study is the first to provide partial evidence for the DMSP in a general population of adolescents. Whether or not the "specialized" pattern leads to optimal functioning later in life remains to be investigated, but given the physical and psychological benefits usually associated with sports participation (Agans & Geldhof, 2012; Agans et al., 2017), this study offers some cues to parents and sports organizations regarding how to encourage sustained involvement in sports during the high school years.

### Authors' contributions

This research was conducted as part of G.D.'s doctoral dissertation. G.D. participated in the coordination of the study, conducted the statistical analysis, interpreted the data, and drafted the manuscript. F.P. is the principal investigator of the larger longitudinal research project, participated in the interpretation of the data and helped to draft the manuscript. A.S.D. participated in the statistical analysis and in the interpretation of the data, and helped to draft the manuscript. All authors read and approved the final manuscript.

### Funding

This work was supported by the Social Sciences and Humanities Research Council of Canada and the Fonds de Recherche du Québec sur la Société et la Culture.

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## References

- Agans, J. P., & Geldhof, G. J. (2012). Trajectories of participation in athletics and positive youth development: The influence of sport type. *Applied Developmental Science, 16*(3), 151–165. doi:10.1080/10888691.2012.697792
- Agans, J. P., Johnson, S. K., & Lerner, R. M. (2017). Adolescent athletic participation patterns and self-perceived competence: Associations with later participation, depressive symptoms, and health. *Journal of Research on Adolescence, 27*(3), 517–594. doi:10.1111/jora.12301
- Arnett, J. J. (2014). *Emerging adulthood: The winding road from the late teens through the twenties* (2nd ed.). New York, NY: Oxford University Press.
- Bandura, A. (1977). *Social learning theory*. Oxford, UK: Prentice-Hall.
- Barnes, J. D., Cameron, C., Carson, V., Chaput, J.-P., Faulkner, G. E. J., Janson, K., ... Tremblay, M. S. (2016). Results from Canada's 2016 ParticipACTION report card on physical activity for children and youth. *Journal of Physical Activity and Health, 13*(s2), S110–S116. doi:10.1123/jpah.2016-0300
- Biddle, S., & Asare, M. (2011). Physical activity and mental health in children and adolescents: A review of reviews. *British Journal of Sports Medicine, 45*(11), 886–895. doi:10.1136/bjsports-2011-090185
- Brown, H., Salmon, J., & Pearson, N. (2014). Ecological correlates of sport participation in youth. *Science & Sports, 29*, S38. doi:10.1016/j.scispo.2014.08.075
- Brustad, R. J. (1996). Attraction to physical activity in urban schoolchildren: Parental socialization and gender influences. *Research Quarterly for Exercise and Sport, 67*(3), 316–323. doi:10.1080/02701367.1996.10607959
- Côté, J. (1999). The influence of the family in the development of talent in sport. *The Sport Psychologist, 13*(4), 395–417. doi:10.1123/tsp.13.4.395
- Côté, J., Baker, J., & Abernethy, B. (2003). From play to practice: A developmental framework for the acquisition of expertise in team sports. In J. Starkes & K. A. Ericsson (Eds.), *Expert performance in sports: Advances in research on sport expertise* (pp. 89–110). Champaign, IL: Human Kinetics.
- Côté, J., Baker, J., & Abernethy, B. (2007). Practice and play in the development of sport expertise. In R. Eklund & G. Tenenbaum (Eds.), *Handbook of Sport Psychology* (pp. 184–202). Hoboken, NJ: Wiley.
- Côté, J., Horton, S., MacDonald, D., & Wilkes, S. (2009). The benefits of sampling sports during childhood. *Physical and Health Education Journal, 74*(4), 6–11.
- Denault, A.-S., & Poulin, F. (2009). Predictors of adolescent participation in organized activities: A five-year longitudinal study. *Journal of Research on Adolescence, 19*(2), 287–311. doi:10.1111/j.1532-7795.2009.00597.x
- Denault, A. S., & Poulin, F. (2016). What adolescents experience in organized activities: Profiles of individual and social experiences. *Journal of Applied Developmental Psychology, 42*, 40–48. doi:10.1016/j.appdev.2015.11.004
- Denault, A.-S., & Poulin, F. (2018). A detailed examination of the longitudinal associations between individual and team sports and alcohol use. *Addictive Behaviors, 78*, 15–21. doi:10.1016/j.addbeh.2017.10.019
- Denault, A.-S., Poulin, F., & Pedersen, S. (2009). Intensity of structured leisure activity participation across the high school years: Longitudinal associations with youth adjustment. *Applied Developmental Science, 13*(2), 14–74. doi:10.1080/10888690902801459
- Deaner, R. O., Balish, S. M., & Lombardo, M. P. (2016). Sex differences in sports interest and motivation: An evolutionary perspective. *Evolutionary Behavioral Sciences, 10*(2), 73–97. doi:10.1037/ebs0000049
- Dodge, K. A., & Coie, J. D. (1987). Social-information processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology, 53*(6), 1146–1158. doi:10.1037//0022-3514.53.6.1146
- Eime, R. M., Young, J. A., Harvey, J. T., Charity, M. J., & Payne, W. R. (2013). A systematic review of the psychological and social benefits of participation in sport for children and adolescents: Informing development of a conceptual model of health through sport. *International Journal of Behavioral Nutrition and Physical Activity, 10*(1), 98. doi:10.1186/1479-5868-10-98
- Fredricks, J., & Eccles, J. (2005). Family socialization, gender, and sport motivation and involvement. *Journal of Sport and Exercise Psychology, 27*, 3–31. doi:10.1123/jsep.27.1.3
- Gonzalez, K., Fuentes, J., & Marquez, J. L. (2017). Physical inactivity, sedentary behavior and chronic diseases. *Korean Journal of Family Medicine, 38*(3), 111–115. doi:10.4082/kjfm.2017.38.3.111
- Gould, D. (2010). Early sport specialization. *Journal of Physical Education, Recreation & Dance, 81*(8), 33–37. doi:10.1080/07303084.2010.10598525
- Harwood, C. G., Knight, C. J., Thrower, S. N., & Berrow, S. R. (2019). Advancing the study of parental involvement to optimise the psychosocial development and experiences of young athletes. *Psychology of Sport and Exercise, 42*(2019), 66–73. doi:10.1016/j.psychsport.2019.01.007
- Hohepa, M., Scragg, R., Schofield, G., Kolt, G. S., & Schaaf, D. (2007). Social support for youth physical activity: Importance of siblings, parents, friends and school support across a segmented school day. *International Journal of Behavioral Nutrition and Physical Activity, 4*(1), 54–63. doi:10.1186/1479-5868-4-54
- Jakobsson, B. T. (2014). What makes teenagers continue? A salutogenic approach to understanding youth participation in Swedish club sports. *Physical Education and Sport Pedagogy, 19*(3), 239–252.
- Kjønniksen, L., Anderssen, N., & Wold, B. (2009). Organized youth sport as a predictor of physical activity in adulthood. *Scandinavian Journal of Medicine & Science in Sports, 19*(5), 646–654. doi:10.1111/j.1600-0838.2008.00850.x
- Kline, R. B. (2015). *Principles and practice of structural equation modeling*. New York, NY: Guilford Publications.



- Knight, C. J., Dorsch, T. E., Osai, K. V., Haderlie, K. L., & Sellars, P. A. (2016). Influences on parental involvement in youth sport. *Sport, Exercise, and Performance Psychology*, 5(2), 161–178.
- Knight, C. J., Berrow, S. R., & Harwood, C. G. (2017). Parenting in sport. *Current Opinion in Psychology*, 16, 93–97. doi:10.1016/j.copsyc.2017.03.011
- LaFontana, K. M., & Cillessen, A. H. (2010). Developmental changes in the priority of perceived status in childhood and adolescence. *Social Development*, 19(1), 130–147. doi:10.1111/j.1467-9507.2008.00522.x
- Larson, R. W. (2000). Toward a psychology of positive youth development. *American Psychologist*, 55(1), 170–183. doi:10.1037/0003-066X.55.1.170
- Mahoney, J. L., Stattin, H., & Lord, H. (2004). Unstructured youth recreation centre participation and antisocial behavior development: Selection influences and the moderating role of antisocial peers. *International Journal of Behavioral Development*, 28(6), 553–560. doi:10.1080/01650250444000270
- Marsh, H. W., Craven, R., & Debus, R. (1999). Separation of competency and affect components of multiple dimensions of academic self-concept: A developmental perspective. *Merrill-Palmer Quarterly*, 45, 567–601.
- Masten, A. S., Morison, P., & Pellegrini, D. S. (1985). A revised class play method of peer assessment. *Developmental Psychology*, 21(3), 523–533. doi:10.1037//0012-1649.21.3.523
- Maturo, C. C., & Cunningham, S. A. (2013). Influence of friends on children's physical activity: A review. *American Journal of Public Health*, 103(7), e23–38. doi:10.2105/AJPH.2013.301366
- Metzler, C. W., Biglan, A., Ary, D. V., & Li, F. (1998). The stability and validity of early adolescents' reports of parenting constructs. *Journal of Family Psychology*, 12(4), 600–619. doi:10.1037//0893-3200.12.4.600
- Muthen, L. K., & Muthen, B. (2012). *Mplus: Version 7 user's guide*. Los Angeles, CA: Muthen & Muthen.
- Pedersen, S. (2005). Urban adolescents' out-of-school activity profiles: Associations with youth, family, and school transition characteristics. *Applied Developmental Science*, 9(2), 107–124. doi:10.1207/s1532480xads0902\_5
- Randall, E. T., Travers, L. V., Shapiro, J. B., & Bohnert, A. M. (2016). Reasons for the “after-school pressure cooker” in affluent communities: It's not how much time, but why. *Journal of Child and Family Studies*, 25(5), 1559–1569. doi:10.1007/s10826-015-0330-4
- Seabra, A., Mendonça, D., Santos, D., Seabra, A., Souza, M., Chaves, R., ... Garganta, R. (2011). The relationship between socio-cultural correlates and sport participation in Portuguese adolescents aged 10 to 18 years. *Medicine & Science in Sports & Exercise*, 43(5), 552. doi:10.1249/01.MSS.0000401522.06983.8e
- Spruit, A., Van Vugt, E., van der Put, C., van der Stouwe, T., & Stams, G. J. (2016). Sports participation and juvenile delinquency: A meta-analytic review. *Journal of Youth and Adolescence*, 45(4), 655–671. doi:10.1007/s10964-015-0389-7
- Strachan, L., Côté, J., & Deakin, J. (2009). “Specializers” versus “samplers” in youth sport: Comparing experiences and outcomes. *The Sport Psychologist*, 23(1), 77–92. doi:10.1123/tsp.23.1.77
- Van Der Horst, K., Paw, M., Twisk, J. W., & Van, W. M. (2007). A brief review on correlates of physical activity and sedentariness in youth. *Medicine and Science in Sports and Exercise*, 39(8), 1241–1250. doi:10.1249/mss.0b013e318059bf35
- Von Eye, A., & Bogat, G. A. (2006). Person-oriented and variable-oriented research: Concepts, results, and development. *Merrill-Palmer Quarterly*, 52(3), 390–420. doi:10.1353/mpq.2006.0032
- Welk, G. J. (1999). The youth physical activity promotion model: A conceptual bridge between theory and practice. *Quest*, 51(1), 5–23. doi:10.1080/00336297.1999.10484297