The longitudinal effect of parental support during adolescence on the trajectory of sport participation from adolescence through young adulthood

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Abstract

Background: One efficient way to increase physical activity is through sport participation because participation in sport activities inherently includes many enjoyable aspects, such as social interaction, competition, personal challenge, and goal achievement. The main purpose of this study was to investigate the longitudinal effect of parental support during adolescence on the trajectory of sport participation from adolescence through young adulthood.

Methods: The data used in this study came from the National Longitudinal Study of Adolescent to Adult Health (Add Health). It is a 4-wave longitudinal study that followed up a nationally representative sample of middle and high school students in the US. A series of multilevel logistic regression models were used to examine the effect of parental support at Wave 1 on the trajectory of sport participation from Wave 1 to Wave 4.

Results: The effect of parental support during adolescence on participants’ sport participation lasted until they become young adults (Wave 3) (p < 0.001). Among the male participants, parental support at Wave 1 was a significant predictor for sport participation at Waves 1, 2, and 3 (p < 0.001). However, a significant effect of parental support at Wave 1 on sport participation in early young adulthood (Wave 3) becomes insignificant when adjusting for self-esteem and depression. Among the female participants, parental support at Wave 1 was a significant predictor for sport participation at Waves 1, 2, and 3 (p < 0.01) even after depression and self-esteem were introduced into the model. That is to say, unlike male participants, parental support during adolescence has an independent effect on sport participation from adolescence (Wave 1) through early young adulthood (Wave 3) over and above the effects of depression and self-esteem in female participants.

Conclusion: The results of this study contributed to the literature by providing important information on the longitudinal effect of parental support during adolescence on the trajectory of sport participation from adolescence through young adulthood using a nationally representative sample of participants transitioning from adolescence to young adulthood.

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Keywords: Adolescents; Depression; Parental support; Self-esteem; Sport participation; Young adults

1. Introduction

Considerable evidence suggests that regular physical activity (PA) can prevent various kinds of chronic diseases, such as diabetes, stroke, heart disease, and osteoporosis.1–4 Many studies have also shown that physical inactivity or low levels of PA can cause dramatic increases in the rate of all-cause mortality.5 In addition, performing recommended levels of PA has been shown to relieve stress, depression, and anxiety.6–8 Despite the clear advantages of regular PA, only 51% of adults (aged 18 or older) were performing recommended levels of PA in the US.9 One efficient way to increase PA is through sport participation because participation in sport activities inherently includes many enjoyable aspects, such as social interaction, competition, personal challenge, and goal achievement. Previous studies have identified that some of the reasons for participating in sports were enjoyment, fitness, and social interaction.10,11 Sport participation has also been shown to improve self-esteem, reduce the risk for obesity, improve body image, and increase muscle mass.12,13 Because participation in sport activities invariably involves PA, it is important to understand the factors that influence sport participation behavior.

General social support (not exercise-specific social support) is one of the important potential factors that may influence PA-related behaviors (e.g., exercise, outdoor play, sport
Higher levels of general social support have almost always been associated with lower mortality and morbidity.\textsuperscript{15,16} Furthermore, affective support was found to be more consistently and strongly associated with well-being and good health compared with other types of general social support.\textsuperscript{17,18} It is possible that part of this association is attributable to the relationship between general social support and PA-related behavior. For example, general social support has been shown to play an important role in the maintenance of mental well-being, which in turn might motivate self-care behaviors, such as exercise and sport participation, in individuals.\textsuperscript{19–21} High levels of general social support might also increase self-esteem, which can potentially help individuals adopt healthy behaviors and avoid unhealthy lifestyle behaviors, such as sedentariness.\textsuperscript{22–28} Therefore, it is important to consider psychological health and self-esteem as potential mediators or moderators when examining the relationship between general social support and PA-related behaviors.

Although some plausible mechanisms in the relationship between general social support and PA-related behaviors have been suggested, not many studies have investigated this relationship. In the 2003 Health Survey for England, lack of general social support was associated with lower levels of PA.\textsuperscript{29} Higher emotional and instrumental social support (not exercise-specific social support) was positively associated with higher levels of PA.\textsuperscript{30} In a longitudinal study, initially sedentary participants became physically active if they met often with their family.\textsuperscript{31} In another longitudinal study, both emotional and practical support (not exercise-specific social support) were shown to help people maintain the recommended level of PA.\textsuperscript{32} In the 1990 Ontario Health Survey, social quantity (number of close friends and number of family members) and social frequency (frequency of meeting family members and close friends) were positively associated with PA.\textsuperscript{33} However, most of these studies did not consider the possibility of reverse causation, as the data used by these studies were mostly cross-sectional.\textsuperscript{29,30,33} and none of these studies considered both depression and self-esteem as potential mediators of the relationship between general social support and PA-related behaviors.

This study attempts to examine the effect of general social support during adolescence on sport participation from adolescence through young adulthood. This study focuses on parental support rather than other potential sources of general social support. Although peers have an important social influence on the mental well-being of adolescents,\textsuperscript{34} previous evidence suggests that parental support is more strongly related to well-being in adolescents compared with peer support.\textsuperscript{35,36} Parental support may therefore be considered as a key source of general social support for adolescents. It is unclear, however, whether people who have a lack of general social support early in life remain at an increased risk for physically inactive lifestyle later in life. According to the concept of the life course trajectory,\textsuperscript{37} different points in the life course of an individual are closely connected with one another. Significant conditions and events at one point in an individual’s life course may play an important role in shaping the course of conditions and events experienced in subsequent years. If this is true, it will be necessary to find out the mechanisms underlying the effect of poor general social support early in life on the trajectory of PA-related behaviors later in life.

The main purpose of this study was to investigate the longitudinal effect of parental support during adolescence on the trajectory of sport participation from adolescence through young adulthood. We examined gender differences in the longitudinal relationship between parental support and sport participation because female adolescents may value relational closeness to a different degree or in a different way compared with male adolescents.\textsuperscript{38} and previous studies have shown that male adolescents engage in higher levels of PA-related behaviors than do female adolescents.\textsuperscript{39–41} We also considered depression and self-esteem as mediators of the longitudinal relationship between parental support and sport participation as previous studies emphasized the importance of psychological health and self-esteem as potential mediators of this relationship.\textsuperscript{19–28}

### 2. Methods

#### 2.1. Data

The data used in this study came from the National Longitudinal Study of Adolescent to Adult Health (Add Health). It is a 4-wave longitudinal study that followed up a nationally representative sample of middle and high school students (7th through 12th grade) in the US. Every high school in the US that included more than 30 enrollees and 11th grade was included in the primary sampling frame. These schools were stratified by urbanicity, region, school type, size, and ethnic mix. Using systematic random sampling, 80 high schools were selected. More than 70% of these schools were recruited. Middle schools that sent graduates to already recruited high schools and included 7th grade were also recruited. A total of 134 middle and high schools were included in the final sample. In each school, students were stratified by grade and gender, and then chosen randomly from official school rosters. In 1995, the Wave 1 in-home interview was conducted from April to December. Seventy-nine percent of the selected students completed interviews. The Wave 2 interview was conducted approximately 1 year later (12% dropouts from Wave 1). The Wave 3 interview was conducted approximately 6 years after the Wave 1 interview (23% dropouts from Wave 2). The Wave 4 interview was conducted between 2007 and 2008 (20% dropouts from Wave 3).

Additional information on the Add Health data is reported elsewhere.\textsuperscript{42} This study used Waves 1–4 public-use datasets ($n = 6504$). When properly weighted, the Add Health public-use datasets provide a nationally representative sample of U.S. middle and high school students.

#### 2.2. Measures

Sport participation at each wave was assessed by asking participants how many times they participated in an active sport, such as baseball, basketball, soccer, swimming, or football during the past week. Because sport participation at Waves 3 and 4 was assessed by asking 2 questions, one about team sport participation and the other about individual sport...
participation, the number of times the participants joined individual and team sports was added to create the total number of participation in sport. Participants who participated in sports 5 or more times per week were considered active participants. Parental support at Wave 1 is the sum of the responses to 5 items, namely how close respondents feel to their resident (biological, adoptive, step, or foster) mother or father (1 = not at all to 5 = very much), how much they think their mother or father cares about them (1 = not at all to 5 = very much), whether their mother or father is warm and loving (1 = strongly disagree to 5 = strongly agree), whether they are satisfied with communication with their mother or father (1 = strongly disagree to 5 = strongly agree), and whether they are satisfied, overall, with their relationship with their mother or father (1 = strongly disagree to 5 = strongly agree). The choice of these items is based on prior studies of parental support with the Add Health data. The reliability of paternal support and maternal support is 0.88 and 0.85, respectively. If information about maternal support is missing, the measure of paternal support is used to indicate paternal support. Likewise, if information about paternal support is not available, the maternal support sum is used to indicate parental support. In cases where both maternal and paternal support measures are available, the arithmetic mean of these items is used to indicate parental support at Wave 1. This method of assessing support substantially reduces the amount of missing data associated with the parent-specific measures.

A shorter version of the Center for Epidemiologic Studies–Depression Scale was used to assess participants’ depressive symptoms at Wave 1. Each item was scored from 0 to 3. Several items were reverse-coded so that a higher score means a higher level of depressive symptoms. The depression scale score was summed to indicate depressive symptoms at Wave 1 (Cronbach’s α = 0.77). Four items were used to assess self-esteem at Wave 1 (Cronbach’s α = 0.72): “You felt that you were just as good as other people”, “You have a lot of good qualities”, “You have a lot to be proud of”, and “You like yourself just the way you are”. The responses to the first item were 1 = never or rarely, 2 = sometimes, 3 = a lot of the time, and 4 = most of the time or all of the time. A 5-point Likert scale (1 = strongly disagree to 5 = strongly agree) was used to assess the last 3 items. After standardizing each response, the arithmetic mean of the 4 items was computed. Additional covariates were race and ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and others) and gender (male and female).

### 2.3. Statistical analysis

A series of multilevel logistic regression models were used to examine the effect of parental support at Wave 1 on the trajectory of sport participation from Wave 1 to Wave 4. The wave used as the time scale (1995 = Wave 1, 1997 = Wave 2, 2002 = Wave 3, and 2009 = Wave 4) and was centered at Wave 1 to accommodate interpretation of results (i.e., capturing the level of average sport participation among participants at Wave 1). Intraclass correlation coefficient (ICC) was computed from the model where no predictor was included (unconditional means model) to find out the proportion of total outcome variation between different individuals. Unconditional growth model for sport participation (Model 1) was constructed to examine whether within-person variation in the outcome was significantly related to linear or quadratic time. Conditional growth models for sport participation (Models 2–5) were then constructed to investigate the effects of parental support at Wave 1 on the trajectory of sport participation from Wave 1 to Wave 4 after controlling for individual-level variables (i.e., sport participation at Wave 1, race and ethnicity, depression, and self-esteem) in a sequential manner. Model 2 is the sport participation at Wave 1- and race and ethnicity-controlled growth model. Model 3 is the sport participation at Wave 1-, race and ethnicity-, and self-esteem-controlled growth model. Model 4 is the sport participation at Wave 1-, race and ethnicity-, and depression-controlled growth model. In the final model (Model 5), depression was introduced into Model 4 to assess the effect of parental support at Wave 1 on the trajectory of sport participation from Wave 1 to Wave 4 above and beyond all other individual-level variables. We performed all the analyses separately by gender. All the analyses described above were performed using HLM Version 6.08 (Scientific Software International, Lincolnwood, IL, USA).

### 3. Results

#### 3.1. Descriptive statistics

Table 1 shows the characteristics of the participants at each wave. The mean age at each wave was similar between male and female participants. Both the mean of self-esteem z-score at Wave 1 and the mean of parental support at Wave 1 were higher in male than female adolescents ($p < 0.001$). On the contrary, the average depression score of male adolescents was lower than that of female adolescents at Wave 1 ($p < 0.001$). For both

| Table 1 Descriptive characteristics of participants. |
|-----------------------------------------------------|
| Characteristics | Full sample ($n = 6504$) | Male ($n = 3147$) | Female ($n = 3356$) |
| Age (year)$^a$ | | | |
| Wave 1 | 15.02 ± 1.62 | 15.11 ± 1.64 | 14.94 ± 1.60 |
| Wave 2 | 16.02 ± 1.62 | 16.11 ± 1.63 | 15.94 ± 1.60 |
| Wave 3 | 21.22 ± 1.70 | 21.37 ± 1.73 | 21.09 ± 1.67 |
| Wave 4 | 27.99 ± 1.62 | 28.10 ± 1.64 | 27.90 ± 1.60 |
| Self-esteem, z-score (Wave 1)$^a$ | 0.00 ± 2.94 | 0.48 ± 2.74$^*$ | −0.45 ± 3.05 |
| Depression (Wave 1)$^a$ | 4.90 ± 3.66 | 4.33 ± 3.29$^*$ | 5.43 ± 3.89 |
| Parental support (Wave 1)$^a$ | 21.76 ± 3.15 | 22.09 ± 2.82$^*$ | 21.46 ± 3.40 |
| Race/ethnicity (Wave 1)$^a$ | | | |
| White | 3853 (59.39) | 1870 (59.57) | 1983 (59.21) |
| Black | 1550 (23.89) | 738 (23.51) | 812 (24.25) |
| Hispanic | 743 (11.45) | 358 (11.41) | 385 (11.50) |
| Others | 342 (5.27) | 173 (5.51) | 169 (5.04) |
| Sport participation ≥5 per week$^b$ | | | |
| Wave 1 | 1582 (24.35) | 1067 (33.94) | 515 (15.38) |
| Wave 2 | 1203 (24.89) | 781 (33.75) | 422 (16.75) |
| Wave 3 | 407 (8.37) | 273 (12.17) | 134 (5.12) |
| Wave 4 | 333 (6.52$^a$) | 218 (9.27$^a$) | 115 (4.17$^a$) |

Note: There is 1 missing value in gender and 16 missing values in race/ethnicity.

a Values presented as mean ± SD.
b Values presented as n (%).
$p < 0.001$, compared with female.
$p < 0.001$, compared with Wave 1.
genders, there was a decrease in the proportion of sport participation as participants aged from Wave 1 (mean age of 15 years) to Wave 4 (mean age of 28 years) \( (p < 0.001) \).

### 3.2. Trajectory of sport participation

Table 2 shows the results of the series of multilevel logistic regression models that examined the trajectory of participants’ sport participation from adolescence through young adulthood. Among the male participants, the population average probability of sport participation was 0.225, that is, \( e^{-1.239} / (1 + e^{-1.239}) = 22.5\% \) (95% confidence interval: 21.4%–23.5%). In the null model, the person-level residual variance was 0.55. Thus, the ICC was \( 0.14 = 0.55 / (0.55 + 3.29) \), indicating that 14% of variance in male participants’ sport participation was explained by the differences between individuals. Therefore, the multilevel approach was warranted. In unconditional growth model (Model 1), only linear time was significant, indicating a downward linear trend in sport participation with time \( (p < 0.001) \). In Model 2, parental support at Wave 1 was significantly associated with sport participation at Wave 1 after controlling for sport participation at Wave 1 and race and ethnicity \( (p < 0.001) \). A significant cross-level interaction between time and parental support indicates that the positive effect of parental support at Wave 1 on sport participation becomes weaker as time passes \( (p < 0.001) \). Parental support at Wave 1 was a significant predictor for sport participation at Waves 1, 2, and 3 \( (p < 0.001) \) but not for sport participation at Wave 4 (not shown in Table 2). In Model 3, depression at Wave 1 was negatively associated with sport participation at Wave 1 \( (p < 0.001) \). In Model 4, self-esteem at Wave 1 was positively associated with sport participation at Wave 1 \( (p < 0.001) \). In the final model (Model 5), parental support at

| Fixed effect | Male \( (n = 3147) \) | Female \( (n = 3356) \) |
|-------------|----------------------|----------------------|
| Intercept   | \( -0.681*** \) 0.038 | \( -0.681*** \) 0.039 |
| Time        | \( -0.127*** \) 0.005 | \( -0.018** \) 0.006 |
| Race/ethnicity |                   |                      |
| White (ref) | –                   | –                    |
| Black       | –                   | –                    |
| Hispanic    | \( 0.249** \) 0.089 | –                    |
| Others      | \( 0.058 \) 0.104   | \( 0.017 \) 0.039   |
| Sport participation (Wave 1) | \( 2.786*** \) 0.052 | \( 3.079*** \) 0.058 |
| Depression  | –                   | –                    |
| Self-esteem, z-score | \( 0.064*** \) 0.012 | \( 0.062*** \) 0.012 |
| Parental support | –                   | –                    |
| Cross-level interaction | –                   | –                    |
| Person-level residuals | 0.803*** 0.896 | 0.938 0.969 |
| Slopes for Time | 0.005 0.072 | 0.001 0.033 |

Table 2

Multilevel logistic regression models examining trajectory of participants’ sport participation from adolescence through young adulthood.

| Male \( (n = 3147) \) | Female \( (n = 3356) \) |
|----------------------|----------------------|
| Intercept | \( -1.568*** \) 0.039 | \( -1.568*** \) 0.039 |
| Time | \( -0.118*** \) 0.006 | \( -0.018** \) 0.006 |
| Race/ethnicity |                   |                      |
| White (ref) | –                   | –                    |
| Black | –                   | –                    |
| Hispanic | \( -0.353*** \) 0.060 | \( -0.353*** \) 0.060 |
| Others | \( -0.164 \) 0.087 | \( 0.176 \) 0.111 |
| Sport participation (Wave 1) | \( 3.079*** \) 0.058 | \( 3.079*** \) 0.058 |
| Depression | –                   | –                    |
| Self-esteem, z-score | –                   | –                    |
| Parental support | –                   | –                    |
| Cross-level interaction | –                   | –                    |
| Person-level residuals | 0.938 0.969 | 0.938 0.969 |
| Slopes for Time | 0.001 0.033 | 0.001 0.033 |

Notes: Model 1 is the unconditional linear growth model with a Time variable; Model 2 is the sport participation at Wave 1- and race/ethnicity-controlled growth model; Model 3 is the sport participation at Wave 1-, race/ethnicity-, and depression-controlled growth model; Model 4 is the sport participation at Wave 1-, race/ethnicity-, and self-esteem-controlled growth model; and Model 5 is the full model where depression was entered into Model 4.

* \( p < 0.05 \), ** \( p < 0.01 \), *** \( p < 0.001 \).

Abbreviations: Coef. = logit coefficient; ref = reference category.
baseline (Wave 1) was a significant predictor for Wave 1 sport participation \((p < 0.001)\) even after controlling for all other individual-level variables, indicating that parental support during adolescence has an independent effect on adolescent sport participation over and above the effects of depression and self-esteem. However, as shown in Fig. 1A, a significant effect of parental support at Wave 1 on sport participation in early young male adulthood (Wave 3) becomes insignificant when adjusting for self-esteem and depression (not shown in Table 2).

The population average probability of sport participation among female participants was 0.108, that is, \(e^{-2.111} / (1 + e^{-2.111}) = 10.8\% \) (95% confidence interval: 10.1%–11.6%). The person-level residual variance was 0.76 in the null model. Thus, the ICC was 0.19 = 0.76 / (0.76 + 3.29).\(^{45}\) Because 19% of variance in female participants’ sport participation was explained by the differences between individuals, the multilevel approach was warranted. The results of Models 1–5 among female participants were very similar to those among the male participants. However, as shown in Fig. 1B, parental support at Wave 1 was a significant predictor for sport participation at Waves 1, 2, and 3 \((p < 0.01)\) even after depression and self-esteem were introduced into the model (not shown in Table 2). That is to say, unlike male participants, parental support during adolescence has an independent effect on sport participation from adolescence (Wave 1) through early young adulthood (Wave 3) over and above the effects of depression and self-esteem in female participants.

4. Discussion

This study is the first study that investigated the effect of parental support (not exercise-specific parental support) during adolescence on the trajectory of sport participation from adolescence to young adulthood using nationally representative data from the Add Health. In addition, our study also examined whether self-esteem and depression mediated the effect of parental support on sport participation from adolescence through young adulthood. Overall, the results of our study showed that parental support during adolescence had an independent effect on sport participation from adolescence through young adulthood. However, unlike female participants, self-esteem and depression mediated the effect of parental support in adolescence on sport participation during early young adulthood (Wave 3) in male participants.

Consistent with previous findings,\(^{29–33}\) the results of our study showed that adolescents who think they receive higher levels of general social support from their parents are more likely to participate in recommended levels of sporting activities. Low levels of general social support have been repeatedly associated with increased morbidity and mortality.\(^{15,16}\) It is possible that a significant part of this association is attributable to the relationship between general social support and PA-related behaviors, such as sport participation. The findings from our study extend previous findings on the association between general social support and PA-related behaviors by suggesting that this association is also evident in adolescence.

Another finding of note is that the effect of parental support during adolescence on participants’ sport participation lasted until they became young adults. Most of the current studies on the effects of early parental support focus on comparatively immediate outcomes. For example, early parental support has been shown to affect problem behaviors among adolescents,\(^{50}\) as well as their mental and physical health.\(^{51}\) Because examining the long-term effects of early parental support is also important, several previous studies have shown that early parental support is linked to mental and physical health during young adulthood and midlife.\(^{52–55}\) The results of our study add to the previous body of results on the association between early parental support and young adult health by suggesting that sport participation may act as an important mediator or moderator in this association.

Although several mechanisms explaining the association between general social support and PA-related behaviors have been proposed,\(^{56}\) not many studies have examined the mediators of this association.\(^{32,57}\) For example, general social support plays an important role in the maintenance of psychological well-being, which in turn motivates self-care behaviors, such as

![Fig. 1. The trajectory of sport participation from adolescence through young adulthood by parental support among male (A) and female (B) participants. The solid and dotted lines indicate averaged upper and lower quartiles of parental support, respectively. PS = parental support.](image-url)
High levels of general social support might also increase self-esteem, which can potentially help individuals adopt self-care behaviors and avoid unhealthy lifestyle behaviors, such as sedentariness. The results of this study showed that the relationship between parental support during adolescence, which is a major source of general social support for adolescents, and sport participation during early young adulthood (Wave 3) was fully mediated by depression and self-esteem in male participants. However, the relationship between parental support in adolescence and sport participation from adolescence to young adulthood was not fully mediated by depression and self-esteem in female participants. There was a very small change after controlling for depression and self-esteem. This result is in line with Kouvonen et al.’s study showing that the link between high levels of general social support and performing recommended levels of leisure time PA is not mediated through depression status. Kouvonen et al.’s study, however, did not consider self-esteem as a mediator between general social support and PA. Further studies are needed to investigate other potential mediators in addition to self-esteem and depression when examining the relationship between general social support and PA-related behaviors in female participants.

This study is not without some important limitations. First, this study only considered 1 source of social support. Previous studies suggest that although parental support is the most important social influence on the health and well-being of adolescents, peer support also has an important role in the lives of adolescents. Because learning to stand alone and becoming independent from parents are the key developmental tasks during adolescence, relationships with peers become increasingly important during this period of the life course. However, proper measurements of peer support are not included in the dataset we used. Future studies need to consider how peer support and parental support interact with developmental trajectories of sport participation. Second, this study used a questionnaire that asked only about emotional support, which provides love and caring, as opposed to practical support, which provides tangible assistance with a goal or task. In other words, this study could not differentiate between emotional and practical support and assess how each of these can differentially influence PA-related behaviors. Third, the Add Health data did not allow the use of more specific types and amount of sport participation. For example, team sport participation could not be distinguished from individual sport participation because the measure of sport participation in the Add Health data at Waves 1 and 2 did not distinguish between team sport participation and individual sport participation. To understand more precisely the influence of parental support received during adolescence on sport participation throughout the life course, future studies need to use the measure of sport participation from various sources. Despite these limitations, the results of this study contributed to the literature by providing important information on the trajectory of sport participation in relation to parental support during adolescence using a nationally representative sample of participants transitioning from adolescence to young adulthood.

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Authors’ contributions

CGL conceived of the study, drafted the manuscript, and performed the statistical analysis; SP helped draft the manuscript and perform the statistical analysis; SY participated in study design and coordination and helped draft the manuscript. All authors have read and approved the final version of the manuscript, and agree with the order of presentation of the authors.

Competing interests

The authors declare that they have no competing interests.

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