

# Physical Pain and Participation in Organized Activities Among U.S. Adolescents

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## Abstract

Chronic physical pain is a public health problem among adolescents in the United States. One important consideration for adolescent healthy development is participation in organized activities. Therefore, the study objective was to examine the associations between repeated or chronic physical pain and participation in organized activities overall and by activity type including sports, clubs, and other organized activities (e.g., dance) among U.S. adolescents. This secondary analysis utilized the 2018-2019 National Survey of Children's Health (NSCH) combined two-year dataset, and included 24,680 adolescents ages 12-17 years. We conducted unadjusted and adjusted logistic regression analyses to examine the relationships between adolescent physical pain and participation in organized activities overall and by type (sports, clubs, other organized activities). Nearly 14% of adolescents had physical pain in the past 12-months. Unadjusted logistic regression model results indicated that adolescents with physical pain were less likely to participate in organized activities (odds ratio [OR] = 0.81, 95% confidence interval [CI] = 0.66, 0.99) compared to adolescents without physical pain. Concerning specific organized activity type, unadjusted (OR = 0.73, 95%CI = 0.61, 0.86) and adjusted (aOR = 0.83, 95%CI = 0.70, 0.99) model results indicated that adolescents with physical pain were less likely to participate in sports compared to adolescents without physical pain. The current study found that adolescents with physical pain had lower odds of overall participation in organized activities, and specifically sports, when compared to adolescents without physical pain. Findings should be considered when developing and implementing pain prevention and treatment programming for adolescents in school and community settings.

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## Introduction

Chronic physical pain, which is defined as persistent or repeated pain lasting over three months (Treede et al., 2019), is a public health problem among adolescents in the United States (U.S.). The prevalence of physical pain widely ranges from 11-38% based on type of pain among adolescents (King et al., 2011). Specifically, chronic pain during adolescence can be derived from a primary pain disorder (e.g., headache) (van Gessel et al., 2011), a specific medical condition (e.g., inflammatory bowel disease)

(Murphy et al., 2021), or an unexplained origin (Hinton & Kirk, 2016). The intensity of chronic pain can range from mild and moderate to severe among adolescents (Lynch-Jordan et al., 2014).

Adolescence is a key developmental period due to the developing and maturing brain, which allows adolescents to develop resilience, explore their own identity, and form new relationships with their peers and adults (Backes & Bonnie, 2019). One important consideration for healthy adolescent development is participation in organized activities (Eisenberg et al., 2015).

Engagement in afterschool activities can play a major protective role against risky behaviors among adolescents by increasing individual-level factors such as self-esteem, peer relationships, and increasing community-level factors such as providing safe and supportive environments for them to thrive (Afterschool Alliance, 2019). Parents highly endorse afterschool programming for their youth due to the many associated benefits including development of emotional and social skills and receipt of academic supports such as assistance with homework (Afterschool Alliance, 2020). Additionally, adolescent participation in organized activities including sports, clubs and other organizations, and other activities such as art, are associated with increased psychosocial adjustment, school attachment, school performance (Badura et al., 2016; Fredricks, 2012; Mahoney & Vest, 2012), and overall general health status (Badura et al., 2015). Specific to physical pain, prior research indicates that physical activity engagement is a protective factor for thoracic spine pain among adolescents (de Vitta et al., 2021). However, much less is known on the specific associations between physical pain and U.S. adolescents' engagement in organized activities.

This current study sought to fill gaps in the research and provide professionals with information that can be used to provide health education programming for U.S. adolescents who may be experiencing physical pain. Therefore, the primary study objective was to examine the associations between repeated or chronic physical pain and participation in organized activities among U.S. adolescents. We hypothesized that when compared to adolescents without physical pain, adolescents with physical pain would be at decreased odds of participating in organized activities overall and by activity type, including sports, clubs, and other organized

activities such as music, dance, language, or other arts.

## **Methods**

### **Participants and Procedures**

This secondary analysis utilized the 2018-2019 National Survey of Children's Health (NSCH) combined two-year dataset (CAHMI, 2021b). NSCH is led by the U.S. Census Bureau with primary funding and direction from the U.S. Health Resources and Services Administration's Maternal and Child Health Bureau. The NSCH collects cross-sectional survey data on the physical and emotional health of children and adolescents who are ages 0-17 years in the United States.

Specific methodological details can be found in the 2018-2019 NSCH Methodology Reports (U.S. Census Bureau, 2019, 2020). The combined 2018-2019 NSCH was conducted between June 2018-January 2019 for the 2018 wave and June 2019-January 2020 for the 2019 wave with weighted overall response rates of 43.1% in 2018 (N = 30,530) and 42.4% in 2019 (N = 29,433) (U.S. Census Bureau, 2019, 2020). Regarding sampling and survey administration, the NSCH randomly selected home mailing addresses across the United States. Therefore, households were initially contacted by mail with an invitation for parents to fill out an Internet-based or paper-based short screening questionnaire to identify all eligible-aged children and adolescents in their household. If there was more than one child or adolescent 0-17 years of age living in the household, then one was randomly chosen to be the sampled child of the main questionnaire. The NSCH oversampled children who were younger (0-5 years) and who had special healthcare needs, which was defined as having an ongoing health condition (e.g., asthma) for at

least 12 months, and had increased associated health and services needs such as prescription medications or specialized therapies (CAHMI, 2021a). Parent respondents were directed to one of three questionnaire versions that asked age-specific questions for the selected sampled child: 0-5 years; 6-11 years; and 12-17 years.

To answer the current study's objectives, the secondary analysis was limited to data from the age-specific topical questionnaire of adolescents ages 12-17 years ( $N = 24,817$ ). We excluded adolescents who were missing physical pain data ( $n = 137$ ), which resulted in 24,680 adolescents included in the current study's sample. The study was approved with a "not human subjects research determination" by a university-based institutional review board due to using publicly accessible, de-identified 2018-2019 NSCH data.

## Measures

**Physical pain.** Physical pain, the independent variable of interest, was assessed in the "This Child's Health" section by asking parents one yes/no question about their adolescent's physical pain, "During the past 12 months, has this child had FREQUENT or CHRONIC difficulty with any of the following... repeated or chronic physical pain, including headaches or other back or body pain?" (CAHMI, 2019, 2020). The response option of "yes" was defined as the adolescent having difficulty with physical pain in the past 12 months.

**Participation in organized activities including sports, clubs, and other organized activities.** One dependent variable of interest was participation in any organized activities or lessons after school or on the weekends in the past 12 months. Participation in organized activities was assessed in the "This Child's Schooling and Activities" section by asking parents the following three

yes/no questions, "DURING THE PAST 12 MONTHS, did this child participate in..." (1) "A sports team or did he or she take sports lessons after school or on weekends?," (2) "Any clubs or organizations after school or on weekends?," and (3) "Any other organized activities or lessons, such as music, dance, language, or other arts?" (CAHMI, 2019, 2020). The NSCH provided a calculated overall participation in organized activities variable by combining these three items, which categorized adolescents as either having participated in organized activities (i.e., "yes" to at least one of the three questions) or not having participated in organized activities in the past 12 months (i.e., "no" to all three questions).

In addition to assessing this combined variable for overall participation in organized activities, the three types of organized activities were individually assessed (yes/no): sports; clubs; and other organized activities.

### Adolescent and family characteristics.

The following covariates were included: adolescent age (12-17 years), adolescent sex, adolescent race/ethnicity, parent education level, family household structure, and family federal poverty level. Adolescent race/ethnicity included the categories of non-Hispanic white, non-Hispanic black, non-Hispanic other/multiracial, and Hispanic. Parent education included the categories of high school graduate/equivalent or less, some college, and college degree or higher. Family household structure included the categories of two currently married parents, two not currently married parents, single parent, and other family type. Family federal poverty level was calculated by NSCH for public use as the poverty level ratio of the household based on U.S. Census guidelines with categories of 0-199%, 200-299%, 300-399%, and  $\geq 400\%$  (CAHMI, 2021a).

## Data Analysis

All analyses were conducted using SPSS Complex Samples version 28. NSCH sampling weights were applied to reflect the U.S. population of adolescents ages 12-17 years (U.S. Census Bureau, 2019, 2020). To determine the extent of physical pain in the past 12 months and for all other variables of interest, descriptive statistics were computed and unweighted sample counts and weighted percents are presented. Separate unadjusted logistic regression analyses were first conducted to examine the relationships between physical pain and the dependent variables of interest including organized activities overall and by activity type (i.e., sports, clubs, and other organized activities). Odds ratios (ORs), 95% confidence intervals (CIs), and *p*-values are presented for each unadjusted model. Then, adjusted logistic regression analyses were conducted to examine these relationships after controlling for the adolescent and family covariates. Adjusted ORs (aORs), 95%CIs, and *p*-values are presented for each adjusted model. The *p*-value was set at 0.05 to indicate statistical significance for all tests.

## Results

The overall mean (SE) age of adolescents was 14.49 (0.03) years (Table 1). A total of 48.8% were female. For adolescent race/ethnicity, 49.8% were non-Hispanic white followed by 26.4% Hispanic, 14.0% non-Hispanic black, and 9.8% non-Hispanic other race or multiracial. Concerning parent education, 31.8% of adolescents had parents who obtained an education of high school graduate/equivalent or less, 21.4% had parents who obtained an education of some college, and 46.8% had parents who had obtained an education of a college degree or higher. The majority of adolescents had a family household structure of two currently

married parents (60.6%), followed by single parent (23.9%), other family household structure type (8.4%), and two not currently married parents (7.1%). A total of 40.3% of adolescents had a family federal poverty level of 0-199%, 16.4% had a family federal poverty level of 200-299%, 12.0% had a family federal poverty level of 300-399%, and 31.3% had a family federal poverty level of  $\geq 400\%$  (see Table 1). Regarding pain, 13.5% ( $n = 3,357$ ) of adolescents had physical pain in the past 12 months.

## Physical Pain and Participation in Organized Activities including Sports, Clubs, and Other Organized Activities

A total of 80.9% ( $n = 20,941$ ) of adolescents participated in organized activities, including sports, clubs, and other organized activities in the past 12 months. Unadjusted logistic regression model results indicated that adolescents with physical pain were less likely to participate in organized activities (OR = 0.81, 95%CI = 0.66, 0.99) compared to adolescents without physical pain (Table 2). Adjusted logistic regression model results indicated that there was no significant association between adolescent physical pain and participation in organized activities (see Table 2).

Significant covariates in the adjusted model were adolescent age, adolescent sex, parent education level, family household structure, and family federal poverty level. Specifically, older adolescents were at reduced odds (aOR = 0.92, 95%CI = 0.87, 0.97) of participating in organized activities compared to younger adolescents. Conversely, female adolescents were 1.28 times more likely (95%CI = 1.07, 1.52) to participate in organized activities compared to male adolescents. Adolescents with parents who had obtained an education of high school graduate/equivalent or less (aOR = 0.27, 95%CI = 0.22, 0.34) and some college

(aOR = 0.47, 95%CI = 0.39, 0.56) were at reduced odds of participating in organized activities compared to adolescents with parents who had obtained an education of a college degree or higher. Adolescents with another family household structure type were less likely (aOR = 0.61, 95%CI = 0.44, 0.85) to participate in organized activities compared to adolescents with two currently married parents. Adolescents with a family federal poverty level of 0-199% (aOR = 0.48, 95%CI = 0.39, 0.59), 200-299% (aOR = 0.56, 95%CI = 0.43, 0.73) and 300-399% (aOR = 0.73, 95%CI = 0.56, 0.94) were at reduced

odds of participating in organized activities compared to adolescents with a family federal poverty level of  $\geq 400\%$  (see Table 2).

### Physical Pain and Participation in Sports

A total of 56.0% ( $n = 14,922$ ) of adolescents participated in sports in the past 12 months. Unadjusted logistic regression model results indicated that adolescents with physical pain were less likely (OR = 0.73, 95%CI = 0.61, 0.86) to participate in sports compared to adolescents without physical pain (Table 3).

Table 1

*Characteristics of U.S. Adolescents 12-17 Years Old, 2018-2019 NSCH*

	<i>n (%)<sup>a</sup></i>
<b>Adolescent Age, <i>M</i> (SE)</b>	14.49 (0.03)
<b>Adolescent Sex</b>	
Male	12,893 (51.2)
Female	11,787 (48.8)
<b>Adolescent Race/Ethnicity</b>	
Non-Hispanic white	17,404 (49.8)
Non-Hispanic black	1,626 (14.0)
Hispanic	2,819 (26.4)
Non-Hispanic other or multiracial	2,831 (9.8)
<b>Parent Education Level</b>	
$\leq$ High school graduate/equivalent	4,205 (31.8)
Some college	5,941 (21.4)
$\geq$ College degree	14,534 (46.8)
<b>Family Household Structure</b>	
Two currently married parents	16,828 (60.6)
Two not currently married parents	1,347 (7.1)
Single parent	5,071 (23.9)
Other family type	1,434 (8.4)
<b>Family Federal Poverty Level</b>	
0-199%	6,562 (40.3)
200-299%	3,919 (16.4)
300-399%	3,677 (12.0)
$\geq 400\%$	10,522 (31.3)

*Note.*  $N = 24,680$ . Abbreviations: NSCH, National Survey on Children's Health.

<sup>a</sup>  $n$  refers to raw counts and percentages are weighted column percent unless noted otherwise.

Table 2

*Physical Pain and Participation in Organized Activities among U.S. Adolescents 12-17 Years Old, 2018-2019 NSCH*

	Adolescent Participates in Organized Activities <i>n</i> (%) <sup>a</sup>	Unadjusted Logistic Regression			Adjusted Logistic Regression		
		OR	95%CI	<i>p</i> -value <sup>b</sup>	aOR <sup>c</sup>	95%CI	<i>p</i> -value <sup>b</sup>
<b>Adolescent Physical Pain</b>							
No	18,221 (81.3)	Ref	Ref	Ref	Ref	Ref	Ref
Yes	2,720 (77.8)	<b>0.81</b>	<b>0.66, 0.99</b>	<b>0.038</b>	0.92	0.75, 1.13	0.435
<b>Adolescent Age, <i>M</i> (SE)</b>	14.44 (0.03)	-	-	-	<b>0.92</b>	<b>0.87, 0.97</b>	<b>0.002</b>
<b>Adolescent Sex</b>							
Male	10,689 (79.1)	-	-	-	Ref	Ref	Ref
Female	10,252 (82.7)	-	-	-	<b>1.28</b>	<b>1.07, 1.52</b>	<b>0.006</b>
<b>Adolescent Race/Ethnicity</b>							
Non-Hispanic white	15,053 (84.3)	-	-	-	Ref	Ref	Ref
Non-Hispanic black	1,273 (78.4)	-	-	-	1.11	0.87, 1.41	0.418
Hispanic	2,225 (75.6)	-	-	-	1.04	0.83, 1.30	0.724
Non-Hispanic other or multiracial	2,390 (80.8)	-	-	-	0.87	0.68, 1.10	0.240
<b>Parent Education Level</b>							
≤ High school graduate/equivalent	2,931 (66.3)	-	-	-	<b>0.27</b>	<b>0.22, 0.34</b>	< <b>0.001</b>
Some college	4,706 (79.1)	-	-	-	<b>0.47</b>	<b>0.39, 0.56</b>	< <b>0.001</b>
≥ College degree	13,304 (91.5)	-	-	-	Ref	Ref	Ref
<b>Family Household Structure</b>							
Two currently married parents	14,900 (85.4)	-	-	-	Ref	Ref	Ref
Two not currently married parents	1,077 (75.0)	-	-	-	0.79	0.56, 1.13	0.197
Single parent	3,981 (75.6)	-	-	-	0.84	0.68, 1.03	0.093
Other family type	983 (67.4)	-	-	-	<b>0.61</b>	<b>0.44, 0.85</b>	<b>0.003</b>
<b>Family Federal Poverty Level</b>							
0-199%	4,853 (71.4)	-	-	-	<b>0.48</b>	<b>0.39, 0.59</b>	< <b>0.001</b>
200-299%	3,257 (79.6)	-	-	-	<b>0.56</b>	<b>0.43, 0.73</b>	< <b>0.001</b>
300-399%	3,183 (86.0)	-	-	-	<b>0.73</b>	<b>0.56, 0.94</b>	<b>0.016</b>
≥ 400%	9,648 (91.6)	-	-	-	Ref	Ref	Ref

*Note.* Abbreviations: NSCH, National Survey on Children's Health; OR, odds ratio; CI, confidence interval; aOR, adjusted odds ratio; Ref, reference category.

<sup>a</sup> *n* refers to raw counts and percentages are weighted row percent unless noted otherwise. <sup>b</sup> Bold font indicates statistical significance  $p < 0.05$ . <sup>c</sup> Model adjusted for adolescent age, adolescent sex, adolescent race/ethnicity, parent education level, family household structure, and family federal poverty level.

Table 3

*Physical Pain and Participation in Sports among U.S. Adolescents 12-17 Years Old, 2018-2019 NSCH*

	Adolescent Participates in Sports <i>n</i> (%) <sup>a</sup>	Unadjusted Logistic Regression			Adjusted Logistic Regression		
		OR	95%CI	<i>p</i> -value <sup>b</sup>	aOR	95%CI	<i>p</i> -value <sup>b</sup>
<b>Adolescent Physical Pain</b>							
No	13,204 (57.1)	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1,718 (49.1)	<b>0.73</b>	<b>0.61, 0.86</b>	<b>&lt; 0.001</b>	<b>0.83</b>	<b>0.70, 0.99</b>	<b>0.039</b>
<b>Adolescent Age, <i>M</i> (SE)</b>	14.37 (0.03)	-	-	-	<b>0.92</b>	<b>0.88, 0.95</b>	<b>&lt; 0.001</b>
<b>Adolescent Sex</b>							
Male	8,087 (58.2)	-	-	-	Ref	Ref	Ref
Female	6,835 (53.6)	-	-	-	<b>0.81</b>	<b>0.72, 0.92</b>	<b>&lt; 0.001</b>
<b>Adolescent Race/Ethnicity</b>							
Non-Hispanic white	10,912 (60.3)	-	-	-	Ref	Ref	Ref
Non-Hispanic black	886 (53.0)	-	-	-	1.08	0.87, 1.34	0.478
Hispanic	1,483 (50.1)	-	-	-	1.02	0.86, 1.22	0.807
Non-Hispanic other or multiracial	1,641 (53.6)	-	-	-	<b>0.82</b>	<b>0.69, 0.96</b>	<b>0.017</b>
<b>Parent Education Level</b>							
≤ High school graduate/equivalent	1,821 (40.7)	-	-	-	<b>0.46</b>	<b>0.38, 0.54</b>	<b>&lt; 0.001</b>
Some college	3,130 (52.4)	-	-	-	<b>0.66</b>	<b>0.57, 0.76</b>	<b>&lt; 0.001</b>
≥ College degree	9,971 (67.7)	-	-	-	Ref	Ref	Ref
<b>Family Household Structure</b>							
Two currently married parents	10,890 (60.6)	-	-	-	Ref	Ref	Ref
Two not currently married parents	750 (49.5)	-	-	-	0.87	0.66, 1.15	0.322
Single parent	2,639 (49.2)	-	-	-	0.91	0.78, 1.07	0.261
Other family type	643 (46.0)	-	-	-	0.86	0.65, 1.14	0.302
<b>Family Federal Poverty Level</b>							
0-199%	3,125 (44.3)	-	-	-	<b>0.52</b>	<b>0.44, 0.61</b>	<b>&lt; 0.001</b>
200-299%	2,165 (54.3)	-	-	-	<b>0.66</b>	<b>0.56, 0.78</b>	<b>&lt; 0.001</b>
300-399%	2,246 (60.5)	-	-	-	<b>0.76</b>	<b>0.64, 0.90</b>	<b>0.002</b>
≥ 400%	7,386 (70.0)	-	-	-	Ref	Ref	Ref

*Note.* Abbreviations: NSCH, National Survey on Children's Health; OR, odds ratio; CI, confidence interval; aOR, adjusted odds ratio; Ref, reference category.

<sup>a</sup> *n* refers to raw counts and percentages are weighted row percent unless noted otherwise. <sup>b</sup> Bold font indicates statistical significance  $p < 0.05$ . <sup>c</sup> Model adjusted for adolescent age, adolescent sex, adolescent race/ethnicity, parent education level, family household structure, and family federal poverty level.

Similarly, adjusted model results indicated that adolescents with physical pain were less likely (aOR = 0.83, 95%CI = 0.70, 0.99) to participate in sports compared to adolescents without physical pain, while controlling for the adolescent and family covariates.

Significant covariates in the adjusted model were adolescent age, adolescent sex, adolescent race/ethnicity, parent education level, and family federal poverty level. Specifically, older adolescents were at reduced odds (aOR = 0.92, 95%CI = 0.88, 0.95) of participating in sports compared to younger adolescents. Female adolescents were less likely (aOR = 0.81, 95%CI = 0.72, 0.92) to participate in sports compared to male adolescents. Adolescents who were non-Hispanic other race or multiracial were at reduced odds (aOR = 0.82, 95%CI = 0.69, 0.96) of participating in sports compared to non-Hispanic white adolescents. Adolescents with parents who obtained an education of high school graduate/equivalent or less (aOR = 0.46, 95%CI = 0.38, 0.54) and some college (aOR = 0.66, 95%CI = 0.57, 0.76) were at reduced odds of participating in sports compared to adolescents with parents who obtained an education of a college degree or higher. Adolescents with a family federal poverty level of 0-199% (aOR = 0.52, 95%CI = 0.44, 0.61), 200-299% (aOR = 0.66, 95%CI = 0.56, 0.78) and 300-399% (aOR = 0.76, 95%CI = 0.64, 0.90) were at reduced odds of participating in sports compared to adolescents with a family federal poverty level of  $\geq 400\%$  (see Table 4).

### **Physical Pain and Participation in Clubs**

A total of 56.2% ( $n = 15,003$ ) of adolescents participated in clubs in the past 12 months. Unadjusted and adjusted logistic regression model results indicated that there were no significant associations between

adolescent physical pain and participation in clubs (Table 4).

Significant covariates in the adjusted model were adolescent age, sex, parent education level, family household structure, and family federal poverty level. Specifically, older adolescents were more likely (aOR = 1.04, 95%CI = 1.01, 1.08) to participate in clubs compared to younger adolescents. Female adolescents were 1.52 times more likely (95%CI = 1.34, 1.72) to participate in clubs compared to male adolescents. Adolescents with parents who obtained an education of high school graduate/equivalent or less (aOR = 0.35, 95%CI = 0.30, 0.42,) and some college (aOR = 0.58, 95%CI = 0.51, 0.67) were at reduced odds of participating in clubs compared to adolescents with parents who obtained an education of a college degree or higher. Adolescents with family household structures of two not currently married parents (aOR = 0.83, 95%CI = 0.62, 1.11), a single parent (aOR = 0.83, 95%CI = 0.71, 0.97) or another family household structure type (aOR = 0.62, 95%CI = 0.42, 0.83) were less likely to participate in clubs compared to adolescents with two currently married parents. Adolescents with a family federal poverty level of 0-199% (aOR = 0.61, 95%CI = 0.52, 0.72), 200-299% (aOR = 0.72, 95%CI = 0.60, 0.86) and 300-399% (aOR = 0.79, 95%CI = 0.67, 0.94) were at reduced odds to participate in clubs compared to adolescents with a family federal poverty level of  $\geq 400\%$  (see Table 4).

### **Physical Pain and Participation in Other Organized Activities**

A total of 47.2% ( $n = 11,924$ ) of adolescents participated in other organized activities in the past 12 months. Unadjusted and adjusted logistic regression model results (Table 5) indicated that there were no

Table 4

*Physical Pain and Participation in Clubs among U.S. Adolescents 12-17 Years Old, 2018-2019 NSCH*

	Adolescent Participates in Clubs <i>n</i> (%) <sup>a</sup>	Unadjusted Logistic Regression			Adjusted Logistic Regression		
		OR	95%CI	<i>p</i> -value <sup>b</sup>	aOR <sup>c</sup>	95%CI	<i>p</i> -value <sup>b</sup>
<b>Adolescent Physical Pain</b>							
No	13,076 (56.3)	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1,927 (55.7)	0.98	0.83, 1.15	0.769	1.05	0.88, 1.25	0.576
<b>Adolescent Age, <i>M</i> (SE)</b>	14.52 (0.03)	-	-	-	<b>1.04</b>	<b>1.01, 1.08</b>	<b>0.040</b>
<b>Adolescent Sex</b>							
Male	7,232 (51.7)	-	-	-	Ref	Ref	Ref
Female	7,771 (61.0)	-	-	-	<b>1.52</b>	<b>1.34, 1.72</b>	<b>&lt; 0.001</b>
<b>Adolescent Race/Ethnicity</b>							
Non-Hispanic white	11,037 (61.7)	-	-	-	Ref	Ref	Ref
Non-Hispanic black	811 (48.7)	-	-	-	0.85	0.69, 1.05	0.126
Hispanic	1,450 (48.4)	-	-	-	0.94	0.79, 1.12	0.463
Non-Hispanic other or multiracial	1,705 (59.9)	-	-	-	1.00	0.85, 1.19	0.963
<b>Parent Education Level</b>							
≤ High school graduate/equivalent	1,681 (37.6)	-	-	-	<b>0.35</b>	<b>0.30, 0.42</b>	<b>&lt; 0.001</b>
Some college	3,133 (52.7)	-	-	-	<b>0.58</b>	<b>0.51, 0.67</b>	<b>&lt; 0.001</b>
≥ College degree	10,189 (70.2)	-	-	-	Ref	Ref	Ref
<b>Family Household Structure</b>							
Two currently married parents	11,074 (62.3)	-	-	-	Ref	Ref	Ref
Two not currently married parents	708 (48.4)	-	-	-	<b>0.83</b>	<b>0.62, 1.11</b>	<b>0.203</b>
Single parent	2,620 (48.7)	-	-	-	<b>0.83</b>	<b>0.71, 0.97</b>	<b>0.017</b>
Other family type	601 (39.2)	-	-	-	<b>0.62</b>	<b>0.47, 0.83</b>	<b>0.001</b>
<b>Family Federal Poverty Level</b>							
0-199%	3,069 (43.7)	-	-	-	<b>0.61</b>	<b>0.52, 0.72</b>	<b>&lt; 0.001</b>
200-299%	2,257 (55.1)	-	-	-	<b>0.72</b>	<b>0.60, 0.86</b>	<b>&lt; 0.001</b>
300-399%	2,325 (61.6)	-	-	-	<b>0.79</b>	<b>0.67, 0.94</b>	<b>0.009</b>
≥ 400%	7,352 (70.7)	-	-	-	Ref	Ref	Ref

*Note.* Abbreviations: NSCH, National Survey on Children's Health; OR, odds ratio; CI, confidence interval; aOR, adjusted odds ratio; Ref, reference category.

<sup>a</sup> *n* refers to raw counts and percentages are weighted row percent unless noted otherwise. <sup>b</sup> Bold font indicates statistical significance  $p < 0.05$ . <sup>c</sup> Model adjusted for adolescent age, adolescent sex, adolescent race/ethnicity, parent education level, family household structure, and family federal poverty level.

Table 5

*Physical Pain and Participation in Other Activities among U.S. Adolescents 12-17 Years Old, 2018-2019 NSCH*

	Adolescent Participates in Other Organized Activities <i>n (%)</i> <sup>a</sup>	Unadjusted Logistic Regression			Adjusted Logistic Regression		
		OR	95%CI	<i>p</i> -value <sup>b</sup>	aOR <sup>c</sup>	95%CI	<i>p</i> -value <sup>b</sup>
<b>Adolescent Physical Pain</b>							
No	10,362 (47.5)	Ref	Ref	Ref	Ref	Ref	Ref
Yes	1,562 (45.5)	0.92	0.78, 1.09	0.355	0.95	0.79, 1.15	0.599
<b>Adolescent Age, <i>M</i> (SE)</b>	14.30 (0.04)	-	-	-	<b>0.89</b>	<b>0.86, 0.92</b>	<b>&lt; 0.001</b>
<b>Adolescent Sex</b>							
Male	5,036 (39.6)	-	-	-	Ref	Ref	Ref
Female	6,888 (55.2)	-	-	-	<b>1.94</b>	<b>1.72, 2.20</b>	<b>&lt; 0.001</b>
<b>Adolescent Race/Ethnicity</b>							
Non-Hispanic white	8,415 (48.1)	-	-	-	Ref	Ref	Ref
Non-Hispanic black	687 (46.3)	-	-	-	1.18	0.97, 1.44	0.096
Hispanic	1,317 (44.5)	-	-	-	1.18	0.98, 1.42	0.085
Non-Hispanic other or multiracial	1,505 (50.9)	-	-	-	1.17	0.99, 1.37	0.058
<b>Parent Education Level</b>							
≤ High school graduate/equivalent	1,482 (35.9)	-	-	-	<b>0.48</b>	<b>0.40, 0.57</b>	<b>&lt; 0.001</b>
Some college	2,462 (43.7)	-	-	-	<b>0.66</b>	<b>0.58, 0.77</b>	<b>&lt; 0.001</b>
≥ College degree	7,980 (56.3)	-	-	-	Ref	Ref	Ref
<b>Family Household Structure</b>							
Two currently married parents	8,675 (50.8)	-	-	-	Ref	Ref	Ref
Two not currently married parents	583 (44.8)	-	-	-	0.96	0.72, 1.30	0.803
Single parent	2,175 (42.6)	-	-	-	0.88	0.75, 1.03	0.103
Other family type	491 (35.2)	-	-	-	<b>0.66</b>	<b>0.49, 0.89</b>	<b>0.006</b>
<b>Family Federal Poverty Level</b>							
0-199%	2,646 (41.1)	-	-	-	<b>0.82</b>	<b>0.70, 0.96</b>	<b>0.016</b>
200-299%	1,797 (44.7)	-	-	-	<b>0.80</b>	<b>0.67, 0.94</b>	<b>0.009</b>
300-399%	1,831 (49.9)	-	-	-	0.89	0.76, 1.05	0.177
≥ 400%	5,650 (55.3)	-	-	-	Ref	Ref	Ref

*Note.* Abbreviations: NSCH, National Survey on Children's Health; OR, odds ratio; CI, confidence interval; aOR, adjusted odds ratio; Ref, reference category.

<sup>a</sup> *n* refers to raw counts and percentages are weighted row percent unless noted otherwise. <sup>b</sup> Bold font indicates statistical significance  $p < 0.05$ . <sup>c</sup> Model adjusted for adolescent age, adolescent sex, adolescent race/ethnicity, parent education level, family household structure, and family federal poverty level.

significant associations between adolescent physical pain and participation in other organized activities.

Significant covariates in the adjusted model were adolescent age, adolescent sex, parent education level, family household structure, and family federal poverty level. Specifically, older adolescents were less likely (aOR = 0.89, 95%CI = 0.86, 0.92) to participate in other organized activities compared to younger adolescents. Female adolescents were 1.94 times more likely (95%CI = 1.72, 2.20) to participate in other organized activities compared to male adolescents. Adolescents with parents who obtained an education of high school graduate/equivalent or less (aOR = 0.48, 95%CI = 0.40, 0.57) and some college (aOR = 0.66, 95%CI = 0.58, 0.77) were at reduced odds to participate in other organized activities compared to adolescents with parents who obtained an education of a college degree or higher. Adolescents with another family household structure type (aOR = 0.66, 95%CI = 0.49, 0.89) were less likely to participate in other organized activities compared to adolescents with two currently married parents. Adolescents with a family federal poverty level of 0-199% (aOR = 0.82, 95%CI = 0.70, 0.96) and 200-299% (aOR = 0.80, 95%CI = 0.67, 0.94) were at reduced odds to participate in other organized activities compared to adolescents with a family federal poverty level of  $\geq 400\%$  (see Table 5).

## Discussion

The current study assessed the associations between adolescent physical pain and participation in organized activities among a national sample of U.S. adolescents ages 12-17 years. Interestingly, when comparing physical pain with overall participation in organized activities in the unadjusted model, and as posited, adolescents with physical pain were less likely to participate in organized activities than adolescents without physical pain. After

adjusting for the important adolescent and family covariates, this association was no longer significant. Thus, it is important to note that significant covariates related to reduced likelihood for overall participation in organized activities in the current study included indicators of lower socioeconomic status such as lower parent education level and lower family federal poverty level. The most recent *America After 3PM* national report revealed that there is an all-time high and unmet demand for afterschool programs for adolescents as about one-in-three U.S. adolescents are waiting to get into a program (Afterschool Alliance, 2020). The report also indicated that there is an even higher unmet demand among adolescents with lower socioeconomic status backgrounds, and that families frequently report barriers of cost and access to programming such as transportation to and from afterschool activities and not being offered in close proximity (Afterschool Alliance, 2020). Irrespective of pain, research indicates that higher engagement in afterschool activities is important starting during the early and middle childhood years, and positively influences academic achievement and social confidence during the adolescence years (Vandell et al., 2020). Thus, support for increased investment in afterschool programming such as sports and other organized activities (e.g., dance) is critically needed for adolescents.

Concerning organized activity type, adolescents with physical pain were significantly less likely to participate in sports in the past 12 months compared to adolescents without physical pain, including after adjusting for the covariates. This is concerning since the health benefits of engagement in physical activity including sports participation have been widely documented among adolescents (Janssen & LeBlanc, 2010). A systematic review identified the top barriers of adolescents not participating in sports as cost, time, accessibility, and perceived fear of judgement, embarrassment, or not being good (Somerset &

Hoare, 2018). While the current study was limited to one question about physical pain and thus unable to determine the cause of pain, one potential reason for this finding specific to sports participation may be that adolescents with pain may have lower interests or capacity to engage in such activities (O'Malley et al., 2021). Additionally, prior research reports a dose-response relation where increased engagement in sports was associated with increased musculoskeletal pain (Kamada et al., 2016). This may be another potential reason why adolescents with physical pain were less likely to participate in sports compared to adolescents without physical pain. Conversely, prior research indicates that participation in regular physical activity was a protective factor against pain in adolescents ages 14-18 years (de Vitta et al., 2021). Longitudinal research also shows that physical activity during adolescence may decrease the risk of lower back pain among male and female adults (Mikkelsen et al., 2006). Therefore, it is important to consider the promotion of participating in organized activities including physical activity (i.e., sports) for both the prevention and treatment of physical pain among adolescents.

While all participation patterns of organized activities have been associated with life satisfaction, engagement in sports only or sports combined with a non-sport organized activity (e.g., clubs, organizations, arts) have been associated with an excellent health status among adolescents (Badura et al., 2021). Unlike the finding based on sports participation, the current study found no associations between adolescent physical pain and participation in clubs or other organized activities (e.g., dance). This is encouraging, especially with the high rates of engagement in clubs and other activities among the current study's sample, irrespective of physical pain. Longitudinal research among adolescents revealed that involvement in organized activities is positively linked with academic outcomes over time (Haghighat & Knifsend, 2019). Specifically, club

involvement has been associated with positive overall health, increased engagement in health-related behaviors (e.g., daily fruit and vegetable consumption), and decreased engagement in health-risk behaviors (e.g., alcohol and tobacco use) among adolescents (Zambon et al., 2010).

There are several study strengths that should be noted. First, this study included a national sample of U.S. adolescents ages 12-17 years, and the weighted results are generalizable to the U.S. adolescent population. Second, adolescent physical pain is an understudied area, and the NSCH dataset included a large sample that provided enough power for analysis to detect between-group differences (i.e., adolescents with physical pain versus without physical pain). There are also several weaknesses that should be noted. First, while we used an NSCH combined two-year dataset, the 2018 NSCH and 2019 NSCH were collected cross-sectionally and temporal associations could not be assessed. For example, we were unable to assess whether physical pain was caused by organized activity participation in 2018 (e.g., sports injury) and led to adolescents stopping organized activity participation in 2019. Further, parents were the respondents and reported about their sampled adolescent's physical pain and participation in organized activities within the past 12 months of survey completion. Therefore, this may have introduced underreporting or overreporting of these items due to social desirability or recall bias if parents answered in a socially desirable manner or did not accurately remember the information being asked. Additionally, the NSCH only asked one general question about physical pain and did not ask more specific information about type or intensity of pain or about pain management. However, pain can be difficult to measure and categorize during adolescence (Mathews, 2011). While we adjusted for important adolescent and family covariates to minimize residual confounding, we did not adjust for health conditions that may contribute to physical pain. Future research should

consider assessing health records to verify responses and to gain more in-depth information about specific physical pain and potential comorbidities among adolescents. Finally, we used the most recent NSCH combined two-year dataset available at the time of analysis. It is important to note that these data were collected before the ongoing coronavirus disease 2019 (COVID-19) pandemic, which led to organized activity cancellations in spring 2020; research indicates that levels of participation have not yet fully resumed to pre-COVID-19 levels among adolescents (McGuine et al., 2022). Therefore, future studies should consider replicating these analyses using more recent NSCH data to assess these relationships during the ongoing pandemic so that stakeholders such as school administrators, teachers, community members, and families can prioritize the reinitiation or continuation of organized activity participation opportunities to improve adolescent health.

The current study found that adolescents with physical pain had lower odds of overall participation in organized activities, and specifically sports, when compared to adolescents without physical pain. However, when considering important covariates such as socioeconomic status indicators, adolescents with physical pain remained less likely to participate in sports, but overall participation in organized activities was no longer significant. Thus, promoting physical pain management among adolescents and their families may lead to higher participation in organized activities.

### **Implications for Health Behavior Theory**

The current study advances research by identifying the importance of participating in organized activities outside of school, and results should be considered when developing and implementing pain prevention and treatment programming for adolescents in the community setting. For example, sports and other activities allow adolescents an

opportunity to gain leadership and social skills, and it may increase their overall dedication and time management skills. Promoting ways for adolescents to be involved when physical pain is a factor is critical to their development. While some activities (e.g., sports) may be too demanding due to physical limitations that may cause pain, for example, there are low-impact options that can be considered for participation (e.g., swimming). These less demanding activities can provide a unique way for adolescents to enjoy participation in activities and develop positive skills for their future. In summary, health educators have an important role in working with families and communities, and can assist with increasing adolescents' participation in organized activities to promote healthy development, especially among adolescents with physical pain.

### **Discussion Question**

Our findings indicate that adolescents with physical pain had reduced participation in organized activities, including sports participation, compared to adolescents without physical pain. What are approaches that health educators can use to increase adolescents' participation in these activities while remaining within the parameters of any physical pain-related limitations?

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