

# Physical Activity, Sadness, and Suicidality in Bullied US Adolescents

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**Objective:** The consequences of bullying are well described, yet little is known about protective factors that may diminish the negative sequelae. One possible factor, physical activity (PA), improves mental health in general and clinical populations. The purpose of this study is to examine relationships among PA, sadness, and suicidality in bullied US adolescents. We hypothesized that physically active students would be less likely to feel sad or to report suicidal ideation or attempts, including bullied students.

**Method:** Using the 2013 National Youth Risk Behavior Survey (N = 13,583), regression models adjusted for age, sex, and race estimated the odds ratios among PA, sadness, suicidal ideation, and suicide attempts, stratified by whether students were bullied.

**Results:** Overall, 30.0% of students reported sadness for 2 or more weeks, 22.2% reported suicidal ideation, and 8.2% reported suicide attempt in the previous 12 months. Bullied students were twice as likely to report feeling sad

and 3 times as likely to report suicidal ideation or attempt. Students who reported exercising 4 to 5 days a week had lower adjusted odds of sadness, suicidal ideation, or suicide attempts than students who exercised 0 to 1 day a week ( $p \leq .0001$ ). After stratifying by bullying, similar but attenuated associations were observed. Overall, exercise for 4 or more days per week was associated with an approximate 23% reduction in suicidal ideation and attempt in bullied students.

**Conclusion:** PA is inversely related to sadness and suicidality in adolescents, highlighting the relationship between PA and mental health in children, and potentially implicating PA as a salient option in the response to bullying in schools.

**Key Words:** bullying, physical activity, aggression, suicide, exercise

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Bullying is a form of aggression that can have a profound, long-lasting impact on the health and well-being of all participants, regardless of role.<sup>1,2</sup> Nationwide, nearly 20% of students report being bullied on school property,<sup>3</sup> with victims at increased risk for a variety of psychosocial consequences, including academic struggle, low self-esteem, anxiety, sadness, depression, and substance abuse.<sup>2,4</sup> There are also well-established associations between bullying, self-harm, and suicide among children and adolescents.<sup>5–10</sup> Indeed, Holt *et al.* and colleagues published a recent meta-analysis that showed a robust association between bullying and both suicidal ideation and behavior in youth.<sup>11</sup> Yet it is important to note that the association between victimization and suicidal ideation may be different than for victimization and suicide attempt. In particular, although bullying has been shown to be independently related to both suicidal ideation<sup>5,12</sup> and suicide attempt/completion,<sup>5,10</sup> victims of bullying may present with different risk profiles that vary along the continuum from ideation to completion.<sup>10</sup>

These outcomes do not appear to be limited solely to the developmental years. Other recent meta-analyses show that bullying victimization is a significant risk factor for depression later in life,<sup>13</sup> while also increasing the likelihood of violence in adulthood by approximately one-third.<sup>14</sup> Alarmingly, adults who report having been bullied during adolescence are more than twice as likely to attempt suicide as adults.<sup>15</sup> It is clear that bullying is a severe public health burden across the lifespan, and cost-effective interventions aimed at the reduction of bullying and/or the mitigation of its consequences are sorely needed.

On the whole, physical activity (PA) and exercise have been shown to be profoundly beneficial to mental health, with robust antidepressive, anxiolytic, and self-efficacy and mood-enhancing effects.<sup>16–20</sup> Consequently, exercise has been increasingly examined as a cost-effective intervention in many mental health populations.<sup>19,21,22</sup> Exercise is also a renowned tool for the maintenance of healthy body weight. Interestingly, recent reports show that overweight children are more likely to be victims of bullying as well as bully perpetrators themselves.<sup>23</sup> Despite this evidence, there is a paucity of research examining the influence of exercise on the psychosocial consequences of bullying, such as sadness and suicidal behavior. Exercise may be an effective component in the public health response to bullying, as it positively affects both the physical and psychosocial constructs that are often disrupted in victims and perpetrators alike.

The purpose of this study is to examine the relationship between physical activity, sadness, and suicidal ideation and



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attempts in a nationally representative sample of bullied and nonbullied US adolescents. To date, this has not been explored in the literature. We were interested in whether exercise frequency was related to sadness, ideation, or suicide attempts for all students, and whether this association was different for students who were bullied. Given evidence indicating that frequency of exercise is associated with significant mental health benefits,<sup>18</sup> we also examined whether the relationship depended on the frequency of exercise. We hypothesized that exercise frequency was inversely related to sadness and suicidality, and that the benefits of PA would extend across all students, including those who have been bullied.

## METHOD

### Participants

The 2013 National Youth Risk Behavior Survey is a representative sample survey of public and private high school students in the United States. The Centers for Disease Control and Prevention (CDC) developed and administered the survey, edited and cleaned the data, and produced the public use dataset.

The sampling frame included all schools with at least 1 of grades 9 to 12 in the 50 states and the District of Columbia. In the first stage of the 3-stage cluster sample design, 1,276 primary sampling units (PSUs) consisting of counties, subareas of large counties, or groups of smaller, adjacent counties were categorized into 16 strata by metropolitan statistical area status and black and Hispanic student populations. From the 1,276 PSUs, 54 were sampled with probabilities proportional to overall school enrollment size for the PSU. In the second stage, 193 schools with grades 9 to 12 were sampled with probabilities proportional to school enrollment size. In the third stage, 1 or 2 classrooms from a required subject or period (for example, second-period English) were randomly sampled in each of grades 9 to 12. All students in sampled classes were eligible to participate. Schools or students that did not choose to participate were not replaced. Black and Hispanic students were oversampled. The school response rate was 77%; the student response rate was 88%; and the overall response rate was 68%.<sup>24</sup>

The final dataset included 13,633 useable questionnaires from students at 148 schools. The CDC cleaned and edited the data for inconsistencies. Missing data were not imputed. When weighted, the dataset is nationally representative of students in grades 9 to 12 who attend public and private schools.

### Instruments

The 86-item, self-administered, paper-and-pencil survey included questions on fighting, violence, suicide, substance use, sexual behavior, body image, nutrition, physical activity, and other health behaviors. Among the 13,633 completed questionnaires, 50 failed quality control (<20 had remaining responses after editing or had the same answer to  $\geq 15$  consecutive questions). Survey procedures protected the anonymity and privacy of all students. The CDC tested and validated the Youth Risk Behavior Survey procedures and design.<sup>25,26</sup> The public use dataset is available for download from the CDC Web site ([www.cdc.gov/healthyyouth/yrbs/data/index.htm](http://www.cdc.gov/healthyyouth/yrbs/data/index.htm)).

### Procedure

We hypothesized that physically active students would be less likely to feel sad or suicidal, regardless of whether they were bullied. The questionnaire asked students, "During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity

that increased your heart rate and made you breathe hard some of the time.)" We categorized students' responses as 0 to 1 days, 2 to 3 days, 4 to 5 days, and 6 to 7 days. We classified students as feeling sad if they answered yes to: "During the past 12 months, did you ever feel so sad or hopeless almost every day for 2 weeks or more in a row that you stopped doing some usual activities?" We classified suicidal ideation as yes responses to: "During the past 12 months, did you ever seriously consider attempting suicide?" or "During the past 12 months, did you make a plan about how you would attempt suicide?" We classified suicide attempt as responses of 1 time or more to "During the past 12 months, how many times did you actually attempt suicide?" or a "yes" response to "If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?"

We explored whether the associations between physical activity and feeling sad, suicidal ideation, or suicide attempts differed for students who were bullied compared to those who were not. We hypothesized that students who were bullied would be more likely to feel sad or suicidal than students who were not. The questionnaire provided a definition of bullying as follows: "Bullying is when 1 or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when 2 students of about the same strength or power argue or fight or tease each other in a friendly way." We classified students as being bullied if they answered "yes" to the following: "During the past 12 months, have you ever been bullied on school property?" or "During the past 12 months, have you been electronically bullied? (Include being bullied through e-mail, chat rooms, instant messaging, Web sites, or texting.)"

Logistic regression models were adjusted for sex, age, and race/ethnicity to control for basic demographics. The questionnaire asked students, "Are you Hispanic or Latino?" (yes or no), and "What is your race?" (American Indian or Alaska Native, Asian, black or African American, Native Hawaiian or other Pacific Islander, or white). Students could select more than 1 race. The CDC calculated students' race and ethnicity.<sup>3</sup> For this analysis, we combined students classified as American Indian or Alaska Native, Asian, Native Hawaiian, or other Pacific Islander, or multiple races into 1 group.

### Data Analysis

Analyses in SAS (Cary, NC) adjusted for the complex survey design. The CDC calculated weights based on student sex, race/ethnicity, and grade to adjust for school and student nonresponse and oversampling of black and Hispanic students. Analyses were weighted to represent all students in grades 9 to 12 who were attending public and private school in the United States. We presented unadjusted percentages and 95% confidence intervals for student sex, age, race/ethnicity, and bullied status by feeling sad, suicidal ideation, and suicide attempt, and unadjusted percentages and 95% CIs between physical activity and feeling sad, suicidal ideation, and suicide attempt, overall, and by bullied status. All unadjusted associations were compared using  $\chi^2$  tests. We used logistic regression models to examine the associations between physical activity and feeling sad or suicidal, controlling for sex, age, and race and stratified by bullied status. We did not control for sadness in the model examining suicidal ideation or attempt due to concerns about the causal pathway between sadness and suicidal ideation or attempt.

## RESULTS

Overall, 30.0% of students felt sad for 2 weeks or more in the past 12 months, and 22.2% and 8.2% reported suicidal ideation or attempt, respectively (Table 1). Females were more likely to report sadness, suicidal ideation, and suicide attempts than males ( $p \leq .0001$  for each association). Students

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