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Physical activity interventions for adolescent suicide ideation and behavior: a rapid review

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ABSTRACT

Physical inactivity, sedentary behavior, and mental health issues have become significant public health challenges. This review aimed to investigate the relationship between physical activity, sedentary behavior, and the risk of suicidal ideation and behaviors during adolescence. A systematic review was conducted following PRISMA guidelines. Studies were sourced from SPORTDiscus, Psychology & Behavioral Sciences Collection, and Google Scholar. The review included English-language peer-reviewed articles published between January 2018 and March 2023, focusing on physical activity, sport, and mental health in adolescents aged 10 to 19. Adolescents with low levels of physical activity or high levels of sedentary behavior were at greater risk of suicidal thoughts compared to their more physically active counterparts. Although moderate-to-vigorous physical activity was not directly associated with self-harm or mental health disorders, the overall mental health benefits of physical activity, especially in the context of socially engaging sports, were evident. Some aspects of these associations warrant further investigation. Physical activity and sport offer cost-effective, widely accepted interventions that have significant potential to reduce the risk of suicidal ideation and behaviors among adolescents. Given the devastating impact of suicide on young people, incorporating physical activity into mental health promotion and intervention strategies is crucial.

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1. INTRODUCTION

Suicide is one of the most pressing global public health problems, resulting in more than 700,000 loss of lives every year [1]. Strikingly, the suicide rate among adolescents increased between 2018 and 2020 [2]. Suicide is an act of purposeful self-inflicted injury causing death [3] and being most frequently observed among youth and ranking as the fourth leading cause of death worldwide [4]. Low- and middle-income countries (LMICs) account for over 77% of all suicides globally [5], with the highest regional rates reported in Southeast Asia (10.2 per 100,000), Europe (10.5 per 100,000), and Africa (11.2 per 100,000) [4]. Males are more likely to complete suicide, often using more lethal methods, while females attempt suicide more frequently [6]. The causes of suicide are highly complex and often linked to mental health disorders, yet much about its underlying mechanisms remains unclear [3], [7]. Mental and substance-use disorders are

associated with approximately 80% of suicide deaths in high-income countries and 70% in low-income countries [8], [9]. Conditions such as depression, anxiety, personality disorders, bipolar disorder, and schizophrenia are most commonly associated with suicide [8]. Studies have shown a strong correlation between prior suicide attempts and the risk of subsequent suicide, particularly among adolescents [10]. Suicidal thoughts often result from a combination of mental health disorders and challenging life circumstances, manifesting as symptoms such as severe anxiety, extremely low mood, and pessimistic thinking. Importantly, individuals contemplating suicide typically do not seek death but rather a way to end their suffering; effective treatment and social support can help them lead fulfilling lives.

Adolescents are particularly vulnerable to mental health issues, with suicidal thoughts increasing significantly during this developmental period [11]. Adolescence is marked by transitions across multiple domains, including education, social relationships, identity formation, and increasing independence [12], [13] These transitions can create feelings of helplessness and distress, contributing to mental health issues, including suicidal thoughts and behaviors. Suicide is the second most common cause of death among adolescents in Europe [14]. A recent meta-analysis reported the prevalence of suicidal ideation among individuals aged 6 to 21 years varying regionally from 14.3% to 22.6% [15], while a global analysis found the prevalence of suicidal ideation, planning, and attempts to be 18%, 9.9%, and 6%, respectively [16]. However, these figures likely underestimate the true severity due to the challenges in identifying and recording suicide accurately [7].

Biological, psychological, and social factors contribute to adolescent suicide risk [13]. Developmental characteristics, such as decision-making style, coping strategies, family dynamics, and peer relationships, can amplify vulnerability to suicidal behaviors [11]. However, these behaviors are modifiable [17]. Access to mental health care, social support, and community activities can serve as protective factors [18], [19]. Among these, sports and physical activity (PA) have emerged as important for promoting mental health and preventing suicide [20], [21]. Early research indicates that youth engaged in sports show lower rates of suicide-related behaviors compared to non-participants [22]–[24]. PA offers numerous advantages, including low cost, ease of dissemination, and minimal stigma [25]. Substantial evidence links PA to the reduction of suicide risk factors such as depression [26], anxiety [27], sleep disturbances [28], substance abuse [29], and psychotic symptoms [30]. Participation in team sports has been identified as a protective factor against suicidal planning and attempts among high school students [30]–[33]. PA promotes the release of endorphins and serotonin, improving mood, energy, and alertness while providing an outlet for frustration and negative emotions. Furthermore, PA with peers and family members facilitates social support and community integration.

Despite these findings, several unresolved issues remain. The specific mechanisms by which PA influences suicide-related behaviors are not fully understood, and there is a need to identify the forms of PA that are most effective for different demographic groups. Additionally, while an association between PA and suicide-related behaviors has been established, research has predominantly been cross-sectional, limiting the ability to infer causality. This review aims to address these gaps by exploring cross-sectional and prospective associations between PA and suicide-related behaviors, particularly focusing on adolescents aged 10 to 19 years. It also investigates the impact of PA interventions on this population to clarify the potential of PA as a preventive strategy against suicide. The following sections detail the methodology employed to systematically review the literature, present the results of studies examining the link between PA and suicidal behaviors, and discuss the implications of these findings. By doing so, this review aims to contribute to the development of targeted, evidence-based interventions that leverage PA as a key component in adolescent suicide prevention efforts.

2. METHOD

2.1. The materials methodology for suicide research

We applied systematic review methods with modifications to deliver rapid, albeit informative, results. This methodological framework draws on existing methods of evidence synthesis related to practice-oriented PA reviews by Public Health England [34]. It included a specific and comprehensive search, synthesis, and translation of the literature relevant to the role of PA in the prevention of adolescent suicide. We aimed for a middle ground between the comprehensiveness of data collection and the operational relevance of our results, with the latter emphasizing clinical action to improve suicide prevention among adolescents.

2.2. Data gathering

Our data collection strategy was meticulously designed to ensure a thorough coverage of the topic. Targeted searches were conducted using SPORTDiscus, the psychology and behavioral sciences collection, and Google Scholar. The analysis focused on peer-reviewed journal articles published between January 2018 and March 2023. Search terms, such as sport or physical activity and adolescent or youth or teenage and suicide, were employed to identify the most relevant studies.

Recognizing the potential of a high volume of documents, we established a systematic process for organizing and reviewing records. Duplicate entries were identified and removed by the research team. The remaining documents were evaluated against a set of stringent exclusion criteria: i) Articles not published in peer-reviewed journals; ii) Publications not in English; iii) Studies unrelated to the relationship between physical activity (PA)/sport and mental health, particularly suicide prevention; iv) Papers that did not involve interventions, trials, evaluations, or evidence-based "what works" studies. v) Research not specifically targeting adolescents aged 10–19 years; vi) Studies involving adolescents with severe mental disorders that might detract from the study's primary focus. vii) Articles centered on policy discussions or formulation rather than empirical analysis; viii) Conceptual or review papers lacking original research data. ix) Studies presenting only formative research without measurable outcomes, and x) Research published before 2018 to ensure findings were relevant to the current context. By applying these stringent criteria, we ensured the selection of high-quality and relevant studies while maintaining the integrity and focus of the research process.

2.3. Quality assurance

A two-step approach was adopted to enhance the reliability and validity of the research evidence. First, the Active Living by Design (ALBD) Community Action Model was utilized. This model includes five core components: preparation, promotion, program, policy, and physical projects. It provides a structured framework to categorize studies within meaningful contexts and identify research gaps effectively. Second, the quality of each study was evaluated using a predefined rubric [35]. The key aspects assessed included the study's design, consideration of longitudinal elements, the rigor of cross-sectional comparisons, frequency of data collection, use of objective measurement tools, and acknowledgment of previous validation and reliability tests. Based on these criteria, studies were scored on a scale from 0 to 8, with scores classified as low-quality (0–2), moderate-quality (3–6), or high-quality (7–8). To maintain accuracy and consistency, inter-rater reliability was measured using Cohen’s kappa with regular assessments and team consensus to resolve discrepancies. Finally, the systematic review was conducted and reported in alignment with the preferred reporting items for systematic reviews and meta-analysis (PRISMA) guidelines, ensuring a transparent and methodical approach to the research process.

3. RESULTS AND DISCUSSION

From the search conducted on studies reporting an association between PA and suicidal ideation in adolescents, we selected seven articles as shown in Figure 1. Interestingly, we found that elevated sedentary behavior was associated with increased odds of suicidal thoughts and behaviors as shown in Table 1 (see Appendix). For males, poor PA showed a particularly strong positive association with suicidal planning and attempts, illustrating the importance of regular PA for adolescents in relation to mental health. Furthermore, an association between PA and several risk factors, such as gender, bullying, and substance use, indicates the role of PA in shaping the susceptibility of adolescents to suicidal ideation. All studies indicated an antidepressant and anti-anxiety effect that is blunted with physical activity, especially among young men. Moreover, the study determined a healthy mental state to be an important protective factor against suicide attempt outcomes and revealed that there is a positive association between PA engagement and individuals’ subjective wellbeing status. All in all, these results give evidence for the multifactorial character of the relationship between PA and mental health during adolescence. Consequently, they advocate for personalized therapies and policies encouraging PA as part of initiatives compiled to avert suicide.

After screening and selection, as shown in Table 1 (see Appendix) describes the seven studies on relationships between PA and suicidal ideation or behaviors [32], [36]–[41]. One study examined the association between sports participation and suicidal ideation in sexual minority youth [42]. Quantitative data sources were used in all included studies. The first authors were from the United States (5 studies), Australia (1 study) and Germany (1 study). The sample sizes also varied substantially from 223 to 206,357 participants.

This review consistently underscores two primary themes: the advantages of PA and the dangers associated with sedentary behavior. It is essential to understand that PA and sedentary behaviors are not merely opposing or mutually exclusive concepts [43]. PA encompasses any bodily movement that expends energy, whereas sedentary behavior refers to waking activities performed while sitting or reclining, with an energy expenditure of 1.5 metabolic equivalents (METs) or less [44]. Physical inactivity was defined as failure to meet recommended PA guidelines. For instance, the World Health Organization (WHO) recommends that children and adolescents engage in at least 60 minutes of moderate-to-vigorous physical activity (MVPA) daily [1]. MVPA includes activities with MET values between 3 and 5.9, while vigorous-intensity activities exceed 6 METs [44]. Adolescents who met these recommendations were classified as physically active. Nevertheless, even individuals who achieve the recommended PA levels may still be at risk of negative health outcomes if they spend extended periods of sedentary activity.

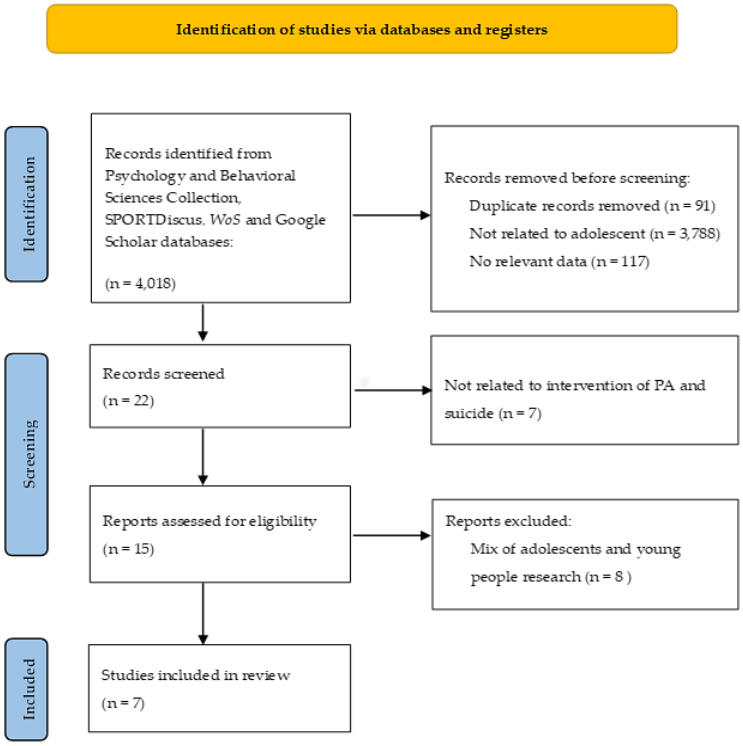

Figure 1. Selected studies in the review

Two studies specifically examined the relationship between PA and sedentary behavior [32], [45]. One large-scale study explored sedentary behavior among adolescents from 52 low- and middle-income countries, providing valuable insights into the global implications of these behaviors [45]. Results showed that adolescents who reported more than three hours of leisure-time sedentary behaviors per day were 45% more likely to have suicidal ideation and 29% more likely to plan or attempt suicide than those reporting less than three hours of sedentary behavior in the past year. Findings from the study also suggest possible differences in the influence of psychopathology on suicidal behaviors between male and female adolescents. Impulse control issues during crises are a long-noted phenomenon in young men, and the authors speculated pain may have been exacerbated by struggles to cope with acute stressors, leading to novel suicidal behaviors in young men. On the other hand, girls are also more likely to think about and move through stages of suicidal behavior. Such differences could explain the lack of association between sedentary behavior and suicidal planning or attempts in male participants within the study. Compared with adolescents who reported less than three hours per day of sedentary behavior during the past 12 months (i.e. leisure time), excess sedentary behavior was associated with increased odds of suicidal ideation by 45% and planning/attempting suicide by 29%. The authors proposed that suicidality during midlife follows different patterns for men and women: men have more impulsive responses during crisis times, and the extreme difficulty of coping with temporal stress leads to unprecedented suicidal behaviors, whereas women think through various stages of suicidal behavior.

Consistent with the findings of this research, a plethora of studies have revealed a relationship between sedentary behaviors and mental health issues such as depression, anxiety, suicidal ideation, poor self-esteem, loneliness, and stress among adolescents [44], [46], [47]. Without much physical movement, fewer endorphins and serotonin are released, and as a result, individuals will have fewer pleasant feelings and less motivation. Individuals with depression and anxiety are known to suffer from fatigue and low energy. As such, when planning PA for adolescents with depressive or anxiety disorders, it is pivotal to start with a small goal and gradually increase it until it reaches an average of 60 min of moderate-to-vigorous physical activity (MVPA) per day, as recommended by the WHO [1] for adolescents. Managing one's mental health may be more difficult when an individual lacks motivation. Hence, it would also be helpful to develop a reward system (such as a favorite meal, watching a movie at cinema, and going out with friends) if the adolescent meets their PA goals for the week or month as a form of positive reinforcement. Table 2 provides a summary of the reviewed research, highlighting the associations between physical activity levels, sedentary behavior, and their impact on suicidal ideation and behaviors. Table 2 facilitates a clearer understanding of each study's contributions to this review.

Table 2. Reporting impact summary

Authors	Physical activity (instrument)	Sedentary behavior	Impact on suicide ideation/behaviors
[45]	Global School-based student health survey.	Yes	High leisure-time SB significantly increases the risk of suicidal thoughts and behaviors among adolescents in LMICs. Inadequate PA has a stronger impact on suicide planning and attempts in males. The combined effect of low PA and high SB amplifies the risk of suicidal ideation, planning, and attempts. Active lifestyle promotion should be a key component of suicide prevention efforts in resource-poor settings.
[36]	PA was assessed asking respondents how many days they were physically active for at least 60 minutes in the past week.	Yes	Insufficient sleep was associated with an increased risk of suicidal ideation, while PA was associated with a reduced risk of suicidal ideation among adolescents in the study.
[38]	MVPA	No	No significant association was identified between MVPA and self-harm or psychological issues in either gender.
[32]	Four measures of PA: daily PA, muscle-strengthening activity, physical education, and sports team participation.	No	SB linked to adolescents' suicidal thoughts and attempts. Suicidal thoughts were associated with inadequate aerobic activity.
[37]	5-Likert scale, with higher scores indicating more frequent PA.	No	The greater positive mental health mediated the suicide-prevention benefits of PA.
[39]	Q79 on the youth risk behavior survey procedures (YRBS) questionnaires.	No	PA and the school environment reduce adolescent suicidal ideation, but sleep duration increases it (though more research is needed).
[40]	Team sports participation from YRBS questionnaires.	No	The study indicated that team sports engagement reduced depression and suicidal ideation in all groups except LGBQ adolescents.

Low to moderate levels of PA have been linked to an increased risk of suicidal behaviors among male adolescents, a finding consistent with previous research [48]. However, LaRocca *et al*. [40], reported no significant relationship between PA and suicidal ideation or behaviors in girls. The authors compellingly argued that this aligns with earlier studies [25], [49] which emphasize the importance of the type of PA engagement rather than PA itself in addressing mental health vulnerabilities. Notably, the concept of social connectedness through sports has gained prominence in recent mental health research [50], [51]. A German study [37], demonstrated positive associations between higher levels of PA and general mental health, along with negative associations with suicide-related outcomes. However, the study lacked precise PA measurements, making it unclear whether team sports or other forms of PA contributed to these associations. Michael *et al.* [32] found no significant link between sports participation and suicidal behaviors. However, both young men and women who did not participate in team sports were more likely to feel sad or hopeless. Collectively, these findings suggest that the social environment provided by team sports could offer valuable protection against mental health challenges, potentially mitigating the risks of mental illness and suicidal ideation or behaviors.

A noteworthy study delves into the connection between PA, mental health, and suicidal thoughts among lesbian, gay, bisexual, transgender, and questioning (LGBTQ) youth [40]. This group requires special attention because of their significantly higher rates of depression and suicidal ideation than their heterosexual peers [52]. Data from the U.S. show that many LGBTQ adolescents experience persistent feelings of sadness or hopelessness, with rates much higher than the approximately 32% reported by heterosexual youth. LGBTQ youth are also over three times more likely to have considered suicide, and transgender youth, in particular, report alarmingly higher rates of suicide attempts than their peers [53]. In a large-scale study of nearly 50,000 adolescents, researchers examined the impact of participation in team sports on mental health, particularly focusing on depression and suicidal ideation. The findings were striking for most groups: involvement in team sports was significantly linked to lower levels of both depression and suicidal thoughts. Among LGBQ youth, participation in team sports was associated with a reduced risk of depression, although it did not appear to affect suicidal ideation. However, transgender youth saw even more profound benefits, with participation in two or more team sports associated with a marked decrease in suicidal thoughts and depression when engaging in three or more sports. The reasons why team sports did not have the same effect for LGBQ youth in terms of suicidal ideation are still unclear but may be related to the bullying and exclusion of many LGBTQ individuals in sports settings [54]. Nonetheless, these findings emphasize the potential mental health benefits of fostering inclusive and supportive team sports environments for sexual minority youth. Given the heightened risk of depression and suicidal ideation in this group, creating opportunities for positive, socially connected physical activity could be a powerful tool for improving wellbeing.

So, this review identified seven key studies examining the association between PA and suicidal ideation among adolescents. The review highlights two main themes: the positive value of PA and the dangers of sedentary behavior. Studies indicate that exceeding three hours of leisure time in sedentary

activities significantly increases the risk of suicidal ideation. This aligns with earlier research showing the negative mental health impacts of sedentary behavior. Interestingly, PA appears to exert antidepressant and anti-anxiety effects, with a positive correlation between PA engagement and enhanced subjective wellbeing. Team sports, in particular, were associated with social connectivity and a reduced risk of depression. However, the protective effect of PA was not uniform across all demographics, and this variation suggests that the benefits of PA may depend on the type and context of participation. This review has several limitations that need to be acknowledged. First, few studies have investigated the association between PA and suicidal ideation and behaviors. We may not even see why this must be the case, and how we needed to have done matters in another way. However, the lack of evidence should prompt caution regarding what can or should be inferred from the findings in practice. Second, the results were derived primarily from cross-sectional research. Longitudinal and interventional studies are required because the cause and effect cannot be determined.

4. CONCLUSION

This review highlights the complex relationship between PA and suicide-related ideation and behaviors in adolescents, emphasizing the important implications for public health strategies and future research. Regular engagement in PA, especially in team sports, appears to protect against suicidal ideation and behaviors, particularly in male adolescents. PA can reduce key suicide risk factors such as depression, anxiety, and hopelessness. Team sports offer additional benefits by fostering social connectivity and support. However, the protective effects of PA were not uniform across all groups. Some studies show limited impact for female adolescents, and while PA can reduce depression in LGBTQ youth, its effect on suicidal ideation in this group is less clear. This suggests that contextual factors such as the inclusivity of sports settings play a role in PA's benefits. Despite these findings, gaps remain. Most studies are cross-sectional, limiting the understanding of causality. Future longitudinal research is needed to clarify how PA influences mental health and suicide risk over time. A multifaceted approach that integrates PA promotion, mental health education, and social support can help reduce suicide rates and enhance adolescent wellbeing. Despite these limitations, this review has clearly identified a strong link between participation in PA and reduced suicidal ideation and behavior. While evidence directly linking organized sports to these benefits is somewhat limited, the potential advantages of socially focused sports that promote connections and community are especially persuasive. PA provides unique potential for intervention with the psychological, social, and physical benefits it entails. It improves mood, strengthens resilience, and creates a sense of inclusion which tackles the areas that drive suicidal ideation and actions. In addition, PA represents a relatively low-cost and easily accessible intervention with almost no side effects to the patient, making this approach egalitarian while directly addressing potential socioeconomic disparities between young people. This strongly supports the inclusion of social physical activity programs as a primary intervention for the prevention and management of suicidal ideation and behavior. Targeting PA in public health and educational programs makes a strong, primary tool to tackle one of the most significant mental disorder looming problem among youth.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

ETHICAL APPROVAL

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DATA AVAILABILITY

Data availability is not applicable to this paper as no new data were created or analyzed in this study.

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APPENDIX

Table 1. Summary of selected studies

Source/ country	Type of study/design	Objective/sample	Methods/measures	Key findings	Rating score
[45]/ Australia	Survey/ Cross-sectional study	To analyze the relationships of PA and SB with suicidal thoughts and behavior among adolescents in LMICs. 206,357 students aged 13-17 participated in the GSHS Survey 2003 – 2015.	Suicidal ideation, planning, and attempts were measured by corresponding questions. Overall, PA and leisure-time sedentary behavior for the past 7 days were assessed.	High SB was associated with suicidal vulnerability. Insufficient PA was positively associated with suicide planning and attempts among boys but not girls.	High
[36]/ USA	Survey/ Cross-sectional study	To analyze the association between insufficient sleep and suicidal ideation Data for this study came from the 2017 Youth Risk Behavior Surveillance System. 13,659 students aged 14–18 years (51.8% female)	Suicidal ideation was assessed in response to the question, "During the past 12 months, did you ever seriously consider attempting suicide?" Insufficient sleep was measured by one item: "On an average school night, how many hours of sleep do you get? Other potential risk factors for suicidal ideation, such as traditional and cyberbullying victimization, feeling sad or hopeless, being overweight, cigarette smoking, alcohol use, marijuana use, and illicit drug use, were also registered. PA was considered a protective factor that could reduce the likelihood of experiencing suicidal ideation.	17.6% of the participants had experienced suicidal ideation during the past 12 months, and 75.2% had insufficient sleep on an average school night. Suicidal ideation was 1.35 times higher for adolescents with insufficient sleep than those with sufficient sleep on a normal school night. Female gender, sexual minority, traditional bullying and cyberbullying victimisation, feeling sad or hopeless, being slightly or very overweight, and substance use were also associated with suicidal ideation. PA was inversely associated with suicidal ideation.	High
[38]/China	Survey	To examine the associations between MVPA, psychological problems, and self-harm behaviors. 13,349 students aged 11-18 years (Stratified cluster sampling)	Sociodemographic information, including age, gender, grade, BMI, and SES, was collected. The YRBS scale evaluated students' frequency of MVPA (days/week) psychological symptoms, and self-harm behaviors. Depressive symptoms were examined using the CES-D scale. Anxiety symptoms were measured using the MASC scale. GEBS, ADHD, ODD, and conduct problems were assessed with YSR.	A high frequency of MVPA was associated with a lower risk of depression and anxiety for boys. The moderate frequency of MVPA was associated with a lower risk of ADHD. For girls, both MVPA (high frequency and moderate) groups were associated with a lower risk of depression. High MVPA was associated with a lower risk of ADHD. Only a moderate frequency of MVPA was associated with a lower risk of ODD.	High
[32]/ USA	Survey / Cross-sectional study	To study associations between PA, sedentary, and healthy dietary behaviors and indicators of mental health, suicidal thoughts, and suicidal attempts. A representative sample of 14,765 students aged 15-18 years (YRBS)	Sex-stratified logistic regression was used to model each mental health-related outcome on the health-related behaviors separately. Measures of PA included daily PA, muscle-strengthening activity, physical education, and sports team participation. Dietary behaviors included breakfast intake, fruit intake, vegetable intake, intake of soda, sports drinks, and water consumption.	Significant associations were found between insufficient PA, sedentary and less healthy dietary behaviors, and mental health-related outcomes. Concerning insufficient PA, feeling sad and hopeless was associated with not meeting the aerobic PA guideline (male only) and not playing on at least one sports team. Suicidal thoughts were associated with not meeting the aerobic PA guideline.	High

Table 1. Summary of selected studies (continued)

Source/ country	Type of study/design	Objective/sample	Methods/measures	Key findings	Rating score
[37]/ Germany	Survey/Longitudinal study	To investigate PA and PMH as potential factors for reducing the risk of suicide ideation and suicidal behavior. 223 students (M_{age} = 22.85 years)	"How frequently do you engage in physical exercise (e.g., swimming, cycling, jogging?" assessed the frequency of PA. The PMH scale measured subjective and psychological aspects of wellbeing. The item "Have you ever thought about or attempted to kill yourself?" of the SBQ-R assessed lifetime suicide-related outcomes.	Suicide-related outcomes were significantly negatively correlated with PA and PMH. PA (at baseline) was significantly positively correlated with PMH.	High
[39]/ USA	Survey/multi-stage cluster sampling	To examine the associations among PA, sleep, and factors relating to the school environment with adolescents' self-reported rates of suicidal ideation. 10,125 students aged 12-18 years (2017 YRBS survey)	YRBS questionnaires were self-administered to assess weapons carried to school, absence from school due to feeling unsafe, bullying, and being offered illegal drugs at school, PA, and sleep.	Meeting PA guidelines every day of the week, hours of sleep, and factors relating to the school environment, including bringing weapons to school, perceived school safety, being bullied, and buying illegal drugs, all significantly independently predicted suicidal ideation.	High
[40]/ USA	Survey/two-stage stratified clustered sampling design	To examine the relationship between team sports participation, depression, and suicidal ideation among a representative sample of adolescents aged 15-18 years (n = 46,537) in the Healthy Kids Colorado Survey.	Students were asked about team sports participation, depression, suicidal ideation, sexual orientation, and gender identity with items from the YRBS.	Team sports participation was associated with a reduced likelihood of depression in all groups and a reduced likelihood of suicidal ideation in all groups except for LGBQ youth.	High

Note: PA = Physical Activity; LMICs = Low- and Middle-Income Countries; GSHS = Global School-based Health Survey; SB = Sedentary Behavior; BMI = Body Mass Index; GAD-2 = Generalized Anxiety Disorder Scale; PHQ-2 = Patient Health Questionnaire; PSQI = Pittsburgh Sleep Quality Index; MVPA = Moderate-to-Vigorous Physical Activity; SES = Socioeconomic Status; YRBS = Youth Risk Behavior Survey; CES-D = Center for Epidemiologic Studies-Depression Scale; CES-DC = Center for Epidemiological Studies-Depression Scale for Children; MASC = Multidimensional Anxiety Scale for Children; ADHD = Attention Deficit Hyperactivity Disorder; GEBS = General Emotion, Behavior, and Social; ODD = Oppositional Defiant Disorder; YSR = Youth Self-Report; CMHS = Complete Mental Health Status; DFS = Diener's Flourishing Scale; CESD-R-10 = Center for Epidemiologic Studies Depression Scale Revised; SMI = Severe Mental Illness; MHC-SF = Mental Health Continuum-Short Form; PMH = Positive Mental Health; SBQ-R = Suicidal Behaviors Questionnaire-Revised.

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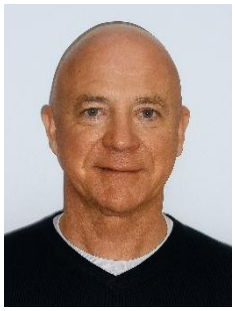

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