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MENTAL HEALTH PROMOTION: THE ACTIVE AND PASSIVE ROLE OF YOUTH SPORT

A Thesis in

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by

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ABSTRACT

Considering that the incidence of mental health problems of adolescents is an ongoing concern that can divert youth from optimal developmental pathways, we need to identify community settings that can be leveraged to support mental health. Organized youth sport can be a potential avenue to promote mental health. Sport has potential as a setting to deliver 'active' strategies such as interventions, or for more 'passive' benefits – focusing on how sport may automatically confer positive mental health outcomes for youth. I conducted this thesis to explore each of these roles within youth sport, spanning two standalone manuscripts.

Relative to the *passive* role of sport, the first manuscript includes a systematic review and meta-analysis to explore the relationship between adolescent organized sport participation and self-reported symptoms of anxiety and depression. From 9,955 records screened, 29 unique articles were selected that included 61 effect sizes and 122,056 participants. Effects were clustered into four categories based on how researchers operationalized sport involvement: absence or presence of involvement, frequency of involvement, volume of involvement, and duration of participation. Meta-analytic findings revealed that symptoms of anxiety and depression were significantly lower among sport-involved adolescents compared to those not involved in sport, although this effect size was small in magnitude.

To examine the potential *active* role of sport, a mixed-methods study was conducted to evaluate the feasibility and acceptability of a peer-based mental health literacy intervention. The mental health literacy intervention (i.e., *Team Talk*) was presented to eleven adolescent sport teams, with a total of 174 participants. Athlete participants completed pre- and post-intervention surveys that included measures of workshop acceptability, social identity, and help-seeking behaviors – semi-structured interviews were also conducted with a subset of athletes, parents,

and coaches. Participants rated the acceptability at a relatively high level, although acceptability varied from one session to another and was predicted by contextual factors related to implementation (e.g., session duration). Athletes' social identities related to their sport team also strengthened when comparing pre- and post-intervention survey responses. Athlete participants, coaches, and parents also provided qualitative responses that inform potential adaptations to mental health programs and reflected on the salience of peer relationships in this context.

In sum, this thesis demonstrates the potential active and passive role of organized sport in adolescent mental health promotion.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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AUTHORSHIP

A version of the second chapter has been published in the Journal of Sport and Exercise Psychology (doi: 10.1123/jsep.2019-0235). Some aspects of the formatting are aligned with this journal's requirements. Furthermore, although I (Michael Panza) am the lead author and guided all components of the paper development, coauthors include: Scott Graupensperger, Jennifer Agans, Isabelle Doré, Stewart Vella, and Blair Evans.

CHAPTER 1: GENERAL INTRODUCTION

Organized sport programs are so common that they now represent cultural institutions in most American communities. Approximately 50% of American adolescents report sport participation, which are traditionally delivered within organized sport programs such as competitive sport clubs, school sport, and recreational community programs (Aubert et al., 2018). The prevalence of sport participation is an important observation when considering potential supports for adolescent mental health, considering sport as both (a) as a supportive out-of-school activity, and (b) as a community context for prevention programming.

It is first critical to recognize the potential role of sport as a supportive or protective out-of-school activity. Anxiety and depression represent particularly prevalent problems that, together, are emerging challenges to adolescent wellbeing (Polanczyk, Salum, Sugaya, Caye, & Rohde, 2015; Kessler et al., 2009). In a given year, around 30% of American adolescents experience depressive symptoms to the extent that they reduce their involvement in activities they would normally enjoy (United States Department of Health and Human Services, 2017). Considering these issues, recent empirical studies indicate that youth sport participants are less likely to experience symptoms of anxiety and depression than non-sport peers (e.g., Brière et al., 2018; Wang, Chow, & Amemiya, 2017). There is thus evidence that sport involvement can reduce symptoms of mental disorders among adolescents.

Second, the popularity of sport programs means that they are also a community resource that could be shaped at higher levels to promote health behaviors and support wellbeing (Hajkowicz, Cook, Wilhelmseder, & Boughen, 2013; Swann et al., 2018). This is especially evident in the emergence of campaigns endorsed by elite athletes and international sport organizations to reduce stigma regarding mental illness. Recent instances of these campaigns

include the Bell Canada *Let's Talk* campaign partnership with Olympic speed skater Clara Hughes (Booth, Allen, Jenkyn, Li, & Shariff, 2018) as well as Michael Phelps' partnership with *Talkspace Online Therapy* (www.talkspace.com/michael). There is also empirical evidence that sport can be leveraged to support adolescent mental health through interventions. Exemplar interventions include those that generally target positive motivational orientations (e.g., Conroy, Kaye, & Coatsworth, 2006), whereas more recent interventions focus directly on mental health (e.g., Vella, Swann, Allen, Schweickle, & Magee, 2017).

These insights mean that adolescent sport involvement entails dual roles as a setting to 'passively' support mental health and to 'actively' integrate prevention programing in sport contexts. These insights are nevertheless grounded in preliminary research. Indeed, it is currently challenging to predict which sport contexts and involvement patterns are optimal for supporting mental health. Furthermore, there are few studies documenting the potential fit of mental health programs within sport clubs – particularly so in the context of the United States. The goal of my thesis is to explore the relationship between sport participation and mental health and to determine the feasibility of a sport-based mental health intervention.

Mental Health

When targeting mental health, researchers have carefully sought to delineate varying aspects of mental health but struggle to reach consensus regarding a universal definition (Whiteford et al., 2013). This ambiguity can be attributed, in part, to the numerous dimensions that contribute to mental health. Among the dimensions used to identify what being mentally healthy entails, Sartorius (2002) identified three as particularly prominent: (a) an absence of any clinical mental disorder (e.g. anxiety or depression), (b) a state of well-being in which individuals can perform necessary functions, and (c) a state of balance that exists within an

individual and between the individual's physical and social environment. Whereas the absence of disorder is perhaps the most intuitive component of mental health from a lay perspective, the latter dimensions are more positive. Indeed, performing daily functions and a form of balance is reiterated in the definition offered by the World Health Organization (WHO, 2014). The WHO (2014) definition highlights how mental health entails realizing one's potential, an ability to respond to demands of life, and contributing to society. Whereas the comprehensiveness regarding definitions of mental health and lack of agreement is a challenge when developing mental health initiatives (Patel et al., 2013), this variability pushes researchers and practitioners to consider the breadth of experiences that connect with mental health.

Consider what it would take for a mentally healthy young athlete to demonstrate each of these dimensions. Imagine an adolescent with realistic ambitions within sport and other domains of life. This adolescent would be able to balance sport requirements, school responsibilities, a part-time job, and various relationships. He or she would also tend to report few symptoms of mental disorders like anxiety or depression – and when they do report symptoms, these experiences would be relatively transient. Importantly, a mentally healthy adolescent would be resilient to routine challenges of day-to-day life.

Despite this inclusive definition within contemporary research, researchers have tended to focus on mental health as the absence of any mental disorders (Westerhof & Keyes, 2010). Mental disorders are indeed a significant societal concern due to the alarming rates during the crucial development period of adolescence (Hankin et al., 1998; Teubert & Pinquart, 2011). Early adolescence is the stage of life when individuals often report their first experiences with mental disorders, with anxiety and depression being especially widespread (Teubert & Pinquart, 2011). Symptoms of anxiety include feelings of tension, excessive worrying, and avoiding

threatening situations (American Psychiatric Association, 2013). Symptoms of depression are incessant sadness, feelings of worthlessness, and a lack of interest in daily activities (American Psychiatric Association, 2013). Additionally, mental disorders can have long-lasting effects due to a strong association with other health and developmental concerns, such as fewer educational achievements, substance abuse, and violence (Patel et al., 2007). Adolescents facing such problems are less likely to engage as productive members of society and will have a reduced quality of life (Sawyer et al., 2002).

Sport and mental health. The risk factors for mental disorders are well-established and there has been progress in developing interventions, yet most mental health service needs go unmet (Patel et al., 2007). A critical next step is to identify how widespread sport programs can be designed to maximize the positive outcomes and prevent negative outcomes for as many adolescents as possible. Anecdotal accounts, alongside intuition, highlight the value of sport for supporting mental health. Extending back toward quotes attributed to Franklin D. Roosevelt (the 32nd president of the United States), sport was viewed as an inherently 'good' activity: "Sports are the very fiber of all we stand for. It keeps our spirits alive."

The intuitive appeal of sport aligns with evidence regarding the association between sport involvement and mental health. For instance, large correlational and longitudinal studies reveal that adolescents involved in sport report fewer anxiety and depressive symptoms (Paluska & Schwenk, 2000), perform better academically (Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001), and perceive less stress when they reach early adulthood (Jewett et al., 2014). Additionally, children who drop out of extracurricular sport experience more psychological difficulties than their peers who maintain regular participation (Vella, Cliff, Magee, & Okely, 2015). Recent narrative or scoping reviews also highlight how sport participation can be associated with

improved social and psychological health among adolescents (Eime et al., 2013). Despite the value of sport involvement, researchers continue to grapple with key questions because there is limited understanding of (a) the magnitude and consistency of the link between sport and mental health, and (b) the mechanisms that explain the association.

Regarding the consistency of the link between sport and mental health outcomes, organized sport experiences are inherently diverse and can generate a wide range of outcomes for adolescents. Although most adolescents experience positive outcomes through sport, some face negative outcomes (Fraser-Thomas et al., 2005). An example of a potential negative experience in youth sport is the exposure to stressful environments that can generate competitive anxiety (Hackfort & Spielberger, 1989). Thus, although the literature seems to produce a generalized depiction of benefits of sport involvement, it is critical to demonstrate the magnitude of the association between sport involvement and mental health. It is similarly critical to identify characteristics of sport experiences that may create optimal and suboptimal experiences.

There are also several theoretical arguments for *why* this link exists; unpacking the explanation for the association between sport participation and mental health. An intuitive presumption is that, when sport is appropriately structured and delivers health-enhancing physical activity, it has the potential to positively influence social and emotional functioning and enhance overall health-related quality of life (Fraser-Thomas & Côté, 2009).

Another perspective to consider the potential for sport to deliver adaptive outcomes is a positive youth development approach. Positive youth development theorists view organized youth sport as a context to develop assets and orientations that help adolescents adaptively respond to factors that might challenge their social functioning (Fraser-Thomas et al., 2005). While a deficit model underlines the reduction of problem behaviors or symptoms of mental

disorders, this strengths-based approach emphasizes how youths' environments may also foster optimal development (Sesma, Mannes, & Scales, 2013). Applied to sport, one perspective is that a young athlete may demonstrate positive development by establishing life skills (e.g., ability to set goals, stress management; Gould & Carson, 2008). Another common positive youth development approach focuses on developmental assets developed through sport, such developing adaptive patterns that guide his or her moral decision-making (i.e., character; Lerner et al., 2005). Although positive youth development models are geared towards a strength-based approach, positive developmental experiences also enable youth to be resilient and adapt to challenging life experiences (Masten, 2014).

Clearly, social interaction, physical activity, and the development of life skills or developmental assets are all appealing and intuitive explanations for why youth sport may contribute to mental health. We nevertheless have limited understanding regarding the power of these mechanisms.

Sport as a Context for Prevention

The prevalence of sport also means that it can be an effective tool in enhancing mental health (e.g., by preventing the onset of disorders; Liddle, Deane, & Vella, 2016). Indeed, this insight is closely aligned with a prevention orientation that has emerged in adolescent development literature in recent decades. Prevention refers to the deterrence of disease onset or progression through interventions. A central component of prevention relating to mental health is the goal of leveraging multiple community contexts (Catalano, Berglund, Ryan, Lonczak, & Hawkins, 2004; Haggerty & Mrazek, 1994), and this approach helps to justify the potential role of sport in prevention. Adolescents experience numerous community contexts that influence their development, including the classroom, sport teams, informal peer groups, families, churches, and

even part-time jobs. Each of these contexts can be prevention tools when they deliver complementary messages. Sport is likely to play an important role in this system of community contexts (Vella et al., 2018). Also, because each of these contexts within the community can present risk *and* protective factors (Hawkins, Catalano, & Arthur, 2002), there is a demand to evaluate community-wide prevention programs to identify and leverage the most influential factors.

Vella and colleagues have pioneered in this domain through programming delivered in Australian youth sport, leveraging the construct of mental health literacy. Specifically, Vella and colleagues delivered a large-scale mental health literacy intervention delivered through grassroots programming in community sport clubs (Vella, Swann, Allen, Schweickle, & Magee, 2017). This intervention applied the concept of mental health literacy of Jorm and colleagues (1997). Mental health literacy consists of many components, including the recognition of symptoms relating to mental disorders, knowledge of help-seeking options, and knowledge of practical self-help strategies (Jorm et al., 1997). A core idea from Jorm's perspective was that communities that are 'literate' regarding mental health will be best-suited to support positive attitudes toward mental health, recognize symptoms when they take place, and be aware of key resources. As reported by Liddle, Deane, Batterham, and Vella (2019), this intervention integrated athlete, coach, and parent education resources along with club-level messaging in a multi-component intervention that produced a significant increase in various indicators of mental health literacy in sport clubs.

The Current Thesis

Given the prevalence of symptoms of anxiety and depression among adolescents, there is a need for (a) a clearer understanding of the link between community activities (e.g., sport) and

mental health and (b) determining the feasibility and acceptability of sport-based mental health interventions designed for adolescents. A better understanding of the link between sport and mental health is critical to advance the design and structure of youth sport. Additionally, mental health interventions need to be developed and assessed specifically within sport programs, given the ideal context of such widespread community activities.

Below, I target these two broad goals through a two-manuscript thesis. Manuscript 1 reports on a meta-analysis that was conducted to identify the magnitude and nature of the association between adolescent sport participation and symptoms of anxiety and depression reported through previous research. In turn, Manuscript 2 reports on a pilot trial to determine the feasibility and acceptability of a novel mental health literacy intervention for adolescent sport teams. Tackling two contrasting ways of thinking about the link between sport and mental health, this research uncovered unique aspects of the passive and active roles that sport can play in mental health promotion and disorder prevention.

CHAPTER 2: MANUSCRIPT 1

ADOLESCENT SPORT PARTICIPATION AND SYMPTOMS OF ANXIETY AND DEPRESSION: A SYSTEMATIC REVIEW AND META-ANALYSIS (MANUSCRIPT 1)

Mental health is a critical component of health and development throughout adolescence. When considering how to delineate a mentally healthy adolescent, definitions integrate the common perspective of the absence of clinically significant mental disorder along with an optimal state of wellbeing (World Health Organization, 2014). Specifically, mental health refers to a state of internal equilibrium and wellbeing where individuals are capable of responding to demands of life and contributing to their community, while actualizing their potential in agreement with societal values (Galderisi, Heinz, Kastrup, Beezhold, & Sartorius 2015). Applying this perspective, adolescents who are mentally healthy possess cognitive and social skills that are typical for their development, along with abilities related to emotional regulation, empathy, stress management, and engagement in social roles (Galderisi et al., 2015).

Although mental health is fundamental for development, mental disorders occur at concerning levels among adolescents (Patel, Flisher, Hetrick, & McGorry, 2007). Along with evidence that symptoms of mental disorders affect 10-20% of adolescents during a given year, researchers have demonstrated that mental disorders account for 15-30% of disability-adjusted life-years lost during the first 30 years of life (Kieling et al., 2011). Considering the prevalence of mental disorders, it is vital to identify activities, interventions, and policies that support adolescent mental health (Patel, Flisher, Hetrick, & McGorry, 2007).

Facing preliminary evidence that youth sport involvement may be protective for mental health (Eime et al., 2013), we sought to synthesize the growing evidence base regarding the relationship between adolescent organized sport involvement and symptoms of anxiety or

depression. We selected symptoms of anxiety and depression as critical outcomes to examine considering that they are strongly correlated with one another (Kessler, Berglund, & Demler, 2003), and impact other dimensions of health such as life satisfaction (Headey, Kelley & Wearing, 1993) and physical health-related quality of life (Jaycox et al., 2009). In addition to revealing current evidence regarding how anxiety and depression symptoms are associated with organized sport involvement, we also sought to advance the quality of evidence by characterizing approaches used to study this relationship.

Sport Participation and Symptoms of Anxiety and Depression

During the crucial developmental period of adolescence, symptoms of both anxiety and depression are widespread (Teubert & Pinquart, 2011). Anxiety disorders entail excessive perceptions of fear or threat, evident for instance in social and generalized anxiety disorders. Depression refers to persistent feelings of sadness and worthlessness and includes mood disorders like major depressive disorder and dysthymia (American Psychiatric Association, 2013). Anxiety and depression also range in severity. For instance, whereas chronic suicidal ideation is evident among adolescents with major depressive disorder (Kandel, Raveis, & Davis, 1991), symptoms integrated in depression measures also include features of mood disorders as well as more transient depressive states, including loneliness, pessimism about the future, and feelings of frustration (e.g., Radloff, 1977). Anxiety and depression are thus commonly conceptualized using measures of the frequency and intensity of symptoms reported by adolescents ranging on a spectrum from subclinical to clinical.

Considering organized sport as a widespread community resource, it is important to consider the extent to which sport participation may protect against symptoms of anxiety and depression. This is because sport offers a unique integration of two factors that are independently

established as inversely associated with anxiety and depression symptoms: (a) physical activity (Ahn & Fedewa, 2011), and (b) social relationships and community participation (Eime, Young, Harvey, Charity, & Payne, 2013).

Adolescents who engage in recommended levels of 60 minutes or more of moderate-to-vigorous activity experience fewer anxiety and depression symptoms (Paluska & Schwenk, 2000). For instance, Ahn and Fedawa (2011) conducted a meta-analysis and found that physical activity can significantly reduce depression, anxiety, psychological stress, and emotional disturbances in clinical and non-clinical samples of children and adolescents (i.e., effect size of -0.30 for randomized control trial studies, -0.57 for non-randomized control trial studies). A recent review-of-reviews (k = 42 reviews) conducted by Biddle, Ciaccioni, Thomas, and Vergeer (2018) further reported that regular physical activity is a protective factor pertaining to depression and anxiety symptoms. Nevertheless, Biddle et al. (2018) reported that anxiety symptoms were rarely the focus of recent studies and that evidence was mixed regarding the magnitude of the inverse relationship between anxiety symptoms and physical activity.

A second argument for an association with mental health is that sport can support social relationships that contribute to mental health via psychosocial, behavioral, and physiological pathways laid out by Umberson and Montez (2010). Perhaps most closely aligned with the theorizing of sport researchers, personal relationships within the sport community can be resources to support mental health through psychosocial processes like social support, personal control, and social identities (Eime et al., 2013). Further aligning with the psychosocial path, sport may satisfy the need to belong and expose adolescents to group memberships that are critical for well-being (e.g., Cruwys, Dingle, Haslam, Haslam, Jetten, & Morton, 2013). Beyond psychosocial influences, there are behavioral mechanisms such as the responsibility that athletes

feel for the mental health of themselves and others (e.g., supporting teammates; Liddle, Deane, Batterham, & Vella, 2019). Social interactions may also generate positive and negative processes within immune, endocrine, and cardiovascular systems. As one example, social support plays a stress-buffering role by reducing cardiovascular reactivity to stress (Uchino, 2006). Adolescent organized sport may thus support mental health, to the extent that adolescents experience positive interpersonal relationships.

Critical to the aforementioned descriptions is the recognition that sport provides exposure to both positive and negative experiences with physical activity and social relationships. Despite the potential for sport as a preventive context, certain sport contexts may produce detrimental effects within physical, emotional, psychological, and social domains (Fraser-Thomas, Côté, & Deakin, 2005). For instance, adolescent athlete mental health may be harmed by experiences with inadequate (e.g., autonomy-thwarting) or even abusive relationships with coaches, parents, peers, and others in sport (Macdonald, Côté, Eys, & Deakin, 2012). Even contextual features like overtraining or spending a large number of hours involved in sport, may be detrimental to one's psychological wellbeing (Merglen, Flatz, Bélanger, Michaud, & Suris, 2014). As such, context is critical to understanding links between sport and mental health (e.g., Evans et al., 2017).

Researchers studying the relationship between sport and mental health should therefore be sensitive to variability in the sport context. This is particularly the case because it can be challenging to define what it means to 'participate' in sport. First, there is ambiguity regarding what types of activities constitute sport. Second, there is variability regarding how we evaluate participation; do we consider overall involvement, amount, frequency, type, or other characteristics of sport? Studies of youth sport accordingly lack a universal definition for what 'sport involvement' entails – employing measures of involvement frequency, differing types of

sport, and different settings (see Evans et al., 2017). In studies examining relationships with anxiety or depression symptoms, measures of sport participation range from whether adolescents report being involved or not (e.g., Jewett et al., 2014) to the amount of sport involvement (e.g., hours per week; Wang, Chow, & Amemiya, 2017). If these different operationalizations represent different 'exposures' to sport, the effects of a given study are likely contingent on how sport is assessed. By accounting for these differences across studies, sport researchers can develop a deeper understanding of this relationship.

Previous Scoping and Systematic Reviews

Considering the aforementioned conceptual arguments, it is perhaps not surprising that several researchers have conducted reviews regarding psychosocial outcomes of organized sport participation. However, key reviews have been narrative or scoping in nature or have focused on psychosocial correlates of organized sport participation that range widely from sport-specific cognitions (e.g., group cohesion, autonomy, sport burnout) to indicators of more general mental health (e.g., self-esteem, wellbeing). This pattern is evident in two recent reviews of sport literature. Eime and colleagues' (2013) scoping review described a predominately positive relationship between sport participation and psychological, psychosocial, and social health domains; many of which were greater in magnitude than other forms of leisure-time physical activity. In a subsequent review, Evans et al. (2017) explored potential psychosocial correlates of youth sport type (e.g., individual or team sport), sport setting (e.g., school-based or community clubs), and individual patterns of involvement (e.g., sampling or specializing in sports). The authors identified trends in published studies that relate to mental health outcomes, including the relationship between the amount of sport involvement and quality of life, but the authors did not report aggregated findings via meta-analysis (Evans et al., 2017).

Although these reviews synthesized evidence, they focus on heterogeneous studies involving an array of psychosocial outcomes. This heterogeneity prevents statistical aggregation, making it challenging to estimate the magnitude of the relationship between adolescent sport participation and symptoms of anxiety or depression. Meta-analysis can aid in producing more precise and powerful estimates of the presence (or absence) of an association that exists in the population of interest, compared with what can be obtained in single empirical studies (Schmidt & Hunter, 2014). Although the usefulness of meta-analysis is limited by key factors like the rigor and nature of underlying studies, this approach can complement the evidence base. Variability in the nature of studies (e.g., sample size, measures used, contexts) also produces heterogeneity that can be examined through moderation analyses (Schmidt & Hunter, 2014). For example, a meta-analysis by Graupensperger, Jensen, and Evans (2018) examined variability in effect sizes by the age of athlete samples to identify potential patterns in effects related to age – revealing moderation effects that had not been tested in the original studies. Meta-analysis has the potential to reveal the magnitude of correlations between sport involvement and symptoms of depression and anxiety – while identifying types of studies or contexts where this correlation is strongest.

The Current Review

In response to calls to consider sport as a protective community context for mental health (e.g., Eime et al., 2013), it is critical to aggregate the available evidence regarding the relationship between sport participation and mental health in adolescents. The purpose of the current review was, thus, to conduct a systematic review of original research regarding the correlation between mental health and organized sport participation among adolescents aged 12 to 18 years of age. Focusing on anxiety and depression symptoms as commonly studied mental disorders that are particularly prevalent among adolescents, we systematically searched for and

aggregated evidence of correlations with sport involvement using meta-analysis. Although definitions vary, we focused on adolescence as a period from 12 to 18 years of age that represents critical developmental transitions (Jaworska & MacQueen, 2015).

Beyond the substantive focus on the magnitude of the correlation between sport involvement and mental health, we also conducted the current review to examine and describe how researchers operationalize sport involvement. Are there different 'types' of measures that researchers use to identify whether or how much adolescents are involved in sport, relative to anxiety and depression symptoms? We anticipated that a review would inform this question by identifying common operationalizations of sport involvement and examining how correlations with anxiety or depression symptoms vary in relation to context and measurement strategy.

We anticipated small-to-moderate inverse effects pertaining to the correlation between sport participation and symptoms of anxiety and depression. A notable factor that prevented us from forming apriori hypotheses is that we anticipated that: (a) studies used varying operationalizations of sport involvement and measures of anxiety and/or depression symptoms, and (b) there would be heterogeneity in these effects across operationalizations. Of note, we subsequently aimed to test moderating variables that would partially explain this variance. We explored whether the correlation between sport participation and symptoms of anxiety and depression varied as a function of sex and age. Moderation analyses were also conducted to test whether effects varied when comparing studies where data were collected primarily to study this relationship or studies that involved secondary analysis of existing datasets.

Method

This systematic review and meta-analysis involved original, published studies that examined the correlation between adolescent organized sport participation and symptoms of

mental disorders, with a focus on self-reported anxiety and depression symptoms. We sought quantitative studies employing both correlational and experimental designs. This review was preregistered using PROSPERO (registration: CRD42019116549) and followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA; Moher et al., 2009).

Search Process

A systematic search was conducted in October of 2018 (updated in April 2019) using queries developed for several databases, including: Web of Science (Clarivate Analytics), SPORTDiscus (EBSCOhost), MEDLINE (PubMed), as well as ERIC and PsycINFO (ProQuest). Searches extended to the earliest date for each database (e.g., Web of Science: 1900).

Search strategies constructed uniquely for each database are provided in the appendix in their entirety. All searches were focused on three groups of terms. Group 1 included terms relating to adolescence (e.g., youth, teenager, boy, girl). Group 2 included terms relating to 'organized sport' (e.g., athlete, training, athletic) and specific sports (e.g., basketball, football, soccer). Lastly, Group 3 included terms relating to anxiety and depression, along with comprehensive terms related to mental health (e.g., internalizing problems; mental health; emotional disturbances). Although some of these terms extended beyond the goal to study anxiety and depression, they were included to capture studies in which subscales or added items that reflected anxiety or depression indirectly could be drawn in during the search. Alongside the extensive systematic search strategy, two supplemental steps included: (a) an adapted search through the Google Scholar search engine, with the first 500 results screened at the title and abstract level, and (b) hand searches of reference lists of included studies and previous reviews of the literature (e.g., Eime et al., 2013; Evans et al., 2017).

Study Selection

Following the database and supplemental searches, the first step included aggregating records within a database manager (i.e., EndNote) and removing duplicates using an online software deduplication program (Rathbone, Carter, Hoffmann, Glasziou, 2015). The lead author and an experienced research assistant screened remaining article records at the level of title and abstract to identify articles that did not focus on sport or mental health constructs, and to exclude ineligible article types (see PRISMA flowchart; Figure 1). The screening process was managed through the web application Rayyan QCRI (Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016). From a sample of 313 doubly coded articles, the screeners agreed on 94% of decisions. After discussing discrepancies, both reviewers progressed toward reviewing full texts for eligibility.

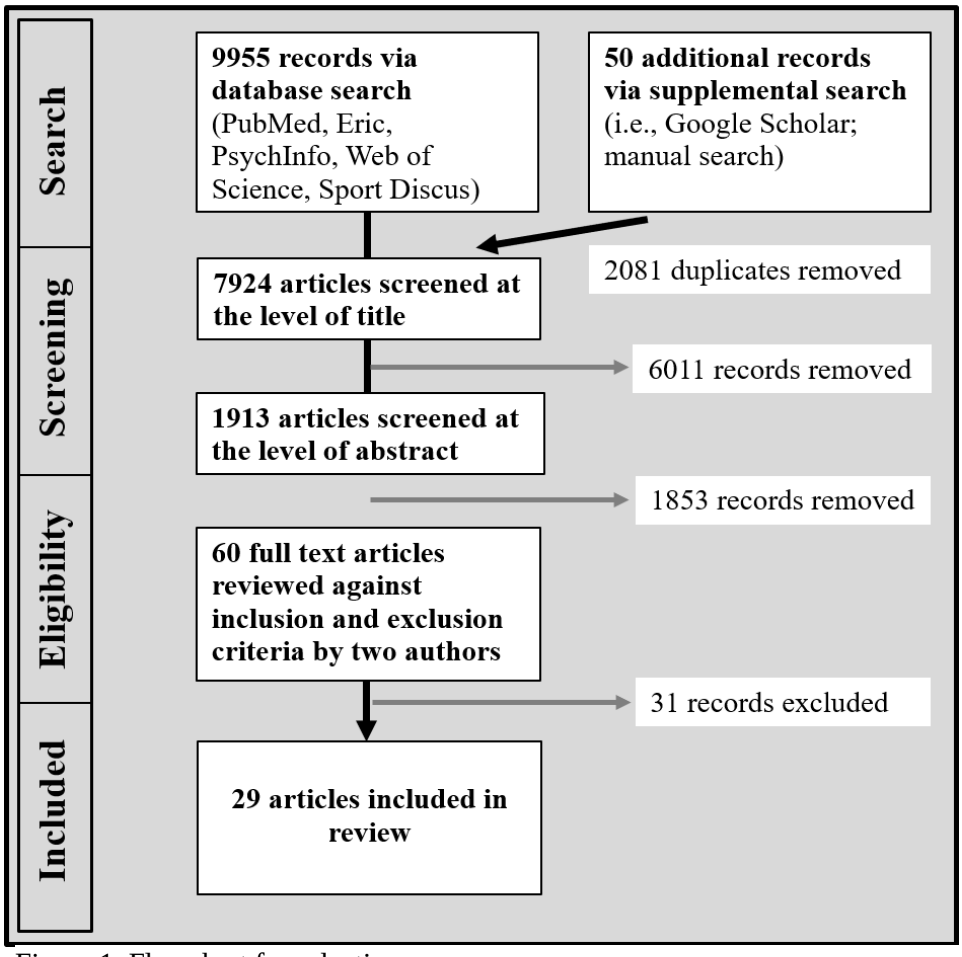

Figure 1. Flowchart for selection process.

Article selection was guided by the inclusion and exclusion criteria listed in Table 1. In addition to several criteria based on paper characteristics (e.g., publication date; language), key criteria were generated through established definitions of the concepts ‘adolescence’, ‘organized sport’, and ‘mental health’. Due to the ambiguity of the term ‘adolescence’, it was essential to operationalize the intended age range. To be included, study samples had to include participants for whom the mean age was between 12 and 18, since these years are generally referred to as adolescence (U.S. Department of Health & Human Services) and align with developmental contexts of sport (e.g., sport clubs; high school sport). Although we only included studies where the mean age was within 12 to 18 years of age when sport participation was measured, study samples occasionally included participants above or below this range. As such, we included only studies with a mean between 12-18 years and with *all* participants older than 8 and younger than 20 years of age. A single study did not meet these age criteria as a whole, but an effect size was nevertheless obtained because statistical results could be drawn from a subsample of the study that fit within our age criteria.

Critically, studies had to include both an indicator of organized sport participation and a measure of anxiety and/or depression symptoms, with a quantitative estimate of the correlation between them. Studies included in this review had to include depression or anxiety variables that were self-reported by adolescent participants as a strategy to reduce potential variability in the operationalization of these constructs. Meanwhile, the definition applied to sport participation was a type of organized and competitive physical activity that is played on a team or as an individual (Eime et al., 2013), and shaped by facilities, policies, and normative beliefs that the activity is seen as sport (Evans et al., 2017). Whereas this definition included varying settings,

including school-based, community-based, and competitive sport, we excluded physical activity settings that did not fit this definition (e.g., physical education, active transportation).

Data Extraction and Risk of Bias Assessment

Data extraction was completed by the lead author, with goals of extracting pertinent information and to assess the risk of bias for each identified article. Coding sheets included descriptive features of studies such as citation details, participant characteristics, study design, anxiety and/or depression symptoms measures, and the approach to measure sport involvement, as well as study findings and analyses. Quantitative details were extracted to estimate effect sizes, both in relation to correlation or regression analyses (e.g., correlation coefficient, sample size) and in relation to analyses involving between-group differences (e.g., mean differences; standard deviation; group sizes). The lead author e-mailed corresponding authors for additional information in cases where required statistical information was not published (e.g., *b* reported instead of *r*). Eight authors were contacted, and 88% provided the required information within three weeks of the request.

Articles were also reviewed to address risk of bias in relation to study methods, analyses, and reporting using an adapted coding tool. The 14-item tool is available in the appendix was developed based on previous reviews (i.e., Eime et al., 2013; Evans et al., 2017). The coding tool integrated items for reporting, design, and measurement as well as results and analyses. In addition to 12 items regarding study design and analysis from existing tools, the authorship team created two items regarding the sport participation operationalization that were unique to this review; these items assessed the clarity of the measurement approach. All items were coded in a binary yes/no fashion and total scores for each article calculated, with greater scores indicating a lower risk for bias. Inter-rater reliability for the tool was demonstrated when three authors (MP;

SG; MBE) independently coded four articles. Using the average Cohen's κ (1960) among reviewers, the coders failed to attain acceptable reliability on an initial sample of four articles (κ = 0.45; 90% agreement). The coding instructions were amended and a review of another four articles produced acceptable reliability (κ = 0.66; 92% agreement). The lead author coded the remaining articles.

Synthesizing Results

Although all studies involved the relation between sport participation and anxiety and/or depressive symptoms, there was considerable variability in the way that sport participation was measured. Thus, a preliminary step was to organize studies within groups based on the method used to measure sport participation. For example, studies that examined how *frequently* adolescents engage in sport were unable to be synthesized with studies that examined how long an adolescent had been playing sport. The classification of studies is described below, and this clustering resulted in four subgroups that were meta-analyzed separately. Importantly, meta-analyses were only carried out when a subgroup included a sufficient amount of effect sizes from distinct studies.

Meta-analytical procedures

Effect sizes were quantitatively synthesized using meta-analytic methods developed by Schmidt and Hunter (2014) using the '*psychmeta*' package in R (Dahlke & Wiernik, 2018). These procedures entail random-effects-modeling, which assumes that the sample from each individual study does not come from one single population and, thus, effects are allowed to deviate from the true population-level effect (see Borenstein, Hedges, & Rothstein, 2007). The random-effects-modeling is recommended by Schmidt, Oh, & Hayes (2009) as it is conservative in nature, providing more accurate results. Beginning by converting effect sizes to correlation

coefficients, we computed an estimate of the mean population effect (i.e., ρ) that is weighted based on study sample size and is corrected for unreliability in measurement (i.e., Cronbach's α). That is, analyses corrected-for attenuation due to measurement error anxiety and depression symptoms measures. We calculated 95% confidence intervals (CI) to determine statistical significance of ρ, whereby intervals that did not include zero were deemed to be 'real'.

An important step to examining moderation in meta-analysis is to consider heterogeneity, regarding the extent that reported effect sizes vary within each meta-analysis. When heterogeneity was present, we tested whether the correlation between sport participation and mental health was moderated by age or sex – and whether effect sizes differed significantly by of the design type of the study (i.e., primary data vs. secondary data use). Heterogeneity was probed by considering *Q*-values indicating the presence of heterogeneity, alongside I^2 values that estimate the magnitude of heterogeneity that was not caused by sampling error, calculated as: $I^2 = 100\% \times (Q\text{-df})/Q)$. I^2 thus represents the proportion of observed variance that reflects variance in true effect sizes rather than sampling error (Borenstein, Higgins, Hedges, & Rothstein, 2017). I^2 values can range from 0-100%, where values of 25%, 50%, and 75% reflect low, medium, and high levels of heterogeneity, respectively. We conducted moderation analyses when effect sizes were heterogeneous (i.e., significant *Q*-value and I^2 of at least 25%) using metaregression analyses and subgroup moderation analysis. Specifically, metaregressions were computed by regressing the correlation coefficient of each study on the mean age and percentage of female participants (Huizenga, Visser, & Dolan, 2011). Subgroup moderation analyses were conducted to contrast effect sizes across studies using primary or secondary data.

In a final set of analyses, we examined the potential for publication bias by inspecting a contour-enhanced funnel plot of standard errors with a quantitative estimate of bias (i.e., Egger's

Regression Test; Egger, Smith, Schneider, & Minder, 1997). Determination of publication bias is based on both visual inspection (i.e., symmetry of effect sizes around the estimated ρ value indicate that bias is unlikely), and the statistical significance of the Egger's test (i.e., significant Z-values indicate that bias may be present).

Results

The initial search query retrieved 9,995 articles, which were evaluated for suitability in the current review. An additional 50 articles were found through a supplemental search. Specifically, 1,913 articles were screened at the level of title and abstract, followed by the full review of 60 full-text articles against the inclusion and exclusion criteria. Ultimately, 29 studies were identified and key details from each article are presented in the study summary table (Table 2). Whereas there was substantial variability in sample sizes – ranging from 62 to 32,456 participants with a median of 1,036 – 13 studies reported on what were considered large-scale samples (i.e., over 1,000 participants), most of which were conducted as secondary analysis of datasets acquired across numerous school contexts. As examples, four studies (i.e., Ashdown-Franks, Sabiston, Solomon-Krakus, & O'Loughlin, 2017; Brunet et al., 2012; Jewett et al., 2014; Sabiston et al., 2016) drew data from the Nicotine Dependence in Teens study and two studies (i.e., Agans & Geldhof, 2012; Zarrett et al., 2009) drew data from the 4-H Study of Positive Youth Development. The majority of studies were published in the past 10 years, with the year of publication distribution in five-year increments included 4% of studies published from 1996-2000, 7% from 2001-2005, 24% from 2006-2010, 24% from 2011-2015, and 41% of studies from 2016-2019. In terms of study design, longitudinal designs were common (55%). Longitudinal studies employed designs where the time between data collection was usually one to three years; 34% of longitudinal studies measured sport participation during adolescence and

symptoms of mental disorders later in adolescence or during emerging adulthood. The remaining 45% of studies were cross-sectional in nature.

The majority of studies came from the USA (k = 10), Canada (k = 9), Australia (k = 3), and Spain (k = 2). Several countries had one study included in the review (i.e., Iceland, Japan, Nigeria, and Slovenia) and one study included participants from various European countries. All of the participants involved in the studies were adolescents between the ages of 10 and 20 at the time when sport participation was measured. Regarding quality, 83% of studies received a score between 11 and 14, indicating a relatively low risk of bias (see scores in Table 2). Nevertheless, items within the risk of bias coding sheet that were least likely to be evident within studies included the inclusion of a researcher-defined operationalization of sport involvement (72% unreported) and the reporting of actual *p*-values (59% unreported).

Recall that measures of both depression and anxiety symptoms were only included if they were completed by adolescent participants. The majority of studies measured exclusively depression symptoms (*k* = 18). Two studies assessed anxiety symptoms exclusively, and nine studies assessed both anxiety and depression symptoms. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) was the most common measure; being included in 10 studies. There was nevertheless substantial variability in the tools used, with no other measure being used more than three times. Additional validated depression tools included the Major Depressive Inventory (used by Brunet et al., 2013) and the Beck Depression Inventory (used by Boone & Leadbeater, 2006). Meanwhile, anxiety scales included the Zung Self-Rating Anxiety Scale (used by McMahon et al., 2017), Hospital Anxiety and Depressive Scale (used by Doré, O'Loughlin, Schnitzer, Datta, & Fournier, 2018), and State-Trait Anxiety Inventory (used by Dolenc, 2015). Across the 15 measures of anxiety and depression that were adequately reported-

on, most scales were validated within adolescent populations (97%), with many validated for use as screening tools in clinical contexts (76%).

We also coded tools regarding scale length, design of items, and severity of symptoms. With the exception of one multiple-choice option measure, all tools involved Likert-type items. Whereas 53% of measures included items asking participants to rate how frequently given symptoms were experienced (e.g., *never to every day*), remaining tools included items asking participants to indicate the extent that item statements reflected them (e.g., *strongly agree* to *strongly disagree*). Whereas 47% of measures assessed at least one item that directly reflected both the severity and frequency of symptoms that reflect anxiety or depression disorder criteria in the DSM-V (American Psychiatric Association, 2013), remaining tools incorporated exclusively generalized and subclinical symptoms of depression.

Operationalization of Sport

A goal of this review was to characterize operationalizations of sport involvement – both as a necessary step for conducting meta-analysis and to identify the status of the evidence base. The resulting operationalization is provided in Table 3. By contrasting studies, we identified four types that signify the approach used to define sport involvement. These include one type reflecting a dichotomous index classifying adolescents as sport-involved or not and three interval or ratio-level classes: (a) frequency of sport involvement using a scale-scored value like hours per week, (b) number of teams or times an individual participates over a period of time (e.g., number of organized sport teams in the past 12 months), and (c) duration of sport involvement, as the number of years in which a participant reported sport involvement over time.

Meta-analyses

The results of separate meta-analyses are reported in Figure 2. Although there were eight possible meta-analyses, three core analyses were conducted because: (a) studies assessing sport frequency and volume employed similar measures, so analyses could be collapsed, and (b) no studies reported the extent that frequency/volume of involvement was associated with anxiety, and (c) there were insufficient studies to justify meta-analyzing subgroups where duration of involvement was measured (although these studies were examined descriptively). A total of 52 relevant effect sizes were included. Across the meta-analyses, we consistently found a small inverse correlation between sport participation and symptoms of anxiety and depression.

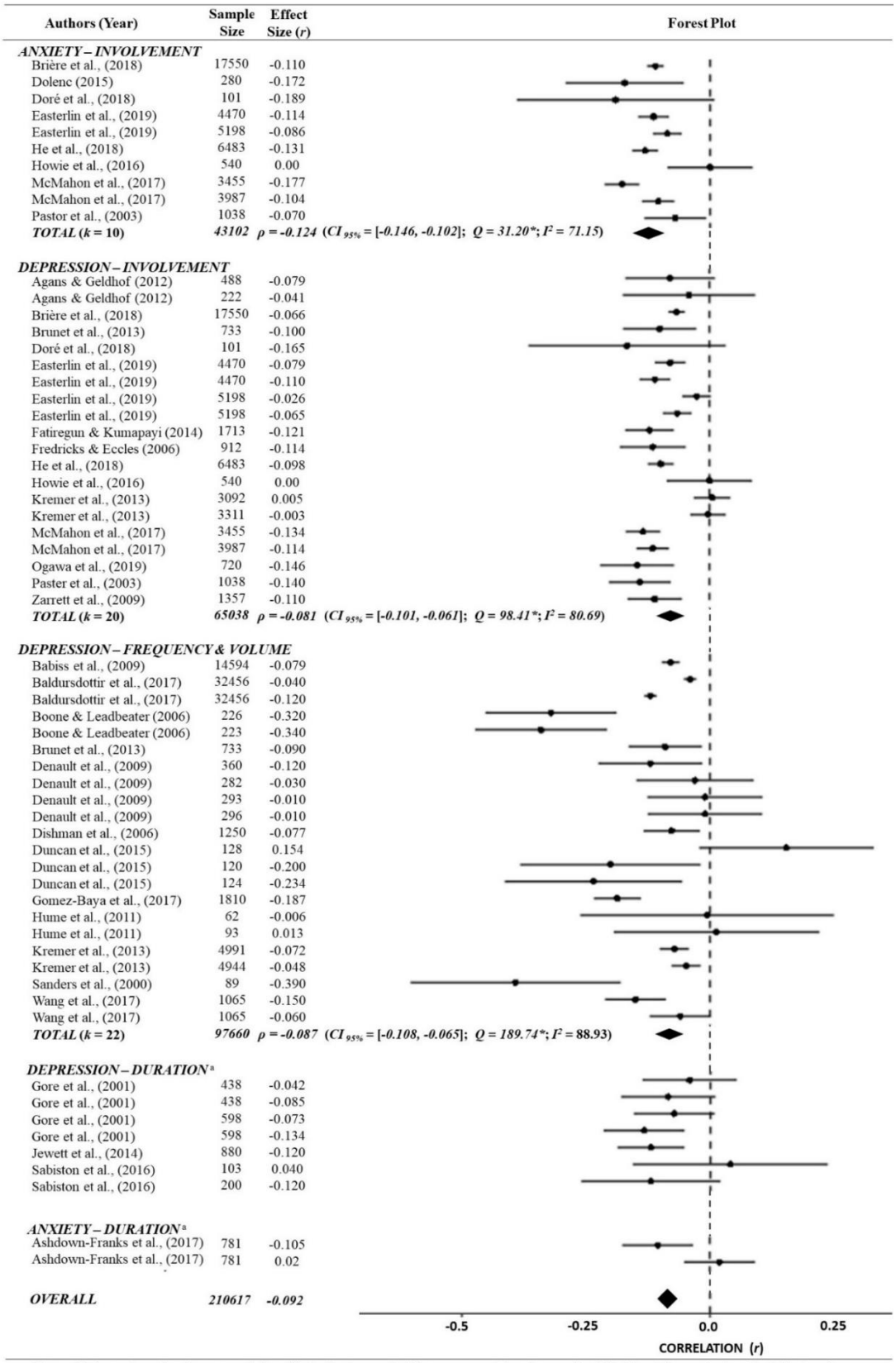

Figure 2. Results of meta-analyses.

Dichotomous index of sport involvement. This operationalization of sport participation as a binary variable (i.e., involved or not) resulted in 30 relevant effect sizes, 10 relating to anxiety and 20 relating to depression. The 10 effect sizes that measured the correlation between symptoms of anxiety and sport participation revealed a small negative mean correlation (ρ = -0.12, $CI_{95\%}$ [-0.15, -0.10]). There was significant heterogeneity across these 10 effect sizes (Q = 31.20, p <.001; I^2 = 71.15). Metaregression revealed that sex significantly moderated this correlation (R^2 = 0.50; see Figure 3). Specifically, for studies with relatively more male participants, there was a stronger inverse (i.e., negative) correlation between sport involvement and anxiety symptoms.

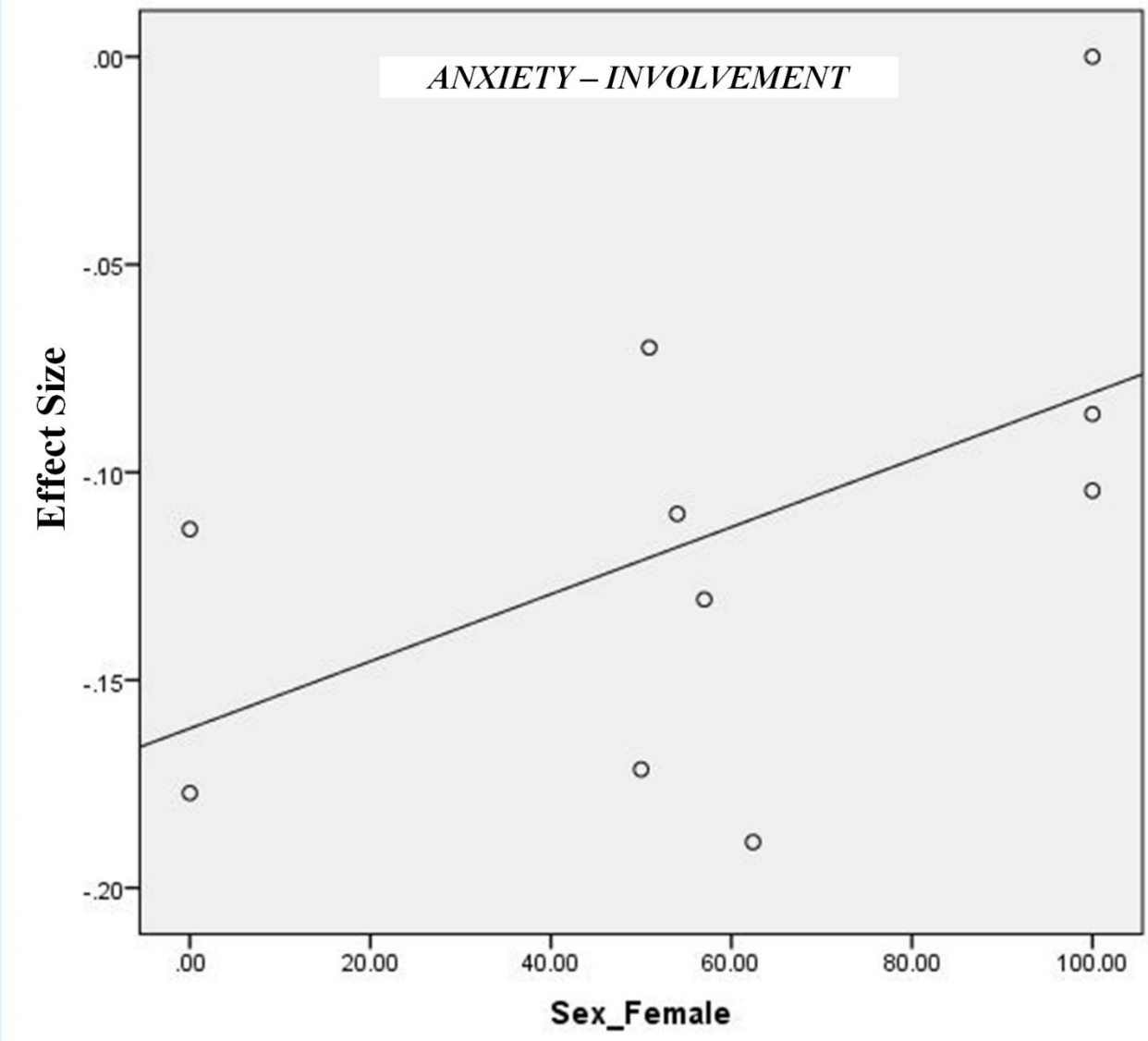

Figure 3. Significant moderation for dichotomous index of sport involvement and symptoms of anxiety

The 20 effect sizes that measured the correlation between symptoms of depression and sport involvement also revealed a small negative mean correlation (ρ = -0.08, $CI_{95\%}$ [-0.10, -0.06]). There was significant heterogeneity among these 20 effect sizes (Q = 98.41, p <.001; I^2 = 80.69). We found that age significantly moderated this correlation such that the inverse correlation between sport involvement and depression symptoms was stronger in samples with a

relatively older mean age (R^2 = 0.39; see Figure 4). As such, sport involvement may be more protective for depression symptoms among older adolescents.

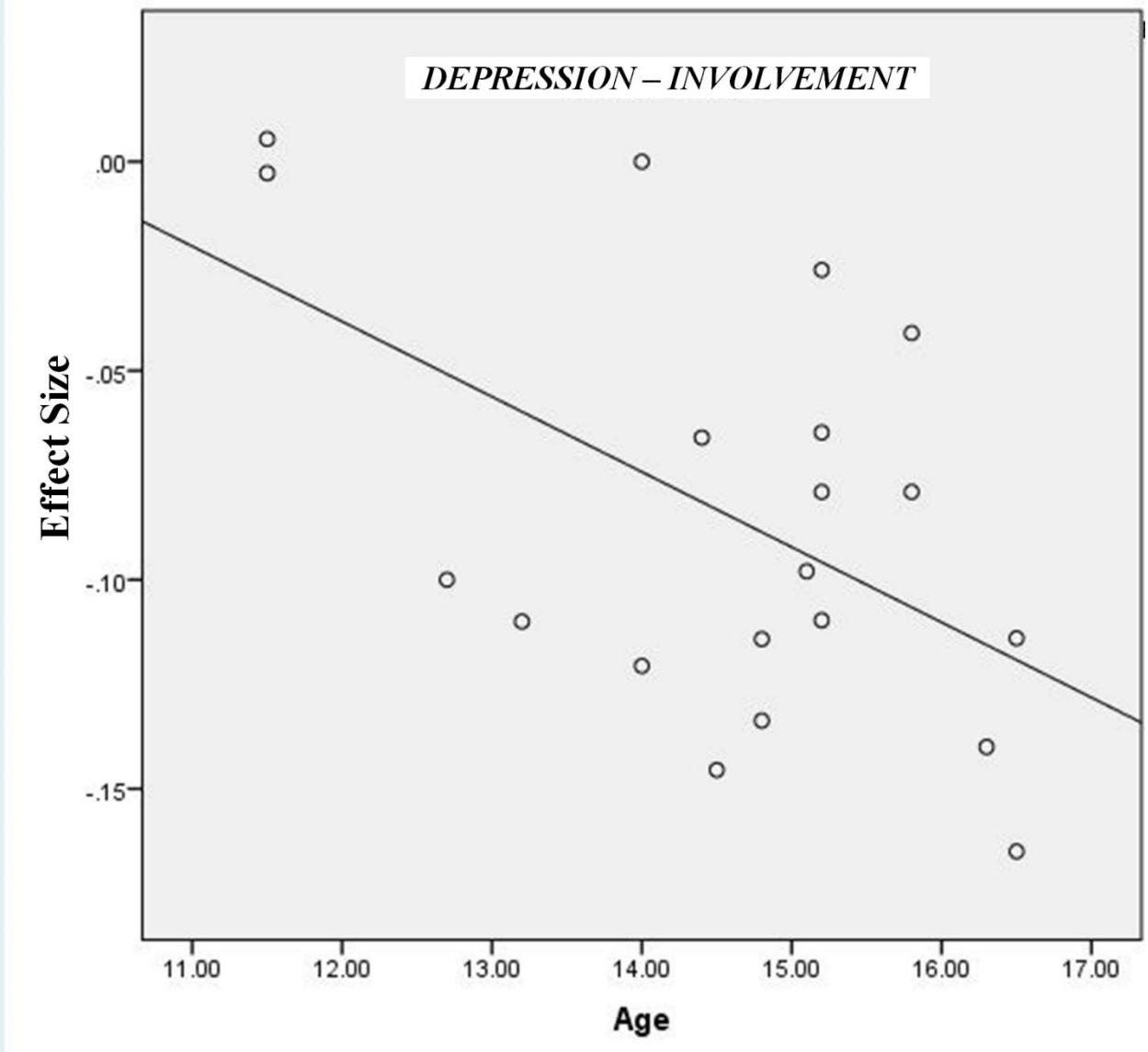

Figure 4. Significant moderation for dichotomous index of sport involvement and symptoms of depression.

Subgroup analyses revealed that the type of data also moderated this correlation – identifying differences between studies that collected data with the primary intent of studying the correlation between sport and depression symptom, relative to secondary analysis of existing

data. Specifically, the inverse correlation between sport involvement and depression symptoms was stronger in primary studies (ρ = -0.14, $CI_{95\%}$ [-0.15, -0.12]) compared to secondary analyses (ρ = -0.07, $CI_{95\%}$ [-0.09, -0.05]).

Frequency and volume of sport involvement. There were 22 effect sizes from studies that operationalized sport participation as the frequency or volume of sport involvement – all of which examined correlations with depression symptoms. In this domain, meta-analysis revealed a small negative mean correlation between frequency of sport participation involvement and depression symptoms (ρ = -0.09, $CI_{95\%}$ [-0.11, -0.06]). Although there was significant heterogeneity across these 22 effect sizes (Q = 189.74, p <.001; I^2 = 88.93), neither the sex nor mean age of study participants moderated this correlation. Similarly, subgroup analyses indicated that the effect sizes did not significantly differ between studies that analyzed primary and secondary data.

Duration of sport involvement. The final operationalization for sport involvement related to the duration that adolescents had been participating in sport. Although these effect sizes are listed in Figure 2, the number of effect sizes using this operationalization did not meet the designated threshold (i.e., at least ten effect sizes from at least five original studies) so meta-analysis was not conducted. One study (i.e., Ashdown-Franks et al., 2017) provided effect sizes for the correlation between duration of sport participation and symptoms of anxiety for adolescents involved in team sport (r = -0.11) and for those involved in individual sport (r = 0.02), although both were non-significant. Additionally, we identified nine effect sizes from four original studies that examined the correlation between duration of sport participation and symptoms of depression. For instance, Jewett et al. (2014) provided an effect size of -0.12 for the correlation between school sport participation throughout the five years of secondary school and

symptoms of depression in young adulthood. Across the available evidence there is an indication that duration of sport participation may have a small inverse correlation with depression symptoms, however, meta-analysis of these existing effect sizes could not be conducted.

Scale Design Meta-Regression

After identifying variability in measures of anxiety and depression symptoms, we conducted exploratory moderation analyses regarding whether effects differed in relation to (a) the Likert-type scaling approach as items assessing symptom frequency, or the degree of support or endorsement for each item, and (b) severity of symptoms. Meta-regressions were collapsed to aggregate effects across both anxiety and depression symptom measures for each of the three sport operationalization types. None of these six exploratory analyses revealed significant moderation as a result of the nature of the measure for anxiety and depression symptoms.

Publication Bias

We conducted follow-up analyses to assess the likelihood of publication bias impacting the current meta-analytic findings. Upon inspecting the contour-enhanced funnel plot of standard errors, it was determined that the effect sizes did not deviate from symmetry enough to warrant apparent concern for publication bias (Figure 5). Across all studies that comprise this literature, a non-significant Egger's Regression Test indicated that publication bias was indeed unlikely (Z = -1.18, p = 0.24, $b_{intercept}$ = .04 $CI_{95\%}$ [-0.21, 0.29]). This conclusion was further supported by conducting Egger's Tests on all three core meta-analyses separately – none were significant (i.e., Depression-Involvement: Z = -.52, p = 0.60, $b_{intercept}$ = -.25, $CI_{95\%}$ [-0.72, 0.22]; Depression-Frequency/Volume: Z = -1.61, p = 0.10, $b_{intercept}$ = .47 $CI_{95\%}$ [-0.28, 0.53]; Anxiety-Involvement: Z = .27, p = 0.79, $b_{intercept}$ = .47 $CI_{95\%}$ [-0.21, 1.14]).

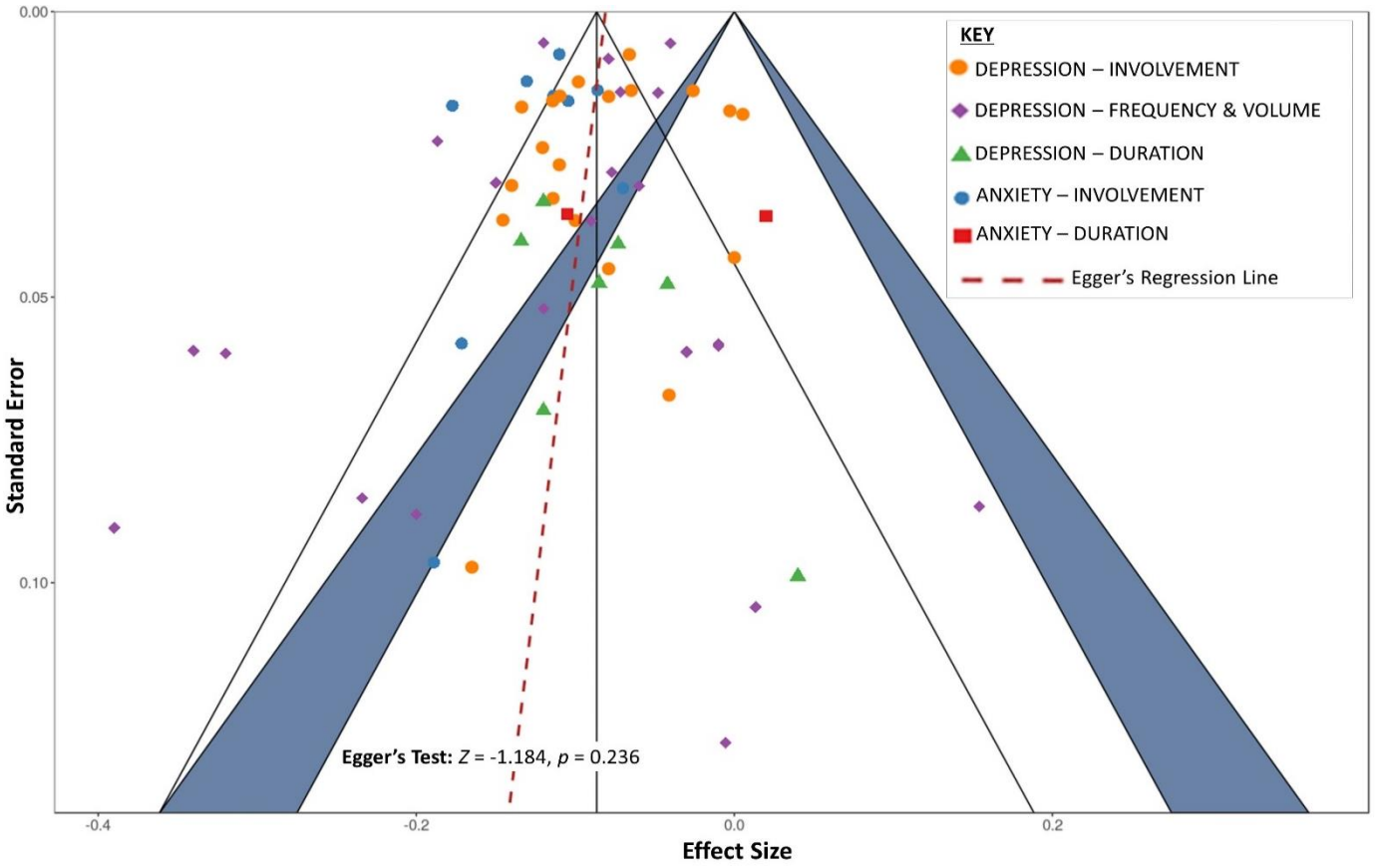

Figure 5. Contour-enhanced funnel plot with Egger's regression line to assess likelihood of publication bias.

Discussion

Research spanning decades provides evidence that self-reported anxiety and depression symptoms are lower in adolescents who engage in greater daily physical activity or who participate in physical activity interventions (Ahn & Fedewa, 2011). However, this evidence has been slower to crystallize in relation to sport. The current systematic review and meta-analysis of peer-reviewed literature examined correlations between organized sport involvement and self-reported anxiety and depression symptoms. We observed a growing evidence base of 29 primary and secondary empirical studies to examine correlations between anxiety or depression symptoms and participation in sport. Sixteen of these investigations were published within the

past five years. Meta-analysis indicated that sport participation a held a negative – albeit small – correlation with anxiety and depression symptoms. These effects were evident within studies assessing whether or not adolescents were involved in sport, as well as studies employing continuous measures of frequency, volume, or duration of sport participation. This discussion incorporates insights regarding how we may advance research alongside implications that can be drawn from these findings regarding correlations between sport involvement and mental health.

Perhaps most notably, the meta-analysis revealed that sport involvement was significantly and inversely associated with anxiety and depression symptoms. Significant effects were evident in the three analyses where enough studies had been published to permit meta-analysis: (a) anxiety associated with binary sport involvement, (b) depression associated with binary sport involvement, and (c) depression associated with either the frequency or volume of sport involvement. These findings align with expectations for the role of organized sport within youth development (Eime et al., 2013). Although effects were relatively weak in magnitude and emerged from survey-based studies, the majority of studies used prospective designs with large samples that provide evidence that sport-involved adolescents report relatively lower levels of anxiety and depression symptoms.

Whereas the inverse correlation between sport and symptoms of mental disorders is small, the magnitude aligns with recent reviews involving the relationship between physical activity and mental disorders. For instance, a review of survey studies reported comparably small effect sizes for the relationships between physical activity behavior and depression symptoms, both when considering longitudinal studies (ρ = -.07) and cross-sectional studies (ρ = -.17; Korczak, Madigan, & Colasanto, 2017). It is nevertheless notable that a review-of-reviews conducted by Biddle et al. (2018) reported comparably stronger effect sizes for the relationship

between depression symptoms and physical activity, particularly for reviews that aggregated experimental evidence. We anticipate that researchers may have more power to estimate correlations between sport and anxiety or depression symptoms by: (a) using more detailed measures of sport involvement, or (b) experimental studies manipulating sport involvement. One further possibility is that sport may have a strong benefit for many, but also a detrimental effect for others who experience ostracism from peers or other detrimental social or physical experiences (e.g., MacDonald et al., 2012). As these positive and negative effects would constrain effect sizes, an avenue for future research would be to examine potential moderators (e.g., program quality, social context) that predict variability in the outcomes resulting from sport involvement. Nevertheless, even weak effect sizes can denote meaningful and salient effects, especially when they are consistently evident.

Although these effects are consistent, few studies have tested how or why sport involvement is inversely associated with anxiety and depression. Researchers tend to align theoretically with expectations that sport delivers opportunities for physical activity and social interactions that, independently, are protective factors (e.g., Eime et al., 2013; Fraser-Thomas et al., 2005; Paluska & Schwenk, 2000). However, we could not test the mediating role of physical activity or physical activity because mediation was neither directly tested within the studies reviewed, nor were these constructs measured frequently enough to use meta-regression models to test associations indirectly. An exception is a study conducted by Doré et al. (2018) that investigated whether social connectedness mediated the relationship between team sport and anxiety and depressive symptoms. Additionally, some investigations (e.g., Ashdown-Franks et al., 2017; Sabiston et al., 2016) contrasted team and individual sport participation as a proxy for social interaction, finding early evidence that depressive symptoms were less frequent for

adolescents involved in team sport. However, studies have employed varying operationalizations of ‘team sport’ and overlooked evidence that individual sport activities commonly integrate social or group contexts (Evans et al., 2013).

In addition to clearer and more consistent measures of sport environments, it is also feasible to directly study mechanisms. For instance, one recent investigation revealed that childhood (i.e., 9 to 11 years) involvement in increasingly social sport contexts was a significant predictor of hippocampal volume, a brain region that has been found to show a reduction in symptoms of depression as assessed using functional magnetic resonance imaging (Gorham, Jernigan, Hudziak, & Barch, 2019). The correlation between sport involvement and mental health could also be explained by additional processes, beyond social interaction and physical activity. For example, involvement in sport may be linked to other health behaviors that influence mental disorders (e.g., diet, sleep, and lifestyle choices) or may develop self-regulation skills for managing daily stressors (Fraser-Thomas et al., 2005). Despite these pathways, further mechanistic research must examine third variables that may account for relationships between sport involvement and mental health.

A further observation is that effects were heterogeneous and varied across study design and sample features, with moderation analyses revealing noteworthy trends related to age and sex. As it pertains to the correlation between depression symptoms and the binary indicator of sport involvement, metaregressions revealed that the inverse effects were stronger in samples that were relatively older. Although the prevalence of depressive symptoms increases throughout adolescence (Merikangas et al., 2010), this finding highlights the importance of keeping adolescents in sport reaching into later adolescence, which is a period when particularly high levels of sport drop-out have been reported (Balish, McLaren, Rainham, & Blanchard, 2014). A

second moderation was that studies including a greater proportion of male participants reported a stronger inverse correlation between sport involvement and anxiety symptoms. Whereas it is important to consider that adolescent females have a higher prevalence of anxiety symptoms than males (Merikangas et al., 2010), this significant moderation provides early-stage evidence that sport involvement may have unique benefits for adolescent males. Alternatively, adolescent males with fewer symptoms of mental disorders may also be those who are more likely to participate in sport, given that boys participate in sport at a higher rate than girls (Slater & Tiggemann, 2011). Slater and Tiggemann (2011) also found that adolescent females experience more adverse social experiences in sport, which could hinder potential protective effects on mental health. Additional research is thus needed to test mediators or additional variables that explain potential sex differences within relationships between sport and mental health.

Exploratory moderation analysis conducted on scale design revealed that neither component (i.e., Likert-type scale design and severity of symptoms) moderated the association between sport participation and symptoms of anxiety and depression. Nevertheless, similar to our discussion relating to the operationalization of sport participation, sport researchers should employ consistent measures to eliminate potential interference on effect sizes. As such, we call upon the leaders in this domain to form a consensus on measurement approaches used within large scale government-funded studies.

As the final notable moderation, we observed that studies involving secondary analyses on existing datasets found a smaller inverse correlation between binary sport participation and depression symptoms, compared to studies in which the primary study aim was to examine the correlation between sport and depression symptoms. Several studies used existing datasets such as the National Longitudinal Study of Adolescent Health (USA; Babiss & Gangwisch, 2009), the

Nicotine Dependence in Teens study (CAN; Sabiston et al., 2016), or the Healthy Neighbourhoods Study (AUS; Kremer et al., 2014). Meanwhile, the 41% of studies using primary data tended to be smaller studies including data collected by the authorship team. Of course, the use of secondary data entails benefits such as the opportunity to capture data from large samples that are often representative of their respective populations and substantial power for testing relationships. Nevertheless, the use of secondary data means relying on measures that may have been selected with alternative study aims in mind and provide few opportunities to design studies to test specific questions and examine potential mechanisms.

Another novel observation within this review related to the diverse sport operationalizations that we identified: Researchers have focused on sport involvement as a binary value, as well as the frequency, volume, or duration of sport involvement. Along with this diversity, comes a threat to the generalizability of a finding using one operationalization to studies using other approaches. For instance, a scale distinguishing time spent in sport as 'no sport participation', 'weekly participation', or 'more-than-weekly participation' (e.g., Brière et al., 2018) would presumably hold a relationship that differs in slope and composition from a scale measuring hours involved per week (e.g., Wang, Chow, & Amemiya, 2017). In addition to diversity in operationalizations, there were threats to validity for approaches to represent sport involvement. Authors commonly employed assessments of sport involvement that: (a) were vague in how sport was defined to participants (e.g., "*do you participate in sporting activities?*"; Fatiregun & Kumapayi, 2014), (b) may be challenging to respond to (e.g., "*indicate the number of sports teams on which you participated in the past year*"; Duncan, Strycker, & Chaumeton, 2015), or (c) that entail researcher-imposed categories that may not fully represent the contexts

involved (e.g., classifying sports as ‘team’ or ‘individual’ based on the name of the sport; Ashdown-Franks et al., 2017).

These issues seemed especially evident for studies using secondary data. Using secondary data amplifies the challenge of accurately and consistently measuring sport involvement, because large scale studies tend to include limited detail regarding the sport contexts or involvement patterns of participants. We argue that richer description of sport involvement could be critical to factor out possible confounds and to reduce measurement error. These concerns were highlighted by Robertson, Hague, Evans, and Martin (2019) who advocated that researchers assess and report richer information regarding sport contexts and samples. More complete contextual descriptions within studies may even enable opportunities to aggregate findings across studies. For instance, our current analysis could have entailed a more complete assessment effect size heterogeneity, had authors consistently reported sport types, competitive levels, sport contexts, or additional demographic aspects more comprehensively.

Even though we did not pursue other dependent variables, the process of conducting this review identified a broader spectrum of mental health indices that are increasingly being applied (e.g., internalizing or externalizing behaviors; well-being) as well as broader approaches to assessing these constructs (e.g., parent-, peer-, or teacher-report). It may be of special interest to use a positive mental health indicator as the dependent variable such as subjective well-being (e.g., Merglen et al., 2014). Studying variability in the degree to which adolescents fully actualize positive mental states could help determine if sport participation has the ability to optimize mental health, beyond the reduction of mental disorders indicators.

Limitations and Future Directions

It is important to consider the boundaries of this review, including sample age and mental disorder measures. Our study was designed to capture adolescent sport participants, which left numerous studies involving children excluded from analyses. Only original peer-reviewed studies that were published in English were considered for inclusion in this review. This is a limitation, considering that unpublished research and work in differing languages would have been overlooked. This review was also constrained to anxiety and depression symptoms. As such, this review is not a complete description of the relationship between sport involvement and mental health across the trajectory of development.

Compared with sample age or measurement, a further constraint to this research is that sport is often only one of several adolescent extracurricular activities. Researchers have made numerous calls to integrate disparate lines of investigation regarding extracurricular activities (Fredricks & Eccles, 2006), but our review only located five studies that contrasted sport participation to other forms of participation in relation to anxiety and depression symptoms. Given that sport participation can only be understood in the broader context of adolescents' lives, further investigation of additional activities is essential.

Further research is critical to fully realize the theoretical and practical significance of this research. Even though numerous theoretical frameworks contribute to understanding of how sport may be a protective context, frameworks of positive youth development (e.g., Côté, Turnnidge, & Evans, 2014) are closely aligned to the goals of this review. This review provides support for frameworks identifying positive outcomes of sport involvement, while also calling on the need for models to balance positive and negative outcomes. Although positive youth development models emphasize a strengths-based approach with youth (e.g., Larson, 2000), it

may be important to develop conceptualizations that focus on positive developmental outcomes of sport alongside the potential to reduce symptoms of anxiety and depression.

Based on the design of underlying studies, this review also provides little guidance regarding the mechanisms that are central to positive youth development frameworks (e.g., personal assets, life skills, behaviors). For example, the personal assets framework (Côté et al., 2014) describes how optimal sport activities, environments, and relationships foster developmental assets like perceptions of connection, character, confidence, and competence. Côté and colleagues (2014) posit that these assets are often critical for youth to gain behavioral, social, and cognitive outcomes through sport. These contextual features and mediating mechanisms are critical to advancing theoretical and practical implications.

In closing, this systematic review and meta-analysis provided evidence that sport participation during adolescence is inversely correlated with symptoms of anxiety and depression. The recommendations we have made for future research are important for advancing these perspectives of youth development. We especially identify a need for researchers to collect primary data in studies that are designed to describe the ways that youth are involved in sport. If researchers can better characterize sport contexts while reporting on psychosocial mechanisms that predict lowered anxiety and depression symptoms, we can make more precise theoretical claims. In turn, we may also make more informed decisions about the forms of adolescent sport involvement that should be promoted. As researchers develop a better understanding of how and why sport involvement is inversely associated with symptoms of anxiety and depression, youth sport can be designed to maintain or strengthen this association.

CHAPTER 3: MANUSCRIPT 2

TEAM TALK: DEVELOPING AND EVALUATING A PEER-BASED MENTAL HEALTH LITERACY INTERVENTION AMONG YOUTH SPORT TEAMS

Among numerous positive and negative life events throughout adolescence, mental health problems are – for many individuals from 12 to 18 years of age – one common aspect of the transition into adulthood. Approximately half of mental disorders emerge by the age of 14 years, with anxiety and depression being the major concerns (Kessler et al., 2009). For example, around 30% of Americans between the ages of 12 and 18 years will experience symptoms of depression in a given year (US Department of Health and Human Services, 2017). Mental health problems related to anxiety and depression symptoms are also critical to consider because of their cascading effects through significant economic, personal, and social costs that can last the entirety of one's life (Costello, Egger, & Angold, 2005; Kessler et al., 2007). Kamal, Cox, and Rousseau (2017) revealed that the United States government spent 89 billion dollars on mental disorders in 2013 and predicted that this expense would increase in subsequent years.

Considering that mental disorders among adolescents are a societal burden related to health, there is a critical need for community-based interventions to address mental health problems during adolescence. Organized sport is a promising context for such interventions because it delivers psychosocial benefits, social capital, and youth development via the potential to form relationships with peers and adults within community programs (Eime et al., 2013). Whereas these positive psychosocial outcomes are delivered 'passively' through ideal sport environments, there is evidence regarding the success of preventive interventions with explicit goals of preventing mental disorders and promoting mental health (e.g., Liddle, Deane, Batterham, & Vella, 2019; Vella et al., 2019). Indeed, Gould's (2019) narrative review

considering the future of youth sport research highlighted that one key area of future research was to develop of strategies to enhance adolescent sport participants' mental health.

Sport is also a promising setting for preventive interventions because most adolescents engage in sport or physical activity programs in their communities (Tremblay et al., 2016). The prevalence of sport settings means that mental health messaging can be delivered in ways that complement messages from other community contexts like schools, healthcare settings, or churches. This aligns with the value of multi-level prevention approaches that are valued in broader frameworks regarding community-based health promotion (Glanz, Sallis, Saelens, & Frank, 2005) as well as more specific frameworks regarding promoting mental health in communities (i.e., mental health literacy; Jorm et al., 1997). These approaches are reflected in a recent intervention to promote mental health literacy by targeting adolescent athletes through individual education and messages, while also delivering interventions to coaches, parents, and entire teams (Vella, Cliff, & Okely, 2014; Vella et al., 2019). Viewing the sport team environment as a promising target for promoting mental health literacy, the current research sought to develop and pilot an intervention that directly targeted components of athletes' peer environments that were expected to amplify intervention goals.

Promoting mental health literacy through sport

Mental health literacy is the guiding framework for several recent sport-based interventions to promote mental health (e.g., Vella et al., 2018; Hurley, Allen, Swann, Okely, & Vella, 2018). Similar to the broader focus on health literacy in contemporary health scholarship, one key goal for targeting mental health literacy is to empower the general public with the knowledge regarding the wellbeing of themselves and others (Jorm, 2015). When compared with strategies delivered in primary care for people experiencing mental health problems, a broader

concern is that individuals often lack knowledge and hold negative attitudes about mental health. People lack knowledge regarding available mental health resources, often avoid seeking treatment, and may not even be aware of how to recognize mental health problems (Jorm et al., 2012). Jorm et al. (1997) developed a framework that pertains to defining mental health literacy in terms of its link to prevention strategies, disorder recognition, help-seeking and self-help knowledge, and awareness of professional treatment (Jorm et al., 1997). Interventions have effectively improved mental health literacy of high school students (Pinto-Foltz, Logsdon, & Myers, 2011), healthcare employees (Moll, Patten, Stuart, MacDermid, & Kirsh, 2018), and random samples (Wright, McGorry, Harris, Jorm, & Pennell, 2006).

Mental health literacy programming is increasingly evident in the context of sport. For instance, Sullivan, Murphy, and Blacker (2019) have developed measures to evaluate perceptions of mental health literacy with athletes and athletic training staff in intercollegiate sport. Recent interventions with adolescents also apply Jorm's (2012) mental health literacy framework. Vella et al. (2018) sought to determine the effectiveness of this strategy through a multi-component program named *Ahead of the Game*. This program aimed to increase the mental health literacy of male adolescent athletes and their support systems (i.e., parents and coaches).

The *Ahead of the Game* program also intervened upon group environments through a workshop termed *Help out a mate*. This 45-minute workshop was delivered to intact teams and focused on increasing knowledge of mental health problems and intentions to provide and seek help for those experiencing such concerns (Vella et al., 2018). *Help out a mate* also targets an implicit goal of impacting inherently social perceptions like stigma within teams. Liddle et al. (2019) conducted a randomized-control trial with a moderate sample of 102 adolescent male athletes across nine teams, assessing the effects of the *Help Out a Mate* intervention compared to

a waitlist control condition. Although the authors did not identify between-group differences for some core outcomes (e.g., personal help-seeking intentions; psychological distress), increases were evident for several outcomes at a one-month follow-up. When compared to baseline assessments and the control condition, athletes who participated in *Help out a mate* reported increased intentions to support peers and developed positive attitudes that relate to recognizing mental health problems in themselves and others.

Preliminary evidence from *Help out a mate* also highlighted the potential to consider team environments and related group processes when developing mental health literacy interventions. Beyond evidence that interventions involving peers have resulted in positive mental health literacy outcomes (Liddle et al., 2019; Vella et al., 2018), qualitative interviews reveal that adolescents prefer peer group interventions when discussing topics such as mental health (Swann et al., 2018). Adolescent athletes consider connection to their team as a crucial factor that influences their willingness to participate in interventions (Swann et al., 2018). Given that team environments can translate to positive health-related outcomes and intervention adherence, it is crucial to develop effective ways to use team environments to promote mental health.

Harnessing small group processes

Beyond being a peer setting that athletes prefer to receive interventions within, sport teams entail numerous small group processes that could be harnessed within mental health interventions. Researchers have indeed reported that when youth belong to ideal team environments, they tend to report positive outcomes such as confidence and social connectedness (Eys & Evans, 2018). There is also emerging understanding that team processes within groups can be leveraged in interventions achieve aims that fall beyond merely strengthening bonds

within teams. For example, Kroshus, Garnet, Baugh, and Galzo (2015) described how interventions seeking to increase youths' willingness to report concussion symptoms in sport could leverage small group norms – focused on sharing information among coaches, parents, and teammates.

Related to mental health, small group processes related to norms and identity could be harnessed in team-based interventions. *Social norm*s refer to informal rules that guide individual behavior in groups (Cialdini, Kallgren, & Reno, 1991). Social norms are commonly the target of interventions related to health behaviors particularly because they are so readily shifted within small groups. For instance, McAlaney et al. (2011) discussed the development of a social norms approach to drug education and prevention, aiming to reduce misconceptions around others' consumption. Presuming that it is likely that small groups construct behavioral norms regarding supportive behaviors among teammates as well as personal disclosure, they are a potential target for mental health interventions.

Along with subjective norms, being a member of a small group tends to entail social identities that more abstractly provide the sense of what it means to 'be' a group member. Social identity is the portion of an individual's self-concept which derives from knowledge of group membership (Tajfel, 1981). Adolescent athletes rapidly develop social identities within sport teams that are salient for their mental health (Rees, Haslam, Coffee, & Lavallee, 2015). Identifying strongly with a group is associated with many psychological benefits. For instance, a recent correlational study with adolescent male athletes focused on the autonomy that adolescent athletes and revealed that sport autonomy enhanced subjective wellbeing and reduced psychological distress – but only for athletes with strong sport team identities (Vella et al., 2020).

When their team identity was weak, even being in an optimal motivational environment was not associated with their wellbeing.

Although social identities can be valuable on their own for wellbeing, their connection to social norms is also key to consider. That is, social identities also strengthen the pressure for members to align their own behaviors and attitudes with those of the 'group' (Bruner, Martin, Evans, & Benson, 2020). It is plausible that athletes with stronger social identities might pay more attention to the attitudes of their teammates regarding mental health, and the typical strategies of teammates or coaches to support one-another. Sport research has also revealed that team-building strategies are available to change both team norms and social identities – so these are modifiable factors within groups. Thus, it seems likely that an ideal mental health literacy intervention delivered in sport teams may integrate strategies to reshape what adolescent athletes believe that being member of their group entails (norms) while reinforcing the athletes' beliefs that they value their identity as a team member (identities).

Current study

It is critical to develop and employ interventions that develop adolescents' knowledge about mental health. Such interventions show particular promise when they adopt a broader perspective involving mental health literacy, providing resources that build their skillset to seek help or assist peers experiencing mental health problems. Team environments are both desirable and efficient settings for delivering interventions with youth, while also including processes that can be harnessed to amplify intervention messages. The current research reports on the *Team Talk* intervention, which aims to increase adolescent athletes' mental health literacy while linking such messages to group norms and identities. We specifically conducted the current research to adapt a peer-based mental health literacy intervention for adolescent sport teams and

evaluate the intervention overall. The trial was particularly designed to evaluate feasibility and acceptability, when considering the potential effectiveness of the intervention and its usefulness in sport contexts. A feasibility and acceptability focus for the trial was critical because: (a) the peer-based strategies used in this intervention were unique compared to past research, and (b) because we delivered *Team Talk* within a novel context. Notably, although numerous life skills and youth development interventions have been studied within the United States, existing evaluations of sport-based mental health interventions were conducted in international settings outside of North America. This distinction is relevant, considering that competitive sport systems within the United States often differ from those in other countries such as Australia, Canada, or the United Kingdom (e.g., structure and processes; Parent, Naraine, & Hoye, 2018; Tacon & Walters, 2016).

Method

Conceptual framework and methodological approach

Our approach to evaluating feasibility and acceptability for pilot workshop sessions involved gathering critical information throughout recruitment and during implementation, along with feedback from athletes, coaches, and parents. Our approach resembled that of recent formative and/or process evaluations reported in relation to mental health in sport (e.g., Vella et al., 2019) as well as physical activity (e.g., Thøgersen-Ntoumani et al., 2019). When researchers thoroughly evaluate interventions based on initial changes in target outcomes or the experiences of those involved in interventions can identify what is most effective, for whom, and through which contextual conditions. Additionally, such process evaluations are necessary to understand why specific intervention components are effective or ineffective and can reveal problematic or

ineffective components before they are delivered at a large scale (Thøgersen-Ntoumani et al., 2019).

We used a mixed-methods design and collected data through recruitment and implementation logs, surveys, and interviews. Whereas acceptability was measured directly from athlete participant surveys and through interviews, the RE-AIM framework (Glasgow, Vogt, & Boles, 1999) more generally informed our approach to identify relevant indices that may relate to feasibility along with distal indicators of effectiveness. Researcher logs and participant surveys targeted reach (e.g., proportion of eligible teams and athletes involved in the trial), effectiveness in influencing presumed proximal mechanisms including self-efficacy and social identification, and implementation (e.g., whether facilitators delivered content as intended). Interviews targeted these components, along with adoption and maintenance in terms of the potential for clubs, coaches, and athletes to willingly participate or deliver this intervention over time.

Participants and sampling approach

Participants were recruited at the level of clubs and teams initially, whereby male and female adolescent sport clubs were contacted using publicly available e-mail addresses and phone numbers. We sought competitive teams that trained at least twice per week and competed regionally, with the presumption that the workshop would be most potent when team members interact frequently. Although teams were recruited from several sports, we focused on competitive lacrosse teams as the population of interest, given the support this research garnered from the United States Lacrosse Association.

Eleven adolescent sport teams from the Northeastern region of the United States participated, including six lacrosse teams, four field hockey teams, and one wrestling team. A total of 174 adolescent athletes (84% female) belonged to these 11 teams and participated in the

intervention. The sample of interest in the current study when relating to survey measures focused on a subset of 119 participants from across the 11 teams who completed the intervention, but who also chose to complete the entire survey following the intervention. Participants ranged from 12 to 18 years of age, although most (i.e., 86.6%) participants were from 13 to 16 years of age (M = 14.89, SD = 1.36). Regarding ethnicity, the majority of participants (i.e., 90%) identified as Caucasian, 3% identified as African-American, 3% identified as Asian, 2% identified as Hispanic, and 2% identified as other. Participants reported an average of 5.98 hours (SD = 4.41) training and competing with their team per week and reported 6.19 hours (SD = 5.26) participating in other sport activities or training alone. Participants averaged 2.66 years (SD = 1.98) on their current team.

Follow-up interviews were completed with a further subsample of five athlete intervention participants who elected to participate, along with nine parents of athlete participants and two coaches. Athlete participants from lacrosse and field hockey teams participated in these interviews. Interviews were conducted by the facilitators who led the intervention (i.e., MBE and MP).

Procedure

Intervention design: *Team Talk*. Recall that the *Team Talk* intervention was inspired by the *Help out a mate* workshop within the multi-component intervention delivered by Vella and colleagues to adolescent male athletes in Australia. Aligning with the concept of mental health literacy and structured from Mental Health First Aid curricula (Jorm, 2012), the broad goal of *Help out a mate* is to increase participants' ability to recognize mental health problems and assist peers experiencing such problems. The *Team Talk* intervention was nevertheless delivered in a novel context (i.e., United States; male and female teams), included a focus on group processes,

and integrated resources that were directly relevant to the regional context for athletes. Relating to the group-based components, athletes discussed what made their team unique as well as aspects of their team identity related to peer support – identifying behavioral norms related to supporting teammates. Mental skills training content was also integrated in *Team Talk*, as a general introduction to sport psychology as a sport science. Table 4 provides a detailed schematic of all content covered during the workshop, focused on four main components in the following order: (a) orientation and social identity, (b) mental skills training, (c) mental health literacy, and (d) team norms.

The *Team Talk* intervention was piloted to five teams to assess the strengths and weaknesses of various components. Potential improvements were discussed between the two facilitators and modifications were made accordingly (e.g., strategies to increase participation, time spent on each component). The resulting intervention was delivered to the teams featured in the current study. This study was approved by the Institutional Review Board at the lead authors' institution.

Intervention delivery. The intervention was delivered by two facilitators (i.e., MBE and MP): A faculty member and a graduate student with education pertaining to youth development and mental health within adolescents. Furthermore, both facilitators attended mental health first aid certification training prior to delivering workshops. A research assistant contacted sport clubs through email, social media, and phone calls. Leaders of clubs that agreed to participate were contacted to arrange an ideal time and location for workshops targeted toward individual teams of athletes. Regarding context, workshop sessions took place at sites that were convenient for each respective club, including available classrooms, conference rooms, and open space at

training facilities (e.g., bleachers). Clubs incurred no cost for the sessions and each team was compensated with a $50 gift card for participating.

Prior to initiating the workshop session, athletes filled-out a pre-survey that included: (a) open-ended items prompting athletes to reflect on their team identity, along with (b) survey items regarding social identity strength and self-efficacy (i.e., baseline values related to effectiveness evaluation). Following these initial questions, one facilitator presented the material while the other facilitator reviewed team identity item responses, with the goal of crystallizing themes from the team's responses and summarizing these to guide team discussion later in the workshop. The workshop session was guided through content presented through PowerPoint slides, or through printed 36" X 42" posters including session content when electronic presentations were not possible. Athletes were also provided with a worksheet related to mental skills training as well as a resource card with names and contact information for regional and national resources, such as help lines, mental health service providers, and sport-specific organizations (e.g., 'SafeSport'; safesport.org).

In addition to content presented by facilitators, discussion was encouraged among team members to elaborate on key concepts. This was especially for the final component of the intervention that featured team discussion of pre-survey responses regarding team identity. After introducing the most common responses and reading several de-identified responses, the workshop facilitator prompted team members to discuss responses and elaborate on their perspectives. Additionally, participants were prompted to identify team norms regarding the behaviors that members can engage to support one another.

Athletes completed surveys after the intervention session that included demographics (e.g., sex, age, ethnicity, years of involvement), along with surveys related to social

identification, intervention efficacy, and acceptability of intervention components. Researchers also invited parents, coaches, and athletes to participate in follow-up one-on-one phone call interviews to discuss the intervention. Athlete interviews included questions on further intervention feedback and focused on the extent to which participants viewed peers in sport as sources of support. Parent and coach interviews entailed describing the broader goals of the intervention and asking them to consider its adoption and implementation within adolescent clubs. Additionally, all participants were asked to provide recommendations relating to how the intervention could be improved to better meet the overall goals. Each individual who participated in a follow-up interview received compensation in the form of a $20 gift card.

Measures

Athlete surveys. Athlete participants completed pre- and post-intervention surveys including several tools.

Acceptability. The post-intervention survey included questions to obtain feedback from participants on a Likert-scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Each of the seven items can be found in Table 5. Although items were developed for the purpose of the current research, items were adapted from the AFFIRM acceptability scale which includes items on intervention appropriateness, enjoyment, and usefulness (Craig & Austin, 2016).

Social identity strength. The Social Identity Questionnaire for Sport was used to assess social identification strength with one's team (Bruner & Benson, 2018). This scale includes nine items completed on a Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) and has been supported through validation research conducted with adolescent athletes (Bruner & Benson, 2018). Given that we intended to examine how athletes' perceived identity strength differed pre- and post-intervention, separate social identification items were distributed into pre-

and post- surveys. A split scale approach (4 items at pre-intervention; 4 items post-intervention) was chosen to reduce participant fatigue or item recall from completing identical items before and after the workshop. Given the odd number of items, one item from the questionnaire was removed (i.e., *I feel strong ties to other members of this team*). The four items assigned to each timepoint are provided in Table 6. Mean scale scores were computed from responses at each time point.

Self-efficacy: Recognizing problems and providing help. Self-efficacy was measured with respect to recognizing mental disorder symptoms and helping teammates experiencing mental health problems. Two items were included at pre- and post-surveys and were completed on a scale from 0 (*not at all confident*) to 100 (*very confident*). Athletes first read a 50-word long fictitious scenario where a teammate was acting in ways that were not normal for them (e.g., missing practices) and that they overheard the teammate saying that he or she felt 'down'. Athletes then rated their confidence that they could recognize the athlete was experiencing mental health problems (item 1), and their confidence in asking teammates how they are doing (item 2). While we developed these items for the purpose of this study, they were adapted from items used by Hurley and colleagues (2018).

Facilitator logs. A further source of data was obtained through facilitator logs tracking recruitment as well as workshop implementation. Regarding recruitment, clubs that were contacted to participate in the intervention was recorded in an excel spreadsheet by a research assistant, along with details regarding responses of clubs. Regarding implementation, facilitators completed a post-workshop journal regarding experiences during each session (e.g., group engagement, perceived clarity of delivery, any challenges during delivery), along with structured

prompts including: (a) reporting all components that were delivered, and (b) workshop context, including venue, time of delivery, and duration of delivery.

Analyses

Analyses focused on several key goals of this study: (a) summarizing researcher logs regarding implementation and reach, (b) descriptive analyses involving acceptability items, (c) analyses examining change in social identity and efficacy items, and (d) thematic analyses of qualitative interviews. Regarding descriptive analyses to evaluate participants' responses regarding acceptability, these analyses focused on reporting average (*M, SD*) perceptions across the sample regarding acceptability, and through t-tests to identify mean differences between the items. We also sought to examine correlates of acceptability items – whether certain participants viewed the intervention differently from others – and to identify potential differences in acceptability. We thus explored differences in perceived acceptability across different participant groups (e.g., age, duration with team) using independent samples t-tests and bivariate correlations. Third, quantitative analyses focused on evaluating preliminary evidence regarding effectiveness. Measures that were included in both pre- and post-intervention surveys (i.e., social identity, self-efficacy) were contrasted using dependent samples t-tests to probe for difference before and after the intervention. Fourth, qualitative interview responses were analyzed, with a focus on insights from participants regarding potential adoption and maintenance of intervention activities within their organizations as well as general beliefs about the relevance of teammate relationships for athlete mental health.

Results

Recruitment and implementation

Despite initial interest in the intervention from clubs, there was difficulty in translation to delivery. Among lacrosse teams contacted via e-mail or phone, 8% of teams replied to recruitment, with only 1% scheduling an intervention. Given the difficulty in recruiting lacrosse clubs, other youth sports were considered for intervention participation. However, percentages were similar among other sports such as field hockey, swimming, wrestling, and volleyball (i.e., 6% replied to recruitment and 2% scheduled an intervention). Out of the six coaches that agreed to the intervention, three held a degree in sport psychology or related field (i.e., 50%). Presumably, coaches with a background in sport psychology may place a higher priority on the intervention content.

Several workshops were scheduled during a large multi-day tournament, with teams completing the workshop during their down time (i.e., before or after their daily games). Although this was desirable for parents and athletes in most cases, two workshop sessions were constrained regarding the time available because of scheduling challenges with delivering sessions amidst team activities. Other workshops were delivered before or after weekly team practices. Based on facilitator logs, participation rates during the intervention varied but were generally high. Interventions ranged from 40 to 75 minutes – with an average around 56 minutes (M = 56 minutes; SD = 11 minutes). On average, the time spent on each of the four-intervention components was approximately equal. Coaches observed all or part of nine of the eleven intervention sessions.

Barriers relating to reach and implementation were identified, including difficulty in the recruitment and research process. Regarding the difficulty in recruitment, several aspects may contribute. First, the recruitment involved directly recruiting clubs and coaches rather than using a top-down recruitment approach through a broader system of clubs or leagues. This meant that

individual contacts with coaches and clubs were necessary – making recruitment more demanding – and that we were unable to use ‘champions’ within the community. Particularly when using e-mail, this approach likely meant that coaches felt limited pressure to return a message to a research team they had not yet met. Second, it is possible that attitudinal barriers (i.e., stigma) prevented clubs from agreeing to participate. Given the lack of time teams have together, coaches or others involved in the club may prefer to dedicate time to other areas, such as skill development. Third, clubs may have been interested but the timing did not align with their season. For example, some clubs that were contacted were in their offseason, not regularly meeting.

Acceptability

The mean score and standard deviation for each acceptability item is illustrated in Table 5. Participant responses demonstrated relatively positive perspectives in regard to acceptability: Although no clear reference value or comparison is available regarding acceptability, all values were near the high end of the rating scale for items. These high values reflect a general evaluation by participants as having learned a great deal, feeling like they had the potential to apply their learning, and more general enjoyment during the session. Indeed, comparing item means using paired-samples t-tests, significant differences were evident only when comparing items on workshop organization, ability to apply what was learned, and the enjoyability of the workshop.

Recognizing that athletes nevertheless varied regarding these perceptions, we also examined bivariate correlations regarding demographic participant characteristics (i.e., age, years on team, hours with team) along with aspects related to intervention implementation (i.e., ordering of intervention session within the current trial; duration of intervention session) (see

Table 7). Whereas no significant correlations with demographic variables were identified, acceptability items were significantly correlated with both session ordering and duration. Regarding the order of the interventions, those who participated in interventions closer to the end of the trial were more likely to perceive that they had learned a lot ($r = 0.21$), had a chance to participate ($r = 0.19$), and felt that they could use what they had learned ($r = 0.24$). The shift in acceptability relating to the intervention session order may signal overall improvements as facilitators gained experience presenting the material. Regarding duration, those who participated in longer intervention sessions also perceived that they had a chance to participate ($r = 0.24$), the intervention was organized ($r = 0.23$), and the intervention would help their team be close-knit ($r = 0.28$). Participants in longer intervention sessions may have experienced more opportunities to participate and, therefore, felt closer to their teammates. The order of the interventions and the duration of the interventions had a significant negative correlation, possibly indicating that sessions presented later in the trial were more efficient.

Preliminary Effectiveness

Recall that social identity strength and efficacy were reported before, and immediately following, sessions to help identify plausible shifts in intervention targets. Paired t-tests revealed a significant difference between social identity scores, $t\ (114) = -4.48$, $p < 0.001$ ($d = 0.35$). When compared to baseline responses regarding social identity strength ($M = 6.08$, $SD = 0.79$), participants reported stronger social identities at follow-up ($M = 6.34$, $SD = 0.71$). Regarding efficacy perceptions, significant differences were not identified in relation to symptom recognition or helping teammates. Related to recognizing symptoms of mental disorders, participants reported an average score of 71.78 ($SD = 19.09$) in the pre-intervention survey and a score of 77.56 ($SD = 17.39$) in the post-intervention survey; using a scale from 0 to 100.

Nevertheless, paired samples t-tests did not identify a significant difference between these values (d = 0.32, p = 0.06,). Regarding the efficacy for providing help, participants reported an average of 85.25 (SD = 17.66) and 85.08 (SD = 17.74) on the pre- and post- intervention surveys, respectively. No significant difference was evident when comparing these values (d = 0.01, p = 0.91).

Qualitative Interviews

Athlete, parent, and coach participants generally described positive attitudes toward intervention acceptability during phone interviews. Particularly for parents and coaches, responses focused on the necessity of mental health literacy interventions within the daily contexts of their sport clubs and homes – whereas athlete interviews focused more on their experiences during the workshop itself. Resulting themes focused on perceptions of acceptability and feasibility in the participants' sport contexts, as well as responses regarding potential adaptations of workshops in the future. Furthermore, participants discussed the integration of team-based components (e.g., small group processes).

Acceptability. Athlete participants discussed enjoying the intervention and how they developed knowledge that could be directly applied to support teammates. For example, one athlete discussed learning the importance of checking in with teammates through the intervention:

> "I think it makes us realize that even if someone's acting perfectly fine in practice, we have to still check in on them to make sure they are doing okay and not just acting okay or something."

Particularly because this response was stated by the athlete in the days following the intervention, the similarity of the response to the interventions goals demonstrates that this

participant absorbed the general goal of their workshop session. Additionally, an athlete mentioned the importance of discussing mental health, given the topics lack of attention:

> "I thought it was good to talk about those topics and kind of take a break from the normal practice and talk about things that are going on that I feel like aren't really talked about much."

This point highlights the demand for mental health literacy interventions alongside adolescent athletes' willingness to discuss mental health problems.

Parents of athletes, as well as coaches, specifically focused on the demand for mental health literacy interventions, discussing the prevalence of adolescent mental health problems. For example, one coach anecdotally described a sense that widespread anxiety among adolescent athletes seemed to increase throughout 18 years of coaching. Through these observations, this coach realized the urgency for strategies that can mitigate mental health problems. Additionally, one parent described that many adolescents do not recognize the prevalence of mental health problems and indicated that interventions targeting mental health literacy during the instability of adolescence are critical:

> "Kids need to know that they are not alone. So, I think doing it during adolescence when, you know, puberty and all the other physical factors are being taken into account, I think that's really important and I think we should do that more with kids in that age.

Another parent mentioned how impactful even one session can be for adolescents, describing how she noticed a change in her daughter who participated in the intervention.

An athlete, coach, and parent who all belonged to the same team also described one case where mental health disclosure took place during the intervention – where a teammate described

their own experiences with depression. Although not the goal of the intervention, the athlete described how this increased her awareness of the experiences of her teammates.

Adaptations to enhance adoption in clubs and teams. Despite the overall positive feedback about the demand and acceptability of the intervention, participants reflected on potential adaptations to intervention delivery. Aligning with the challenges from the research team in recruiting participants, coaches and parents both reflected on competing demands on athletes' time and strategies to maintain mental health literacy. Additionally, athletes discussed how potential intervention benefits could be maximized if presented early in the sporting season, especially pertaining to the social component of the intervention.

Given the societal stigma, publicly discussing mental health problems can be difficult for many individuals. As a potential solution to the sensitive topic of mental health, parents discussed the importance of preparing adolescents in advance. For example, one parent suggested providing some of the participation questions a week or so prior to the intervention for athletes to prepare. This could prevent athlete participants from feeling uncomfortable with unexpected topics and generate higher quality discussions.

Athlete participants from two workshop sessions also commented on how the workshop was useful but they were concerned that the key messages may not be maintained within the groups. One athlete described how check-in meetings may help maintain the key message and provide opportunities for athletes and coaches to provide support:

> "I feel like maybe if there were multiple meetings and maybe like once a month or once every two months, just like a quick hour to check-in and see how everyone's doing."

Parents raised a similar concern and offered additional recommendations to ensure mental health literacy is maintained. First, several parents suggested identifying team leaders to facilitate

conversations with other teammates regarding mental health. Team leaders could develop a deeper understanding of signs and symptoms relating to mental health problems and learn to recognize these 'red flags' in teammates. Second, parents discussed how resources designed specifically for coaches and parents could be instrumental in maintaining mental health literacy within youth sport. A coach described how such resources could assist in increasing awareness and community outreach:

> "…and then give the coaches and parents or teachers resources to help maintain that language and outreach is what I would like to see on the bigger scale of all."

Reflecting on small group components of *Team Talk*. When reflecting on interview responses that related to the small group context, athlete and parent reflections demonstrated: (a) concrete or generalized ways that teammate interactions were perceived to have changed after the intervention, and (b) the role of teammates in recognizing to mental health problems.

One coach described how the intervention positively impacted the social fabric of the team, especially the communication between teammates:

> "I think 95% of that group walked out of there like, 'okay this was good for us, that was really awesome' and I think they even gained more knowledge on how to best communicate with their teammates."

An athlete also alluded to the social benefit of the intervention, describing how teammates developed stronger bonds through participating:

> "I feel like some people who had talked before, but not as much, started talking to each other more, creating an even stronger bond, which was nice to see."

Athletes and coaches thus reflected on how the intervention provided an opportunity to strengthen existing bonds with teammates and improve team members' willingness to share their feelings with teammates.

Athletes described how teams can be an effective target for mental health interventions, given the link between relationships and wellbeing. Specifically, one athlete discussed the support she felt from teammates and how her teammates positively impacted her day:

> "They always try and make my day better. Especially if I've had a rough day at school and stuff like that, they'll always be there to cheer me up and make me laugh."

This quote particularly reflects on how adolescents on her team sought opportunities to check-in on her and provide support – even before participating within the workshop.

Athlete participants also described seeking support from teammates because they are a similar age and could be experiencing similar mental health problems. One athlete participant acknowledged that discussing mental health problems with teammates is preferred compared to parents, and this sentiment was shared by a parent:

> "[the athletes] are very hesitant to tell their parents anything. But they're more apt to open up sometimes to a third impartial party because you're not going to judge them. So, it's actually, in my opinion, a great thing that she has this outlet, and that in the same time you're teaching them ways to assist themselves and ways to assist their peers."

This quote further demonstrates the recognition of teammates as potential resources for mental health promotion through the *Team Talk* intervention.

Discussion

This study aimed to evaluate the feasibility and acceptability of an adapted mental health literacy intervention specifically for adolescent sport teams. The *Team Talk* intervention focused

on increasing athletes' mental health literacy and generating supportive small group environments via identities and norms. The current study revealed challenges with recruitment (e.g., timing during season, lack of top-down approach) and identified the potential to enhance the quality of how mental health literacy content is promoted among adolescents. Interviews and surveys from athletes, as well as their parents and coaches, nevertheless provided preliminary support for the feasibility and acceptability of the intervention. This support included positive evaluations of intervention components and descriptions of the necessity for mental health interventions during adolescence. Participants also reported significantly higher levels of social identity post-intervention, supporting the potential for this intervention to target the small group environment. We will focus our discussion toward how this research informs the future design and implementation of sport-based mental health literacy interventions, along with theory about peer relationships.

This mixed methods study revealed promising results particularly for researchers interested in leveraging sport as a catalyst for mental health promotion. This study revealed (a) quantitative effectiveness via descriptively high acceptability ratings, (b) athletes enjoyed components of the intervention, and (c) athletes, coaches, and parents identified a demand for mental health literacy interventions. These results indicate the informative and enjoyable attributes of the intervention, which are both critical to effectiveness. Athletes, coaches, and parents of athletes all discussed a general desire for mental health literacy interventions specifically presented in a group context. These encouraging results demonstrate a demand for mental health education in some form. However, to ensure active participant engagement and intervention effectiveness, it is critical that adolescents enjoy the presentation and subsequent discussions.

When considering whether the current intervention has potential to produce a shift in supposed group-based mechanisms, we identified that athletes generally reported stronger social identification with their team following the intervention sessions. Given the link between social identity and adolescent athlete's mental health (Vella et al., 2020), promoting social identity among teams may be an effective strategy to enhance mental health. We anticipate the prompts to write-about and discuss what made their team unique and important to them may have supported these perceptions of identity and could be useful in other interventions to influence identity. Nevertheless, many techniques can more indirectly foster social identity by drawing members together, such as increasing perceptions of groupness and team-building activities (Martin, Balderson, Hawkins, Wilson, & Bruner 2017; Paradis & Martin 2012). Therefore, youth sport leaders can integrate more regular identity-fortifying strategies into their daily team activities.

Compared to the significant change in identity perceptions, results failed to identify significant differences in athletes' beliefs in their efficacy to recognize mental health problems in teammates and their intentions to provide help to teammates. This is an important observation because it is crucial for effectiveness trials to shape mental health problem recognition. Also, a controlled trial revealed that the *Help out a mate* intervention enhanced adolescent athletes' knowledge of mental health problems and fostered positive attitudes toward mental health (Liddle et al., 2019). Given that the current intervention was derived from *Help out a mate*, these shifts in efficacy are indeed plausible. Perhaps the non-significant effects in our study are related to how athletes in our sample reported relatively high perceptions of efficacy at baseline (i.e., above 70, on a 0-100 scale) and that the study was underpowered to detect a moderate effect regarding shifts in recognizing mental health problems in others. Nevertheless, it is critical

to elicit change in these outcomes, so these topics should be more directly targeted in future interventions.

We also note challenges to recruitment and implementation that resemble many of those reported by Vella and colleagues (2019). One challenge relates to the low rate of coaches and clubs contacted who were willing to participate. Several factors can explain the challenges relating to recruitment, including the lack of a top-down approach, lack of time, and inconvenient timing relating to the team's season. Although speculative, we anticipate that part of this challenge could relate to how we targeted competitive clubs in the community, where athletes pay to participate on teams and travel to the team from within a region. For such teams with diverse members and with a focus on athlete skill development, coaches may struggle to justify the time for this intervention, as opposed to physical training or skill development. However, strategies can be utilized to overcome some of the barriers relating to recruitment, such as embedding mental health literacy content within other activities or training that are demanded within teams more generally (e.g., mental skills training; injury prevention). Researchers could partner with larger sport leagues or governing bodies, which may extend the reach of the workshop and develop 'champions' within organizations to help support the intervention. This approach was used and reported within the *Ahead of the Game* workshop (Vella et al., 2018).

Qualitative interviews demonstrated the impact of the intervention on viewing peers as a potential resource for mental health. Athlete participants, coaches, and parents of athlete participants all recognized peers as a critical resource for mental health promotion and perceived that their involvement was beneficial. Both athletes and parents specifically acknowledged adolescents' preference to discuss mental health with peers, aligning with findings by Swann and colleagues (2018). Furthermore, athlete participants recognized how to apply the information to

be a resource for their teammates. Similar to results from recent qualitative studies (e.g., Hurley et al. 2017; Wiersma & Fifer, 2008), parents of athletes recognized the potential supportive social environment that sport offers.

These quantitative and qualitative results may have implications that extend beyond merely the delivery of mental health literacy interventions, and more generally to strategies to influence group environments. We especially recognized these implications in relation to disclosure. Admittedly, written and discussion activities that asked athletes to reflect on their team identity resembled strategies reported within team-building activities guided by a personal disclosure, mutual sharing approach (e.g., Barker, Evans, Coffee, Slater, & McCarthy, 2014; Dunn & Holt, 2004). The personal-disclosure mutual-sharing approach involves an activity where a facilitator leads team discussions about personal features such as their values and meaning behind their sport involvement (Barker et al., 2014). For example, Dunn and Holt (2004) conducted interviews with intercollegiate athletes who had participated in a disclosure and sharing intervention and described how they felt the activity increased team cohesion, understanding of self and others, and confidence. Anecdotally, athletes often described enjoying the disclosure activities and felt that they supported an overall message of supporting teammates. Dunn and Holt nevertheless noted potential risks of such activities, such as pressure to disclose within a group and the potential for other team members or coaches to make inappropriate use of disclosed information (Dunn & Holt, 2004). Indeed, interview participants from one team reflected on an instance where an athlete disclosed their own efforts to seek help with mental health problems, even though the current intervention was not designed to elicit personal disclosures regarding mental health. As a result, a critical component of interventions such as *Team Talk* involves setting expectations and boundaries before conducting workshop sessions,

and to find ways to ensure the voluntary nature of workshop participation and openness to adjust content relative to any participants who may have adverse responses to any workshop content. Researchers studying prevention related to substance use, mental health, victimization, and other aspects during adolescence must be prepared to manage risks of disclosure (Fisher, 2013).

Regarding future directions, research is required to determine the effectiveness of online resources for participants to explore material further. Studies aimed at determining the most effective way to distribute resources is a critical next step to ensure mental health literacy is maintained among intervention participants, or to consider approaches to deliver similar outcomes to the current intervention but at a larger scale. One particular approach may involve online training or resources to enable coaches to deliver mental health literacy activities within their teams. To accomplish this aim, studies designed to test the effectiveness of online mental health literacy educational courses for coaches are necessary. These online educational courses can be designed to increase mental health literacy and instruct how to facilitate a mental health literacy workshop. Promoting coaches to facilitate interventions may be an effective way to reach more adolescent athletes. Additionally, research has demonstrated the potential utility in using coaches as program facilitators (Goldberg & Elliot, 2008). For example, in a program aimed at preventing substance use (i.e., Adolescents Training & Learning to Avoid Steroids; ATLAS) and another aimed at nutrition and effective exercise training (Athletes Targeting Healthy Exercise & Nutrition; ATHENA), coaches were effectively trained as facilitators (Goldberg & Elliot, 2008). Lastly, considering the lack of racial diversity in our sample, future studies should focus on integrating various perspectives to ensure interventions are inclusive and beneficial to individuals from all backgrounds.

Conclusion

This mixed-methods study aimed to test the feasibility and acceptability of a mental health literacy intervention designed for adolescent sport teams. Overall, participants rated the acceptability relatively high, although acceptability varied across sessions based on contextual factors (i.e., session order and duration). Furthermore, results demonstrate the potential of leveraging group processes embedded in youth sport to promote mental health, as social identity scores significantly increased following the intervention. Athlete participants, coaches, and parents discussed potential adaptations to enhance the intervention and reflected on the salience of peer relationships in the sport context. Recruitment remained the main barrier throughout the implementation process. This research provides general evidence for the acceptability and feasibility of the *Team Talk* intervention and can inform the design of future mental health literacy interventions.

CHAPTER 4: GENERAL DISCUSSION

Individuals have connected forms of physical activity (e.g., sport) to psychology for centuries. For example, G. Stanley Hall, the first president of the *American Psychological Association*, noted that physical education optimizes intellect, feelings, and will (*Proceedings of the National Education Association,* 1908). This statement alludes to the potential role of physical activity forms, such as sport, in wellbeing and mental health promotion. This two-paper thesis aimed to explore the active and passive role of organized youth sport in promoting mental health. First, manuscript one examined the passive role of sport, identifying the magnitude and nature of the association between adolescent sport participation and symptoms of anxiety and depression. Second, manuscript two examined the potential active role of sport, testing the feasibility and acceptability of a novel mental health literacy intervention.

The meta-analysis conducted in manuscript one revealed an inverse association between sport participation during adolescence and symptoms of anxiety and depression – which was small in magnitude but consistent across several approaches to measure sport involvement. Although this association aligned with intuitive views of those involved in sport as well as researchers, this was the first meta-analytic evidence of this association. Additionally, it is also critical to consider how this association was also relatively small in magnitude: For those involved in sport (or who reported more sport involvement), incidence of depression and anxiety was only slightly lower compared to peers who were not involved.

Explaining this weak association, one explanation is that most studies examining the relationship between adolescent sport participation and mental health utilize secondary data and adopted whichever sport involvement measure was adopted in those large-scale surveys. It is critical for future studies to include primary data where researchers design sport involvement

measures incorporating critical details, such as sport context and potential psychosocial mechanisms (e.g., social support, belongingness). Primary research can inform policymakers and coaches how to structure youth sport to yield mental health benefits for as many adolescents as possible.

Study two provides important findings regarding the potential of implementing mental health-based interventions in organized adolescent sport. This mixed methods study revealed the acceptability and feasibility of a mental health literacy intervention designed specifically for adolescent sport teams. Indeed, the *Team Talk* intervention received relatively high acceptability ratings from adolescent athlete participants. Furthermore, athlete participants, coaches, and parents discussed the necessity of mental health literacy given increasing problems. Therefore, based on the current demand for mental health education and overall feasibility and acceptability of the *Team Talk* intervention, organized youth sport represents a promising context to promote mental health directly through interventions.

Various risk factors (e.g., exposure to psychosocial stress, developmental factors) interact during adolescence to influence mental health problems such as anxiety and depression (Thapar, Collishaw, Pine, Thapar, 2012). Given the complexity of mental health problems, research is required to expand our understanding, particularly during adolescence when many individuals experience problems for the first time (Teubert & Pinquart, 2011). Organized sport presents a unique opportunity, given the potential active and passive influence on mental health. Regarding the passive role of sport, research can be conducted to ensure that programs are contributing towards positive youth development (e.g., mandatory coach training, league design). Alongside a more ideal environment, preventive interventions that aim to increase mental health literacy and provide resources can be integrated.

This distinction between the active and passive role of organized sport points towards a broader debate regarding the explicit or implicit approach to supporting youth development through sport (Bean, Kramers, Forneris, & Camiré, 2018; Turnnidge, Côté, & Hancock, 2014). Should we explicitly integrate activities like mental health literacy training to shape the knowledge, attitudes, and norms within sport settings, or instead, design sport settings to more implicitly support the outcomes we are targeting? Although future research is required to determine benefits and limitations, neither approach advocates a *laissez-faire* attitude toward development (Turnnidge et al., 2014). It is critical for sport programs to foster appropriate environments and supportive relationships that are conducive to positive youth development (Turnnidge et al., 2014). Results from this thesis demonstrate that both approaches can be effective in promoting mental health. However, future research involving experimental or quasi-experimental evaluations is necessary to compare the two approaches (Turnnidge et al., 2014).

This thesis provides evidence for organized sport as a promising avenue to promote mental health and prevent mental health problems in adolescents at the population-level. As organized sport remains the most common extracurricular activity among American adolescents (Aubert et al., 2018), evidence-based strategies are necessary to ensure positive experiences and outcomes for participants. Although organized sport has the potential to positively influence adolescent development, this contribution is not an automatic process (Fraser-Thomas et al., 2005). There are many elements related to participation that need to be considered in the design of youth sport programs (Fraser-Thomas et al., 2005). For example, factors such as amount of practice, competition schedule, off-season duration, and coaching styles influence youth participants' experience and, therefore, outcomes. Sport can be designed to promote mental health, but a deeper understanding of effective strategies and ideal design is necessary.

The review conducted in study one revealed various interests for future research. First, researchers should include mediation analysis to further our current understanding of why sport participation has a positive effect on mental health. Second, further research is required comparing organized sport to other extracurricular activities. Out of the twenty-nine studies included in the review, only five compared organized sport to other extracurricular activities in relation to symptoms of anxiety and depression. Given the commonality of organized sport, it has become the most studied extracurricular activity. However, by studying other common extracurricular activities, researchers can theorize which aspects contribute to mental health. For example, organized sport may not provide unique benefits compared to a drama or music club if the primary mechanism relates to group processes. Given the lack of research, it is unclear if organized sport influences mental health more than other extracurricular activities.

Lastly, given the sole focus on symptoms of anxiety and depression in both studies, future studies should focus on positive constructs related to mental health (e.g., subjective well-being, happiness). Although the inverse association between sport participation and symptoms of anxiety and depression is encouraging for the potential preventative role of organized sport, additional research is necessary to determine the positive effect. For example, studies could focus on enhancing group processes such as social identity or belongingness through mental health literacy interventions. Therefore, instead of simply addressing potential mental health problems, interventions could increase participant wellbeing.

The two studies included within this thesis highlight the potential mental health promotion role of organized youth sport. By optimizing both the ‘active’ and ‘passive’ role of organized sport, adolescent athletes can gain benefits pertaining to mental health. However, as more research is conducted, it is critical to communicate findings to policymakers, coaches,

parents of athletes, and athletes to ensure organized sport can enhance or maintain adolescent mental health.

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APPENDIX

APPENDIX A: TABLES

Table 1. Inclusion and exclusion criteria.

Component	Inclusion	Exclusion
Date range	Inception of database to October, 2018	
Language	English language	
Sample	Youth sport participants with mean ages between 12 and 18 years.	Study includes participants younger than 8 or older than 20.
Mental health outcome measure (i.e., anxiety or depression)	Study measures self-reported symptoms of anxiety and depression.	
Sport participation measure	Studies contrasting youth in relation to whether or not they were involved, sport volume, sport frequency, etc.	Non-sport forms of physical activity, vigorous exercise, recreational activity
Organized sport (setting)	Participants completing sport participation measures in relation to organized sport within the school or community	Any non-organized sport participation (e.g., recess, free play, physical education)
Study design	Quantitative studies that compared sport participation to a different activity, to no sport participation, or to other level of sport participation. Study designs include correlational (i.e., cross-sectional and prospective), cohort, and experimental designs	Qualitative research, case studies, literature reviews

Table 2. Details of included studies.

First author Year (Country) Article ID	Sample age, sex, & context	Study design and primary analysis [quality /14]	Sport participation operationalization Measure of sport participation	Guiding theory or argument	Mental health variable(s) Measures[1]
Agans 2012 (USA) 1	n = 710 68.7% female Mage = 15.8 Individual sports, integrative team sports, and dance-like sports	Longitudinal Cluster analysis, ANOVA [12]	**Presence/Absence:** To be included as an athlete, youth needed to participate at least a couple of times a month.	Relational developmental systems theory and positive youth development	Depressive symptoms CES-D
			Core findings: Years of involvement simultaneously in team and individual sport was inversely associated with depression, within a regression model controlling for numerous variables.		
Ashdown-Franks 2017 (CAN) 2	*n* = 781 55.2% female Mage = 14.5 18 organized sport teams in or outside of school, classified as team or individual.	Longitudinal Multinomial and binomial logistic regression [12]	**Amount – Duration:** Total sport participation was coded as 0 (no sports) to 5 (at least one sport in every year of high school).	Thermogenic hypothesis; Mastery hypothesis	Anxiety symptoms CCHS
			Core findings: Number of years of sport participation in high school was not protective of symptoms of generalized anxiety disorder in young adulthood.		
Babiss 2009 (CAN) 3	*n* = 14594 47.8% female Mage = 15.5 Active sport, such as baseball, softball,	Longitudinal Bivariate analyses and t-tests, hierarchical logistic	**Amount – Frequency:** Frequency of sport involvement in the past week measured on a Likert-style scale from not at all, to 1 or 2 times, 3 or 4 times, and 5 times or more.	No guiding theory	Depressive symptoms CES-D

	basketball, soccer, swimming, or football.	regression analyses [11]	**Core findings:** As sport participation increased, the odds of suffering from depression decreased by 25% among adolescents. This association was mediated by self-esteem and social support.		
Baldursdottir 2017 (ISL) 4	*n* = 32456 49.4% female Mage = 14.5 Organized sports with a club or a team.	Cross-sectional Multiple linear regression [13]	**Amount – Number of times:** Participants completed two questions about sport involvement. Based on the responses, three categories were created: almost never, 1-3 times per week, and >4 times per week. **Core findings:** As age increased, depressive symptoms increased. Organized sport participation was associated with lower levels of depressive symptoms, with stronger effects among girls.	No guiding theory	Depressive symptoms SCL-90
Boone 2006 (CAN) 5	n = 449 49.7 % female Mage = 14 Team sports	Cross-sectional Structural equation modelling [11]	**Amount – Frequency:** Participants reported hours per week of team sport involvement (‘team sports’ not defined). **Core findings**: Positive team sport involvement partially mediated risks for depressive symptoms for both boys and girls. Positive team sport involvement was measured using a questionnaire that contained 16 items regarding how often positive and negative experiences occur during team sports. Supplemental analyses focused on hours per week of sport involvement, and revealed that	No guiding theory	Depressive symptoms BDI
Brière 2018 (CAN)	*n* = 17550 54% female *Mage* = 14.4 (*SD* = 1.3)	Longitudinal	**Presence/Absence:** Measured as ‘no involvement, once a week, twice a week, three times a	Positive youth development (Lerner, 2005)	Depressive symptoms CES-D Social anxiety symptoms

6	Numerous sports, reported through in-school survey.	Linear regression, Wald tests [13]	week, four or more times a week', answers were dichotomized as sport participation and no sport participation. (Assessment did not specifically delineate organized sport from physical activity and exercise in the survey). **Core findings**: Sport participation predicted small reductions in depressive symptoms and social anxiety symptoms in adolescents who had higher baseline scores on each outcome. Adolescent sport participation predicted small reductions in social anxiety one year later.		SCAS
Brunet 2013 (CAN) 7	n = 1293 52% female Mage = 12.7 (SD = 0.5) Organized team sports	Longitudinal Latent growth curve modeling, multiple hierarchical linear regression models [13]	**Presence/Absence:** Sport involvement was dichotomized as "not involved" or "involved". **Amount – Number of teams:** Number of organized sports involved in during the past 12 months **Core findings** Physical activity within team sport contexts resulted in less depressive symptoms in young adulthood. Both current and past involvement in team sports was significantly negatively related to depressive symptoms.	Social support theory	Depressive symptoms MDI
Denault 2015 (CAN) 8	n = 362 59% female Mage = 13.4 (SD = 0.42)	Longitudinal Cross-lagged correlation and latent growth	**Amount – Frequency:** Participation was operationalized as the total number of hours spent in sport (number of hours X number of months).	No guiding theory	Depressive symptoms CDI

	30 different activities were categorized as "sports"	curve (LGC) models [13]	Core findings Involvement in sport and in youth clubs was inversely associated with depressive symptoms.		
Dishman 2006 (USA) 9	n = 1250 100% female Mage = 17.7 (SD = 0.61) Sport teams run by school and by organizations outside of school.	Cross-sectional Confirmatory factor analysis and structural equation modeling (SEM) [13]	**Amount – Number of teams:** Participants reported how many sports teams they were involved in during the past 12 months. **Core findings:** Sport participation might reduce depression risk among adolescent girls mediated by unique, positive physical self-concept.	No guiding theory	Depressive symptoms CES-D
Dolenc 2015 (SVN) 10	n = 280 50% female Mage = 16.6 Organized sports within a club from a list of team sports (e.g., basketball, volleyball, soccer) and individual sports (= (e.g., athletics, swimming, gymnastics)	Cross-sectional Multiple regression analysis, Mann-Whitney test [11]	**Presence/Absence:** Two groups were created: athletes and non-athletes. The group of athletes were defined as regularly engaged in organized sports over the past twelve months. **Core findings:** Participants engaged in organized sports reported lower anxiety compared to non-sport participants. Female athletes showed higher levels of anxiety than male athletes.	No guiding theory	Anxiety symptoms STAI

Doré 2018 (CAN) 11	*n* = 460 62.4% female Mage = 16.5 (SD = 2.6 Involvement in team sports since the beginning of the semester (Fall)	Longitudinal Multivariate linear regression, mediation analyses, ANOVA [12]	**Presence/Absence:** Participants were asked how many team sports they had been involved in (0, 1, 2, or 3). Participants were classified as sport-involved (1 or more) or not. Core findings The context of team sports (i.e., more social interactions) was inversely associated with depressive symptoms.	No guiding theory	Anxiety symptoms and depressive symptoms HADS
Duncan 2015 (USA) 12	n = 372 100% female *Mage* = 12 Involvement in organized sports from a list of 18 possible sports (e.g., basketball, soccer, volleyball).	Cross-sectional Multiple-sample structural equation models [12]	**Amount – Number of times and number of teams:** Responses ranged from 1 (not at all) to 6 (at least twice a week). In addition, girls indicated the number of sport teams they participated on in the past year. Core findings Greater sports participation was related to less depression for Latino and White girls, but not African American girls.	No guiding theory	Depressive symptoms CES-D
Easterlin 2019 (USA) 13	n = 372 100% female *Mage* = 12 Team sports (e.g., basketball, ice hockey). Participants identified as experiencing adverse	Longitudinal Univariate and bivariate analysis, multivariable logistic regression [12]	**Presence/Absence:** Adolescents were designated as participating in team sports if they selected one or more sports from a list. **Core findings:** Among those with adverse childhood experiences, team sports participation during adolescence was significantly associated with lower odds of receiving a diagnosis of depression.	No guiding theory	Depressive symptoms CES-D

	childhood experiences.				
Fatiregun 2014 (NGA) 14	n = 1713 55.3% female *Mage* = 14 Participation in sporting activities	Cross-sectional Bivariate and multivariate analysis [10]	**Presence/Absence:** Participants were categorized as participating in sport activities or not. **Core findings:** Respondents who did not participate in sporting activities had a higher proportion of depressive symptoms when compared with those who did participate. Those who participated in sport were less likely to develop depression.	No guiding theory	Depressive symptoms PHQ-9
Fredricks 2006 (USA) 15	n = 912 51% female *Mage* = 16.5 Participation in school sports and in any organized summer or after-school sports.	Longitudinal ANCOVA [12]	**Presence/Absence:** Organized sport involvement was assessed with two yes-no questions (i.e., sport-involved at school and outside of school). **Core findings:** Breadth of participation, or number of activity contexts, was associated with positive academic, psychological, and behavioral outcomes.	No guiding theory	Anxiety and depressive symptoms CDI
Gomez-Baya 2017 (ESP) 16	n = 1810 50.9% female *Mage* = 14.6 Sports outside out-of-school time	Cross-sectional Partial mediation analysis and moderation analysis [11]	**Core findings:** Participants reported how often they participate in sports with five Likert-type response options (never, rarely, one day a week, several days a week, and every day). **Core findings:** A higher frequency of sport participation was associated with a lower presence of depressive symptoms, both directly and through its effect on body satisfaction.	Objectification theory	Depressive symptoms CDI

Gore 2001 (USA) 17	*n* = 1036 57.7% female Mage = 15.6 (SD = 1.00) Team sports involvement	Longitudinal Linear regression [10]	**Amount – Duration:** A Likert-type scale assessing amount of time spent in team sports in the past 12 months ranging across 5 points from "a lot of time" to "no time. Core findings Significant association between team sports involvement and depressed mood among both males and females.	No guiding theory	Depressive symptoms CES-D
He 2018 (USA) 18	*n* = 6483 57% female *Mage* = 15.1 Sport team involvement, other than gym class, that involved adult coaching or instruction	Cross-sectional Logistic regression [11]	**Presence/Absence:** Participants were asked how many years they played sport. Responses were dichotomized to distinguished those never reporting sport with those reporting at least some involvement. Core findings Youth who reported at least some involvement in sport were less likely to experience psychological distress and mood disorders.	No guiding theory	Anxiety and depression CIDI
Howie 2016 (AUS) 19	n = 1679 49% female Mage = 14 Organized sport, in school and outside of school hours	Longitudinal Chi square, paired Spearman correlations, repeated-measures latent class analysis, generalized linear models	**Presence/Absence:** A single-item question with a binary yes/no response regarding sport involvement in or out of school. Core findings Consistent participation in organized sport was associated with the greatest health benefits for both sexes as opposed to those who dropped out or joined later in adolescence.	No guiding theory	Depressive and anxiety symptoms DASS

[13]

Hume 2011 (AUS) 20	n = 155 60% female Mage = 14.5 (SD = 0.64) Various organized sports (e.g., cricket, netball, tennis)	Longitudinal Logistic regression models, linear regression [12]	**Amount – Frequency:** Frequency and duration of organized sports were reported for a typical week and total time (mins/week) was calculated. Core findings There were no cross-sectional or longitudinal associations between MVPA, VPA, organized sport, sedentary time, and symptoms of depression among boys or girls.	No guiding theory	Depressive symptoms CES-DC
Jewett 2014 (CAN) 21	*n* = 880 54% female Mage = 15 (SD = 0.75) Involvement in school sport (e.g. 11 common sports, such as basketball, soccer, rugby, hockey, volleyball)	Longitudinal MANOVA, linear regression models [14]	**Amount – Duration:** Participants were asked if they belonged to common sports. Responses across a single school year were collapsed in yearly participation (yes or no). School sport participation ranged from 0 (no involvement) to 5 (involved in school sport throughout the 5 years of secondary school).	No guiding theory	Depressive symptoms MDI

			Core findings Involvement in school sport during adolescence was a statistically significant predictor of lower depression symptoms in young adulthood.		
Kremer 2014 (AUS) 22	n = 8256 52% female Mage = 11.5 (SD = 0.8) Organized sports at school and outside of school	Cross-sectional Chi-square analyses and Multivariate logistic regression [10]	**Presence/Absence:** Involved in school sport more than 5 times in the past 12 months (more than 5 considered as sport involved, less than 5 considered as not involved). **Amount – Number of teams:** Participants were asked how many sport teams they played on at school and outside of school in the previous 12 months. Core findings Greater involvement in sport (in and out of school) was associated with lower odds for depressive symptoms.	No guiding theory	Generalized Tool SMFQ
McMahon 2017 (EUR) 23	*n* = 11,072 59% female Mage = 14.8 (SD = 0.84) Team and individual sports	Cross-sectional T-test, ANOVA, multi-level mixed effects linear regression [12]	**Presence/Absence:** Participants were asked if they played sports in the past 6 months, with response of yes or no. Sport involvement versus no sport involvement categories created. Core findings Participation in sport (team or individual/fitness) was associated with significantly lower levels of anxiety and depressive symptoms.	No guiding theory	Depressive symptoms BDI-II Anxiety Symptoms Zung SAS
Ogawa 2019 (JPN)	n = 720 50% female *Mage* = 14.5	Cross-sectional Multiple regression	**Presence/Absence:** Participants were asked how often they took part in sport, with five responses.	No guiding theory	Anxiety and depressive symptoms GHQ-12

24	Sport club activities at school (e.g., football, basketball, tennis)	[12]	"Always", "often", and "about half the time" were categorized as being adequate PA; those who answered "rarely" or "never" were without adequate PA. **Core findings:** GHQ-12 score was significantly better in adolescents with adequate PA than those with inadequate PA.		
Pastor 2003 (ESP) 25	n = 1038 50.9% female *Mage* = 16.3 Sports excluding athletics at school.	Cross-sectional Structural equation modeling [6]	**Presence/Absence:** Sport participation was measured by asking the subjects how often they participated in sports, ranging from 6 (6-7 times per week) to 1 (never). Sport participation was categorized as involved or not. **Core findings:** Sport participation affected perceived health directly and indirectly by decreasing feelings of depression.	No guiding theory	Anxiety and depressive symptoms Unvalidated tool
Sabiston 2016 (CAN) 26	*n* = 860 54% female Mage = 17.4 Numerous sports organized into team vs. individual and school vs. outside of school	Longitudinal Multivariate linear regression [13]	**Amount – Duration:** Participants were asked if they belonged to school sports and sports outside of school. Responses across a single school year were collapsed in yearly participation (yes or no). School sport participation ranged from 0 (no involvement) to 5 (involved in school sport throughout	No guiding theory	Depressive symptoms MDI

			the 5 years of secondary school). **Core findings**: Years of involvement in team sport was inversely associated with depression, within a regression model controlling for numerous variables. Number of years of individual sport involvement was not associated with depression.		
Sanders 2000 (USA) 27	*n* = 89 58% female *Mage* = 17 Sports involvement	Cross-sectional Chi-square analyses, MANOVA [8]	**Amount – Frequency:** Sports involvement was divided into three categories: low (2 hours per week), moderate (3 to 6 hours per week), and high (7 or more hours per week). Core findings Youth reporting moderate sports involvement had significantly lower depression scores than did the low sports involvement group; the high sport involvement group did not differ from either group.	No guiding theory	Depressive symptoms CES-D
Wang 2017 (USA) 28	n = 1065 51% female Mage = 15.5 Different types of sport, which were coded into team-based sports (e.g.,	Cross-sequential longitudinal latent growth curve analyses, growth mixture models	**Amount – Frequency:** Participants reported their participation in different sports and the number of hours spent on these activities per week, ranging from 1 (none) to 8 (21 or more hours per week).	Expectancy-value theory	Depressive symptoms SCL-90-R

	soccer, basketball, baseball) vs. individual sports (e.g., boxing, skiing)	[13]	Core findings Higher levels of team-sport participation were associated with faster declines in depressive symptoms.		
Zarrett 2009 (USA) 29	n = 1,357 57.9% female Mage = 13.2 Various community- and school-based sports, separated into team (e.g., soccer) and individual sports (e.g., martial arts)	Longitudinal cluster analysis, logistic regression, ANCOVA [12]	**Presence/Absence:** *Participants were asked if they participated in community- and school-based sports.* The authors also asked about other organized activities. Comparisons were between those having only reported sport activity involvement in a given year compared to those reporting no sport involvement. Core findings High-engaged youths (i.e., participating in sports, clubs, performing arts, religious activities, and volunteer activities) and non-sport youths had the highest depression levels.	Positive youth development	Depressive symptoms CES-D

Note.
Full article citations can be found in the Appendix.
[1]Measures
CES-D: Centre for Epidemiologic Studies – Depression Scale
CCHS: Canadian Community Health Survey
SCL-90-R: Symptom Checklist-90
BDI: Beck Depression Inventory
SCAS: Spence Children's Anxiety Scale
MDI: Major Depression Inventory
STAI: State-Trait Anxiety Inventory
CDI: Children's Depression Inventory
HADS: Hospital Anxiety and Depression Scale
PHQ-9: Patient Health Questionnaire
DASS: Depression Anxiety and Stress Scales
CES-DC: Centre for Epidemiologic Studies – Depression Scale for Children
SMFQ: Short Mood and Feelings Questionnaire
Zung SAS: Zung Self-Rating Anxiety Scale
GHQ-12: General Health Questionnaire

Table 3. Operationalization of sport involvement.

Type Operationalization	Example	Article IDs[1]
Presence or absence of sport involvement		
1. **Involvement.** Dichotomous index classifying youth as sport-involved or not	Answers were dichotomized into any sport participation (1) and no sport participation (0). **(Brière et al., 2018)**	1, 6, 7, 10, 11, 13, 14, 15, 18, 19, 22, 23, 24, 25, 29
Amount of sport involvement		
2. **Frequency.** Frequency of sport involvement	Participants reported their frequency of involvement, using one of three options: (a) low =/< 2 hours per week, (b) moderate, representing 3 to 6 hours per week, and (c) high, representing 7 or more hours per week. (**Sanders et al., 2000)**	5, 8, 20, 27, 28
3. **Volume.** Number of teams or amount of times an individual participates across a period of time	Participants were asked to report the number of sports teams (both in, and out, of school setting) that they had been involved in, during the previous 12 months. Scores ranged from 0 to 3 teams. (**Dishman et al., 2006**)	3, 4, 7, 9, 12, 16, 22
4. **Duration.** Duration of sport involvement, originating from a dichotomous indicator but aggregated	Focusing on the number of years a youth had been involved in sport throughout high school, each participant was assigned a score from 0 (no involvement) to 5 (sport-involved throughout high school). (**Sabiston et al., 2016)**[2]	2, 17, 21, 26

Note.
[1] Studies employing the stated operationalization, with identifiers located within Table 2.
[2] Note that this study was conducted in a school system where students often complete five years of secondary school.

Table 4. Outline of intervention content, goals, conceptual or empirical support, and facilitator roles.

	1) Orientation and exploring team identity	2) Mental skills training	3) Developing mental health literacy	4) Constructing lasting norms
CONTENT	Facilitator presents intervention goals before athletes independently complete a pencil and paper pre-intervention survey focusing on uniqueness of team, social identity, and aspects of mental health literacy	Facilitator discusses mental skills, with a focus on awareness and pre-competitive anxiety.	Facilitator presents mental health literacy content: *What is mental health and illness?* *What is depression?* *What is anxiety?* *How to provide help* *How to find reliable information*	Team reaches consensus on intra-team norms and values related to mental health support Team constructs practical statements to assist in maintaining mental health Participants complete post-intervention surveys
GOAL	Orient members to the intervention and complete pre-intervention surveys	Introduce participants to common mental skills that can be utilized to improve athletic performance	Strengthen mental health literacy and skill set for helping others Inform participants about mental health resources	Connect mental health knowledge to team identity and norms and complete post-intervention surveys
SUPPORT	Social identity theory (Tajfel, 1981)		Jorm's conceptualization of mental health literacy (Jorm, 1997) Materials adapted from the 'Ahead of the Game' program	Social norms approach to behavior change (McAlaney, Bewick, Hughes, 2011)
FACILITATOR ROLES	Both facilitators provide a brief introduction to the intervention and answer any questions about the pre-intervention survey	Facilitator One presents the material through PowerPoint slides or posters Facilitator Two reviews surveys to determine team trends relating to uniqueness and importance of team		Facilitator Two presents survey results to team Both facilitators brainstorm norms with the team and discuss how to connect norms to mental health literacy

Table 5. Means and standard deviations of the seven acceptability items.

Acceptability Item	Mean	SD
1. I learned a lot from the *Team Talk* workshop	5.76	1.27
2. I had a chance to participate and discuss my thoughts	5.67	1.61
3. The *Team Talk* workshop was well-organized	6.48	0.99
4. I can use what I learned to help myself or my teammates	6.43	1.04
5. This workshop will help my team be more close-knit	5.84	1.23
6. The *Team Talk* workshop was enjoyable	6.10	1.17
7. I enjoyed the *Team Talk* presentation slides	5.93	1.29

Table 6. SIQS items in pre- and post-intervention surveys.

Pre-Intervention SIQS Items	Post-Intervention SIQS Items
1. I feel a sense of being "connected" with other members of this team.	1. I find it easy to form a bond with other members of this team.
2. I feel good about being a member of this team.	2. In general, I'm glad to be a member of this team.
3. In general, being a member of this team is an important part of my self-image.	3. Generally, I feel good when I think about myself as a member of this team.
4. The fact that I am a member of this team often enters my mind.	4. Overall, being a member of this team has a lot to do with how I feel about myself.

Note: The following item was removed from the SIQS for the purpose of this study: "I feel strong ties to other members of this team".

Table 7. Bivariate correlations between acceptability items and participant characteristics and session details.

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Order of intervention	-										
2. Duration of intervention	-0.20**	-									
3. Age of participants	-0.66**	0.24**	-								
4. Years on team	-0.24**	0.00	0.20*	-							
5. Hours spent with team a week	-0.32**	0.12	0.11	0.09	-						
6. A1 (learned a lot)	0.21*	0.07	-0.06	-0.09	-0.03	-					
7. A2 (opportunities to participate)	0.19*	0.24**	-0.10	0.08	-0.17	0.40**	-				
8. A3 (well-organized)	0.23**	0.23*	-0.15	0.00	0.08	0.44**	0.43**	-			
9. A4 (learned how to help others)	0.24**	0.14	-0.11	-0.01	0.03	0.61**	0.43**	0.51**	-		
10. A5 (helped us be close-knit)	0.16	0.28**	-0.03	-0.12	-0.06	0.61**	0.47**	0.46**	0.60**	-	
11. A6 (enjoyable)	0.10	0.17	0.07	-0.03	0.02	0.54**	0.43**	0.49**	0.48**	0.66**	-
12. A7 (enjoyed slides)	0.16	0.07	0.05	-0.06	0.06	0.54**	0.31**	0.48**	0.49**	0.54**	0.74**

* $p < .05$; ** $p < .01$

Note: Pearson correlations are reported in this table, with the exception of correlations related to intervention ordering. Because the order of sessions (1-11) was a rank order variable, we report Spearman rank-order correlation statistics (column 1). Also, variables 6-11 refer to acceptability-related items.

APPENDIX B: ASSESSMENT OF STUDY QUALITY

The authors used the following coding sheet to assess the quality of each study. The sheet included two main sections (a) reporting, design, and measurement and (b) results and analyses. Each section contained seven criteria, with a binary evaluation (i.e., 0 = insufficient quality, 1 = sufficient quality). The maximum score a study could receive was 14, indicating the highest possible quality.

REPORTING, DESIGN, AND MEASUREMENT

1. Objective of the study is clearly described.
2. Demographics are described for key participants.

   -Further detail: If key demographics such as gender, age, and at least one additional demographic such as ethnicity, social class are not included, score = 0.
3. Study was designed in a way to overcome challenges with correlational designs.
4. Sport participation was operationalized.

   Further detail: If sport participation is not clearly defined or coder cannot interpret what dimension of sport involvement is being targeted, score = 0.
5. The measurement and operationalization of sport participation was of high quality.

   Further detail: If the measurement of sport participation did not appear valid or reproducible in the future, score = 0.
6. The depression and/or anxiety measurement was valid.

   Further detail: If the measure did not have a correlation of ≥.40 with similar constructs, score = 0.

7. The depression and/or anxiety measurement was reliable.

   Further detail: If the measure did not have an internal consistency score of ≥.70, score = 0.

RESULTS AND ANALYSES

1. Main findings of the study are clearly described.
2. The study provides estimates of the random variability within depression and/or anxiety measurements.
3. Actual probability values have been reported for the main outcomes, except when $p < 0.001$.
4. Statistical tests were appropriate.
5. Potentially relevant variables were controlled for or examined, if the sample was heterogenous.

   Further detail: If relevant variables (e.g., age, gender) were not controlled for, score = 0.
6. The sample size was adequate.

   Further detail: If the study included less than 180 participants (minimum sample size calculated for this research), score = 0.
7. The effect size was provided.

APPENDIX C: DATABASE SEARCH CONCEPTS

PubMed Search

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PsychInfo Search

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ab(“girls”) OR ti(“high schools”) OR ab(“high schools”) OR ti(“high school”) OR ab(“high school”) OR ti(“youth”) OR ab(“youth”) OR ti(“youths”) OR ab(“youths”))

AND

(MAINSUBJECT.EXACT("Athletes") OR ti(”athletes") OR ab(“athletes") OR MAINSUBJECT.EXACT("Sports (Attitudes Toward)") OR ab(“attitudes toward sports") OR ti(“attitudes toward sport”) OR ti (“attitude toward sport”) OR ab(“attitudes toward sport”) OR MAINSUBJECT.EXACT("Extreme Sports") OR ti(”extreme sports") OR ab(“extreme sports") OR MAINSUBJECT.EXACT("Sports") OR ti(”sports") OR ab(“sports") OR MAINSUBJECT.EXACT("Basketball") OR ti(”basketball") OR ab(“basketball") OR MAINSUBJECT.EXACT("Soccer") OR ti(”soccer") OR ab(“soccer") OR MAINSUBJECT.EXACT("Baseball") OR ti(”baseball") OR ab(“baseball") OR MAINSUBJECT.EXACT("Football") OR ti(”football") OR ab(“football") OR MAINSUBJECT.EXACT("Tennis") OR ti(”tennis") OR ab(“tennis") OR ti(“hockey”) or ab(“hockey”) MAINSUBJECT.EXACT("Running") OR ti(”running") OR ab(“running") OR MAINSUBJECT.EXACT("Weightlifting") OR ti(”weightlifting") OR ab(“weightlifting") OR MAINSUBJECT.EXACT("Athletic Performance") OR ti(”athletic performance") OR ab(“athletic performance") OR MAINSUBJECT.EXACT("Athletic Training") OR ti(”athletic training") OR ab(“athletic training") OR MAINSUBJECT.EXACT("Swimming") OR ti(”swimming") OR ab(“swimming") OR ti(“snow sports”) OR ab(“snow sports”) OR ti(“volleyball”) OR ab(“volleyball”) OR ti(“bicycling”) OR ab(“bicycling”) OR ti(“running”) OR ab(“running”) OR ti(“wrestling”) OR ab(“wrestling”) OR ti(“boxing”) OR ab(“boxing”) OR ti(“weight lifting”) OR ab(“weight lifting”) OR ti(“gymnastics”) OR ab(“gymnastics”) OR ti(“track and field”) OR ab(“track and field”) OR ti(“water sports”) OR ab(“water sports”) OR

ti(“swimming”) OR ab(“swimming”) OR ti(“diving”) OR ab(“diving”) OR ti(“golf”) OR ab(“golf”) OR ti(“badminton”) OR ab(“badminton”) OR ti(“field hockey”) OR ab(“field hockey”) OR ti(“lacrosse”) OR ab(“lacrosse”) OR ti(“snowmobiling”) OR ab(“snowmobiling”) OR ti(“sledding”) OR ab(“sledding”) OR ti(“rugby”) OR ab(“rugby”) OR ti(“rugbies”) OR ab(“rugbies”) OR ti(“martial arts”) OR ab(“martial arts”) OR ti(“wave surfing”) OR ab(“wave surfing”) OR ti(“rowing”) OR ab(“rowing”) OR ti(“water polo”) OR ab(“water polo”) OR ti(“kayaking”) OR ab(“kayaking”) OR ti(“calisthenics”) OR ab(“calisthenics”) OR ti(“boating”) OR ab(“boating”) OR ti(“surfboarding”) OR ab(“surfboarding”) OR ti(“water skiing”) OR ab(“water skiing”) OR ti(“athletics”) OR ab(“athletics”) OR ti(“athletic”) OR ab(“athletic”) OR ti(“extreme sports”) OR ab(“extreme sports”) OR ti(“athletic training”) OR ab(“athletic training”))

AND

(MAINSUBJECT.EXACT("Mental Health") OR ti(”mental health") OR ab(“mental health") OR MAINSUBJECT.EXACT("Long-term Depression (Neuronal)") OR ti("Long-term Depression (Neuronal)") OR ab("Long-term Depression (Neuronal)") OR MAINSUBJECT.EXACT("Major Depression") OR ti(”major depression") OR ab(“major depression") OR MAINSUBJECT.EXACT("Endogenous Depression") OR ti(”endogenous depression") OR ab(“endogenous depression") OR MAINSUBJECT.EXACT("Recurrent Depression") OR ti(”recurrent depression") OR ab(“recurrent depression") OR MAINSUBJECT.EXACT("Reactive Depression") OR ti(”reactive depression") OR ab(“reactive depression") OR MAINSUBJECT.EXACT("Depression (Emotion)") OR ti(”depression (emotion)") OR ab(“depression (emotion)") OR MAINSUBJECT.EXACT("Atypical Depression") OR ti(”atypical depression") OR ab(“atypical depression") OR

MAINSUBJECT.EXACT("Social Anxiety") OR ti(”social anxiety") OR ab(“social anxiety") OR MAINSUBJECT.EXACT("Anxiety") OR ti(”anxiety") OR ab(“anxiety") OR MAINSUBJECT.EXACT("Performance Anxiety") OR ti(”performance anxiety") OR ab(“performance anxiety") OR MAINSUBJECT.EXACT("Anxiety Disorders") OR ti(”anxiety disorders") OR ab(“anxiety disorders") OR MAINSUBJECT.EXACT("Generalized Anxiety Disorder") OR ti(”generalized anxiety disorders") OR ab(“generalized anxiety disorders") OR MAINSUBJECT.EXACT("Anxiety Disorders") OR ti(”anxiety disorders") OR ab(“anxiety disorders") OR MAINSUBJECT.EXACT("Well Being") OR ti(”well being") OR ab(“well being") OR MAINSUBJECT.EXACT("Internalization") OR ti(”internalization") OR ab(“internalization") OR MAINSUBJECT.EXACT("Externalization") OR ti(”externalization") OR ab(“externalization") OR ti(“depression”) OR ab(“depression”) OR ti(“depressive disorder”) OR ab(“depressive disorder”) OR ti(“depressive disorders”) OR ab(“depressive disorders”) OR ti(“melancholia”) OR ab(“melancholia”) OR ti(“anxieties”) OR ab(“anxieties”) OR ti(“hypervigilance”) OR ab(“hypervigilance”) OR ti(“nervousness”) OR ab(“nervousness”) OR ti(“anxiety disorder”) OR ab(“anxiety disorder”) OR ti(“behavior disorder”) OR ab(“behavior disorder”) OR ti(“behaviour disorder”) OR ab(“behaviour disorder”) OR ti(“behavior disorders”) OR ab(“behavior disorders”) OR ti(“behaviour disorders”) OR ab(“behaviour disorders”) OR ti(“neurotic anxiety state”) OR ab(“neurotic anxiety state”) OR ti(“neurotic anxiety states”) OR ab(“neurotic anxiety states”) OR ti(“anxiety neuroses”) OR ab(“anxiety neuroses”) OR ti(“externalizing behavior”) OR ab(“externalizing behavior”) OR ti(“externalizing behaviour”) OR ab(“externalizing behaviour”) ti(“externalizing behaviors”) OR ab(“externalizing behaviors”) ti(“externalizing behaviours”) OR ab(“externalizing behaviours”) OR ti(“internalizing behavior”) OR ab(“internalizing behavior”) OR ti(“internalizing behaviors”) OR

ab(“internalizing behaviors”) OR ti(“internalizing behaviour”) OR ab(“internalizing behaviour”) OR ti(“internalizing behaviours”) OR ab(“internalizing behaviours”))

Sport Discus Search

("ADOLESCENT psychology" OR "ATHLETES" OR "TEENAGERS" OR "TEENAGERS' health" OR "YOUTH" OR "SPORTS for girls" OR "MALE athletes" OR “adolescent” OR “adolescents” OR “adolescence” OR “teens” OR “teen” OR “teenager” OR “teenagers” OR “boy” OR “boys” OR “girl” OR “girls” OR “high schools” OR “youths”)

AND

("SPORTS" OR "BASKETBALL" OR "YOUTH league baseball" OR "YOUTH league basketball" OR "YOUTH league football" OR "YOUTH league softball" OR “sport” OR “sports” OR “basketball” OR “basketballs” OR “soccer” OR “soccers” OR “baseball” OR “baseballs” OR “softball” OR “softballs” OR “football” OR “footballs” OR “hockey” OR “hockeys” OR “ice hockey” OR “ice hockeys” OR “field hockey” OR “field hockeys” OR “racquet sports” OR “racket sports” OR “racket sport” OR “racquetball” OR “racketball” OR “racket ball” OR “badminton” OR “lacrosse” OR “tennis” OR “snow sports” OR “snow sport” OR “snowmobiling” OR “sledding” OR “volleyball” OR “volleyballs” OR “rugby” OR “rugbies” OR “bicycling” OR “bicycling” OR “running” OR “runnings” OR “golf” OR “golfs” OR “wrestling” OR “wrestlings” OR “boxing” OR “boxings” OR “weight lifting” OR “weight liftings” OR “gymnastics” OR “calisthenics” OR “martial arts” OR “track and field” OR “field and track” OR “water sports” OR “water sport” OR “wave surfing” OR “rowing” OR “water polo” OR “kayaking” OR “canoeing” OR “boating” OR “surfboarding” OR “water skiing” OR

“athletics” OR “athletic” OR “swimming” OR “swimming” OR “diving” OR “extreme sports” OR “athletic training”)

AND

("MENTAL health" OR "MENTAL health of athletes" OR "MENTAL depression" OR "ANXIETY" OR “mental hygiene” OR “depression” OR “depressions” OR “depressive disorder” OR “depressive disorders” OR “depressive symptoms” OR “depressive symptom” OR “melancholia” OR “melancholias” OR “behavior disorder” OR “social anxiety” OR “anxiety” OR “social anxieties” OR “hypervigilance” OR “nervousness” OR “neurotic anxiety state” OR “neurotic anxiety states” OR “well being” OR “internalizing behavior” OR “internalizing behaviors” OR “internalizing behaviour” OR “internalizing behaviours” OR “externalizing behavior” OR “externalizing behaviors” OR “externalizing behaviour” OR “externalizing behaviours” OR “internalization” OR “externalization” OR “emotional disturbance” OR “emotional disturbances”)

Web of Science Search

TS=(“adolescent” OR “adolescents” OR “adolescence” OR “teens” OR “teen” OR “teenager” OR “teenagers” OR “boy” OR “boys” OR “girl” OR “girls” OR “high schools” OR “youth” OR “youths” OR “female adolescents” OR “female adolescent” OR “male adolescents” OR “male adolescent” OR “adolescent psychiatry” OR “adolescent psychotherapy” OR “adolescent development” OR “adolescent characteristics” OR “adolescent psychology” OR “adolescent psychopathology” OR “adolescent characteristics”) AND TS=(“athlete” OR “athletes” OR “sport” OR “sports” OR “basketball” OR “basketballs” OR “soccer” OR “soccers” OR “baseball” OR “baseballs” OR “softball” OR “softballs” OR “football” OR “footballs” OR “hockey” OR “hockeys” OR “ice hockey” OR “ice hockeys” OR “field hockey” OR “field

hockeys” OR “racquet sports” OR “racket sports” OR “racket sport” OR “racquetball” OR “racketball” OR “racket ball” OR “badminton” OR “lacrosse” OR “tennis” OR “snow sports” OR “snow sport” OR “snowmobiling” OR “sledding” OR “volleyball” OR “volleyballs” OR “rugby” OR “rugbies” OR “bicycling” OR “running” OR “runnings” OR “golf” OR “golfs” OR “wrestling” OR “wrestlings” OR “boxing” OR “boxings” OR “weight lifting” OR “weight liftings” OR “gymnastics” OR “calisthenics” OR “martial arts” OR “track and field” OR “field and track” OR “track” OR “tracks” OR “water sport” OR “wave surfing” OR “rowing” OR “water polo” OR “kayaking” OR “canoeing” OR “boating” OR “surfboarding” OR “water skiing” OR “athletics” OR “athletic” OR “swimming” OR “diving” OR “extreme sports” OR “athletic training”) AND TS=(“mental health” OR “mental hygiene” OR “depression” OR “depressions” OR “depressive disorder” OR “depressive disorders” OR “depressive symptoms” OR “depressive symptom” OR “depressive neuroses” OR “depressive neurosis” OR “endogenous depression” OR “endogenous depressions” OR “depressive syndrome” OR “depressive syndromes” OR “neurotic depression” OR “neurotic depressions” OR “melancholia” OR “melancholias” OR “unipolar depression” OR “unipolar depressions” OR “emotional depression” OR “emotional depressions” OR “behavior disorder” OR “social anxiety” OR “anxiety” OR “social anxieties” OR “hypervigilance” OR “nervousness” OR “anxiety disorders” OR “anxiety disorder” OR “anxiety neuroses” OR “neurotic anxiety state” OR “neurotic anxiety states” OR “well being” OR “internalizing behavior” OR “internalizing behaviors” OR “internalizing behaviour” OR “internalizing behaviours” OR “externalizing behavior” OR “externalizing behaviors” OR “externalizing behaviour” OR “externalizing behaviours” OR “major depression” OR “long-term depression” OR “recurrent depression” OR “reactive depression” OR “atypical depression” OR “performance anxiety” OR “generalized anxiety

disorder" OR "internalization" OR "externalization" OR "emotional disturbance" OR "emotional disturbances")

Michael J. Panza

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EDUCATION

2020 **M.S.: Kinesiology (Cum Laude)**
Pennsylvania State University, University Park, PA

2018 **B.A., Sport Psychology (Cum Laude)**
Laurentian University, Sudbury, ON

2015 **B.Sc., Human Kinetics***
University of Guelph, Guelph, ON
*Transferred out before degree completion

PUBLICATIONS

1. **Panza, M. J.**, Graupensperger, S. A., Agans, J. P., Doré, I., Vella, S. A., & Evans, M. B., (2020). Adolescent sport participation and symptoms of anxiety and depression: A systematic review and meta-analysis. *Journal of Sport and Exercise Psychology*. Advance online publication.

2. Graupensperger, S., **Panza, M.**, & Evans, M. B. (2020). Network centrality, group density, and strength of social identification in college club sport teams. *Group Dynamics: Theory, Research, and Practice, 24*, 59–73.

3. Graupensperger, S., **Panza, M. J.**, Budziszewski, R., & Evans, M. B. (In-Press). Growing into 'us': Trajectories of social identification with college sport teams predicts subjective well-being. *Applied Psychology: Health and Well-Being*. (Submitted: November, 2019).

TEACHING EXPERIENCE

Pennsylvania State University

Fall 2018 Teaching Assistant, KINES 202: Functional Human Anatomy (175 students)
Lab Instructor (35 students)

Fall 2019 Teaching Assistant, KINES 100: The Cultural and Behavioral Foundations of Kinesiology (220 students)

Spring 2020 Teaching Assistant, KINES 345: Meaning, Ethics, and Movement (200 students)