

An investigation into how mindfulness-based interventions can be used to address post-injury anxiety among athletes.

By

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Abstract

This paper is an examination of research for the purpose of further the understanding of the extent to which mindfulness-based interventions can address the negative consequences of post-injury anxiety after a sustained injury among athlete populations. Post-injury anxiety is a psychological response that occurs when athletes sustain injuries resulting in decreased confidence to return to sport. By not returning to sport, athletes experience a significant decrease of their quality of life and possible loss of future career opportunities. Previous literature has found that mindfulness-based techniques can be useful in addressing post-injury anxiety, however, current literature does not address the extent to which it can be helpful. The author examines 10 quantitative peer-reviewed studies through careful examination of overall findings of each study, and the analysis and critique of methodological frameworks. The author hypothesized that mindfulness-based techniques would be a sufficient stand-alone treatment protocol for post-injury anxiety if athletes are able to adopt acceptance and mindfulness-based practice. Results of the study found that acceptance plays an important role in adherence to rehabilitation, however, requires the presence of awareness in order to address post-injury anxiety. Furthermore, the benefits of mindfulness-based techniques are limited being used in conjunction with physical rehabilitation programs. In conclusion, due to the lack of mindfulness-based models intended for this population, further exploration is encouraged to determine the potential use of mindfulness-based techniques as a treatment for post-injury anxiety.

Keywords: *post-injury anxiety, athletes, sports-related injury, sports rehabilitation, fear avoidance*

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Chapter 1: Introduction

Background

Over the years, research has repeatedly emphasized the positive effect that sports participation and exercise can have on mental and physical health (Fossati et al., 2021). On the other hand, research has shown how competitive athletes and sports-related injuries can have the exact opposite effects on mental health depending on the severity and recovery period for the sustained injury (Haugen, 2022). In cases where athletes are reliant on their sport as a pathway to a career, injuries can be incredible determinantal to their future performance and can hinder their overall quality of life due to the loss of previously accessed mobility (Anderson et al., 2021). Furthermore, sports injuries as a whole have been found to cause an increased risk of depression and anxiety among this population due to their inability to participate in sport and their anxiety regarding movement when they return to sport (RTS). Although there are a range of different type of injuries, common injuries include anterior cruciate ligament (ACL) ruptures, lumbar muscle strains, and bone fractures across different bodily joints (Prieto-Gonzalez et al., 2021). In ACL injuries, physical recovery is relatively straightforward, however, the injury may also result in significant psychological distress that require immediate intervention (Filbay & Grindem, 2019). Similarly, former athletes that experienced historical concussions during high collision sports have reported psychological distress including anxiety and depression (Gouttebauge & Kerkhoff et al., 2021). Coupled with other psychological distresses that are a result of the intense psychological and physical demands for their sport, athletes experience significant levels of anxiety following a sport-related injury (Rice et al., 2019; Ekelund et al., 2022; Ford et al., 2017). The prevalence of injury differs depending on the sport; however, studies have found that

specific sports such as soccer and football have up to 40% incident rates of injuries (Mack et al., 2020; Prieto-Gonzalez et al., 2021). Athletes who have sustained injuries have been found to present with higher levels of depression and anxiety in comparison to non-injured athletes (Sullivan et al., 2022). More specifically, sports-related injuries have been found to result in symptoms of post-injury anxiety where athletes are reluctant RTS due to the fear of reinjuring, pain catastrophizing, or perceived reduced function (Raizah et al., 2022; O'Connor et al., 2022; Hart et al., 2020).

Based on the statistics and risk factors for sports-related injuries, there is a need to discuss the current state of injury emotional rehabilitation. Higher injury rates have been found to be associated with increased numbers of hours of practicing, minimal warm-up exercises, minimal engagement in preventative exercises, inadequate practice facilities and equipment, younger age, and engaging in unmanageable training load (Prieto-Gonzalez et al., 2021). Furthermore, college level athletes are found to sustain an average of two injuries per year which contributes to a significant barrier of returning to sport due to post-injury anxiety (Nwachukwu et al., 2019; Lemoyne et al., 2017). Therefore, although the majority of literature focuses on injury prevention, it is important to recognize the usefulness of psychological interventions such as goal setting, imagery, social support, and relaxation for decreasing psychological distress following a sports injury (Reese et al., 2012; Walker & Heaney, 2013; Sant et al., 2022). Of these identified interventions, social support and relaxation techniques have taken the forefront as two factors that significantly impact an athlete's mental health (Griffin et al., 2021; Sullivan et al., 2022; Walker & Heaney, 2013). Research suggests teaching athletes how to emotionally regulate during the rehabilitation stages following an injury can be incredibly helpful in decreasing symptoms of depression and anxiety (Walker & Heaney, 2013; Anderson et al., 2021). Although

not necessarily labeled as mindfulness, relaxation techniques that are used during rehabilitation include many coping strategies for emotional regulation and awareness which is common across mindfulness-based interventions (Canby et al., 2021). Techniques that have been labeled as relaxation, such as guided imagery, are techniques and strategies that often seen in mindfulness-based interventions such as dialectical behavioural therapy (DBT) (Fassbinder et al., 2016). When used in the form of educational programs, meditation sessions, and relaxation techniques, mindfulness-based techniques are helpful in increasing pain tolerance and mindful awareness in injured athletes (Mohammed et al., 2018; Walker & Heaney, 2013). In the same way that athletes are able to apply mindfulness to sports performance, they can also apply the ideas of mindfulness to handle negative emotions resulting from sports-related injuries.

Research problem

The focus of this study is to address the consistent occurrence of sports-related injuries that are currently being experienced among athletes and the effect that they have on mental health. Although there have been studies that look into athlete mental health, there is room for improvement when discussing emotional rehabilitation after an injury. Historically, mindfulness has been shown to be effective in addressing sports performance, athlete burnout, increasing pain tolerance, and post-injury anxiety (Jekauc et al., 2017; Tang et al., 2022; Mohammed et al., 2018; Anderson et al., 2021). Research suggests teaching athletes how to emotionally regulate during the rehabilitation stages following an injury can be incredibly helpful in decreasing symptoms of depression and anxiety (Walker & Heaney, 2013; Anderson et al., 2021). Although not necessarily labeled as mindfulness, relaxation techniques that are used during rehabilitation include many coping strategies for emotional regulation and awareness which is common across mindfulness-based interventions (Canby et al., 2021). Techniques that have been labeled as

relaxation, such as guided imagery, are techniques and strategies that are often seen in mindfulness-based interventions such as dialectical behavioural therapy (DBT) (Fassbinder et al., 2016). When used in the form of educational programs, meditation sessions, and relaxation techniques, mindfulness-based techniques are helpful in increasing pain tolerance and mindful awareness in injured athletes (Mohammed et al., 2018; Walker & Heaney, 2013). Regardless of how research has addressed the effectiveness of mindfulness-based interventions on post-injury anxiety in injured athletes, there is a need for a further emphasis on the limitations of using mindfulness-based interventions (Sant et al., 2022; Coronado et al., 2020; Moesch et al., 2020; Mohammed et al., 2018).

Question of the study

Given the research problem described above, the research question that will guide this study is, “To what extent can mindfulness-based interventions be used to address post-injury anxiety among athletes?”.

Justification

This topic can provide incredible insight on the current use of mindfulness-based interventions among a specific population, such as athletes. It is important to recognize that there has been a constant occurrence of sports-related injuries which have been shown to affect RTS among athletes resulting in a decline in quality of life and mental health (Haraldsdottir & Watson, 2021). This study encourages a further understanding of different levels of stressors and perception of injuries that athletes face when compared to the general population. Furthermore, this study will place an emphasis on the need for further research on protocols for emotional rehabilitation for athletes, including the use of mindfulness-based techniques.

Significance

As previously discussed, by addressing the extent to which mindfulness-based interventions can help in post-injury anxiety among athletes, it would allow for mental health professionals to be aware of when to include other means of psychological interventions beyond mindfulness techniques. Since the literature is already supportive of the effectiveness of mindfulness-based interventions for fear of re-injury in athletes, understanding the limitations would encourage the investigation into other areas that may be helpful within rehabilitation and psychological interventions for injured athletes. Many of the interventions reflect similar strategies seen in therapies such as DBT (Fassbinder et al., 2016). DBT is a mindfulness-based therapy that grounds the strategies and research on principles of mindfulness and emotional regulation. DBT often uses concepts of validation and acceptance of internal personal events which is consistent across many other mindfulness-informed interventions and relaxation techniques that are discussed in sports literature. Similarly, acceptance and commitment therapy (ACT) focuses on the idea of committed actions which is similar to the idea of goal setting to increase self-efficacy after a sports related injury (Hayes et al., 2012; Brinkman et al., 2019). Based on these similarities, the understanding of the limitations to mindfulness-based techniques on post-injury anxiety may allow for the implementation of such techniques across various other modes of therapeutic intervention. For example, if it is found that mindfulness-based therapy is beneficial as a means to address post-injury anxiety, regardless of mitigating factors, practitioners may freely integrate them into the rehabilitation process. As previously mentioned, non-RTS can cause a significant decrease in quality of life, increased anxiety, and depression (Filbay et al., 2017; Hsu et al., 2017). Therefore, by understanding limitations to mindfulness-based techniques on post-injury anxiety, we may be able to contribute to

contributing research that affects poor rehabilitation and establish effective rehabilitation programs for athletes.

In addition to clinical application, the current study may be beneficial in creating policies and awareness surrounding athlete mental health and sports psychology as a whole. When an athlete sustains an injury, rehabilitation is generally more concerned about the physical recovery rather than psychological rehabilitation (Covassin et al., 2014). Therefore, this study would allow for future students and policy makers to further explore the gaps within rehabilitation medicine to pursue a more comprehensive rehabilitation procedure tailored for athletes. For example, policies for rehabilitation may include psychological screening to ensure that athletes reach a safe psychological state prior to returning to sport. By understanding the extent to which mindfulness-based techniques can address post-injury anxiety, rehabilitation teams may be able to identify athletes that may benefit from this specific intervention ahead of time based on a standardized psychological measure for readiness to return to sport. Furthermore, the development of such a policy and how mindfulness-based techniques address post-injury anxiety would further bring awareness to the existence and complexity of post-injury anxiety and mental health concerns of athletes outside of performance optimization.

Theoretical framework

Post-injury anxiety will be conceptualized by using the integrated model of response to sports injury (Wiese-bjornstal et al., 1998; Ford et al., 2017). This model dictates that an athlete will perceive an injury in a way that will influence their emotional and behavioural responses resulting in an impact on their physical and psychological recovery outcomes. The way that the athlete cognitively appraises the injury will rely on factors such as personality, history of stressors, coping strategies, and person and situational factors. In the case of post-injury anxiety,

an athlete who has developed an anxious personality trait may experience an increased risk of fear of reinjury, which indicates the need for psychological interventions (Ford et al., 2017). For example, in another study that looked into ACL injury, young athletes who have suffered ruptures in their ACL have been found to experience symptoms that are consistent in post-traumatic stress disorder (Padaki et al., 2018). Individuals that had adopted higher athletic identity were more susceptible to developing symptoms of post-traumatic stress disorder following the ACL injury. According to the integrated model of response to sports injury, the high athletic identity and previous personal factors contributed to their cognitive appraisal of the ACL injury and therefore, results in the increased risk of PTSD symptoms (Wiese-bjornstal et al., 1998). For the purpose of this study, the use of cognitive appraisals and the integrated model of response to sports injury will allow for the conceptualization and understanding of how mindfulness-based techniques can address post-injury anxiety in athletes with high athletic identities that sustain sports-related injuries. If it is understood that post-injury anxiety results from the cognitive appraisal of injuries, it is reasonable to believe that mindfulness-based techniques can be used as a primary treatment to address post-injury anxiety and the way that athletes perceive their pain and current function through awareness and acceptance.

Terms and definitions

In this study, the core concepts are post-injury anxiety and mindfulness-based interventions. Although the concept of post-injury anxiety is discussed within the literature, researchers do not typically use the term post-injury anxiety as it is a new form of terminology to encompass a set of anxiety-related symptoms resulting after a sustained injury. Instead, post-injury anxiety is discussed synonymously with post-injury fear avoidance and kinesiophobia (Meierbachtol et al., 2020; Fischerauer et al., 2018; Hart et al., 2020). Therefore, to ensure the

clarity in this study, post-injury anxiety in this study will be defined as a psychological response involving significant levels of anxiety after sustaining an injury (Covassin et al., 2014; O'Connor et al., 2022). Symptoms of post-injury anxiety is defined as excessive fear of physical movement causing distress and inability to return to sport after sustaining an injury (Bordeleau et al., 2022; Fischerauer et al., 2018). Similarly, mindfulness-based interventions are typically discussed as such, however, there are various other modalities across psychology, such as acceptance and commitment therapy (ACT), that operate on the same principles of acceptance of internal and external events (Hayes et al., 2012; Brinkman et al., 2019). Mindfulness-based techniques typically include interventions that promote relaxation and non-judgement of negative internal and external events. For example, mindfulness teaches an individual experiencing anxiety to take notice of internal events without trying to change the experience or engage in a struggle to correct it. By doing so, the individual may begin to relax as mindfulness allows for acceptance and understanding of the emotion which creates an opportunity to release the negative emotion. Therefore, to simplify the understanding of mindfulness-based techniques, this study will define mindfulness-based techniques as techniques that promote internal acceptance of physical injuries and cognitive appraisals.

Researchers position

This specific topic is an area that I have a personal interest due to previous experience with sports-related injuries with myself as well as family members. Although I recognize that my personal reasons may come into play in the presentation of my final draft, I would like to emphasize that I am not concerned about whether or not mindfulness is effective in the experiences of athletes. Rather, this research paper will focus on understanding the extent that mindfulness-based interventions have on post-injury anxiety. I am not arguing for or against the

usefulness of mindfulness, simply attempting to investigate the possible limitations to mindfulness within re-injury anxiety. One of the ways that I might combat a possible bias would be to have others read through this study to ensure that the paper remains unbiased in its presentation. Additionally, I made certain that I was selecting articles in a way that allowed for information gathering to help answer my research question rather than simply trying to prove a point. Academically and professionally, I am currently working as a student mental health therapist and often work with individuals experiencing anxiety and fear and often use techniques that are mindfulness-based. Albeit this does not usually surround post-injury anxiety, however, I am interested in the extent to which it can be used for this particular population as this is a population that I would like to work more with.

Overview

To ensure that I am answering my research question in the most comprehensive way, the remainder of this paper will be presented in the proceeding chapters that contribute to the understanding of post-injury anxiety and the use of mindfulness-based techniques across the literature. The contents of the following chapters will discuss the methodology that was used in core reviewed articles, discuss the clinical applications of my findings, and finally, discuss the recommendations and conclusions of my study.

Chapter 2: Methodology

Prior to searching for specific articles, I had begun reading literature on sports psychology and physical rehabilitation to create a foundation in understanding athlete mental health, sports-related injuries, and the risk of re-injury (Barber-Westin et al., 2020; Anderson et al., 2021; di Fronso et al., 2022; Prieto-Gonzalez et al., 2021; Haugen, 2022). Using vague terms, such as sports psychology and sports-related injuries, the results primarily focused on injury

prevention, physical rehabilitation, and psychological impacts of sport injuries. Although none of these articles were used for the current study, they played a significant role in understanding the realm of sports psychology and eventually lead to other articles that would further explain post-injury anxiety and the effects of mindfulness. Notably, a large amount of the literature seemed to revolve around anterior cruciate ligament ruptures (ACL) as this is a common sports-related injury which effected the later used search terms (Montalvo et al., 2019). By creating a better understanding of sports-injury, rehabilitation, and various definitions of post-injury anxieties, I was able to use specific search terms and combinations to find 10 core studies to investigate my proposed research question.

For the purpose of this study, I had used the City University Library portal using databases such as PsycBooks, PsycInfo + PsycArticles, Psychology and Behavioural Sciences Collection, and PubMed while ensuring I was selecting peer-reviewed articles. These search engines are common across different universities and allow access to specific universities paying for various journal access for students. I selected these specific databases as they would produce articles that were within the realm of psychology which is the over compassing discipline that my research problem was based on. For example, PsycInfo is a psychology database that is operated by the American Psychological Association which allowed for easy access to peer-reviewed articles through its feature to filter article searches. This feature was also similar in the other databases which made searching for peer-reviewed articles to be easily accessible and discoverable. In addition to the City University Library, other means of attaining articles also included google scholar and the MacEwan University Library. Similar to the other databases that were used, these databases included search filters to help narrow down articles that were related to post-injury anxiety, mindfulness, and rehabilitation. I had accessed the MacEwan University

Library portal by using my previous student log in for the university and cross referenced these articles with the City University Library if I was unable to gain access through MacEwan University. By doing so, I was able to find articles from journals that City University did not have complete access to and was able to expand my search engine.

After establishing a foundational understanding of sport-related injuries and becoming familiar with search engines, it was important to ensure that resulting articles were peer-reviewed and published within the last 5 years based on the criteria presented for this study. In order to ensure that all the resulting articles were around this time frame and peer-reviewed, filters were used to only show peer-reviewed journals and limit the results to articles published between the years 2018 to 2023. By doing so, this guaranteed that the pool of articles used current literature to support their findings and were published by a journal that is peer-reviewed. Once these filters were selected, it became exceptionally easier to establish proper search terms in order to find articles relating to post-injury anxiety and mindfulness.

During article selection, search terms gradually evolved to better suit the current research question as many of the resulting articles were not suitable to be considered as a primary source for this study. Due to the large quantity of literature on sports-injury anxiety, it was essential to create an exclusion criterion to help navigate literature and only select relevant articles to answer my proposed research question. Articles that were not included as a primary study were any articles that were meta-analyses, review articles, articles that were published prior to 2018, qualitative studies, and articles on injury prevention. Although some of the resulting articles became supplementary sources, none of the articles that fit the exclusion criteria were selected as a core study due to the type of literature and the relevancy to post-injury anxiety and

mindfulness. Notably, qualitative studies were excluded from article selection due to the lack of qualitative studies on post-injury anxiety and mindfulness.

Articles that were used as core studies included any quantitative studies including pilot studies, randomized control trials (RTC), multiple-baseline single case studies, and cohort studies. This allowed for different types of quantitative literature to be analyzed to determine the effects of mindfulness-based techniques and the discussion of post-injury anxiety. Additionally, inclusion criteria included articles discussing ACL injuries, rehabilitation procedures, collegiate level athletes, and mindfulness-based practices among athletes. During the literature review portion of this study, it became apparent that the overall literature did not necessarily label post-injury anxiety as such. Apart from a few newer studies, post-injury anxiety was described with differing terms such as fear avoidance, Kinesiophobia, and sports-related anxiety. Although these terms were different, they all had the same symptoms of anxiety as it relates to an injury sustained playing a sport. Therefore, search terms included combinations of the terms ‘sports-related injury’, ‘fear avoidance in athletes’, ‘kinesiophobia in athletes’, ‘athlete anxiety’, and ‘post-injury fear avoidance’. By including these search terms, it enabled the conceptualization of post-injury anxiety as well as access to other research articles that discuss post-injury anxiety but do not label it as such. Additionally, it was also important to include mindfulness-based techniques in the search as it is a main component of the current study. Therefore, other search terms included a combination of ‘mindfulness-based sports rehabilitation’, ‘mindfulness for fear avoidance’, ‘mindfulness for Kinesiophobia’, ‘mindfulness in athletes’, ‘guided mediation in athletes’, ‘acceptance in athletes’, and ‘awareness in athletes’. Moreover, a large majority of articles focused on ACL ruptures which further changed the way that terms were being searched. To ensure that the research question did not have to be adjusted

to strictly discussing ACL ruptures, it was important to use the term ‘sport-related injuries’ as this would encompassing of other sports-related injuries and the effects of mindfulness on them. This allowed for the proposed research question to be inclusive of all types of injuries that can manifest post-injury anxiety and the way that extent to which mindfulness-based techniques can help address it. Due to the fact that this question focuses on the extent of mindfulness, which suggests the already beneficial nature of its use, looking into different injuries would include the possibility that types of injuries can affect the limit to which mindfulness can be helpful. Therefore, by encompassing all sports-related injuries, it is further investigating the limits of mindfulness-based techniques in post-injury anxiety.

Although the literature was vast, there were challenges in findings articles that were relevant to post-injury anxiety, sports-related injuries, and mindfulness. Sports psychology is a field that seems to have been gradually growing over the years and therefore, many of the studies that discuss rehabilitation for injuries are older studies that did not fit within the 5-year publishing range. Therefore, finding current literature was exceptionally difficult in the beginning as I did not realize that post-injury anxiety was a term that was only recently used on the past 1-2 years and was not a term that was common across the literature. In order to remedy this, reading old literature and investigating into definitions, as well as conceptualization models, were extremely helpful in understanding that fear avoidance and kinesiophobia were the same as what I had defined as post-injury anxiety. Additionally, many of the current articles focused mainly on injury prevention as previous studies had already looked into various forms of mindfulness-based techniques for athletes. In this sense, it was challenging to find recent articles that discussed mindfulness-based techniques for post-injury anxiety. Furthermore, this was made even more difficulty due to the fact that the COVID-19 virus had halted a lot of in-person

research which made it challenging to find studies within the last 5 years due to the world-wide quarantine.

Chapter 3: Review of Literature, Findings, and Ethical considerations

Using core reviewed studies, I focused primarily on including qualitative studies that addressed post-injury anxiety and application of mindfulness techniques among injured athletes to explore concepts that would inform the research question, “To what extent does mindfulness-based techniques address post-injury anxiety among athletes?”. Although the concept of mindfulness-based techniques is a commonly discussed intervention for injury anxiety among athletes, the evidence suggests that there are limits to how it may address injury anxiety based on differences in factors such as pain catastrophizing, pain intensity, injury characteristics, and perceived function (Guo et al., 2018; O’Connor et al., 2022; Hart et al., 2019; Reese et al., 2012). Each study that was selected was published within the last 5 years which garners the ability to utilize current literature and understandings of each study's respective topics. Using recent literature, the authors are able to further explore and define post-injury anxiety factors and psychological distress that results from injury (Hart et al., 2020; O’Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020).

In this chapter, I will be discussing the foundation of post-injury anxiety and mindfulness-based techniques used for post-injury anxiety. Due to the mass amount of literature on mindfulness-based techniques, I will limit my study to presenting a methodological analysis and discussion of the reviewed studies, discussion of (a) mindfulness meditation, (b) mindfulness psychoeducation, and (c) acceptance within the literature, ethical considerations, and concluding thoughts. Through discussing factors contributing to post-injury anxiety and the current state of

the use of mindfulness-based techniques, I hope to add to the current literature on the uses of mindfulness to further inform the application of its use among injured athletes. My hypothesis is that mindfulness-based techniques will be sufficient as a stand-alone treatment protocol for post-injury anxiety if the athlete is able to adopt acceptance and mindfulness. Therefore, mindfulness and acceptance are identified as the independent variables that will influence a decrease in post-injury anxiety among athletes.

Current understanding of post-injury anxiety and mental health in athletes

In the context of sports-injury, post-injury anxiety can result in a decrease in participation and a significant delay to RTS (Hsu et al., 2017). Research has found that when athletes sustain injuries, they may develop symptoms of depression and anxiety which seems to manifest in post-musculoskeletal injuries and post-concussive injuries across collegiate athletes at different points of time (Sabol et al., 2021). Albeit anxiety-related symptoms seem to fluctuate over recovery time which further supports the concern for post-injury anxiety inhibiting RTS. The overall consensus of the literature suggests that post-injury anxiety occurs when athletes cognitively appraise their injury based on factors that may lead to fear avoidance (Ford et al., 2017; Covassin et al., 2014; O'Connor et al., 2022; Meirebachtol et al., 2020; Fischerauer et al., 2018). This fear avoidance manifests into barriers to RTS and recovery processes as athletes will avoid engaging with their sport or training routines due to factors such as fear of causing re-injury, perceived decreased function, or re-experiencing similar pain from initial injury (Meirebachtol et al., 2020; Fischerauer et al., 2018; Hart et al., 2020).

Contributing factors of post-injury anxiety

In order to understand the extent to which mindfulness-based techniques can address post-injury anxiety, it is important to gain knowledge on post-injury anxiety and mental health

repercussions of sustaining a sports injury. Post-injury anxiety can manifest based on a variety of factors which include pain intensity, specific movement, location of injury, type of injury, and perceived function (Hart et al., O'Connor et al., 2022; Meierbachtol et al., 2020; Guo et al., 2018; Fischerauer et al., 2018). In particular, post-injury anxiety is common in athletes who sustained orthopedic type injuries in their lower extremities when compared to higher extremities and internal type injuries (Guo et al., 2018; Fischerauer et al., 2018). Guo et al. (2018) compared the psychological symptoms that occur post injury among higher level athletes who sustained a concussion and orthopedic injuries. The researchers included numerous sports with varying types of orthopedic injuries and found that orthopedic injury types were more susceptible to fear of RTS and fear of reinjury than the concussion group. Results of the study found that athletes that had sustained an orthopedic injury reported higher fear of reinjury and return-to-sport when compared to the concussion group over time. Similarly, these findings are consistent across the literature as the vast majority of sports-related injury is centered around injuries such as anterior cruciate ligament (ACL) ruptures which is a lower extremity and orthopedic type injury (Hart et al., 2020; Meierbachtol et al., 2020).

Effects of post-injury anxiety on athlete mental health

In addition to injury type factors, post-injury anxiety is also affected by an athlete's perceived function after sustaining the injury which can drastically affect their likelihood to return to sport. (Hart et al., 2020; O'Connor et al., 2022). Hart et al. (2020), in their work with athletes recovering from ACL reconstruction, investigated the relationship between function, fear avoidance, pain, and readiness to return-to-sport. The study included athletes who had undergone ACL reconstruction after they had sustained an ACL rupture. Using assessment tools such as the Tampa Scale of Kinesiophobia, which is common across the literature for sports injury, the

researchers found that athletes who experienced higher knee pain and post-injury anxiety reported a lower perceived function. On the other hand, athletes who reported higher knee function had also reported an increased confidence to return to sport which resulted in a higher likelihood that they had returned to sport. Similar results were found in the Connor et al., (2022) study that investigated post-injury fear avoidance and readiness to return to sports among injured Irish collegiate athletes. O'Connor et al. (2020) followed athletes for one season of a field-sport and found that the athletes who sustained an injury and experienced high pain intensity demonstrated higher fear avoidance and lower confidence to return-to-sport. However, it is also important to mention that fear avoidance decreased from the initial injury which suggests that interventions during the recovery process can lead to a possible faster decrease in negative psychological responses.

Rehabilitation process and returning-to-sport

Furthermore, the rehabilitation process after an injury plays a crucial part in an athlete's ability to return-to-sport based on the athlete's likeness to experience negative psychological responses (Reese et al., 2012). Literature suggests that symptoms of post-injury anxiety can hinder the recovery period for the injury due to perceived decreased physical function and lack of engagement in the rehabilitation process (O'Connor et al., 2022; Guo et al., 2018; Fischerauer et al., 2018). This is suspected to be based on the athletes perceived function and readiness to return-to-sport as lower perceived functioning and psychological readiness to return-to-sport can support post-injury anxiety and fear avoidance to tasks used within the rehabilitation processes (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020). Fear-invoking tasks such as specific movements in sports can also create barriers in readiness to return-to-sport and perceived function (Meierbachtol et al. 2020). Cutting was identified to be one of the more

fear-inducing movements among athletes as it is a common movement used in multiple field sports and is found to contribute to post-injury anxiety. Therefore, the way that athletes experience post-injury anxiety include a variety of factors that contribute to different dimensions for post-injury anxiety which direct the use for mindfulness-based techniques.

Methodological analysis

The purpose of this study on post-injury anxiety and mindfulness-based techniques was to conduct a methodological analysis on existing literature to understand the extent to which that mindfulness-based techniques can address symptoms of post-injury anxiety. Through surveying the literature, I have found that most of the methodological approaches are relatively consistent across the selected literature to create a comprehensive understanding of mindfulness-based techniques and its uses in the complicated factors of post-injury anxiety. Through these methods, I will examine the mindfulness-based techniques that have been used in different aspects of post-injury anxiety to further explain the extent of its usefulness. After reviewing the literature, I have selected 10 core studies as indicated in Table 1 below.

Table 1

Authors	Title	Year	Research Method
Bagheri, S., Naderi, A., Mirali, S., Calmeiro, L., & Brewer, B. W.	Adding mindfulness practice to exercise therapy for female recreational runners with patellofemoral pain: A randomized control trial.	2021	Quantitative

Coronado, R. A., Sterling, E. K., Fenster, D. E., Bird, M. L., Heritage, A. J., Woosley, V. L., Burston, A. M., Henry, A. L., Huston, L. J., Vanston, S. W., Cox, C. L., 3rd, Sullivan, J. P., Wegener, S. T., Spindler, K. P., & Archer, K. R.	Cognitive-behavioural-based physical therapy to enhance return to sport after anterior cruciate ligament construction: An open pilot study	2020	Quantitative
Fischerauer, S. F., Talaei-Khoei, M., Bexkens, R., Ring, D. C., Oh, L. S., & Vranceanu, A. M.	What is the relationship of fear avoidance to physical function and pain intensity of injured athletes?	2018	Quantitative
Guo, J., Yang, J., Yi, H., Singichetti, B., Stavrinou, D., & Peek-Asa, C.	Differences in postinjury psychological symptoms between collegiate athletes with concussions and orthopedic injuries	2020	Quantitative
Hart, H. F., Culvenor, A. G., Guermazi, A., & Crossley, K. M.	Worse knee confidence, fear of movement, psychological readiness to return-to-sport and pain are associated with worse function after ACL reconstruction.	2020	Quantitative
Meierbachtol, A., Obermeier, M., Yungtum, W., Bottoms, J., Paur, E., Nelson, B. J., Tompkins, M., Russell, H. C., & Chmielewski, T. L.	Injury-related fears during the return-to-sport phase of ACL reconstruction rehabilitation	2020	Quantitative
Moesch, K., Ivarsson, A., & Johnson, U.	“Be mindful even though it hurts”: A single case study testing the effects of a mindfulness-and acceptance-based intervention on injured athletes mental health	2020	Quantitative

Mohammed, W., Pappous, A., & Sharma, D.	Effects of mindfulness-based stress reductions (MBSR) in increasing pain tolerance and improving mental health of injured athletes.	2018	Quantitative
O'Connor, S., Moloney, A., Beidler, E., Whyte, E., Moran, K., Teahan, C., & Farrelly, M.	Post-injury fear-avoidance and confidence in readiness to return to sport in Irish collegiate athletes	2022	Quantitative
Sant, B., Nesti, M., & Eubank, M.	The effects of mindfulness training on sport injury anxiety during rehabilitation.	2022	Quantitative

Research paradigms

All of selected studies are quantitative studies that focus on the use of empirical evidence to answer the proposed research question. Therefore, all of the studies that were selected stem from a positivist paradigm which is defined to be deductive method of research (Park et al., 2020). A positivist paradigm is essentially the core steps within quantitative research that includes creating a hypothesis, operational variables, and conducting the experiment to inform a proposed research question or theory.

Fischerauer et al. (2018)'s study grounds in a positivist paradigm based on the authors use of a quantitative cross-sectional study and its deductive format to answer their proposed research question. Similarly, Moesch et al. (2020)'a study also approaches a positivist paradigm based on its use of a multiple-baseline single-case design. Other authors, such as Bagheri et al. (2021), Mohammed et al. (2020), and Sant et al. (2022), decided to use a randomized control trial design which is quantitative in nature and therefore, is based on a positivist paradigm. Based on their specific variables, O'Connor et al. (2022) and Guo et al. (2018) had approached their

study using a quantitatively based cohort design while other authors used a quantitative cross-sectional design, case series, and pilot studies to further investigate their proposed research questions (Hart et al., 2020; Meierbachtol et al., 2020; Coronado et al. (2020)). Each of these studies selected a quantitative design study that would best suit their proposed topics and therefore, would be considered to have a positivist paradigm. Although positivist paradigms have value in research, it does not necessarily take into consideration differences between people such as capacity to learn and influences on their lived realities which limits the scope of understanding more complex human experiences and psychological distress (Teherani et al., 2015). Therefore, it is important to be mindful that the use of only positivist paradigm studies may limit the knowledge of proposed experiences of athletes experiencing post-injury anxiety.

Participants

All the studies that were selected had participants who sustained an injury and participated in sports-related activities (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). Inclusion criteria were relatively similar across the studies where participants were above 18 years old, sustained a sports-related injury, required to take time to rehabilitate, and participated in some type of physical activity of a minimum amount of time (Hart et al., 2020; O'Connor et al., 2022; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). Other studies included specific injury types based on their research interest and forms of sports-related injuries. For example, Hart et al. (2020), Meierbachtol et al. (2020), and Coronado et al. (2020) were focused on ACL tears and reconstruction which informed their inclusion criteria to be sports-related ACL injuries. In

comparison, Bagheri et al. (2021) had also only included females with patellofemoral pain as the only sports-related injury that was included in her study. Therefore, the inclusion criteria that is consistent across all studies allows for mindfulness-based techniques to be assessed across similar demographics. However, this also suggests that there is a specific sub-population within athletes as many of these studies are inclusive of collegiate level athletes and therefore, not necessarily applicable to the general population (Guo et al., 2018; Mohammed et al., 2018; O'Connor et al., 2022).

Although there were many similarities across studies, there were also differences depending on the specific research question, the geographic location of the study, and participant gender inclusion which further affect generalizability of literature findings. For example, Meierbachtol et al. (2020) included individuals who were between 14-20 years old when they received surgery for a sports-related injury as they were looking at injury related fears after an ACL reconstruction. The differences in ages may allow the authors investigate younger athletes and their injury related fears after an ACL which may differ from adult athletes. Based on the findings of this specific study, it seems as though the common injury movement was cutting which suggests that athlete ages may not play a factor in injury related fears. In the same way, participants in O'Connor et al. (2022)'s study were all Irish players based on their research interest of the differences that sex, injury severity, and pain have on fear avoidance and RTS among Irish collegiate athletes. This was the only study that was specific in its geographic location and specific cultural inclusion of participants as Irish collegiate athletes participate in field sports which has a high injury rate and therefore, would be an important population to investigate. However, investigating only Irish collegiate athletes does not allow for the generalizability of its findings across all sports based on cultural differences and perspectives of

sports and injuries. Lastly, Bagheri et al. (2021) had only included female runners within their studies while other studies, such as Guo et al. (2018), Mohammed et al. (2018), and Moesch et al. (2021), included a mix of both genders. The inclusion of female runners allowed the authors to investigate the unique experience of female runners that suffer from patellofemoral pain to further inform rehabilitation strategies that are helpful in this population. However, this ignores the population of men who also experience patellofemoral pain in running sports and therefore, invites a further exploration between both genders.

Sampling, recruitment, and selection process

As mentioned, participants across the 10 studies were included if they participated in some type of sport along with other inclusion criteria. When comparing the sampling of each of these studies, there are a couple of articles that included a larger number of participants while others had a significantly lower number of participants (Guo et al., 2018; O'Connor et al., 2022; Fischerauer et al., 2018; Mohammed et al., 2018; Meierbachtol et al., 2020). The articles that had a higher quantity of participants were ones that that studied college athletes, as they had the ability to connect with injured athletes based on their location and facility, such as a sports clinic or university. Although this allowed for a variety of sports-injuries and athletes to be studied, it raises the question of whether these findings can be generalized across the population as many individuals do not participate in sports at a collegiate level. Notably, one of the studies did not have enough participants which resulted in the need for snowball sampling where participants were asked to suggest others to join the study negatively affecting generalizability (Sant et al., 2022). However, for the purpose of this study and its targeted population, it does allow for a more insightful look into the factors effecting higher level athletes among the population.

The selection processes for many of these studies had similar inclusion criteria which allowed for articles to be applied to the research question as it specifies the effects on injured athletes. All of the studies that were selected included participants that were over the age of 18, experienced a lower limb injury, such as an ACL rupture, and participated in varying levels of competitive sport, with one exception to an article that investigated female recreational runners (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). Additionally, out of the articles that discussed mindfulness-based techniques, only one of them had ensured that participants did not have any previous experience with mindfulness (Moesch et al., 2021). This suggests the possibility that previous knowledge or experience with mindfulness can affect level of change in mindfulness measures. For example, Moesch et al. (2021) had ensured that participants did not have any experience with mindfulness and found that their intervention protocol had increased participants mindfulness, in relation to nonreactivity, well-being, and acceptance. When understanding that this may be a factor to the levels of mindfulness, results from the Sant et al. (2020) study where the authors did not take into consideration the effects of previous knowledge of mindfulness and still found that sports-related injury anxiety had decreased in the treatment group compared to the control group may be affected. This does not necessarily mean that mindfulness-based techniques are not useful, however, it does present the question of the effects that individual differences and experiences have in the findings of quantitative research.

Data collection

Since all of the studies relied on targeting and understanding post-injury anxiety, each of the studies had utilized questionnaires such as the Tampa Scale of Kinesiophobia, Pain

Catastrophizing Scale (PCS), Visual Analog Scale (VAS), Athlete Fear Avoidance Questionnaire, and varying scales for assessing knee function and pain as many of the studies had primarily ACL injuries (Fischerbauer et al., 2018; Bagheri et al., 2021; O'Connor et al., 2022; Hart et al., 2020; Meierbachtol et al., 2020; Mohammed et al., 2018). By using these tools, researchers are able to promise reliability in the use of assessment tools that have already been tested and reach the standard for test-retest reliability. Reliability is defined as the consistency of a measure which allows for the measure to produce consistent results (Heale & Twycross, 2015). Therefore, scales that have been empirically tested for reliability ensures that each use of the instrument is consistent in its production for results. Additionally, many of the study's findings seem to align with previous research with regard to the use of mindfulness-based interventions among injured athletes (Sant et al., 2022; Mohammed et al., 2018; Bagheri et al., 2021). In this way, the use of mindfulness-based techniques seems to be helpful in the rehabilitation process of injured athletes and can be considered reliable as it is found to produce positive responses in previous literature.

Although the reliability of these measurements was ensured through the use of empirically tested assessment tools, there were some issues in validity across studies. Validity is characterized as the ability for a measurement to be accurately measure its intended use (Heale & Twycross, 2015). The idea is that researchers design their study and use measurements in a way that is directed to their specific interest. For example, in Moesch et al.'s (2020) study, assessments included two translated scales of the Five Facets Mindfulness Questionnaire (FFMQ), Swedish Acceptance and Action Questionnaire (SAAQ), the World Health Organization Well-Being Index (WHO-5), and The Patient Health Questionnaire for Depression and Anxiety (PHQ-4). However, the Five Facets Mindfulness Questionnaire (FFMQ) was Swedish translated and, although the measure is reliable, validity issues may occur due to

concepts that are lost in translation. Similarly, Mohammed et al.'s (2018) study that had participants complete the Depression Anxiety and Stress Scale (DASS), but only the anxiety and stress section of the measurement. Issues in validity arise when the whole measurement includes questions that allow internal validity and therefore, only using a subsection of the measurement can interfere with the validity of the instrument. Furthermore, it is important to note that, although these are standardized measurement tools, the use of different measurements for depression, anxiety, and mindfulness over others is determined by the researchers' perspective, geographical location, and previous experiences (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). Therefore, the use of one assessment tool over another bring validity and reliability of these measurements into question (Guo et al., 2018; Mohammed et al., 2018; Moesch et al., 2021). It suggests that different author may see one assessment as being more valid or more reliable than another, even if they are supposedly measuring the same thing. For example, Guo et al. (2018) uses the State-Trait Anxiety Inventory to measure anxiety and stress while other studies used measurements such as the Depression Anxiety and Stress Scale or The Patient Health Questionnaire for Depression and Anxiety (Mohammed et al., 2018; Moesch et al., 2021). Moreover, Bagheri et al. (2020) did not include a mindfulness scale despite investigating into the effects of adding mindfulness to exercise therapy. The decision to not include a mindfulness scale seemed to stem from the reliance on other scales being able to determine change and the lack of mindfulness training in the control group. However, the lack of a mindfulness scale measure does not allow for the authors to conclude if the effects were the result of mindfulness training or if there were other factors involved, such as patient-report function due to physical

rehabilitation. Therefore, it is essential to recognize that the inclusion or exclusion of specific measurements can be considered an issue in validity based on applicability to research topic and possible researcher biases.

Data Analysis

Quantitative data analysis relies on the measurement tools and study design to draw conclusions based on the associations of objective data. Therefore, depending on the study and the variables chosen, each study selected a data analysis that was best suited for their study design (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). For example, Fischerauer et al.'s (2018) investigation of the association between physical function, fear avoidance, and pain intensity, the researchers utilized a bivariate analysis model which examines how different variables are related as this would be the best-chosen analysis model for this specific research question. Similarly, Sant et al. (2022) and Mohammed et al. (2018) both utilized three-factorial mixed analysis of variance (ANOVA) for their data analysis as they had compared data from two separate groups involving more than one variable. By using bivariate analyses, both of these studies are able to compare different variables and the relationships between them which provides an effective use of the collected data on the use of mindfulness and the effects it has as an independent variable.

In addition, many quantitative studies also utilize descriptive statistics along with selected inferential statistics model, such as the ANOVA (Kaliyadan & Kulkarni, 2019). Descriptive statistics data to be grouped and summarized for easy analysis and visual representation of the findings through graphs or percentages. For example, Bagheri et al. (2020), Coronado et al., (2020), and Guo et al. (2018) all used descriptive statistics, along with another data analysis

model, in their data analysis to visually represent percentages of their findings. Based on the structure of the design study, using a descriptive statistics data allows for a visual representation of the findings which creates an easily digestible discussions of the findings. For example, Guo et al. (2018)'s study was based on comparing the psychological effects of concussions and orthopedic injuries. Based on its large participant pool, data collection can become overwhelming and difficult to understand as there are many varying factors across each individual. Using a descriptive statistics data analysis, the authors created a table that included the demographics of each participant, including sports, race, gender, and history of injury. The authors also included the percentage of individuals who sustained a concussion compared to those who with an orthopedic injury which allowed an effective use of data collection as all demographic information is laid out.

Findings

The research question that informed this study was “To what extent does mindfulness-based techniques address post-injury anxiety in athletes?”. The hypothesis was based on mindfulness and acceptance acting as independent variables that were expected to decrease post-injury anxiety based on previous literature that argues that mindfulness-based techniques reduce anxiety-related symptoms in elite athletes (Myall et al., 2022). Previous studies argue that emotional recovery from a sports-related injury is mediated by the presence of acceptance which is thought to further influence resulting behaviours during rehabilitation (Tatsumi & Takenouchi, 2014). Therefore, my hypothesis stated that mindfulness-based techniques would be enough to act as a stand-alone treatment plan under the circumstances that athletes adopt acceptance and mindfulness during their recovery period. This hypothesis is based on two parts: the presence of acceptance and the idea that mindfulness-based techniques can be

used as a primary treatment plan for post-injury anxiety. Therefore, the results will be discussed separately to develop a more comprehensive understanding.

Based on the discussed literature, mindfulness-based techniques are helpful in addressing post-injury anxiety, but there is not enough evidence to suggest that it would be sufficient as a stand-alone treatment for post-injury anxiety (Coronado et al., 2020; Bagheri et al., 2021; Sant et al., 2022; Fischerauer et al., 2018; Moesch et al., 2020; Mohammed et al., 2018; Meierbachtol et al., 2020). The extent to which mindfulness-based techniques can address post-injury anxiety may be limited to being a supplement to physical rehabilitation. Meierbachtol et al. (2020)'s study determined that cutting was the most common fear-evoking action, however, ACL-related fears were decreased after training which resulted in a P-value of over 0.05 indicating statistical significance. This training was done with the absence of mindfulness-based techniques and seemed to be more focused on physical rehabilitation. Similarly, O'Connor et al. (2022) found that fear avoidance in injured athletes was significantly reduced from initial time of injury to the time of return to sport with a p value of < 0.00001 indicating statistical significance. This does not minimize the usefulness of mindfulness-based techniques; however, it does highlight the possible limitations to the use of it within post-injury anxiety as physical rehabilitation has been shown to be effective in addressing post-injury anxiety. Therefore, rather than mindfulness-based techniques being the primary treatment plan, it may be better suited to be an addition to physical therapy. Bagheri et al. (2021)'s study included mindfulness-based techniques to the exercise therapy and compared an exercise group and a mindfulness-exercise group. This resulted in both exercise and mindfulness-exercise groups having an improved knee function from baseline at week 9 with a p-value of < 0.001 and < 0.001 respectively. However, there were decreases in fear of movement scales and pain catastrophizing in the mindfulness-exercise group compared to the

exercise group with p-values of <0.001 and <0.01 at week 9 in each scales respectively. This is a recent study and, although this demonstrates potential in the use of mindfulness-based techniques within post-injury anxiety, further investigation is encouraged to determine if it can be used as a stand-alone treatment or if it is better served as a supplementary treatment with physical rehabilitation.

With regard to the adoption of acceptance, the results of this study demonstrated that acceptance is an important factor to help address post-injury anxiety, however, may be contingent on the presence of awareness (Moesch et al., 2020; Mohammed et al., 2018; Sant et al., 2022). Moesch et al. (2020) resulted in increased acceptance but did not see any significant changes in awareness and symptoms of anxiety and depression. The authors found that acceptance in one participant was statistically significant with a p value of <0.01 but had a varying baseline in scales of anxiety and depression. Similarly, Mohammed et al. (2018)'s study used the Mindfulness Attention Awareness Scale (MAAS), which included awareness, and found a p-value of 0.033 in the main effect of the group which indicates higher MAAS scores in the intervention group compared to the control. They had also found that there was decrease in anxiety with a p-values of 0.008 in the Depression Anxiety and Stress Scale. This proposes the possibility that, although acceptance can be helpful, it may rely on the need for awareness. This is discussed in the Sant et al. (2022) study where they discuss the purpose of awareness is to help athletes bring awareness of their feelings and experiences to further support them into the state of acceptance. However, this speculation is inconclusive as there were no specific measurement and intention to explore the influence of the presence of awareness compared to other factors of mindfulness.

Strengths and limitations of methodological approaches

One of the salient strengths seen across the studies is the authors choice of study design. The study design informs how researchers define their independent and dependent variables and how they decide to test them (Tully et al., 2014). There are many different study designs that a researchers can choose from so that it is best suited to explore their desired topic. For example, a randomized controlled trial (RTC) is a study design that is often referred to as the gold standard for quantitative research (Hariton & Locascio, 2018). Using an RTC the researchers can determine cause-effect between an intervention and the results in a way that reduced biases. Bagheri et al. (2021) used an RTC design to compare a group that was treated with just exercise therapy to their mindfulness treatment group. The aim of their study was to examine the effects of including a mindfulness-based program to their exercise therapy. Therefore, using a RTC design was the best choice in being able to compare the effect of using mindfulness-based to a non-treatment group which was reflected in their results. Similarly, other researchers may choose to use a single-case design approach which involves recording measurements for the same individuals across time (Lobo et al., 2017). This is an alternative for studies that do not have access to large sample participants or lower resources as it allows for effective investigation of causal relationships while also promising validity and reliability to remain stable. Moesch et al. (2021) used a single-case study design to determine the effects of mindfulness- and acceptance-based interventions on injured athletes. When compared to a RTC was used in Bagheri et al. (2021), using a single-case study design in Moesch et al. (2021) is better suited as researchers were investigating into the effects that mindfulness- and acceptance- based interventions had on facets of mindfulness, anxiety, and depression within individuals. Furthermore, Moesch et al. (2021) also had a smaller sample size which further justified their choice in design study. Lastly, many of the discussed literature utilized reliable and valid

measurement scales that were tailored for their specific research question and therefore, established a clear and quantitatively designed study that was both reliable and valid in nature when discussing the topic of post-injury anxiety and injuries among athletes (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al., 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020).

Although there are strengths across all studies, there are also limitations that should be discussed across the methodological approaches. Firstly, a significant limitation that can be observed across a number of studies is that there were often higher numbers of one gender compared to the other (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al., 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). Out of the 10 studies, five of them had a higher number of male participants compared to their female counterparts (O'Connor et al., 2022; Guo et al., 2018; Hart et al., 2020; Fischerauer et al., 2018; Mohammed et al., 2018). Being oversaturated in one gender across the sample population makes it difficult to generalize the findings as it cannot be applied as being representative of the general population. For example, O'Connor et al. (2022)'s study had included 416 males and 256 females in their study which represents a larger sample size of men compared to females which can be considered a limitation in the participant sample population. The lack of female representation among these studies ignores the gender differences that occur as research has found the female athletes are at a higher risk of developing symptoms of anxiety (Rice et al., 2019). Therefore, a major fault of these studies is the lack of equal representation and consideration of gender differences in the manifestation of anxiety-related disorders, more specifically, post-injury anxiety. Second, the

inclusion criteria across the studies were inclusive of collegiate level athletes who operate at a higher level than recreational athletes (O'Connor et al., 2020; Guo et al., 2020; Fischerauer et al., 2018; Mohammed et al., 2018; Meierbachtol et al., 2020). Some of the studies contained a larger sample population due to the researcher's desire to study the specific subpopulation of athletes participating in the collegiate level and therefore, had access to injury clinics and university level athletes (Guo et al., 2020; O'Connor et al., 2022; Fischerauer et al., 2018; Mohammed et al., 2018; Meierbachtol et al., 2020). Therefore, these studies, although targeting athlete population, is addressing the higher-level athlete levels which may not be applicable to the general population of athletes that participate at a junior or recreational level. Lastly, a major limitation within the methodological approaches was the current lack of mindfulness-based interventions that are tailored for negative psychological events among injured athletes (Moesch et al., 2020; Coronado et al., 2020). Due to the lack of such model, some of the studies had to design their own models of intervention for mindfulness-based programs for their respective studies and proposed topic for research athletes (Moesch et al., 2020; Coronado et al., 2020). These mindfulness-based programs had not been previously tested for validity and therefore, may be considered a limitation in the validity of these studies as they have not been found to be empirically tested for reliability or validity. Therefore, further research is encouraged to present a reliable and valid mindfulness-based model that can be used for athletes suffering from post-injury anxiety.

Limitations

One of the most salient limitations to the methodological approaches across the studies is that every study is quantitative and therefore, grounded in positivist paradigms. Although positivist paradigms have its value in quantitative research, it is important to mention that other

paradigms could have also been beneficial in understanding my research question. For example, qualitative research often uses constructivist approaches where the research is more concerned over the individual experience rather than the statistical evidence (Khan, 2014). Due to the fact lack of qualitative research and the nature of post-injury anxiety, there is a need for further exploration into the experiences that athletes have with post-injury anxiety and how this effects their readiness to return-to-sport on a more individual level.

Additionally, the research is still developing to further the understanding facets of mindfulness and how it can be implemented in sports rehabilitation. There is certainly areas of improvement and further exploration is a notion of other contributing factors that effects psychological changes in post-injury anxiety. As previously mentioned, there has yet to be a an empirically tested mindfulness-based program developed to address post-injury anxiety in injured athletes which places limitations on the extent to which the research can progress. The lack of such a model creates a barrier in being able to compose a complete understanding of the extent that mindfulness-based techniques can be helpful in treating post-injury anxiety (Mohammed et al., 2018; Moesch et al., 2020). Furthermore, the studies that are available on post-injury anxiety and sports-related injuries are commonly on ACL ruptures. ACL ruptures are one of the most common sports-related injury and therefore, many of the studies that are available on post-injury anxiety and sports-related injuries are on ACL ruptures and reconstructions (Gans et al., 2018). In this way, researchers are limited to studying ACL tears as these are the most common and are likely to develop post-injury anxiety as previously discussed (Guo et al., 2018).

Mindfulness-based techniques in post-injury anxiety

Mindfulness-based techniques have been found to be useful for athletes for psychological responses to injury and for sports performance (Anderson et al., 2021; Sant et al., 2022). Mindfulness-based interventions is one of the more popular third-wave therapies as many newer theory models such as acceptance and commitment therapy (ACT) and mindfulness-based cognitive therapy (MCBT) encourage the idea of cognitive flexibility and a focus on the present (Hayes & Hofmann, 2021). In the context of sports injury, mindfulness in the form of educational programs, meditation sessions, and relaxation techniques has yielded positive results in increasing pain tolerance and mindful awareness in injured athletes (Mohammed et al., 2018; Walker & Heaney, 2013). Athletes are able to learn these skills to provide them the psychological tools to handle negative emotions resulting from sports-related injuries. Since the literature is already supportive of the effectiveness of mindfulness-based interventions for fear of re-injury in athletes, understanding the limitations would encourage further investigation to facilitate a better understanding in the literature. Many of the mindfulness techniques that are used across the literature reflect similar strategies seen in therapies such as DBT (Fassbinder et al., 2016; Sant et al., 2022; Mohammed et al., 2018; Bagheri et al., 2021; Coronado et al., 2020). DBT is a mindfulness-based therapy that grounds the strategies and research on principles of mindfulness and emotional regulation. DBT often uses concepts of validation and acceptance of internal personal events which is consistent across many other mindfulness-informed interventions and relaxation techniques that are discussed in sports literature. Similarly, acceptance and commitment therapy (ACT) focuses on the idea of committed actions which is similar to the idea of goal setting to increase self-efficacy after a sports related injury (Hayes et al., 2012; Brinkman et al., 2019).

Post-injury anxiety and meditation

Meditation is often associated with yoga and sitting meditation and, although that is part of the technique, it is a snapshot of the overall purpose of meditation. In the context of sports injury, meditation can be defined as bringing attention to body signals and cognitions to the present moment which teaches athletes to notice bodily sensations and maladaptive thoughts without engaging in the struggle to change it (Bageheri et al., 2021; Fischerauer et al., 2018; Moesch et al., 2020; Mohammed et al., 2018). As previously mentioned, athletes report post-injury anxiety based on a variety of factors, one of which includes pain intensity (Hart et al., O'Connor et al., 2022). Therefore, the purpose of mindfulness meditation is to turn the athletes' attention to the negative cognitions of pain and current body sensations without engaging in the need to change it (Bagheri et al., 2021). By doing so, the athlete is able to cognitively appraise their injury in the present moment which prevents athletes from ruminating on their injury and contributing to pain catastrophizing and post-injury anxiety. Based on the understanding that external lower limb injuries can manifest symptoms of anxiety, it is crucial to discuss how mindfulness meditation can be helpful in addressing negative symptoms in populations with lower limb injuries and pain experiences (Guo et al., 2018).

Bagheri et al. (2021) investigated into the effects of adding mindfulness practice to exercise therapies for female recreational runners who experience patellofemoral pain. Their hypothesis stated that implanting mindfulness training along with exercise therapy would result in lower pain intensity, fear of reinjury, pain catastrophizing, and improved knee function. In this study, mindfulness is defined as being aware of present experiences without attempting to change them which encompasses the idea of acceptance within mindfulness. Researchers discovered that athletes in the mindfulness-training group, reported lower post-injury anxiety and were able to distract from pain sensations in their leg. Authors believe that these results suggest that

meditation allows for athletes to disassociate from pain intensities. By doing so, athletes are able to engage in a present state of mind which minimizes psychological barriers to the recovery process such as symptoms of post-injury anxiety. Similarly, Moesch et al.'s study (2020) investigated into whether mindfulness- and acceptance-based interventions can improve mindfulness, acceptance, well-being, and decrease symptoms of anxiety and depression among injured athletes. Once selected, the athletes included had suffered a severe ACL injury, Achilles tendon, or foot fracture and did not have any previous experience with mindfulness or any ongoing psychological interventions. Findings of the study suggested that injured athletes who participated in mindfulness meditation in a study utilizing mindfulness- and acceptance-based interventions had increased non-reactivity, defined as non-reaction to injuries, and well-being.

Although results of Moesch et al. (2020) suggest meditation can be helpful in addressing post-injury anxiety, the results did not find any changes in acting with awareness which is the basis for mindfulness meditation. This suggests that there are limitations in the use of meditation as a way to address the entirety of post-injury anxiety. Even though changes were identified in some facets of mindfulness, this study suggests that mindfulness meditation does not necessarily help increase acting with awareness which is suggested to be an important factor in addressing post-injury anxiety. Awareness has been discussed as an important factor for injured athletes engaging in physical rehabilitation as it allows them to be conscious of negative thought patterns that inhibit their ability to engage in exercise therapy and fear-evoking movements (Wu et al., 2023; Meierbachtol et al., 2020). In a different study published by Meierbachtol et al. (2020), the researchers hypothesized that a task that evokes fear would be different across athletes and that fear intensity for that specific task would be significant higher and would show minimal change after participating in return-to-sport training compared to other identified injury-related

fears. They found that athletes reported to experience a decrease in in post-injury anxiety after advanced group training after an ACL surgery, which is in alignment with their hypothesis. Therefore, if we are conceptualizing post-injury anxiety based on similar factors, advanced return-to-sport training seems to be enough to address issues in post-injury anxiety. This indicates that advanced training may be equally as helpful in addressing post-injury anxiety when compared to studies using meditation which speaks to the extent to which mindfulness techniques can address anxiety-related symptoms as a result of injury.

In Mohammed et al.'s (2018) study, researchers used common meditation from the Mindfulness Based Stress Reduction (MBSR) to help increase pain tolerance and reducing perceptions of pain and anxiety caused by injuries in athletes. Similar to the previous studies, the intervention included meditations that were focused on increasing awareness to body sensations and negative thoughts. Their hypothesis stated that engaging in regular mindfulness would increase pain tolerance and awareness which would subsequently result in a positive increase in the mental health of injured athletes. Researchers found that there was a notable decrease in stress and anxiety, however the results were not statistically significant. Furthermore, both groups had reported improved mood which researchers suggested could be a result of time period between initial injury and recovery.

The literature indicates that meditation as a mindfulness-based technique to address post-injury anxiety can be helpful in taking notice of maladaptive thought patterns and bodily sensations (Moesch et al., 2020; Bageheri et al., 2021; Fischerauer et al., 2018; Mohammed et al., 2018). Notably, meditation seems to be helpful in increasing some aspects of mindfulness, such as non-reactivity, but does not necessarily help in teaching awareness. Furthermore, results of these studies imply that mindfulness meditation is a technique that is not necessarily more

effective than the use of normal rehabilitation for sports injury. Post-injury anxiety occurs as a result of a variety of factors which includes perceived decrease in function. In sports rehabilitation and physical therapy, athletes train their bodies to recover from the injury in an attempt to increase their previously lost function (Fares et al., 2022). In this way, the work that they put in sports rehabilitation seems to be effective in increasing perceived function of injured limbs which would then decrease the chances of post-injury anxiety occurrence.

Post-injury anxiety and mindfulness psychoeducation

Across the literature, many researchers have utilized mindfulness psychoeducation as a means for intervention for injured athletes (Coronado et al., 2020; Bagheri et al., 2021; Sant et al., 2022). By including psychoeducation on mindfulness to the rehabilitation process, athletes are able to learn about mindfulness skills that work for them and implement them as needed. As previously discussed, Bagheri et al. (2021) added mindfulness exercise to the physical rehabilitation program for injured athletes and found tremendous success in the decrease of post-injury anxiety. Athletes simply learning about mindfulness and how to implement the skills seems to be helpful in increasing mental health and decreasing negative psychological reactions to injuries (Mohammed et al., 2018; Coronado et al. 2020). Psychoeducation allows for individuals to understand the purpose of mindfulness skills to ensure that they are able to fully engage in the activity without feeling lost or confused. By creating a strong foundation for mindfulness, athletes are able to implement the skills that are appropriate to their lifestyle and rehabilitation process.

Similar to other researchers in the past, Sant et al. (2022) investigated into the effects of mindfulness training has on sports injury during rehabilitation process. Athletes that had sustained a sport-injury were asked to participate in an 8-week program where the researchers

used a combination of psychoeducation, mindfulness, value identification, and ACT skills and practice to address sports-related anxiety. Findings of this study showed that this state of mindfulness training was helpful in decreasing post-injury anxiety. Furthermore, the results of this study also supported the idea that by teaching and practicing skills of mindfulness in injured athletes, it may also support their ability to return to sport. By understanding the blockages that post-injury anxiety and negative thought patterns can have on returning to sport, injured athletes are able to comprehend the commitment to utilizing skills to support a stronger recovery process.

With the knowledge of useful athlete psychoeducation is, there is a need to also discuss limitations of psychoeducation in mindfulness among this population. As previously discussed, Sant et al. (2022) found that there were increases in the mental health of injured athletes, however, two participants in the control group, without the mindfulness training, had experienced a small increase in mindfulness and decrease of post-injury anxiety. This is suggested to be the result of an increase in exercise in one participant and a beginning of a new diet in the other. This suggests that, although helpful, there are other mitigating factors that can contribute to the decrease of post-injury anxiety outside of mindfulness-based interventions such as psychoeducation. In the same way, Coronado et al. (2020) conducted an open pilot study that focused on using telephone-delivered cognitive-behavioural-based physical therapy to assist in the return to sport post ACL surgery. Their hypothesis stated that CBPT-ACLR intervention would address fear of reinjury, enhance self-efficacy, and potentially effect acceptability and adherence to the rehabilitation program. When analyzing the components of this intervention, many of the skills and psychoeducation that is introduced to participants were based in mindfulness-based theories which is in alignment with the type of techniques discussed throughout this paper. The study included psychoeducation on topics such as present mindedness

which included teaching individuals that previous actions and thoughts may be automatic due to previous experiences but by turning attention towards them, we can slowly change those habitual actions. As previously mentioned, mindfulness is based on the fact that an individual has to bring awareness towards internal and external factors which seems to be encompassing in a variety of the sessions that were included in this study. Similar to previous studies, researchers used the Tampa Scale for Kinesiophobia where they found a decrease in post-injury anxiety after the implementation of the cognitive-behavioural-based physical therapy skills. Furthermore, results found high adherence rate, adherence to skills learned, and positive feedback. Although there was high adherence, there was also a lower report of the cognitive behavioural physical therapy skill adoption after the program was finished which suggests a lack of integrated skills.

Therefore, the literature suggests that psychoeducation on mindfulness is helpful in teaching skills and decreasing post-injury anxiety, but there are limits to the extent to how well skills are learned, integrated, and efficacy compared to other forms of rehabilitation processes set in place for injured athletes.

Post-injury anxiety and acceptance

Mindfulness is a concept that revolves around the ideas of awareness and acceptance. As previously mentioned, awareness is the ability to turn attention to internal and external thoughts in a way that is non-judgemental and does not engage in the struggle to change it (Bagheri et al. 2021). If awareness is the first step to mindfulness, acceptance becomes the second step to allow for negative events, such as sports injuries, to be accepted for what they are so that individuals are able to move forward. Post-injury anxiety manifests based on a variety of factors which includes pain perception and catastrophizing (O'Connor et al., 2022). Therefore, the purpose of

acceptance is to accept pain and sustained injury so that it does not become a barrier to recovery (Mohammed et al., 2018).

In Sant et al.'s (2022) study, the mindfulness training that was offered to participants was adapted from concepts of acceptance and commitment therapy (ACT). Since there is no current acceptance-based model to use in injured athletes, they created the Mindfulness-Acceptance-Commitment (MAC) intervention which included the acceptance piece of mindfulness. As mentioned, these results indicated a negative association between mindfulness and post injury anxiety in athletes where mindfulness increased while post-injury anxiety decreased. Furthermore, researchers discussed that the role of learning acceptance allows for athletes to nonjudgmentally engage in each stage of the recovery process without succumbing to negative cognitions and perceptions of their perceived function and pain. Sant et al. (2022) further discuss the role of acceptance in their study and conceptualized it using the social validation interviews to discuss subthemes across awareness, acceptance, and action. In particular, acceptance included subthemes of resilience, meaning/purpose, and patients which was hypothesized to aid in encouraging athletes to engage in rehabilitation. By achieving acceptance, athletes are able to use their own values to drive their desire to engage in recovery and therefore, lead to acceptance of injury which allows for a decrease in post-injury anxiety. Results of the study found that participants in the experimental group identified increased focus, being in the present moment, and attention based on the social validation interviews. Furthermore, having greater awareness was reported to help participants accept their situation and therefore, adhere to the rehabilitation process. This indicates that acceptance has a contributing role in the adherence to rehabilitation engagement, similar to the role of awareness.

These implications can extend to Coronado et al. (2020)'s study where researchers had investigated into the adherence and feasibility of using cognitive-behavioural-based physical therapy to enhance RTS after ACL reconstruction. As mentioned, many of the strategies in Coronado et al. (2020)'s study reflects mindfulness-based strategies which included present-mindfulness whose descriptions are similar to the acceptance themes discussed in the social validation interviews in the Sant et al. (2022) study. Results of this study found high adherence rate to the telephone sessions, moderate adherence to skills adoption, and had positive reception of intervention. In this sense, acceptance may be seen as a contributing factor to adherence based on athletes accepting the rehabilitation process which further engages them in recovery. To further this discussion on the functionality of acceptance, Moesch et al. (2020) had also measured acceptance across their participants and found that there were increased levels of acceptance but did not see any significant statistical changes in awareness, anxiety, or depression. If acceptance is understood as the second step in mindfulness rehabilitation, the lack of awareness and presence of acceptance is not enough to decrease symptoms of post-injury anxiety. Clinical implications for acceptance across multiple studies suggest that the occurrence of acceptance is not sufficient on its own to address post-injury anxiety. However, the presence of awareness and acceptance play important roles in the adherence of rehabilitation strategies based on athlete-value driven encouragement and acceptance to pain and sustained injury (Moesch et al., 2020; Bagheri et al., 2021; Mohammed et al., 2018; Sant et al., 2022).

Ethical considerations

All researchers are expected to follow their respective professional associations to ensure that they are acting on approved and ethical grounds for research. The 10 examined studies were screened by their own respective regulatory bodies to ensure that the study followed proper

protocols to be ethically approved (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). As stated in the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (TCPS2), researchers are expected to follow ethical procedures to access funding for research proposals (Government of Canada, 2022). All of the ethical polices reflect similar ethical expectations to ensure researchers are maintaining respect for dignity of persons and peoples, responsible caring, integrity of relationship, and responsibility to society within their studies (Canadian Psychological Association, 2017; College of Alberta Psychologists, 2018; College of Alberta Psychologists, 2019).). Therefore, discussion of ethical considerations will be discussed using the general principles outlined in the Canadian Codes of Ethics with the understanding that the TCPS2 and Standards of Practice reflect the same principles.

Principle I: Respect for dignity of persons and peoples

As stated in the Canadian Code of Ethics, principle I details the respect for dignity of persons and peoples' which states that people are to be treated fairly without discrimination and in a way that prioritizes their best interest (CPA, 2017). Although these studies were not conducted in Canada, all of the selected studies acted in accordance with principle I through study design and methodology. All studies required written informed consent and an approved ethical review by their own respective boards before launching the study (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020). Informed consent stresses the importance of individuals being able to consent to participation with the freedom to withdraw at any point without consequence. Furthermore,

principle I also protects the privacy and confidentiality of participants which is also consistent across all studies as identifying information has been removed, coded, and securely stored.

Principle II: Responsible caring

Responsible caring states the importance of risk/benefit analysis of pilot studies to determine if the effects of the treatments have a higher benefit than risk factor (CPA, 2017). For example, some of the studies included discussed previous pilot studies being approved and trials being registered to guarantee that studies were safe and acted in accordance with ethical guidelines (Sant et al., 2022; Bagheri et al., 2021). Consistent with ethical standards in the TCPS2, responsible caring also requires competency in the research and recommend consultation to ensure that expertise is promised across the study which was also consistent among selected studies (Hart et al., 2020; Sant et al., 2022; Moesch et al., 2020; CPA, 2017; Government of Canada, 2023).

Principle III: Integrity of relationships

Principle III states the importance of maintain integrity of relationships which includes being honest, objective, lack of biases, straightforward, avoidance of conflict of interest, and avoidance of incomplete disclosure and deception (CPA, 2017). As mentioned, the TCPS2 reflects many of these principles as it also outlines expectations in ensuring that participants are properly debrief, conflict of interests are addressed and managed, and that researchers act in accordance with honesty, fairness, and straightforwardness. Amongst the selected studies, all of the researchers address their limitations to ensure honesty in the results of their study which includes discussion of biases, possible conflicts of interests that were addressed, and transparency in the methodology and results of the study (Hart et al., 2020; O'Connor et al.,

2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020)

Principle IV: Responsibility to society

Finally, Principle IV discusses responsibility to society which operates under the expectation that research and psychological interventions will provide development of knowledge, beneficial activities for society, maintain respect for society, and help the development of society as a whole (CPA, 2017). The primary goal for this principle, as well as similar policies under the TCPS2 and Standards of Practice, is that conducted research will be for the benefit of society and maintain a high expectation on the development for the better of society. This is reflected across all of the studies as they contribute to the further understanding of post-injury anxiety, the population it affects, and the interventions available to aid in the resulting psychological distress (Hart et al., 2020; O'Connor et al., 2022; Meierbachtol et al., 2020; Sant et al., 2022; Mohammed et al., 2018; Moesch et al., 2021; Bagheri et al. 2020; Fischerauer et al., 2018; Guo et al., 2018; Coronado et al., 2020).

Chapter 4: Applications to Clinical Practice

Application on a societal level

The understanding on how mindfulness-based techniques can be useful in addressing post-injury anxiety can be helpful at a societal level with regards to injury prevention and emphasis on athlete mental health. One of the more salient ways that this study can be applied into society is the implications that it has on colleges and sports associations in their rehabilitation programs. By understanding the important components to addressing post-injury anxiety and the need for a strong physical rehabilitation program, sports associations and colleges may be able to create training programs that use current injury prevention literature and

the limitations of the use of mindfulness to better suit their athletes and teams (Pettersson & Olson et al., 2017). As previously mentioned, injury prevention is on a rise across the sports community and the knowledge of the possible usefulness of acceptance and awareness may prove to be incredibly valuable (Edouard & Ford, 2020). As discussed by Edouard & Ford (2020), the authors discuss the challenges of injury prevention and rehabilitation. They argue that there should be a bigger emphasis for the reduction of injuries rather than prevention as zero occurrence of injuries is simply not plausible. Therefore, they concluded that there is room for improvement in the theoretical understanding of epidemiology, risk factors, and strategies to help reduce injury or reinjury. The authors discuss how rehabilitation can help address reinjury in athletes by understanding the social, psychological, and contextual factors that create barriers to RTS. In this sense, the findings of the current study allow for the understanding of how injuries can uniquely affect athletes and which mechanisms are specifically helpful in teach strategies that will reduce the time to RTS but also provide athletes with the tools for rehabilitation and therefore, reduce reinjury. Using the results of this study, it is crucial that athletes are able to learn how to become aware of their post-injury anxiety and learn how to accept their current function. By doing so, athletes would be able to engage in physical rehabilitation in a way that is meaningful and subsequently, speed up the recovery process.

Considerations for integration into practice

Integrating the benefits of the current studies results into clinical practice comes with considerations for clinical practice. The results of the current study state that mindfulness-based techniques rely on the presence of both awareness and acceptance among athletes (Moesch et al., 2020; Mohammed et al., 2018; Sant et al., 2022). Therefore, an important consideration for the integration into practice may be to investigate the further use of acceptance and commitment

therapy (ACT) as this is a modality that is largely based on these two components (Hayes et al., 2012; Brinkman et al., 2019). As previously discussed in an earlier chapter, ACT therapy focuses on increasing cognitive flexibility in order to address mental health issues such as anxiety and depression through the use of acceptance, awareness of cognitive barriers, and committed actions (Hayes et al., 2021). Therefore, although this modality seems to fit seamlessly into addressing post-injury anxiety, the use of ACT has not been extensively studied for sports-related injuries. Mahoney & Hanrahan (2011) discussed the use of ACT in a qualitative study with four injured athletes and found that it had educated the athletes to understand the challenges of sustaining an injury and improved their engagement within rehabilitation. This suggests that there is an avenue to explore in future research when investigating into post-injury anxiety and the use of mindfulness-based therapy in models that primarily focus on aspects of acceptance and awareness. With this information, clinicians who choose to practice ACT and may gain clients with post-injury anxiety should consider the mindfulness-based techniques that are embedded within the modality and tailor it to the athletes' needs.

In addition to considering the implementation of these techniques under different modalities, it is also important to consider cultural differences across the population. Although this study utilized literature that was conducted primarily in North America, it is incredibly important to recognize that there are athletes that may experience similar symptoms to post-injury anxiety. However, as previously discussed, post-injury anxiety was used a general umbrella term that encompassed definitions for Kinesiophobia and fear avoidance (Meierbachtol et al., 2020; Fischerauer et al., 2018; Hart et al., 2020). Therefore, one of the more salient consideration pieces for clinicians to be aware of is the cultural differences of symptoms and how this may affect the use of mindfulness-based techniques for post-injury anxiety. When

anxiety is discussed, it is typically defined using physiological and psychological symptoms of fear and is known to be influenced by age, gender, socioeconomic status, and cultural factors (Hofmann & Hinton, 2014). There are some cultures that view anxiety in a different perspective due to influence of a collectivist society rather than an individualistic society. In this sense, other cultures may not acknowledge the symptoms of anxiety and therefore, people may not be formally diagnosed with anxiety-related disorders due to societal preconceived notion on mental health. Therefore, it is incredibly important for clinicians to consider that athletes who have a different cultural perspective may not recognize symptoms of post-injury anxiety and may not respond to the use of mindfulness-based techniques. In the same way, clinicians should also consider the need to culturally adapt mindfulness-based techniques to address cultural differences and perceptions. Recent studies have shown that culturally adapting mindfulness-based interventions can be incredibly helpful in addressing mental health disorders in a way that is culturally relevant and effective for their given culture (Castellanos et al., 2020; Watson-Singleton et al., 2019). Therefore, integrating mindfulness-based techniques with the emphasis on awareness and acceptance should consider the cultural differences and perspectives on mental health and prioritize cultural values so that techniques are tailored in a way that is meaningful for the clients.

Reflection

During this writing and research process, I have learned a lot about the work that goes behind conducting research and the amount of time and research that occurs before the actual experiment. Although this current paper did not conduct any physical experiments, it still relied on a well-rounded knowledge of the current state of literature and how this understanding can be applied in answering a different question. Prior to writing this paper, I was aware of research

biases, but had never truly understood why this might be an incredible feat for people to overcome. However, by spending time and effort into this particular project, I began to see how hard it might be for researchers to separate themselves from their given topic. Although I believe that I was able to minimize the risk of researcher biases in the current study, I can only imagine how hard it would be for someone who has done years of research and experimentation in their given topic to be able to completely separate themselves. I believe that this lesson of understanding biases on a more personal level further extends into clinical and professional practice as many mental healthcare providers may experience transference and countertransference with their own clients. Similar to pulling information from different studies, there are many therapists that pull from different therapies to create a more eclectic approach to counselling. Once homing in on a particular style of therapy, it may be hard to adjust to a clients' needs based on established biases of the way that therapy occurs within session. In this sense, I think that I have learned a different way of being aware of biases as I have experienced it in a researchers' position and as a student counsellors' position. This further encourages me to continue to be conscious of my own internal events and how this may affect the work that I am currently doing.

Recommendations for clinical practice

An article discussed the importance of a multidisciplinary approach to handling sports injury and rehabilitations (Edouard & Ford, 2020). The authors argue that being able to understand each healthcare providers recommendations would allow for further optimization of treatment for athletes. The results of this study suggest that mindfulness-based techniques can be optimized for post-injury anxiety and injury rehabilitation when it is used in conjunction with physical rehabilitation. This is further supported by the Bagheri et al. (2021) study that found

that by adding mindfulness, in conjunction with exercise therapy, fear of movement had decreased from baseline which resulted in a decrease of re-injury anxiety. Therefore, the recommendation for the use of mindfulness-based techniques is to use it with a tailored form of rehabilitation for the given athlete which would require the need for multidisciplinary plan and action. Through these results, it is apparent that by understanding the limitations of mindfulness, the field of counseling psychology is able to not only explore the possibility of adding mindfulness into other pre-existing interventions, but also be aware of how it can impact rehabilitation within a multidisciplinary scope. One of the primary goals for rehabilitation is for the athlete to return to sport at a prior injury emotional and physical state as well as prevent reinjury (Dhillion et al., 2017). Rehabilitation is discussed in three stages which include the acute phase which focuses on healing, reconditioning phase which focuses on physical rehabilitation and progressive loading and return to sport. In the acute phase, athletes are focused on the healing process of injuries and where the multidisciplinary approaches, such as psychological interventions, take place. However, as discussed in the current study, it is recommended that psychological interventions further extend to the reconditioning phase as this would allow for athletes to be aware of their injury and learn to accept their current state of function which would result in a further engagement in reconditioning. Post-injury anxiety can result in a diminished return-to-sport and quality of life due to the inability to engage in a previous enjoyed activity and possible loss of career opportunity (Filbay et al., 2019; Filbay et al., 2016). Therefore, understanding that acceptance and awareness are large players in contributing to the reduction of post-injury anxiety, rehabilitation teams are able to determine the best course of action for athletes and work together to create plans that are tailored to injury characteristics, current function, and individual factors.

In addition to the recommendations for multidisciplinary use in clinical practice, it is important to remember that mindfulness-based techniques do not solely belong to one modality within psychology, but instead, it has its place in many other modes of therapy which can be tailored to fit clients (Fassbinder et al., 2016; Sant et al., 2022; Mohammed et al., 2018; Bagheri et al., 2021; Coronado et al., 2020; Hayes et al., 2012; Brinkman et al., 2019). Mindfulness-based techniques can be discussed in different types of modalities and therefore, it would be beneficial for a mindfulness-based model for athletes to be established. As mentioned, many of the discussed studies highlight the limitation of not having an already created mindfulness-based program for injured athletes which resulted in the authors creating their own (Moesch et al., 2020; Coronado et al., 2020). In the discussed studies, the researchers adapted a chosen therapeutic modalities to better suit injured athletes and focus on the use of present-mindfulness, non-judgement, and acceptance. Therefore, a model that utilizes similar background literature of mindfulness and pain theory for athletes should be further investigated. For example, the Mindfulness Based Stress Reduction (MBSR) model was used as a reference in two studies where one study found a general decrease in anxiety while the other found an increase in acceptance (Mohammed et al., 2018; Moesch et al., 2020). The MBSR model was designed as a weekly course that focused on learning mindfulness-based techniques such as relaxation breathing, meditation, and monitoring self-talk (Kabat-Zinn, 1982). MBSR was to teach individuals how to manage pain by observing their internal events of the pain and learn to accept without judgement. The example discussed in the article suggests that instead having thoughts that the pain is killing them, which suggests prolonged pain, MBSR would seek to shift perspective to the idea that pain is temporary. Similar to what Moesch et al. (2020) did in their study, a model that integrates the MBSR and ACT may be incredibly valuable in sports injury.

As formally mentioned, ACT focuses on increasing cognitive flexibility so that individuals are able to accept and engage in committed action (Hayes et al., 2012). However, this model would focus on the use of psychoeducation and meditation with an emphasis on awareness and acceptance in order to target post-injury anxiety. To have this further be tailored to athletes, it would be important to have the athlete become aware of their athletic identity through cognitive appraisals as mentioned in the theoretical framework of the current study (Wiese-bjornstal et al., 1998). In individual sessions with athlete clients, it may be important to bring awareness through having the client be aware of athletic identity using strategies from ACT to help facilitate increase cognitive flexibility. For example, if a client presents as having a high athletic identity with perfectionist qualities, it may be beneficial to bring awareness to how these verbal knots may be causing internal distress. Therefore, by implementing ACT followed by MBSR strategies, clients would be able to become aware of their own cognitive perception of themselves as athletes, the recovery of their injury, and post-injury anxiety symptoms. For this reason, the establishment of such model may be incredibly helpful for mental health care professionals working with injured athletes dealing with post-injury anxiety.

Chapter 5: Recommendations and Conclusion

The purpose of this study was to answer the proposed research question asking, “to what extent can mindfulness-based interventions be used to address post-injury anxiety among athletes?”. By conducting an extensive search of current literature, this study examined the contributing factors to post-injury anxiety and different types of mindfulness-based techniques that have been used to address post-injury anxiety. Based on the reviewed literature, this study has answered the research question as the main finding suggests mindfulness-based techniques can be used as supplementary psychological intervention to encourage engagement in physical

rehabilitation. While mindfulness-based techniques as a whole play an important role in addressing post-injury anxiety, the specific presence of awareness and acceptance are significant elements that seem to allow for meaningful engagement in physical rehabilitation. Techniques such as psychoeducation and meditation were found to yield favourable results when used to address post-injury anxiety (Moesch et al., 2020; Bageheri et al., 2021; Fischerauer et al., 2018; Mohammed et al., 2018; Coronado et al., 2020; Sant et al., 2022). Notably, the studies using meditation and psychoeducation as a way to address post-injury anxiety seem to be helpful in a relative decrease in post-injury anxiety, however, did not show any significant changes in awareness (Bageheri et al., 2021; Fischerauer et al., 2018; Moesch et al., 2020; Mohammed et al., 2018; Coronado et al., 2020; Sant et al., 2022). Similarly, the presence of acceptance in mindfulness-based techniques are still helpful in addressing symptoms of post-injury anxiety but has shown to not completely address anxiety-related symptoms with its presence alone (Moesch et al., 2020; Bagheri et al., 2021; Mohammed et al., 2018; Sant et al., 2022). In conclusion, post-injury anxiety can cause significant decreases in RTS due to a variety of factors such as fear of reinjury (Meirebachtol et al., 2020; Fischerauer et al., 2018; Hart et al., 2020). The results of the current study found that mindfulness-based techniques, used in conjunction with physical therapy, is helpful in addressing symptoms of post-injury anxiety through acceptance and awareness. I hope that these findings will encourage and support future research on ways to integrate mindfulness into physical rehabilitation and contribute to the growing trajectory of psychological rehabilitation for athletes.

Athlete mental health is uniquely affected by internal and external events such as performance expectations, individual perceptions, and sports-related injuries (Haugen, 2022). Therefore, this population of individuals may be more susceptible to experiencing severe levels

of depression and anxiety which encourages the need for further exploration into psychological interventions. Despite the results of the current study, there are still gaps within the literature that should be further investigated. As previously stated, Meierbachtol et al. (2020) discuss how advanced training programs do decrease intensity of fear-evoking tasks and suggest that it may be due to the reliance on progressive neuromuscular training rather than sudden exposure to feared tasks. These findings infer the possibility that training program that primary focus on progressive muscle challenges may inadvertently teach mindful awareness. To further support this idea, recent literature investigated into the relationships between mindfulness, competitive state anxiety, self-criticisms, and obligatory exercise in injured athletes (Wu et al., 2023). The authors discussed the idea of obligatory exercise as being the type of exercise that injured athletes will engage in with the desire to progress rehabilitation to pre-injury functions quickly. This is argued to be one of the contributing factors to re-injury as athletes are likely to engage in exercise that is not fit for their current function. To remedy this, mindfulness is thought to encourage athletes to engage in progressive muscle exercise to steadily regain full function. Results of the study found that mindfulness supported the adoption of positive thoughts which reduced self-criticism. The idea is that the less self-criticism, the less the athlete would engage in obligatory exercise which would subsequently reduce reinjury and address negative cognitions of injury. Notably, the presence and influence of awareness is not directly investigated in either study which encourages further investigation. In addition to investigating awareness, it is notable that a couple of the reviewed studies created their own versions of mindfulness-based programs using other theoretical models due a lack of a previously established model (Moesch et al., 2020; Coronado et al., 2020). The lack of an established mindfulness-based programs for athletes presents a significant limitation to the further investigation on the degree to which mindfulness

can be implemented in rehabilitation for athletes. By doing so, the literature may further understand the mechanisms of mindfulness-based techniques on anxiety-related symptoms that athletes uniquely experience which subsequently results in better rehabilitation and prevention strategies. As research develops, these questions may be able to further explore ideas presented within the current study. With the trajectory of the state of current literature, exploration into establishing a mindfulness-based program for rehabilitation training that is tailored for injured athletes using identified factors may become a valuable asset to injury prevention and psychological rehabilitation. Given these gaps within the literature, I present the following questions as possible questions for future research:

1. What role does awareness play in the physical and psychological rehabilitation in injured athletes?
2. What are the psychological factors that contribute to successful physical rehabilitation post-injury?
3. What mindfulness-based factors contribute to the psychological wellness in injured athletes during rehabilitation phases?

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