Competitive and High Performance Endurance Athletes' Experiences and Management of Exercise-Induced Pain, Mental Performance, Mental Health, and Mental Illness Symptoms: A Mixed Methods Investigation

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Abstract

The overall aim of this doctoral research was to study competitive and high performance endurance athletes' experiences and management of exercise-induced pain (EIP), mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms. A mixed methods experimental design guided by the pragmatic stance was employed across three studies to (a) investigate how elite endurance athletes experience and manage EIP (Study 1), (b) compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners (Study 2), and (c) qualitatively examine the impact of the online intervention focusing on self-regulation or mindfulness and designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation and mindfulness), and mental health (Study 3).

Study 1. With a paucity of research investigating EIP management in elite endurance sports, the purpose of Study 1 was to examine how elite endurance athletes experience and manage EIP, using an applied self-regulation lens to help inform the work of Mental Performance Consultants (MPCs). Individual semi-structured interviews were conducted with 12 female and 3 male athletes (M_{age} = 23.73, SD = 2.31) competing in track and field (i.e., 600-1500 m; n = 5), swimming (i.e., 200-400 m; n = 5), and canoe kayak (i.e., 500-1000 m; n = 5). Given the centrality of self-regulation and the necessity to effectively manage internal states (e.g., EIP) in elite sport, the social cognitive model of self-regulation was employed to guide Study 1. The codebook thematic analysis generated two themes and six subthemes (i.e., sensations [burning, tightness, heaviness], beliefs [detrimental, mental, progressive]) related to the experience of EIP as well as three themes and 17 subthemes (i.e., preparation [accept and commit to EIP, recall

sources of self-efficacy, develop a segmented performance plan, be accountable to training partners or coach, expose yourself to EIP when training, expose yourself to EIP when warming up, use imagery, implement typical pre-performance routine; execution [direct attention away from EIP, use instructional/motivational self-talk, implement a segmented performance plan, regulate breathing and relax, accelerate pace, self-monitor]; evaluation [reflect using a training journal, identify possible explanations, talk with a coach]) related to the management of EIP. Findings suggest that the experience of EIP is highly cognitive and generally perceived as detrimental to performance if not effectively managed. Athletes used several psychological strategies to prepare to experience EIP, reduce the aversive effects of EIP while performing, and learn from their EIP management strategies to improve their coping capacity. In terms of the number of reported psychological strategies, findings suggest that those used to prepare to experience EIP seem to be a priority. In general, the most popular strategies pertained to accepting and committing to experiencing EIP and directing attention away from EIP. Novel strategies not typically reported in the literature included exposing oneself to EIP when warming up, being accountable to training partners or coaches, using imagery to rehearse reactions to EIP, and accelerating one's pace. Importantly, combining self-regulation and mindfulness strategies appears to be key to effectively manage EIP.

Study 2. No research has compared the impact of online sport psychology interventions on various outcomes affecting endurance athletes while employing an active control group. The purpose of Study 2 was therefore to compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners. Using a pre-post experimental design, 61 middle-distance runners competing at provincial to

international levels were allocated to either a self-regulation, mindfulness, or active control group using stratified randomization. They completed a pre-intervention survey measuring EIP catastrophizing, mental performance (i.e., self-regulation capacity, dispositional mindfulness), mental health, and mental illness symptoms (i.e., anxiety, depression, and eating disorder). A final sample of 52 participants (i.e., 17 self-regulation, 19 mindfulness, and 16 active control) completed the interventions and a post-intervention survey measuring the same outcomes addressed in the pre-intervention survey. Contrary to hypotheses, results from multiple mixed ANOVAs indicated that while mean scores trended in the positive direction between Time 1 and Time 2, the self-regulation and mindfulness interventions did not significantly differ from the active control intervention on the targeted outcomes. Interestingly, when excluding athletes who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder), the active control intervention was more effective in reducing anxiety symptoms than the mindfulness intervention. Overall, the self-regulation and mindfulness interventions were not any more effective than the active control intervention in improving the selected outcomes.

Study 3. The purpose of this study was to *qualitatively* examine the impact of the online sport psychology intervention from Study 2, which focused on either self-regulation or mindfulness and was designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation, mindfulness), and mental health. A sample of 16 middle-distance runners (i.e., 11 women and 5 men) aged between 18 to 25 years old (M_{age} = 21.31, *SD* = 2.18) who participated in the eight-module SI or MI were purposefully selected based on their high, moderate, and low pre-post evolution scores. The codebook thematic analysis generated three themes and 13 subthemes (i.e., EIP management [reframing, understanding, self-talk, segmented performance plan]; mental performance [attention regulation, motivation, self-

monitoring, self-efficacy, acceptance, defusion]; mental health [self-compassion, autonomy, support]) related to the participants' perceived changes as well as three themes and seven subthemes (i.e., delivery format [asynchronous, synchronous], content [applicability, audio and video files, examples, metaphors], timing [alignment with competitive season]) related to participants' recommendations. Findings suggest that both the self-regulation and mindfulness intervention positively impacted EIP management, mental performance, and mental health. Self-regulation and mindfulness should therefore be seen as complementary rather than conflicting or incompatible approaches. Furthermore, athletes reported that their EIP literacy and EIP management skills were limited at the onset of the intervention. Consequently, an educational component should continue to be integrated in future interventions to provide an overview of EIP and relevant mental performance skills to manage it. Given the prevalence of stressors and mental health challenges in competitive and high performance sport, screening for both positive mental health and mental illness symptoms at the onset of interventions is recommended so that athletes partaking in applied sport psychology studies can obtain appropriate mental health care and support as needed. Lastly, a hybrid delivery format incorporating both asynchronous and synchronous options may be the most effective when providing online sport psychology interventions.

Overall, the findings of the current doctoral research suggest that both self-regulation and mindfulness strategies positively impact EIP management, mental performance, and mental health in endurance athletes. This inquiry is also the first to quantitatively and qualitatively compare the effectiveness of an online asynchronous self-regulation and mindfulness intervention in improving key outcomes affecting endurance athletes. With increased applied

research and mental performance consulting occurring virtually due to the COVID-19 pandemic, it is vital to continue examining the quality and impact of online interventions on athletes.

Keywords: exercise-induced pain management, mental health, mental illness symptoms, self-regulation, mindfulness, online sport psychology interventions, endurance athletes

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Statement of Contribution

I, Jonathan Lasnier, was responsible for (a) co-conceptualizing this doctoral research, (b) co-creating the self-regulation and mindfulness interventions, (c) collecting and analyzing the data, and (d) writing the three articles that are comprised in this doctoral dissertation. Dr. Natalie Durand-Bush, my thesis supervisor, was involved in (a) the co-conceptualization of this doctoral research, (b) the co-creation of the self-regulation and mindfulness interventions, and (c) the revision of the three articles and this doctoral dissertation. Dr. Durand-Bush also provided critical feedback and encouraged reflexivity throughout the entire process (Smith & McGannon, 2018). Given the contributions of Dr. Durand-Bush, she is a co-author on the three articles that were created throughout this doctoral research. Dr. Scott Rathwell, an Assistant Professor in the Department of Kinesiology and Physical Education at the University of Lethbridge, provided guidance with the statistical analyses and interpretation of the results of Study 2. Dr. Rathwell also edited the manuscript related to Study 2 (i.e., Article 2). Given the contributions of Dr. Rathwell in Study 2, he is a co-author on Article 2. Dr. Diane Culver and Dr. Göran Kenttä, my thesis committee members, provided valuable feedback during the proposal stage of this doctoral research. Further, their expertise and insights were helpful in navigating challenges that arose throughout this doctoral research. Ethical approval was obtained from the Office of Research Ethics and Integrity of the University of Ottawa (see Appendix A for Certificate of Ethics Approval).

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PART I

Introduction

There is growing interest and research on the use of mental performance skills such as self-regulation (McCormick et al., 2019) and mindfulness (Corbally et al., 2020) in endurance sports to help athletes optimize performance. This is in part due to a unique psychological demand that endurance athletes must manage compared to non-endurance athletes (e.g., power athletes). This psychological demand pertains to exercise-induced pain (EIP), which is a temporary pain arising from intense exercise that does not cause injury or permanent damage (Mauger, 2019). Endurance athletes are prone to engaging in EIP catastrophizing (i.e., negative and exaggerated psychological response to actual or anticipated pain; Sullivan et al., 1995) thus they require support and resources to cope with and limit the negative impact of this. Unfortunately, evidence-informed strategies to manage EIP and reduce catastrophizing in sport are limited.

Endurance athletes have explored ways to enhance their mental performance skills (e.g., EIP management) and have reported using the Internet to do so (McCormick et al., 2020). Considering the worldwide COVID-19 pandemic in which in-person support and resources have been significantly limited, and considering the demanding and complex schedules of competitive and high performance athletes, one can argue that developing and offering online mental performance interventions is an important avenue. In particular, asynchronous interventions specifically tailored to EIP management may help to maximize the reach and support for endurance athletes who have shown a preference for accessing psychological support in times and locations of their choosing (McCormick et al., 2020). In addition, interventions targeting self-regulation and mindfulness – two key mental performance skills deemed important in

endurance sports (Brick et al., 2016; Corbally et al., 2020; McCormick et al., 2019; Thienot & Adams, 2019) – appear worthwhile. Having said this, only a few studies have examined the impact of online sport psychology (i.e., mental performance) interventions (e.g., self-talk; Latinjak et al., 2019). Further, no study has compared the effectiveness of an online self-regulation and mindfulness intervention in improving specific outcomes of interest affecting endurance athletes (e.g., EIP management). As such, intervention research in this area is warranted.

Aside from EIP management, another important outcome having implications for endurance athletes is mental health. Within the last five years, mental health and mental illness in athletes have gained increased attention (Vella et al., 2021). For instance, several key organizations recently published consensus statements (e.g., Breslin et al., 2019; Henriksen et al., 2019, 2020; Reardon et al., 2019) and position statements (e.g., Chang et al., 2020; Moesch et al., 2018; Schinke et al., 2018; Van Slingerland et al., 2019) on mental health and mental illness in sport. Additionally, numerous narrative and scoping reviews (e.g., Aron et al., 2019; Currie et al., 2019; Kuettel & Larsen, 2020; Reardon et al., 2021) as well as systematic reviews and meta-analyses (e.g., Castaldelli-Maia et al., 2019; Golding et al., 2020; Gouttebarge et al., 2019; Rice et al., 2016, 2019) have shed light on the importance of improving mental health outcomes for all athletes. Given this call and given the critical role of MCPs in facilitating the development of mental skills that support both performance and mental health (Durand-Bush & Van Slingerland, 2021; Fogaca, 2021), it is surprising that mental performance intervention studies focusing on improving mental health and mental illness symptoms in athletes remain scarce. More studies are needed, including in the context of endurance sports, given the salience of prioritizing mental health to help athletes cope with high psychological demands such as EIP.

All in all, the aforementioned gaps pertaining to endurance sports, EIP management, online mental performance interventions, as well as athlete mental health and mental illness have shaped the aims of the current doctoral research. The aims of this research were to (a) investigate how elite endurance athletes experience and manage EIP (Study 1), (b) compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners using an experimental design (Study 2), and (c) qualitatively examine the impact of the online self-regulation and mindfulness interventions designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation and mindfulness), and mental health (Study 3).

Literature Review

The following section presents an overview of the literature pertaining to constructs relevant to endurance sports and the aims of this research project including EIP, pain catastrophizing, mental health, mental illness, self-regulation, and mindfulness. Research on self-regulation and mindfulness interventions is also reviewed. The section concludes with the rationale for conducting the current doctoral research and a review of its aims.

EIP

According to Mauger (2019), EIP is a type of pain that (a) naturally occurs when athletes engage in intense exercise, (b) does not cause lasting damages, and (c) usually disappears shortly after intensity is reduced or exercise is ceased. The experience of EIP is often associated with a burning sensation, dull ache, or heaviness in the muscles (Cook et al., 1997; Miles & Clarkson, 1994). Importantly, EIP differs from the pain athletes may experience from an acute injury (e.g., sprained ankle), a chronic injury (e.g., stress fracture), or from the micro-trauma and

inflammation arising from delayed onset muscle soreness (Mauger, 2019). Further, the intensity of EIP increases alongside exercise intensity (Mauger, 2019). For instance, a middle-distance runner will experience a higher level of EIP when completing a workout at race pace compared to when completing a recovery run. Experiencing EIP generates a powerful psychological drive to decrease exercise intensity in order to reduce the pain intensity (i.e., sensory experience of pain) and pain unpleasantness (i.e., affective experience of pain) associated with it (Mauger, 2019).

Interestingly, observing unpleasant images of athletes in pain has been shown to increase the perceived intensity of EIP and to impair endurance performance in cyclists (Astokorki et al., 2021). Painful images impact affect and while negative affective states increase pain sensitivity, and the opposite also occurs whereby positive affective states decrease pain sensitivity (Meagher et al., 2001; Meng et al., 2012). Of particular interest for endurance athletes, decreased sensations of EIP usually result in sustained increased power output (i.e., intensity) and significantly improved endurance performance (e.g., Astokorki & Mauger, 2017; Foster et al., 2014; Mauger et al., 2010).

Given the inevitable experience of pain in endurance sports, EIP management is a prominent psychological demand that athletes face. For example, former Olympic cyclists reported that pain imposed the greatest psychological demand on them (Kress & Statler, 2007). Similarly, endurance athletes indicated that pain was particularly salient when competing and training at high intensity (McCormick et al., 2016). Endurance athletes realize the importance of developing psychological EIP management strategies to maximize their performance. For instance, Canadian Olympic triathlete Tyler Mislawchuk (2018) reported:

> I think the biggest misconception on the part of amateurs and professionals is the notion that training is purely physical preparation for whatever goal has been set forward. Of course, training is physical, but mental strength plays its own role: we must learn techniques and strategies to deal with the pain that comes with competitive sport.

To the researchers' knowledge, Kress and Statler (2007) are the only ones who have investigated the psychological strategies used by endurance athletes to manage EIP. These authors recruited a sample of nine former American male Olympics cyclists who were between 27 to 50 years of age (M_{age} = 37.8). To manage EIP, participants reported (a) directing their attention on task-relevant cues to maximize their efficiency, (b) setting goals, (c) mentally rehearsing possible sensations they could experience (e.g., EIP), (d) using positive self-talk, (e) accepting EIP, and (f) relaxing their breathing. Given that participants had not been competing for several years, they may not have remembered in detail their experiences. Further, no woman was part of the sample. Future researchers examining EIP management should therefore recruit elite endurance athletes who are still competing and include women.

Pain Catastrophizing

Pain catastrophizing, which is a potential by-product of mismanaged EIP with which endurance athletes contend, refers to a negative and exaggerated psychological response (i.e., helplessness, rumination, and magnification) to actual or anticipated pain (Sullivan et al., 1995). Pain catastrophizing is evident in athletic populations (e.g., Gagnon-Dolbec et al., 2021; Geva & Defrin, 2013; Jones & Parker, 2016, 2018; Sciascia et al., 2020). For example, pain catastrophizing predicted pain intensity and pain unpleasantness in endurance athletes (Gagnon-Dolbec et al., 2021). Additionally, pain catastrophizing negatively correlated with mindfulness (e.g., Jones & Parker, 2016, 2018) and pain tolerance (e.g., Geva & Defrin, 2013) within this

population. Pain tolerance refers to the maximum level of perceived pain that someone is able to tolerate, or the duration someone is willing to be exposed to a given pain intensity (Stevens et al., 2018). Importantly, pain is a subjective experience and its perceived intensity is not always directly related to the magnitude of the pain signal sent to the brain (Stevens et al., 2018). Hence, athletes can receive a large pain signal but experience little to no pain, whereas they can receive a small pain signal but feel a significant level of pain (Mauger, 2019). Acute psychological stress has been found to alter the process by which the brain processes pain signals, increase pain sensitivity, and decrease pain inhibition in endurance athletes (Geva et al., 2017).

Given the evidence showcasing that (a) perceptions of pain influence endurance performance (Stevens et al., 2018), (b) pain catastrophizing is negatively correlated to pain tolerance (Geva & Defrin, 2013), and (c) higher EIP tolerance produces superior endurance performance (Astokorki & Mauger, 2017), endurance athletes must find ways to appraise and manage EIP so that they can minimize pain catastrophizing and maximize pain tolerance. One of the ways that athletes may potentially be able to do this is by learning and applying EIP management strategies by working with MPCs. MPCs may be able to help athletes change their appraisal of EIP and expand their comfort zone, which in turn could lead them to enhance their EIP tolerance and reach new performance heights. No study to date has compared the effectiveness of sport psychology interventions to improve EIP catastrophizing in athletes, which provided the rationale for the current doctoral research.

It appears that pain catastrophizing is related to not only performance but also mental health and mental illness. In clinical settings, pain catastrophizing and mental illnesses (e.g., anxiety, depression) frequently occur together and are challenging to treat (Slawek et al., 2021). Studies conducted with chronic pain patients show that pain catastrophizing is intertwined with

psychological distress and predicts pain intensity, pain tolerance, pain threshold, and variability in pain experiences (Quartana et al., 2009; Sullivan et al., 2001). Further, Craner et al. (2016) reported that pain catastrophizing was significantly negatively correlated with mental health functioning and significantly positively correlated with depression in a sample of 648 adults with chronic pain. According to the systematic review and meta-analysis of Schütze et al. (2018), Acceptance Commitment Therapy (ACT) can effectively reduce pain catastrophizing in adults with chronic pain. It is therefore worthwhile to explore if this type of intervention could decrease pain catastrophizing and improve associated mental health and mental illness outcomes in endurance athletes as ACT has been used to achieve other types of relevant outcomes in sport (e.g., improve objective performance in ice hockey; Lundgren et al., 2021).

Mental Health and Mental Illness

Mental Health

Mental health and mental illness have been important topics of discussion and investigation in sport, particularly as the COVID-19 pandemic progressed. Mental health refers to a state of emotional, psychological, and social well-being in which individuals are able to feel, think, and behave in ways that allow them to manage the normal stresses of life, work productively, contribute to their community, savor life, and fulfill their potential (Van Slingerland et al., 2019; World Health Organization, 2004). Emotional well-being refers to one's perceived happiness and satisfaction with life as well as one's ratio of positive to negative affect experienced (Magyar & Keyes, 2019). Psychological well-being, which reflects the extent to which one is thriving in life, is comprised of six dimensions: self-acceptance, positive relationships with others, autonomy, environmental mastery, purpose in life, and personal growth (Ryff, 1989; see Table 1 for a description of each dimension). Social well-being refers to one's

perception of functioning in society and includes five dimensions: social integration, social contribution, social coherence, social actualization, social acceptance (Keyes, 1998; see Table 2 for a description of each dimension). Put simply, individuals with high levels of emotional well-being feel good about life and those with high levels of psychological and social well-being function well in life (Magyar & Keyes, 2019). According to Keyes (2002), the presence of mental health is described as flourishing, while the absence of mental health is characterized as languishing.

Table 1.

Dimensions of Psychological Well-Being

Dimension	Description
Self-acceptance	Having a positive attitude and feelings toward oneself and one's past life and acknowledging and accepting multiple aspects of oneself, including unpleasant personal aspects.
Positive relationships with others	Being able to cultivate the presence of warm, trusting, and intimate relationships with others; showing concern for the welfare of others and being able to empathize, cooperate, and compromise.
Autonomy	Seeking self-determination and personal authority or independence in a society that sometimes compels obedience and compliance; being able to resist social pressures to think or behave in certain ways and guide and evaluate behavior based on internalized standards and values.
Environmental mastery	Being able to recognize personal needs and desires, manage everyday affairs, control a complex array of external activities, make effective use of surrounding opportunities, and choose or create contexts suitable to personal needs.
Purpose in life	Having aims and objectives for living, including life goals and a sense of directedness; seeing one's daily life as fulfilling a direction and purpose and viewing the present and past as meaningful.
Personal growth	Continuously pursuing existing skills, talents, and opportunities for personal development and realizing one's potential; being able to remain open to experience and to identify challenges in a variety of circumstances.

Note. Data from Ryff (1989).

Table 2.

Dimensions of Social Well-Being

Dimension	Description
Social integration	Having something in common with others who constitute one's social reality (e.g., neighborhood); feeling that one belongs to one's communities and society.
Social contribution	Believing that one is a vital member of society with something of value to give to the world.
Social coherence	Having meaningfulness in life and concern for knowing about the world; appraising that society is discernable, sensible, and predictable.
Social actualization	Believing in the evolution of society and the sense that society has potential that is being realized through its institutions and citizens.
Social acceptance	Trusting others and believing that others are capable of being kind and industrious; holding favorable views of human nature and feeling comfortable with others.

Note. Data from Keyes (1998).

Minimal research has examined flourishing and/or languishing in Canadian athletes. However, in one study, Van Slingerland et al. (2018) investigated the level and prevalence of mental health functioning (i.e., flourishing, languishing) in 388 student-athletes (M_{age} = 20, SD = 1.96) from 30 Canadian universities across two time points during the academic year. The authors found that levels of mental health functioning were moderate to high and that more student-athletes were flourishing than languishing at both time points. Although 18% of student-athletes disclosed a previous mental illness diagnosis, they maintained moderate mental health functioning across time. This finding is important as it demonstrates that the presence of mental illness symptoms does not automatically imply low levels of mental health functioning (i.e., languishing).

In another study, Pankow et al. (2021) surveyed 36 Canadian student-athletes about their mental health and only 17% of them (n = 6) were identified as flourishing. The six flourishing student-athletes were invited to take part in a pre- and post-season semi-structured interview and to write a weekly diary during their season to give insight into protective mental health factors before, during, and after the season. In the pre-season, student-athletes discussed making positive connections (i.e., spending time with people they care about) and planning their in-season sport, academic, and social schedules to build a foundation for flourishing. During the season, student-athletes reported being more focused on maintaining their mental health by managing their commitments (i.e., both in sport and school), communicating with coaches, and having a positive outlook when experiencing an injury or illness. In the post-season, participants explained re-investing in their mental health by reflecting on their season and taking a break from sport. The findings of this study show that student-athletes used different mental performance strategies (i.e., planning, focus, communication, recovery, reflection) to protect their mental health. MPCs should therefore discuss with athletes the utility of implementing such strategies to not only improve athletic performance but also foster mental health and prevent the onset of mental illness challenges.

Mental Illness

Mental illness is a health condition characterized by significant distress and impaired functioning in personal and professional activities due to alterations in the way individuals feel, think, and behave; it includes all diagnosable psychological disorders (e.g., mood disorders, anxiety disorders, eating disorders; Van Slingerland et al., 2019; World Health Organization, 2004). In any given year, one in five Canadians will experience a mental illness (Canadian Mental Health Association, 2021). Athletes have been found to experience mental illnesses at

similar rates as members of the general population (Rice et al., 2016). However, the intense mental and physical demands placed on athletes may increase their susceptibility to experience certain mental illnesses and to engage in risk-taking behaviors (Hughes & Leavey, 2012). For instance, athletes of both genders are at higher risk of developing an eating disorder compared to the general population, especially in sports where low body weight or leanness is associated with a competitive advantage (e.g., endurance sports; Joy et al., 2016). This is especially evident for female athletes as they are even more likely than male athletes to develop an eating disorder (Joy et al., 2016).

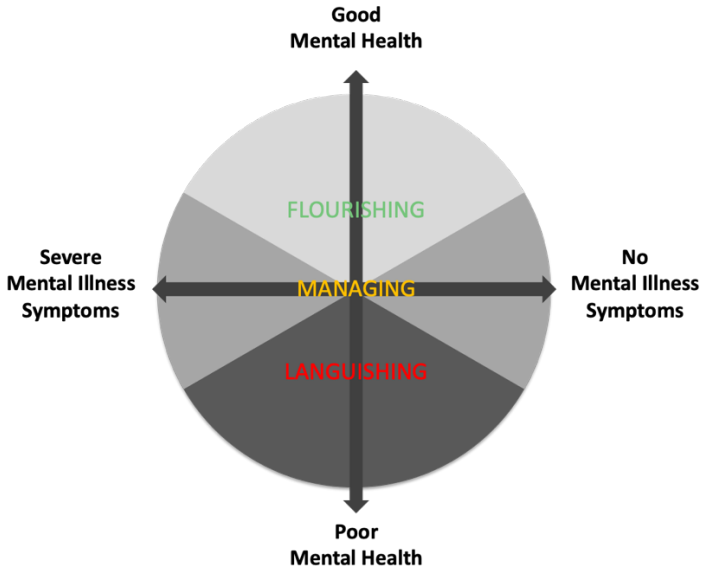
Previous studies have shown the prevalence of mental illness symptoms in endurance athletes. For example, Krebs et al. (2019) examined eating disorder risk in 366 male and 272 female National Collegiate Athletic Association (NCAA) Division I runners and discovered that three times as many females (46%) screened positive for this condition compared to males (14%). Additionally, individual sport athletes may be more prone to experiencing depressive symptoms than team sport athletes (Nixdorf et al., 2016). For instance, Wolanin et al. (2016) described the prevalence of symptoms of depression among 722 NCAA Division I student-athletes at a single institution over three consecutive years. They found that among the nine sports represented, track and field (e.g., middle-distance running) was associated with the highest prevalence of depressive symptoms (35.4%) and the highest relative risk ratio (2.066). When data were analyzed by gender and by sport, female track and field athletes were associated with the highest prevalence of depressive symptoms (37.5%) and the highest relative risk ratio (2.257).

Two-Continua Model of Mental Health and Mental Illness

According to Keyes' (2002) two-continua model of mental health and mental illness, mental health and mental illness are related but distinct constructs that contribute to overall human functioning. One continuum indicates the presence or absence of mental health, while the other continuum indicates the presence or absence of mental illness (Westerhof & Keyes, 2010). Individuals can have languishing (i.e., poor), moderate, or flourishing (i.e., good) mental health, and they can also have a mental illness or not (see Figure 1; Durand-Bush & Van Slingerland, 2021; Keyes, 2005). For instance, in the sport context, athletes can either have (a) languishing mental health and no mental illness, (b) languishing mental health and a mental illness, (c) moderate mental health and no mental illness, (d) moderate mental health and a mental illness, (e) flourishing mental health and no mental illness, or (f) flourishing mental health and a mental illness. It is noteworthy that individuals with a mental illness are more functionally impaired when they have languishing mental health compared than when they have moderate or flourishing (i.e., good) mental health (Durand-Bush & Van Slingerland, 2021; Keyes & Michalec, 2010). This underscores the importance of optimizing mental health, regardless of whether or not one is experiencing a mental illness. The value of Keyes' model in the context of sport has been shown in both research (e.g., Van Slingerland et al., 2018) and reports (e.g., Mental Health Strategy for High Performance Sport in Canada; Durand-Bush & Van Slingerland, 2021). This model was used to guide the current doctoral research.

Figure 1.

Two-Continua Model (Keyes, 2002)



Note. Figure from Durand-Bush and Van Slingerland (2021).

Mental Health, Mental Illness, and the COVID-19 Pandemic

The World Health Organization declared the COVID-19 outbreak as a global pandemic on March 11, 2020. This pandemic has created new strains on athletes (Reardon et al., 2021), which can trigger or exacerbate mental illnesses (e.g., mood disorders, anxiety disorders; Edwards & Thornton, 2020). In the Spring of 2020, during the span of a month, NCAA Research (2020) investigated the impact of the COVID-19 pandemic on the mental health of 37,658 student-athletes. Overall, participants reported experiencing high rates of mental distress since the outset of the pandemic. More specifically, participants felt (a) overwhelmed by everything they had to do (i.e., 50% of women and 31% of men), (b) fatigued due to sleep difficulties (i.e., 42% of women and 31% of men), (c) mentally exhausted (i.e., 39% of women and 26% of men), (d) very lonely (i.e., 33% of women and 22% of men), (e) at a loss (i.e., 31% of women and 21% of men), (f) sad (i.e., 31% of women and 17% of men), (g) overwhelmingly anxious (i.e., 27% of

women and 14% of men), (h) hopeless (i.e., 16% of women and 11% of men), (i) overwhelmingly angry (i.e., 11% of women and 11% of men), and (j) so depressed that it was difficulty to function (i.e., 9% of women and 7% of men). Further, the rates of mental health concerns experienced within this month were 1.5 to 2 times higher than what has been historically reported by NCAA student-athletes (NCAA Research, 2020). It is noteworthy that 85% of the participants reported a desire to receive mental health support and resources (NCAA Research, 2020). Additional interventions are therefore needed in times of high distress and uncertainty.

Mental performance, which refers to the capability with which individuals use cognitive processes and mental competencies to perform in their changing environment, has been identified as an important construct that can support both performance and mental health in athletes (Durand-Bush & Van Slingerland, 2021; Fogaca, 2021). However, only a few studies have investigated the impact of sport psychology (i.e., mental performance) interventions on mental health and mental illness symptoms in this population (e.g., Bertollo et al., 2021; Dubuc-Charbonneau & Durand-Bush, 2015). For example, Bertollo et al. (2021) examined the effectiveness of a one-month sport psychology intervention comprised of a webinar on mental health literacy and three online focus groups (i.e., focused on self-talk, relaxation, mindfulness, self-efficacy, and imagery) in improving the mental health of 38 professional cyclists during the COVID-19 pandemic. The first 19 professional cyclists who agreed to take part in the study were allocated to the intervention group, whereas the other 19 were allocated to a waiting list comparison group. Overall, Bertollo et al. (2021) found that the participants from the intervention group significantly improved their levels of psychological well-being compared to the ones from the waiting list comparison group. No significant differences were found for

emotional and social well-being. This study had limitations, including no randomization and the timing of the pre-intervention measure (i.e., three months before the intervention). Future studies should include randomization and ensure that data are collected closer to the beginning of the intervention. Lastly, Bertollo et al. (2021) recommended that future studies include a qualitative component to more accurately assess the effectiveness of sport psychology interventions to enhance mental health in athletes.

Self-Regulation

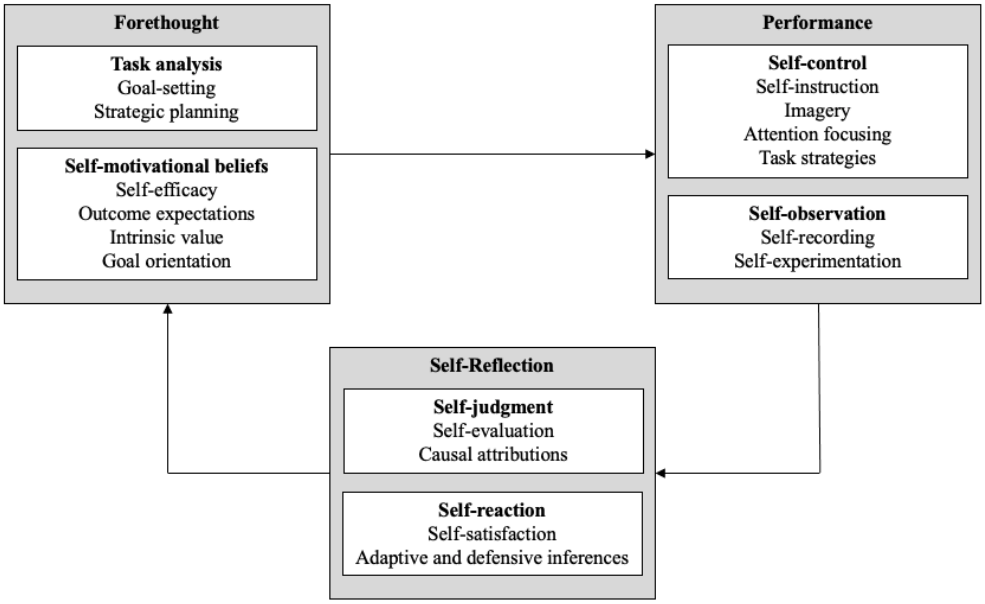
Sport psychology interventions often target self-regulation as this skill is required for success in sport and is a typical outcome of MPCs' work (Durand-Bush et al., 2015; Kitsantas et al., 2018). Managing internal experiences (i.e., thoughts, feelings, sensations) is essential to maximize performance and can lead to goal accomplishment or goal failure. Preparing, executing, evaluating, and adapting one's internal experiences and actions to achieve personal standards and goals in one's constantly changing environment represent what self-regulation is in a nutshell (Zimmerman, 2000). Interestingly, elite athletes employ more effective and a higher number of self-regulation strategies compared to more novice athletes (McCardle et al., 2019).

According to Zimmerman's (2000) social cognitive model of self-regulation (SCMSR, see Figure 2), self-regulation encompasses self-motivational beliefs and cognitive processes occurring within three cyclical self-regulatory phases: forethought (i.e., preparation), performance (i.e., execution), and self-reflection (i.e., evaluation). The forethought phase, which takes place before the performance phase, is comprised of task analysis processes (i.e., goal-setting and strategic planning) and self-motivational beliefs (i.e., self-efficacy, outcome expectations, intrinsic value, and goal orientation). Remembering one's own capabilities to withstand EIP and past successes in managing it successfully is an example of a task-analysis

process that an endurance athlete may use. Forethought processes are crucial as they impact one's tendency and ability to engage in the performance phase. The performance phase, which involves implementing the components of the forethought phase to optimize the completion of the targeted task, includes self-control (i.e., self-instruction, attention focusing, imagery, and task strategies) and self-observation processes (i.e., self-recording and self-experimentation). Focusing on performance-relevant cues (e.g., technique) when experiencing EIP is an example of a self-control process that an endurance athlete may use. The self-reflection phase, which involves reflecting and learning from performing the task, includes self-judgment (i.e., self-evaluation and causal attributions) and self-reaction (i.e., self-satisfaction, adaptive and defensive inferences) processes. According to the cyclical nature of self-regulation, the self-reflection phase informs the subsequent forethought phase. Reflecting on how to adapt EIP management strategies for an upcoming race is an example of a self-reaction process that an endurance athlete may use. Importantly, the SCMSR is widely supported in sport (Durand-Bush et al., 2015).

Figure 2.

Social Cognitive Model of Self-Regulation (Zimmerman, 2000)



There is preliminary evidence of the effectiveness of an in-person SCMSR-informed self-regulation intervention with athletes. More specifically, Dubuc-Charbonneau and Durand-Bush (2015) demonstrated from a quantitative standpoint that the self-regulation intervention (i.e., seven to nine bi-weekly sessions), which was individually provided to varsity student-athletes experiencing moderate to high levels of burnout, led to decreased stress and burnout symptoms, and increased self-regulation capacity and mental health. Although these results are promising, the study included a small sample of athletes (i.e., $n = 8$) and flexible procedures (e.g., variations in duration and content provided to meet the needs of participants), which limits the generalizability of the results. It would be valuable to build on Dubuc-Charbonneau and Durand-Bush (2015)'s study by including more participants as well as a structured and controlled intervention to examine its impact using an experimental design. Of note, other researchers have found that higher levels of self-regulation were linked to lower levels of mental illness symptoms (e.g., burnout) and/or higher levels of mental health in coaches (McNeill et al., 2018), university students (Durand-Bush et al., 2015), teachers (Mattern & Bauer, 2014), as well as physicians and medical students (Gagnon et al., 2016; Simon & Durand-Bush, 2014). Self-regulation interventions targeting improved mental health and mental illness outcomes in sport therefore deserve attention.

Qualitative studies exploring athletes' experiences after taking part in an in-person self-regulation intervention informed by the SCMSR are scarce. However, Dubuc-Charbonneau and Durand-Bush (2018) included a qualitative component in their 2015 study to investigate how four of the varsity student-athletes' stress and burnout experiences evolved as they completed the season-long self-regulation intervention. Narratives were created to illustrate the unique experiences of each athlete. Overall, the varsity student-athletes reported developing and

implementing various self-regulation strategies (e.g., setting goals, managing time, conducting daily check-ins, journaling, reappraising challenging situations) to navigate the demands and challenges they faced throughout their season, which led them to perceive improvements in their mental health, and their stress and burnout symptoms. While a strength of the study was the person-centered nature of the intervention, Dubuc-Charbonneau and Durand-Bush indicated that it was difficult to compare the experiences of each participant as they had different demands based on their sport (i.e., basketball, fencing, hockey, swimming) and the length of their season varied. Nonetheless, given the positive findings of this investigation, the intervention they created serves as a valuable example for future research.

Of note, the in-person format that these authors used poses a challenge when considering the worldwide COVID-19 pandemic. This pandemic has been accompanied with multiple in-person restrictions that have impacted ways in which athletes train, compete, and live their daily lives. With communication and training primarily occurring online during the first two waves of the pandemic (March 2020 to April 2021), asynchronous online sport psychology interventions have been appealing because they are self-directed and offer the flexibility of completing them at one's own pace (Price et al., 2020). The convenience of this format can arguably help to reach more athletes, including those from the same sport, and provide additional structure to facilitate comparisons between athletes.

In another qualitative study informed by the SCMSR, McNeill et al. (2020) examined the perceived impact of a self-regulation intervention in improving self-regulation, burnout symptoms, and mental health in five Canadian coaches (i.e., two women and three men) experiencing moderate to high levels of burnout symptoms. Coaches had to complete six workbook sections and the first section was completed with the facilitator either in person (n = 3)

or over Skype (n = 2). The coaches could choose to complete the remaining five sections of the workbook independently or with the facilitator over the phone or Skype. Three of the coaches completed some or all of the workbook sections with the facilitator. Additionally, the intervention was supposed to last 10 weeks, but two coaches required additional time (i.e., 20 and 22 weeks, respectively) to complete all the sections of the workbook. Overall, coaches reported learning to self-regulate more effectively by developing various competencies (e.g., strategic planning for their mental health) and strategies (e.g., task delegation). Additionally, four out of the five coaches perceived improvements in their levels of burnout symptoms and mental health. McNeill et al. (2020) argued that adopting a person-centered approach (e.g., by adapting the delivery format and the duration of the intervention) throughout the intervention was a strength of their study. However, similar to Dubuc-Charbonneau and Durand-Bush (2018)'s study, the flexibility in procedures, combined with the small sample size (n = 5), limited comparisons. The authors recommended collecting data from more coaches using multiple sources to facilitate the triangulation of findings. To this end, researchers are encouraged to recruit additional participants from the same level and sport, use mixed methods, and increase the homogeneity of interventions to facilitate comparisons. Importantly, no qualitative study has explored athletes nor coaches' experiences from completing a self-regulation intervention that was delivered solely online.

Mindfulness

Mindfulness in Sport

Another type of sport psychology intervention that has received increased attention in both research and practice is mindfulness (e.g., Gardner & Moore, 2020; Henriksen et al., 2020). Contrary to self-regulation interventions in which athletes learn to control or change their

internal experiences, mindfulness interventions promote a modified relationship with internal experiences (Gardner & Moore, 2020). More specifically, mindfulness interventions can help athletes to develop the ability to view internal experiences as normal, non-threatening, time-limited, and not in need of reduction or control (Garner & Moore, 2007; Hayes et al., 1999). Mindfulness, which has been conceptualized and studied as both a state (i.e., momentary condition) and a trait (i.e., stable characteristic), involves adopting a structured mindset of being aware of the present moment in an accepting, non-judging, and non-avoiding way (Kabat-Zinn, 1994). Several mindfulness interventions for athletes have been created in the past 20 years, such as the Mindfulness-Acceptance-Commitment (MAC) approach (Gardner & Moore, 2007), Mindful Sport Performance Enhancement (MSPE; Kaufman et al., 2009), Mindful Meditation Training for Sport (MMTS; Baltzell et al., 2014), and MMTS 2.0 (Baltzell & Summers, 2018). The first (i.e., oldest) and most well-researched mindfulness intervention designed for athletes is the MAC approach (Gardner & Moore, 2020; Josefsson et al., 2020). The MAC approach, which is based on the principles of Acceptance and Commitment Therapy (ACT; Hayes et al., 1999), aims to (a) enhance mindful awareness and non-judgmental acceptance of present-moment internal experiences, and (b) help athletes engage in behaviors that align with their personal values (Gardner & Moore, 2007). The manualized MAC approach includes seven modules: (a) psychoeducation, (b) mindfulness and cognitive defusion (c) values and values-driven behaviors, (d) acceptance, (e) commitment, (f) skills consolidation and poise (i.e., combining mindfulness, acceptance, and commitment), and (g) enhancement and maintenance of mindfulness, acceptance, and commitment (Gardner & Moore, 2007). ACT, which has also been used with athletes (Henriksen et al., 2020), aims to improve psychological flexibility through the core processes of defusion, acceptance, contacting the present moment, self-as-context, values, and

committed action (Harris, 2009; see Table 3 for a description of each core process). It is noteworthy that MAC is manualized (i.e., topics are covered in a specific order), whereas ACT is nonlinear and therefore provides flexibility to practitioners to work on any core processes at any time with clients (Harris, 2009).

Table 3.

ACT Core Processes

Core Process	Description
Defusion	Separating or distancing oneself from one's thoughts; looking *at* them rather than *from* them.
Acceptance	Allowing one's thoughts, feelings, and sensations to be as they are, regardless of whether they are pleasant or painful; opening up and making room for them; not judging them; dropping the struggle with them; letting them come and go as they naturally do.
Contacting the present moment	Being psychologically present (i.e., consciously connecting with and engaging in whatever is happening in this moment); flexibly bringing one's awareness to either one's physical surrounding world or one's internal psychological world, or to both simultaneously.
Self-as-context	Observing one's thoughts, feelings, and sensations from a viewpoint/space (i.e., observing self) in which one can move freely without being harmful; noticing that one is noticing them; becoming conscious of one's own consciousness (i.e., pure awareness).
Values	Personal statements about what one stands for and wants to be doing with one's life, and how one wants to behave on an ongoing basis; leading principles that guide, motivate, and keep one on track as one navigates life and tries to achieve goals.
Committed action	Doing what it takes to live congruently with one's values even if this generates pain and discomfort; taking actions that are guided and motivated by the principles for which one stands for.

Note. Data from Harris (2009).

Effectiveness of Mindfulness Interventions. There is a paucity of randomized controlled trials (RCTs) investigating the effectiveness of ACT or MAC interventions in

improving specific outcomes in athletes (i.e., only one for ACT [Lundgren et al., 2021) and two for MAC [Gross et al., 2018; Josefsson et al., 2019). These three studies primarily focused on performance-related outcomes, although one also targeted mental health. More specifically, Lundgren et al. (2021) found that an in-person four-week ACT intervention significantly improved objective performance (i.e., goals, assists, shots taken) in 34 ice hockey athletes compared to a wait-list control group. Athletes in the ACT group also received significantly superior increased ratings of athletic performance, focus, and commitment from their coaches compared to the athletes from the wait-list control group. It is noteworthy that no active control group was used in Lundgren et al. (2021)'s study, which weakens the research design given that there is no way to know to which extent the observable effect could be attributed to the experimental manipulation (i.e., ACT intervention), rather than the potential placebo effect of receiving an intervention, for example. According to Lundgren and colleagues, researchers should investigate new formats of delivering ACT interventions to advance research on how ACT can be of help for athletes. They particularly recommended examining an online delivery format to facilitate athletes' access to interventions. Further, according to Lundgren et al. (2021), using an online delivery format may benefit athletes who extensively travel and may provide them with continuous access to the intervention content, which would allow them to keep training their mental skills over time to maintain the intervention's effects.

In another RCT, Gross et al. (2018) compared a six-week in-person MAC group intervention to a six-week in-person psychological skills training (PST) group intervention (i.e., control group) using a sample of 22 female NCAA Division III basketball players. Participants were assessed one week before and after the interventions as well as one-month post-intervention. The Counselling Centre Assessment of Psychological Symptoms-62 (CCAPS-62;

Locke et al., 2011), which was developed primarily for college counselling centres, was employed to measure psychological symptoms and distress via eight subscales: depression, generalized anxiety, social anxiety, academic distress, eating concerns, family distress, hostility, substance abuse. Challenges with emotion regulation were measured using the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) and athletes' performance was measured using the Sport Performance Questionnaire (SPQ; Wolanin, 2005). The SPQ was completed by the head coach of the basketball team. Findings indicate that the MAC intervention was more effective than the PST intervention in reducing substance use, hostility, and emotion dysregulation over time. Further, only the MAC participants significantly improved performance from pre- to post-intervention based on the head coach's ratings. These improvements in performance were also maintained one month after the MAC intervention. Findings show that the PST participants experienced no statistically significant changes over the course of the intervention. Limitations of this study include a small sample size (n = 22), low diversity (i.e., participants were all women and primarily African American), and a lack of random selection (i.e., athletes were part of the same basketball team, which may have generated group contamination). Additionally, the MAC and PST intervention were delivered by different individuals (i.e., MAC by the first author and PST by the second author), which may have generated confounding variables between the two interventions (e.g., experience and characteristics of each author). Lasty, Gross and colleagues did not differentiate between the constructs of mental health and mental illness; the measure they used to assess mental health was in fact measuring psychological symptoms related to mental illness. Researchers must more clearly define and measure both mental health and mental illness constructs to get a comprehensive view of athletes' functioning (Durand-Bush & Van Slingerland, 2021).

Similarly to Gross et al. (2018), Josefsson et al. (2019) investigated the impact of a seven-week in-person MAC group intervention and a seven-week in-person PST group intervention (i.e., control group) designed to decrease emotion regulation challenges. Josefsson and colleagues recruited 69 athletes (i.e., 33 women and 36 men) who competed in either floorball (n = 38), golf (n = 27), soccer (n = 2), soccer (n = 1), or wrestling (n = 1). Data were collected at three time points (i.e., prior to the first group session, prior to the fourth group session, and after the last group session). Performance was assessed using a single item (i.e., During the last two weeks, I rate my performance as…) rated on a 10-point Likert scale ranging from "very poor" to "very good". Challenges in emotion regulation were measured using the DERS (Gratz & Roemer, 2004). Results indicate that the MAC intervention was more effective than the PST intervention in enhancing perceived performance and in reducing emotion regulation difficulties. One limitation of this study is the use of a performance item that was specifically developed for this study (i.e., psychometric properties have not been established). Another limitation resides in the choice of having two different practitioners delivering the MAC intervention and two different practitioners delivering the PST intervention. There were therefore four practitioners involved in this RCT, which may have generated confounding variables within either or both the MAC and PST intervention, but also between the two interventions. Josefsson and colleagues' findings are consistent with those reported by Gross et al. (2018). All in all, with only three RCTs investigating the effectiveness of ACT and MAC interventions with athletes, more research addressing a variety of relevant outcomes (e.g., mental performance, mental health, mental illness; Noetel et al., 2017) is warranted. Further, no RCT has examined the impact of an *online* ACT or MAC intervention with athletes to date.

Aside from quantitative studies such as RCTs, other types of inquiries have been conducted to uncover the value of mindfulness-based programs in sport. For instance, four studies have focused on the experiences of athletes after completing a mindfulness intervention, however, none of these focused on ACT or MAC approaches. Rather, these studies pertained to MMTS (i.e., Baltzell et al., 2014), MMTS 2.0 (i.e., Cote et al., 2019), and MSPE (i.e., Mistretta et al., 2017) interventions. One of these studies (i.e., Vidic et al., 2017) did not disclose the nature of the mindfulness intervention in which athletes participated. MMTS, which is a six-week program, is comprised of 12 short 30-minute sessions (i.e., twice per week) and focuses on increasing mindfulness through various meditation exercises (Baltzell & Summers, 2016). MMTS 2.0 is a six-week program that includes one weekly session of 60 minutes or two weekly sessions of 30 minutes (Baltzell & Summers, 2018). Each 30-minute segment is comprised of 10 minutes of psychoeducation, 10 minutes of guided practice, and 10 minutes of group discussion (Baltzell & Summers, 2018). Similarly to the MMTS, the MMTS 2.0 includes several meditation exercises (Baltzell & Summers, 2018). However, it also focuses on self-compassion, which was not the case for the MMTS (Baltzell & Summers, 2018). MSPE is a four-week program consisting of a one weekly session of 2.5 hours (Kaufman et al., 2009). MSPE includes body scans, sitting and walking meditations as well as mindful breathing and yoga (Kaufman et al., 2009). When comparing these latter three approaches to that of ACT and MAC, it appears that MMTS, MMTS 2.0, and MSPE include a higher volume of meditation exercises. Further, they focus less on values and committed action.

To briefly summarize the aforementioned four studies, Baltzell et al. (2014) examined the experiences of seven female NCAA Division I soccer players after partaking in a six-week in-person MMTS group intervention using semi-structured interviews. Overall, participants

reported an improved ability to notice and accept thoughts and feelings both on and off the field, and to focus on the task at hand. Limitations of this study include the small sample size (i.e., n = 7) and the timing of the post-intervention interview (i.e., took place less than a week after the intervention), which precluded the researchers from examining more long-term effects of the intervention.

Cote et al. (2019) employed semi-structured interviews to investigate the experiences of nine NCAA Division I tennis players (i.e., four women and five men) who took part in a MMTS 2.0 in-person group intervention. The main finding was that participants learned to respond more effectively to sport- and school-related challenges by observing, accepting, and expressing self-compassion toward unpleasant internal states. Limitations of this study include the small sample size (i.e., n = 9) and the brief duration of the exit interview (i.e., average of 16.31 minutes). Longer interviews were recommended by Cote et al., (2019) to better capture nuances in athletes' experiences.

Mistretta et al. (2017) studied the experiences of 22 NCAA Division III athletes after completing a six-week in-person group MSPE intervention (i.e., six 75-minute sessions) using open-ended questions in a brief post-intervention questionnaire. Overall, participants reported benefiting from enhanced self-awareness and emotion regulation both in and outside of sport. Mistretta and colleagues included participants who were considered "attenders" (i.e., took part in at least one session) and "completers" (i.e., took part in five out of the six sessions) in the interviews. However, the authors provided no information related to the extent to which the sample was comprised of "attenders" compared to "completers". Additionally, they were not able to prompt participants to gain further insight given that they employed a brief post-intervention questionnaire, which limited the breadth and depth of the data they collected.

Lastly, Vidic et al. (2017) investigated the experiences of 13 female NCAA Division I basketball players after participating in an in-person mindfulness group intervention (i.e., 10 weekly one-hour sessions over 16 weeks) using open-ended questions that athletes had to answer in a journal at the end of the last group session. Participants reported an improved ability to focus, relax, be present, and be aware in various aspects of their life (e.g., school, sport). Vidic and colleagues only allotted 10-15 minutes for participants to answer the open-ended questions at the end of the last session, which may not have been enough time to allow participants to reflect adequately and provide in-depth and nuanced answers to each question. Further, the sessions were not evenly spaced out (i.e., nonconsecutive) during the intervention (i.e., the intervention was comprised of 10 weekly sessions and it lasted 16 weeks). Vidic and colleagues (2017) recommended that scholars include consecutive weekly mindfulness sessions in future intervention research.

Based on the four aforementioned studies exploring athletes' experiences, it appears that the athletes typically derived benefits from participating in the mindfulness interventions. It is noteworthy that the study samples have been limited to American varsity athletes thus studies involving non-U.S. athletes competing at different levels are needed. One final study in the context of sport of relevance to the current research was conducted by Foster and Chow (2020). This inquiry did not involve an intervention, however, it showed that mindfulness significantly predicted athletes' mental health in a sample of 222 NCAA Division I athletes (i.e., 167 women and 55 men).

Mindfulness Outside of Sport

Benefits of mindfulness have been shown not only within sport but also outside of this context. For instance, according to the review of Zeidan and Vago (2016), mindfulness can

significantly attenuate the subjective experience of pain in chronic pain patients. Furthermore, a high level of trait mindfulness has been associated with lower pain ratings in a sample of 76 healthy adults (Zeidan et al., 2018) and reduced pain catastrophizing in a sample of 214 undergraduate students (Day et al., 2015). According to the narrative review of Feliu-Soler et al. (2018), the effectiveness of ACT for the management of chronic pain within the general population context is well established.

From a mental illness standpoint, higher psychological flexibility, which is a typical outcome of mindfulness training, has been associated with lower psychopathology (e.g., anxiety and depressive disorders; Kashdan & Rottenberg, 2010). Bai et al. (2020) also reported that ACT can effectively reduce symptoms of depression, while Landy et al. (2015) stated that ACT serves as an evidence-based approach for the treatment of anxiety disorders. Finally, Linardon et al. (2017) reported in their meta-analysis that ACT can produce large improvements in eating disorder symptoms. Given the aforementioned evidence regarding the positive impact of ACT on pain and mental illness symptoms, it may be worthwhile to investigate the effectiveness of this approach for managing EIP and improving symptoms of depressive, anxiety, and eating disorders in sport.

Rationale and Purpose

In the previous section, literature relevant for this doctoral research that pertained to endurance sports, EIP, pain catastrophizing, mental health, mental illness, self-regulation, and mindfulness was reviewed. Collectively, the literature shows that several studies in these areas have been conducted, however, important gaps exist. Following is a summary of these gaps and recommendations for future studies, which provided the rationale to develop and carry out the current research project:

(a) Studies on EIP catastrophizing and EIP management in sport are limited.

(b) Research examining psychological strategies used by active (i.e., non-retired) elite endurance athletes to manage EIP is warranted.

(c) No study has compared the effectiveness of sport psychology (i.e., mental performance) interventions in improving EIP catastrophizing and EIP management in athletes.

(d) Studies investigating online mental performance interventions are scarce and no study has explored athletes' experiences from participating in an online self-regulation or mindfulness intervention; both self-regulation and mindfulness constructs have been shown to have relevance for endurance athletes.

(e) Research examining the effectiveness of mental performance interventions to improve mental health and mental illness symptoms in athletes are practically non-existent.

(f) There is a call-to-action for researchers who are conducting intervention research to (i) recruit more participants including those from the same sport, (ii) randomize participants across groups, (iii) implement controlled intervention procedures, (iv) provide structured interventions, (v) clearly define and measure mental health and mental illness constructs, (vi) combine quantitative and qualitative methods to more accurately assess the effectiveness of interventions, and (vii) conduct longer interviews to better capture nuances with regards to similarities and differences in athletes' experiences.

The aforementioned gaps and recommendations provided the rationale for developing and carrying out the current doctoral research, which aimed to:

(a) Investigate how elite endurance athletes experience and manage EIP (Study 1);

(b) Compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners using an experimental design (Study 2);

(c) Qualitatively examine the impact of the online self-regulation and mindfulness interventions designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation and mindfulness), and mental health (Study 3).

PART II

Supplemental Methods

The following section complements the methods sections included in the three articles in Part III of the dissertation. Due to journal page restrictions, some aspects of the methods were not fully addressed in these studies. Specifically, this section depicts the doctoral candidate's personal experience in endurance sports to situate the current dissertation. It also outlines how pragmatism and a mixed methods experimental design informed the current doctoral research. Lastly, it describes in greater detail the online interventions, procedures, and data collection in the chronological order in which they occurred.

Personal Experience with Endurance Sports

The doctoral candidate decided to focus his thesis on the broader context of endurance sports given his personal experience, knowledge, and interest in this context. He was a competitive middle-distance and cross-country runner for seven years and then a cross-country and track and field (e.g., middle-distance running) coach for another seven years before becoming an MPC. He was also a volunteer in a few major sporting events (e.g., world series and championships) that focused on endurance sports (e.g., speed skating, triathlon). Currently, he trains as a road runner and provides mental performance services to several endurance athletes from a variety of endurance sports. All in all, the doctoral candidate had a strong desire to answer applied research questions that could benefit athletes, coaches, and MPCs who are involved in endurance sports.

Pragmatism

Pragmatism, which is oriented toward "what works" and applied practice, focuses on the consequences of the research and on the use of multiple methods of data collection to address the

applied research questions under study (Creswell & Plano Clark, 2018). It emphasizes the practical and empirical over the ontological and epistemological (Tashakkori & Teddlie, 1998). From a pragmatic perspective, the purpose for which methods are useful therefore matters more than any epistemological or ontological differences (Gibson, 2016). Further, contrary to postpositivist researchers who view reality as singular and to constructivist researchers who view reality as multiple, pragmatic researchers view reality has both singular and multiple (Creswell & Plano Clark, 2018). Additionally, pragmatic researchers argue that a continuum exists between objective and subjective viewpoints and that the choice of a particular viewpoint depends on the nature of the research question being investigated (Tashakkori & Teddlie, 1998). A pragmatic stance was adopted in the current project because the use of both qualitative and quantitative methods was seen as the most comprehensive means to accurately answer the research questions. This permitted the selection of methods and procedures that best met the needs and aims of the mixed methods design employed (Creswell & Creswell, 2018).

Interestingly, between 2017 and 2019, 22 mixed methods articles were published in the six leading sport and exercise psychology journals (i.e., International Journal of Sport and Exercise Psychology [IJSEP], Journal of Applied Sport Psychology [JASP], Journal of Sport and Exercise Psychology [JSEP], Psychology of Sport & Exercise [PSE], Sport, Exercise and Performance Psychology [SEPP], and The Sport Psychologist [TSP]). Among those 22 mixed methods studies, only eight of them addressed the paradigm guiding the research, of which five adopted a pragmatic stance (Ryba et al., 2020). According to the findings of Ryba et al. (2020), pragmatism seems to be the most prevalent paradigm guiding recent mixed methods studies conducted in the field of sport psychology. Similarly, Feilzer (2010) noted that pragmatism is the most frequently identified paradigm on which mixed methods researchers based their work.

Mixed Methods Experimental Design

Mixed methods research is an approach in which researchers collect, analyze, and interpret both quantitative and qualitative data, integrate or combine the two approaches in various ways, and frame the study within a specific type of design or procedure (Creswell, 2015). In the current doctoral research, a mixed methods experimental design (see Figure 3), which is a type of complex mixed methods design (Creswell & Plano Clark, 2018), was employed to:

(a) Collect and analyze qualitative data to inform the content related to EIP management in the online self-regulation and mindfulness interventions (i.e., Study 1);

(b) Collect and analyze quantitative data at two time points (i.e., pre- and post-intervention) to investigate the effectiveness of the online self-regulation and mindfulness interventions in improving specific outcomes (i.e., Study 2);

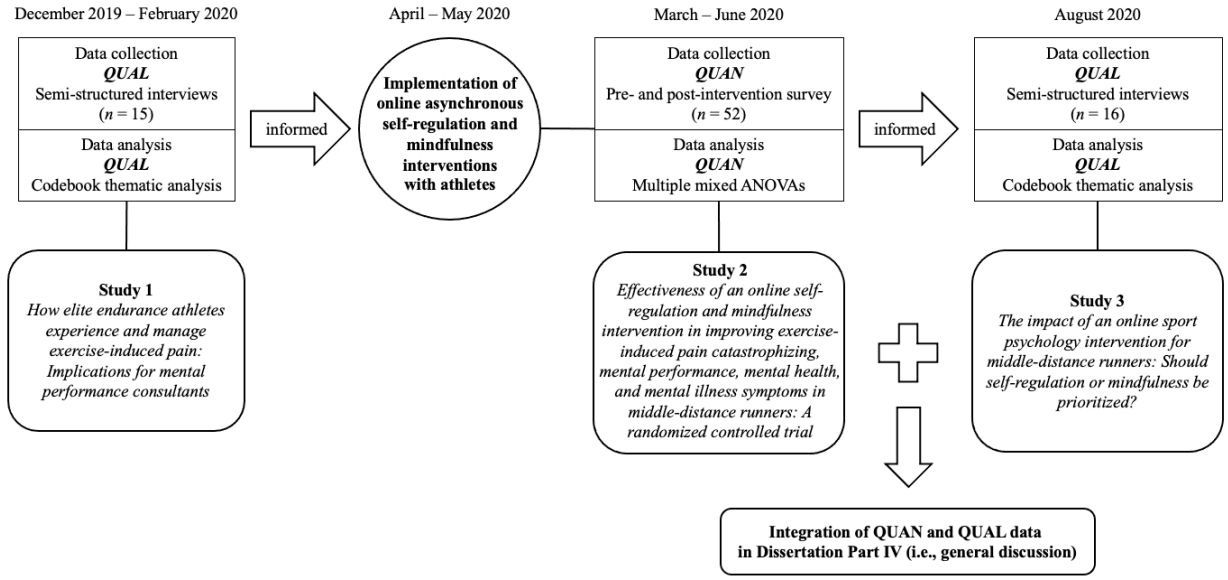
(c) Collect and analyze qualitative data two months after completion of the online interventions to examine participants' perceived impact of the self-regulation and mindfulness intervention (i.e., Study 3); and

(d) Integrate and interpret both quantitative and qualitative data in Part IV (i.e., general discussion) of this dissertation.

It was deemed that this type of comprehensive sequential design would enable the researchers to accurately assess competitive and high performance athletes' experiences and management of EIP, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in the context of endurance sports.

Figure 3.

Mixed Methods Experimental Design



Following are additional details regarding each study that were not discussed in depth in the manuscripts in the Results section of the thesis. The reader is invited to read this section in conjunction with the manuscripts to get a full appreciation of each study and to keep in mind both the research questions and Figure 3 to appreciate the methods and chronology of events.

Study 1

Purpose

The purpose of Study 1 was to investigate how elite endurance athletes experience and manage EIP.

Procedures

Ethical approval was obtained from the Office of Research Ethics and Integrity of the doctoral candidate and thesis supervisor's university for the entire research project (see Appendix A). A bilingual (i.e., French and English) recruitment text (see Appendices B and C) and consent form (see Appendices D and E) were sent to Athletics Canada, Swimming Canada,

and Canoe Kayak Canada. Senior national team athletes also directly received the same documents through their publicly available Facebook account. They communicated their interest to take part in the study by sending an email to the doctoral candidate or by answering his Facebook message. Given the time and resources allocated to conduct the study, athletes were selected on a first-come, first serve basis. They had to sign the consent form before commencing the interview and received no incentive or compensation for taking part in the interview.

Data Collection

Data were collected via individual semi-structured interviews. The interviews were conducted face-to-face online via Zoom and lasted between 28 and 68 minutes ($M_{minutes}$ = 51.19, *SD* = 10.62). Three interviews were conducted in French and 12 interviews were conducted in English. Interviews were conducted by the doctoral candidate who is a bilingual MPC and a Professional Member of the Canadian Sport Psychology Association (i.e., high level of interpersonal and communication skills and well-versed in the assessment and application of sport psychology interventions and outcomes). The interviews were audio-recorded and scheduled at a time that was deemed convenient for both the participants and doctoral candidate. The interviews took place over a period of two months (i.e., between early December 2019 and early February 2020) prior to Canadian Olympic Trials set to occur in April for canoe kayak and swimming and in June for track and field. The French and English interview guides can be found in Appendices F and G.

Study 2

Purpose

The purpose of Study 2 was to compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners using an experimental design.

Design, Recruitment, Randomization, and Procedures

A pre-post experimental design involving three intervention groups (i.e., self-regulation, mindfulness, active control) was used to conduct Study 2. This type of design was congruent with the pragmatic stance to fulfill existing gaps and answer an applied research question pertaining to online sport psychology interventions. The active control group was included to fulfill the gaps highlighted in previous reviews (e.g. Carraça et al., 2018; Van Dam et al., 2018) and RCTs that did not include this type of control (e.g., Lundgren et al., 2021). The current RCT design is different than previous ones in which mindfulness and PST interventions were compared (i.e., Gross et al., 2018; Josefsson et al., 2019) in that it included three groups rather than two. The additional active control group in the current study received an online intervention that had a nutrition rather than a sport psychology focus and according to Melnyk et al.'s (2012) recommendations, the intervention required equal time and attention from athletes as the self-regulation and mindfulness intervention groups. Stratified randomization was used to allow a more even distribution of participants to the three groups based on shared characteristics (Kendall, 2003).

Before recruiting participants, an a priori power analysis for a mixed ANOVA with three groups (i.e., self-regulation, mindfulness, active control) and two measurements (i.e., pre- and

post-intervention) was performed using G*Power to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, and an effect size of 0.40 (Faul et al., 2007). According to the power analysis, 51 participants were needed to detect a large effect size with a power of 0.80. Once the desired sample size was determined, recruitment commenced. To this end, a bilingual (i.e., French and English) information package containing recruitment texts (see Appendices J and K), consent forms (see Appendices L and M), and infographics (see Appendices N and O) was sent to (a) Athletics Canada and its provincial branches, (b) organizations promoting Canadian track and field content (e.g., Trackie), and (c) middle-distance runners through Instagram based on publicly available information. Recruiting participants from only one high intensity endurance sport (i.e., middle-distance running) was deemed essential to minimize the presence of potentially confounding variables in the current RCT and to address the call-to-action from other researchers to recruit participants from the same sport when conducting intervention research (e.g., Dubuc-Charbonneau & Durand-Bush, 2018). Further, given that EIP management was one of the dependent variables and given that EIP increases alongside exercise intensity (Mauger, 2019), it was deemed necessary to recruit participants from a high intensity endurance sport, such as middle-distance running.

To be eligible for this study, athletes had to be (a) between 16 to 35 years of age (i.e., compete in the U18, U20, or senior category), (b) provincial, national, or international (i.e., competitive or high performance) middle-distance runners (i.e., 600 meters to the mile), and (c) able to read in English given that the content of the interventions was in English only. All interested participants replied by email or Instagram and were selected on a first-come, first-serve basis due to the time and resources allocated to conduct the study. Out of 65 who expressed interest, a total of 61 individuals met the inclusion criteria. Four individuals were excluded

because they were competing in long-distance running events (e.g., 5 kilometers, 10 kilometers) rather than middle-distance events (i.e., 600 meters to the mile). Participants signed the consent form before data were collected and no incentives or compensation were provided for their participation in the study. Importantly, the different types of online interventions (i.e., self-regulation, mindfulness, active control) were not disclosed in the information package to prevent athletes from knowing they could be allocated to a control group.

In preparation for the stratified randomization of athletes into the three intervention groups (see description of interventions in subsequent section), participants completed either a French or English demographic questionnaire (see Appendices P and Q) and either a French or English pre-intervention survey (see Appendices R and S) between the second and third week of March 2020[1]. Four variables were used for the stratified randomization: athletes' gender (i.e., female or male; first round of stratification), level of experience in middle-distance running (i.e., low = 4 years or less; high = 5 years or more; second round of stratification), level of mental health (i.e., low = under median score; high = above median score; third round of stratification), and level of EIP catastrophizing (i.e., low = under median score; high = above median score; fourth round of stratification). Level of mental health was measured based on a global mental health score, which was calculated by subtracting the summation of the mental illness scores from the mental health score. Overall, stratified randomization ensured that potential confounding variables were more evenly distributed among the groups (Kendall, 2003).

[1]Half of the sample completed the pre-intervention survey one to two days before COVID-19 was declared a global pandemic and the second half of the sample completed it in the following days. Independent t-tests were used to compare the means (i.e., before and during COVID-19) for each scale at Time 1. No significant differences were found between participants who completed the pre-intervention survey before or during the COVID-19 pandemic. Thus, the timing of completion (i.e., before or during COVID-19) was not included as a covariate in the analyses.

Following ethical guidelines, the doctoral candidate and thesis supervisor had planned to follow up with athletes who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder) and refer them to appropriate mental health resources. In total, 10 of the 61 athletes who completed the pre-intervention survey screened positive for one or more of the three aforementioned outcomes based on existing thresholds (Garner et al., 1982; Radloff, 1977; Spitzer et al., 2006). The doctoral candidate and thesis supervisor met individually with each of these 10 athletes to assess their overall functioning and current mental health support. Five of them reported currently working with a mental health practitioner. The other five who were not were encouraged to do so (i.e., by using the list of mental resources included in the consent form). The doctoral candidate and thesis supervisor then discussed with psychologists specialized in sport to assess the benefits and risks of including these 10 athletes in the study, as they were all eager to participate. The practitioners argued that the benefits of taking part in an online sport psychology intervention outweighed the risks, particularly during a pandemic that was creating isolation for individuals. The 10 athletes were therefore included in the research. However, from an ethical and professional standpoint, both the researchers and psychologists felt that these 10 participants, who were considered more vulnerable, should be randomized into the self-regulation or mindfulness groups only, and not allocated to the control group. As such, these 10 athletes formed a sub-sample of the larger sample. The rest of the sample (i.e., other 51 participants) were randomized into the self-regulation, mindfulness, or control group.

The initial sample included 61 participants (i.e., 22 self-regulation, 22 mindfulness, and 17 active control). However, nine participants dropped out of the study (i.e., 5 self-regulation, 3 mindfulness, and 1 active control). Reasons for dropping out included overload with schoolwork

(i.e., two participants), training cessation due to the COVID-19 pandemic (i.e., one participant), and lack of interest (i.e., one participant). The five other participants who dropped out simply stopped responding to emails. The final sample consisted of 52 participants (i.e., 17 self-regulation, 19 mindfulness, and 16 active control). Participants were between 16 to 25 years of age (M_{age} = 21.25, *SD* = 2.31) and identified as female (*n* = 33, 63.46%) or male (*n* = 19, 36.54%). Additionally, they identified as English Canadian (*n* = 23, 44.23%), French Canadian (*n* = 22, 42.31%), Arabic (*n* = 2, 3.85%), French (*n* = 2, 3.85%), Asian (*n* = 1, 1.92%), British (*n* = 1, 1.92%), and South American (*n* = 1, 1.92%). The majority of the participants were varsity student-athletes (*n* = 49, 94.23%) while the other three were high school (*n* = 2, 3.85%) and professional (*n* = 1, 1.92%) athletes. The years of experience in middle-distance running ranged from 1 to 11 (M_{years} = 5.86, *SD* = 2.22). Participants were competing at the provincial (*n* = 20, 38.46%), national (*n* = 30, 57.69%), and international (*n* = 2, 3.85%) level. Some participants reported being physically injured (*n* = 9, 17.31%) and having a diagnosed mental illness in the past (*n* = 8, 15.38%).

Online Interventions and Data Collection

The online interventions (i.e., self-regulation, mindfulness, active control) occurred between the first week of April and the third week of May 2020. Each intervention was asynchronous (i.e., self-directed and completed without interactions with a facilitator), lasted 8 consecutive weeks, and consisted of completing a weekly workbook module that took approximately 30 minutes. Participants had to complete each module directly into Word using a computer. Internet was needed to complete the modules as some of them included hyperlinks to video and audio files. After completing each module, participants had to email it back to the doctoral candidate by the end of the week (i.e., before 11:59 p.m. on Sunday) to receive the

subsequent one. The doctoral candidate verified that the participants' workbook modules were completed appropriately before sending the ensuing one on Monday morning. If a participant failed to submit their module in the requested delay, the doctoral candidate followed up and asked them to submit it as soon as possible in order for them to receive the subsequent module and not fall behind the rest of the participants. The same email content was used to submit each module to the participants of each intervention in order to standardize the procedure. On a similar note, no feedback was provided on participants' responses to maintain consistent interactions across participants and the workbook modules were not used as a source of data. During the first two weeks following completion of the interventions (i.e., between the last week of May and the first week of June 2020), participants completed either the French or English post-intervention survey, which included the same questionnaires as the pre-intervention survey (see Appendices R and S).

The self-regulation intervention was informed by the SCMSR (Zimmerman, 2000) and included the following topics: self-regulation definitions and personal standards (i.e., module 1), goal setting (i.e., module 2), strategic planning (i.e., module 3), self-efficacy (i.e., module 4), motivation (i.e., module 4), self-talk (i.e., module 4), focus (i.e., module 5), imagery (i.e., module 6), self-monitoring (i.e., module 7), and self-reflection (i.e., module 8). The mindfulness intervention was informed primarily by ACT (Harris, 2009) and secondarily by the MAC approach (Gardner & Moore, 2007) and covered the following topics: mindfulness and MAC definitions (i.e., module 1), defusion (i.e., module 2), acceptance (i.e., module 3), contacting the present moment (i.e., module 4), self-as-context (i.e., module 5), values (i.e., module 6), and committed action (i.e., modules 7 and 8). The purpose of the first module of both interventions was to introduce participants to either self-regulation or mindfulness. Further, each module,

regardless of the intervention, was comprised of a mix of psychoeducation and practical exercises. Additionally, participants had to reflect on their biggest takeaways at the end of each module to consolidate their key learnings. Of note, each mindfulness module started with a brief centering exercise, which was not the case for the self-regulation modules.

Following the recommendations of McCormick et al. (2015), both interventions were designed specifically to address the demands of middle-distance running (e.g., EIP management). Additionally, the exercises and examples provided were specific to middle-distance running. The EIP management strategies reported by the elite endurance athletes in Study 1 helped to inform the EIP content (EIP management was not addressed in the active control intervention). More specifically, the self-regulation intervention was comprised of exercises helping participants to (a) recall sources of self-efficacy, develop a segmented performance plan, and use imagery before experiencing EIP, (b) direct their attention on performance-relevant cues (e.g., cadence, technique, relaxing, race plan), use instructional and motivational self-talk, implement a segmented performance plan, regulate breathing and relax, and self-monitor when experiencing EIP, and (c) reflect using a training journal and identify possible explanations after experiencing EIP. The mindfulness intervention, on the other hand, included exercises helping participants to accept EIP before experiencing it and to focus on the present moment (e.g., one repetition at a time) when experiencing it.

Of note, these two interventions were designed by the doctoral candidate and thesis supervisor who have extensive experience developing and implementing these types of interventions with athletes. Both are trained MPCs and Professional Members of the Canadian Sport Psychology Association. While the full self-regulation and mindfulness workbooks are not

provided in this dissertation to protect the researchers' intellectual property, a summary of the modules can be found in Appendix H and Appendix I, respectively.

The active control intervention was informed by an endurance sports nutrition textbook (Eberle, 2014) and consisted of reading a chapter each week and reflecting on its content by answering three questions (i.e., What will you start doing? What will you stop doing? What will you continue doing?). The topics covered are summarized in Table 4.

Table 4.

Topics Covered in the Active Control Intervention

Module	Topic
1	Eating smart, training smart, racing smart
2	Meeting energy demands
3	Weighty matters: Losing, gaining, maintaining
4	Timing fuel and fluids for optimal results
5	Effective use of supplements
6	Solving peak performance challenges
7	Endurance eating for vegetarians
8	Meal planning for endurance athletes

Internal Reliability of Measures

The measures included in the pre- and post-intervention survey and the data analyses performed (i.e., with and without the subset of athletes screening positive for mental illness symptoms) are described in the Study 2 article in the Results section. The internal consistency reliability of each measure at each time point was assessed using Cronbach's alpha (see Table 5). Alpha values ranged from 0.49 to 0.93. Without the subset of nine participants included in the

full sample (i.e., $n = 43$), 10 out of 14 internal consistency coefficients demonstrated an acceptable value of more than .70 (Nunnally, 1978). With the subset of nine participants included in the full sample, 13 out of the 14 internal consistency coefficients demonstrated an acceptable value of more than .70 (Nunnally, 1978). The EAT-26 scale generated the lowest internal consistency coefficients without the subset of nine participants.

Table 5.

Internal Consistency Coefficients for Each Measure at Each Time Point

		Without the Subset of Nine Participants (i.e., $n = 43$)	With the Subset of Nine Participants (i.e., $n = 52$)
	T	Cronbach's Alpha	Cronbach's Alpha
PCS	1	0.85	0.84
	2	0.87	0.86
SSRQ	1	0.90	0.93
	2	0.90	0.88
CAMS-R	1	0.68	0.84
	2	0.71	0.69
MHC-SF	1	0.79	0.90
	2	0.88	0.90
GAD-7	1	0.85	0.91
	2	0.63	0.76
CES-D	1	0.71	0.93
	2	0.80	0.83
EAT-26	1	0.65	0.89
	2	0.49	0.80

Note. PCS = Pain Catastrophizing Scale; SSRQ = Short Version of the Self-Regulation Questionnaire; CAMS-R = Cognitive and Affective Mindfulness Scale-Revised; MHC-SF = Mental Health Continuum Short Form; GAD-7 = Generalized Anxiety Disorder Scale; CES-D = Center for Epidemiological Studies Depression Scale; EAT-26 = Eating Attitudes Test; T = time.

Pearson Correlation Coefficients

Pearson correlation coefficients were calculated to investigate the strength of the relationships between the variables at the two different time points with and without the subset of participants who screened positive for mental illness symptoms (see Tables 6, 7, 8, 9). Without the subset, a significant positive correlation was observed at both time points between (a) self-regulation and mindfulness, (b), self-regulation and mental health, and (c) anxiety and depression. A significant negative correlation was found between (a) mindfulness and anxiety, and (b) mental health and depression.

When the subset was included and both time points were considered, there was a significant positive correlation between (a) self-regulation and mindfulness, (b) self-regulation and mental health, (c) mindfulness and mental health, (d) anxiety and depression, and (e) anxiety and eating disorder. Furthermore, there was a significant negative correlation between (a) mindfulness and anxiety, (b) mindfulness and depression, (c) mental health and anxiety, and (d) mental health and depression. Interestingly, the EAT-26 was found to have the lowest number of significant relationships, especially at Time 1, which may be linked to the low internal consistency coefficients reported for this measure at Time 1 in Table 5.

Table 6.

Pre-Intervention Correlations (Without the Subset of Nine Participants)

	SSRQ	CAMS-R	MHC-SF	GAD-7	CES-D	EAT-26
SSRQ	1.00	.61**	.46**	-.25	-.35*	.28
CAMS-R	.61**	1.00	.33*	-.38*	-.24	.08
MHC-SF	.46**	.33*	1.00	.16	-.35*	.20
GAD-7	-.25	-.38*	.16	1.00	.43**	.10
CES-D	-.35*	-.24	-.35*	.43**	1.00	.20
EAT-26	.28	.08	.20	.10	.20	1.00

Note. *$p < .05$; **$p < .01$; SSRQ = Short Version of the Self-Regulation Questionnaire; CAMS-R = Cognitive and Affective Mindfulness Scale-Revised; MHC-SF = Mental Health Continuum Short Form; GAD-7 = Generalized Anxiety Disorder Scale; CES-D = Center for Epidemiological Studies Depression Scale; EAT-26 = Eating Attitudes Test.

Table 7.

Post-Intervention Correlations (Without the Subset of Nine Participant)

	SSRQ	CAMS-R	MHC-SF	GAD-7	CES-D	EAT-26
SSRQ	1.00	.51**	.40**	-.31*	-.30	-.05
CAMS-R	.51**	1.00	.25	-.30*	-.30*	-.12
MHC-SF	.40**	.25	1.00	-.22	-.64**	-.11
GAD-7	-.31*	-.30*	-.22	1.00	.47**	.18
CES-D	-.30	-.30*	-.64**	.47**	1.00	.25
EAT-26	-.05	-.12	-.11	.18	.25	1.00

Note. *$p < .05$; **$p < .01$; SSRQ = Short Version of the Self-Regulation Questionnaire; CAMS-R = Cognitive and Affective Mindfulness Scale-Revised; MHC-SF = Mental Health Continuum Short Form; GAD-7 = Generalized Anxiety Disorder Scale; CES-D = Center for Epidemiological Studies Depression Scale; EAT-26 = Eating Attitudes Test.

Table 8.

Pre-Intervention Correlations (With the Subset of Nine Participants)

	SSRQ	CAMS-R	MHC-SF	GAD-7	CES-D	EAT-26
SSRQ	1.00	.68**	.58**	-.44**	-.46**	.03
CAMS-R	.68**	1.00	.66**	-.61**	-.64**	-.17
MHC-SF	.58**	.66**	1.00	-.36**	-.75**	-.08
GAD-7	-.44**	-.61**	-.36**	1.00	.59**	.29*
CES-D	-.46**	-.64**	-.75**	.59**	1.00	.24
EAT-26	.03	-.17	-.08	.29*	.24	1.00

Note. *$p < .05$; **$p < .01$; SSRQ = Short Version of the Self-Regulation Questionnaire; CAMS-R = Cognitive and Affective Mindfulness Scale-Revised; MHC-SF = Mental Health Continuum

Short Form; GAD-7 = Generalized Anxiety Disorder Scale; CES-D = Center for Epidemiological Studies Depression Scale; EAT-26 = Eating Attitudes Test.

Table 9.

Post-Intervention Correlations (With the Subset of Nine Participants)

	SSRQ	CAMS-R	MHC-SF	GAD-7	CES-D	EAT-26
SSRQ	1.00	.48**	.39**	-.15	-.26	-.01
CAMS-R	.48**	1.00	.32*	-.39**	-.43**	-.29*
MHC-SF	.39**	.32*	1.00	-.35*	-.71**	-.25
GAD-7	-.15	-.39**	-.35*	1.00	.64**	.41**
CES-D	-.26	-.43*	-.71**	.64**	1.00	.44**
EAT-26	-.01	-.29*	-.25	.41**	.44**	1.00

Note. *$p < .05$; **$p < .01$; SSRQ = Short Version of the Self-Regulation Questionnaire; CAMS-R = Cognitive and Affective Mindfulness Scale-Revised; MHC-SF = Mental Health Continuum Short Form; GAD-7 = Generalized Anxiety Disorder Scale; CES-D = Center for Epidemiological Studies Depression Scale; EAT-26 = Eating Attitudes Test.

Study 3

Purpose

The purpose of Study 3 was to qualitatively examine the impact of the online self-regulation and mindfulness interventions designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation and mindfulness), and mental health.

Procedures

Study 3 included 16 participants who were purposefully selected from the self-regulation ($n = 17$) and mindfulness ($n = 19$) groups from Study 2 based on their pre- and post-intervention survey scores (i.e., EIP catastrophizing, self-regulation, mindfulness, mental health, and mental illness symptoms [anxiety, depression, and eating disorder]). The aim was to account for varied and inclusive perceptions and experiences and selection was based on participants' evolution

score, which was calculated by subtracting the sum of undesired score variations (i.e., pre to post negative changes) from the sum of desired score variations (i.e., pre to post positive changes). A breakdown of the evolution score of the 16 participants [i.e., high score (n = 8), moderate score (n = 4), and low score (n = 4)] who completed the follow-up interview can be found in Table 1 of Article 3 in the Results section.

In total, 45 athletes from Study 2 consented to participate in the interview. From this sample, 16 were initially contacted via email by the doctoral candidate with an aim to recruit eight from each intervention based on whether they had high, moderate, or low scores. Three participants never replied to the invitation and one participant declined. Using the evolution score, the doctoral candidate then invited the next athletes on the list to eventually create a sample of 16 participants (i.e., eight from the self-regulation intervention and eight from the mindfulness intervention). Of note, participants who screened positive for mental illness symptoms (see Study 2) had high evolution scores and four athletes from this subset (i.e., two per intervention) were included in the sample to account for their unique experiences. This explains why this category includes eight participants, rather than four like the moderate and low score categories (see Table 1 of Article 3). Participants signed the consent form before completing the interview and no incentives or compensation was provided for their participation in the study.

Data Collection

Data were collected via individual semi-structured interviews conducted face-to-face via the online Zoom platform. Interviews took place two months after participants had submitted the last module of their online intervention (i.e., August 2020) and lasted approximately 40 minutes (between 28 and 56 minutes; M_{minutes} = 40.32, SD = 7.11). Conducting the interviews two months

post-intervention was deemed appropriate to allow enough time for the participants to reflect on and apply what they had learned from the self-regulation or mindfulness intervention. Interviews were audio-recorded and scheduled at a time that was convenient for both the participants and doctoral candidate. Half of the interviews were conducted in English and the other half in French. The bilingual doctoral candidate's training and experience as a researcher and MPC allowed him to easily build rapport and effectively prompt the participants to gain in-depth information. The French and English interview guides can be found in Appendices T and U.

PART III

Results

The following section presents the results of this doctoral research, which are depicted in three separate articles. Article 1 (i.e., Study 1) integrates a qualitative approach to showcase elite endurance athletes' experience and management of EIP, which have implications for MPCs supporting them. Article 2 (i.e., Study 2) addresses the effectiveness of the online self-regulation and mindfulness interventions in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners. Contributions and limitations of the experimental design that included an active control group are discussed. Article 3 (i.e., Study 3) qualitatively presents athletes' perceived changes and recommendations from participating in the online self-regulation and mindfulness interventions, along with implications for future online sport psychology interventions. All three articles are structured and formatted according to the guidelines of the referred journal to which they were submitted. That being said, figures and tables were included directly into the text of the articles to maximize flow when reading the current dissertation. Articles 1 and 2 have been revised and resubmitted while Article 3 is still currently under review.

Article 1: How Elite Endurance Athletes Experience and Manage Exercise-Induced Pain: Implications for Mental Performance Consultants

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Manuscript revised and resubmitted

Abstract

There is a paucity of research examining exercise-induced pain (EIP) management in elite endurance sports. The purpose of this study was therefore to investigate how elite endurance athletes experience and manage EIP, using an applied self-regulation lens to help inform the work of Mental Performance Consultants. Individual semi-structured interviews were conducted with 12 female and 3 male athletes (M_{age} = 23.73, SD = 2.31) competing in track and field (i.e., 600-1500 m; n = 5), swimming (i.e., 200-400 m; n = 5), and canoe kayak (i.e., 500-1000 m; n = 5). Given the centrality of self-regulation in elite sport and in the management of internal states (e.g., EIP), the social cognitive model of self-regulation was used to guide this study. The codebook thematic analysis generated (a) two themes (i.e., sensations, beliefs) and six subthemes (e.g., tightness, progressive) related to the experience of EIP as well as (b) three themes (i.e., preparation, execution, evaluation) and 17 subthemes (e.g., accept and commit to EIP, direct attention away from EIP, reflect using a training journal) related to the management of EIP. Findings suggest that the experience of EIP is highly cognitive and generally perceived as detrimental to performance if not effectively managed. Athletes used several psychological strategies to prepare to experience EIP, reduce the aversive effects of EIP while performing, and learn from their EIP management strategies to improve their coping capacity. Importantly, combining self-regulation and mindfulness strategies appears to be valuable to successfully manage EIP.

Keywords: qualitative research, psychological skills, self-regulation, coping, middle-distance events

Lay Summary

This study examined how elite track and field, swimming, and canoe kayak athletes experience and manage exercise-induced pain when training at a high intensity and competing. Beliefs and sensations influenced the experience of EIP and athletes used 17 psychological strategies to manage this prominent psychological demand.

Implications for Practice

Mental Performance Consultants are encouraged to:

- Emphasize the development of preparation strategies to manage EIP as this phase seems to be a priority. Specifically, accepting and committing to experiencing EIP appears to be essential.
- Help endurance athletes focus on performance-relevant cues (e.g., cadence, technique, relaxing, race plan) and the present moment (e.g., one repetition/segment at a time) when experiencing EIP.
- Develop a brief guided self-reflection tool that endurance athletes can use to assess the experience and management of EIP.

How Elite Endurance Athletes Experience and Manage Exercise-Induced Pain: Implications for Mental Performance Consultants

> Performance. It's a question of how much pain a person can handle…. I remember vividly realizing that no matter what shape I was in, I had something the others did not. I had the ability to suffer more than most people I had come to know in sport. It was a weapon and I knew that if used properly, no one could beat me (Hughes, 2005).

Athletes like Olympic champion Clara Hughes, who has won multiple medals at both the Summer and Winter Olympic Games, do not achieve success without mental performance support. Endurance athletes must learn how to withstand exercise-induced pain (EIP), which has important implications for Mental Performance Consultants (MPCs) assisting them. Yet, the literature focusing on strategies to manage EIP in sport is scarce. This was the focus of the current study.

EIP

EIP, which is a type of pain that naturally occurs when athletes engage in intense exercise, does not cause lasting damages and usually disappears shortly after intensity is reduced or exercise is ceased (Mauger, 2019). The experience of EIP is often associated with a burning sensation, dull ache, or heaviness in the muscles (Cook et al., 1997; Miles & Clarkson, 1994). Importantly, EIP is different from the pain one may experience from an acute injury (e.g., sprained ankle), a chronic injury (e.g., stress fracture), or from the micro-trauma and inflammation arising from delayed onset muscle soreness (Mauger, 2019). The intensity of EIP increases alongside exercise intensity (Mauger, 2019). For example, a middle-distance runner will experience a higher level of EIP when completing a workout at race pace compared to when completing a recovery run.

EIP management is a prominent psychological demand in endurance sports. For instance, former Olympic cyclists reported that pain imposed the greatest psychological demand on them (Kress & Statler, 2007). Similarly, endurance athletes indicated that pain was particularly salient when competing and training at high intensity (McCormick et al., 2016). Endurance athletes, such as Tyler Mislawchuk, a Canadian Olympic triathlete, are now realizing the importance of developing psychological EIP management strategies to maximize their performance:

> I think the biggest misconception on the part of amateurs and professionals is the notion that training is purely physical preparation for whatever goal has been set forward. Of course, training is physical, but mental strength plays its own role: we must learn techniques and strategies to deal with the pain that comes with competitive sport (Mislawchuk, 2018).

There is a scarcity of studies examining the psychological strategies used by endurance athletes to manage EIP. To the authors' knowledge, Kress and Statler (2007) conducted the only study investigating this phenomenon. Nine former American male Olympic cyclists with a mean age of 37.8 were recruited and participated in a semi-structured interview. Participants' strategies included (a) directing their attention on task-relevant cues to maximize their efficiency, (b) setting goals, (c) mentally rehearsing possible sensations they could experience (e.g., EIP), (d) using positive self-talk, (e) accepting EIP, and (f) relaxing their breathing. Limitations of this study are that participants were all males and they may not have had full and detailed recall of their experiences as some of them had not been competing for several years. There is therefore a need for research to focus on endurance sports with elite athletes who are still competing, including female athletes.

Pain research findings suggest that the appraisal and interpretation of pain sensations are crucial to pain tolerance (Birrer & Morgan, 2010). For example, pain catastrophizing, which refers to a negative and exaggerated psychological response (i.e., helplessness, rumination, and magnification) to actual or anticipated pain (Sullivan et al., 1995), has been negatively correlated to pain tolerance in endurance athletes (Geva & Defrin, 2013). Pain tolerance refers to the maximum level of perceived pain that someone is able to tolerate, or the duration someone is willing to be exposed to a given pain intensity (Stevens et al., 2018). Further, pain is a subjective experience and its perceived intensity is not always directly related to the magnitude of the pain signal sent to the brain (Stevens et al., 2018). The late American running legend, Steve Prefontaine, famously spoke about how he could beat anyone because he could endure more pain than anyone else. Given the evidence showing that higher EIP tolerance produces superior endurance performance (Astokorki & Mauger, 2017), MPCs can help athletes increase their EIP tolerance by modifying their perception, appraisal, and interpretation of EIP. Implementing psychological strategies to facilitate EIP management could help endurance athletes achieve the physiological adaptations necessary to improve their performance when training and their desired outcome when competing (McCormick et al., 2016).

Self-Regulation

According to McCormick et al. (2019), endurance athletes typically engage in cognitive processes that either guide them toward or away from states or goals in training and competition settings. The ability to use cognitive processes to accept or alter responses or inner states (e.g., EIP) as a means to work toward a goal is an essential feature of self-regulation. From a social cognitive perspective, self-regulation refers to the dynamic process in which individuals plan, generate, evaluate, and adapt their thoughts, feelings, and actions in order to achieve their

personal standards and goals in their constantly changing environment (Zimmerman, 2000). Elite athletes often mention self-regulation as one of the most important factors for their success (Kitsantas et al., 2018). They also engage in more frequent and more sophisticated self-regulatory processes than less elite athletes (McCardle et al., 2019).

According to Zimmerman's (2000) social cognitive model of self-regulation (SCMSR), self-regulation includes self-motivational beliefs and cognitive processes occurring within three cyclical self-regulatory phases: forethought (i.e., preparation for performance), performance (i.e., execution during performance), and self-reflection (i.e., evaluation after performance). The forethought phase precedes an athlete's engagement in a performance task and includes task analysis processes (i.e., goal-setting and strategic planning) and self-motivational beliefs (i.e., self-efficacy, outcome expectations, intrinsic value, and goal orientation). Mentally fractionating a race into distinct segments with specific short-term goals is an example of a task-analysis process. Forethought processes are crucial as they impact one's tendency and ability to engage in the performance phase. The performance phase involves implementing the components of the forethought phase in order to optimize the completion of the targeted task. The performance phase includes self-control (i.e., self-instruction, attention focusing, imagery, and task strategies) and self-observation processes (i.e., self-recording and self-experimentation). Strategically using motivational self-talk during a grueling training session is an example of a self-control process that an endurance athlete can use. The self-reflection phase involves reflecting and learning from performing the task. This phase includes self-judgment (i.e., self-evaluation and causal attributions) and self-reaction (i.e., self-satisfaction, adaptive and defensive inferences) processes. The self-reflection phase informs the subsequent forethought phase in the cyclical

self-regulation process. A swimmer reflecting on how to adapt an EIP management strategy for an upcoming race is an example of a self-reaction process.

Endurance athletes require self-regulation to manage their internal experiences (e.g., EIP) and keep progressing toward their goals (McCormick et al., 2019). As a widely supported framework in sport (Durand-Bush et al., 2015), the SCMSR may be deemed appropriate to provide insight into the regulation of EIP across different phases of endurance athletes' performance. With a paucity of research examining EIP management in elite endurance sports (Birrer & Morgan, 2010), the SCMSR was used to investigate how elite endurance athletes experience and manage EIP, using an applied lens to help inform the work of MPCs.

Methodology

Pragmatism

This study aims to answer an applied research question and authentically aligns with pragmatism (Giacobbi et al., 2005). Pragmatism embraces the two extremes of the paradigm continuum (i.e., postpositivism and constructivism) and provides a more flexible approach to research design (Feilzer, 2010). In adopting a pragmatic stance, the researchers were able to select the method that was most appropriate to address the applied research question (Bishop, 2015). Further, it allowed the use of an abductive reasoning process in which shifts between deduction and induction were possible (Kaushik & Walsh, 2019).

Method

Participants

A total of 15 (i.e., 12 women and 3 men) senior Canadian national team endurance athletes aged between 21 and 29 years old (M_{age} = 23.73, SD = 2.31) from the sports of track and field (i.e., 600-1500 m; n = 5), swimming (i.e., 200-400 m; n = 5), and canoe kayak (i.e., 500-

1000 m; $n = 5$) participated in this study. These high-intensity endurance events (i.e., middle-distance events) were chosen given their shorter duration (i.e., 1.5 to 5 minutes; Sandford & Stellingwerff, 2019) and involvement of EIP (Mauger, 2019). Participants were considered endurance athletes given that they perform continuous, dynamic, and whole-body exercise for 75 seconds or longer when competing in their respective sport (McCormick et al., 2015). According to Birrer and Morgan (2010), the participants may also be classified as high-intensity endurance athletes given the duration of their middle-distance events (i.e., 1.5 to 5 minutes). To be eligible to take part in the study, participants had to (a) be a senior national team endurance athlete competing in the aforementioned sports and events (typically between 18 to 35 years of age) and (b) have competed in at least one of the events in the past year. The 15 participants were Caucasian and had the status of elite athlete as they had represented Canada at major sporting events (e.g., Olympic Games, World Championships, FISU World University Games). Participants had no prior relationship with the researchers.

Procedure

Ethical approval was obtained from the Office of Research Ethics and Integrity of the researchers' university. A bilingual (i.e., French and English) recruitment text and consent form were sent to Athletics Canada, Swimming Canada, and Canoe Kayak Canada. These national sport organizations were asked to forward the information to their senior national team athletes on the researchers' behalf. The same documents were also directly sent to the athletes through their publicly available Facebook account. Interested participants replied by email or through Facebook and were selected on a first-come, first-serve basis due to the time and resources allocated to conduct the study. This aligns with the pragmatic stance of this study as well as Braun and Clark's (2019) arguments regarding sample size and data saturation; they postulated

that determining sample size is a pragmatic exercise that relies on interpretative, situated, and pragmatic judgment. Participants signed the consent form before completing the interview and no incentive or compensation was provided for their participation in the study.

Data Collection

Data were collected via individual semi-structured interviews. The interviews were conducted face-to-face online via Zoom and lasted between 28 and 68 minutes ($M_{minutes}$ = 51.19, *SD* = 10.62). Three (*n* = 3) interviews were conducted in French and 12 interviews were conducted in English. Interviews were conducted by the main researcher who is a bilingual MPC and a Professional Member of the Canadian Sport Psychology Association (CSPA). The interviews were audio-recorded and scheduled at a time that was deemed convenient for both the participants and researcher. The interviews took place over a period of two months (i.e., between early December 2019 and early February 2020) prior to Canadian Olympic Trials set to occur in April for canoe kayak and swimming and in June for track and field. The researcher's competencies and experience as a researcher and MPC were conducive to rapport building, naturally flowing conversations, and the use of prompts to gain further in-depth information.

The interview guide included different types of questions grouped under the five following sections:

- Section 1: Introductory questions (e.g., What is your general sporting background?) to create a comfortable atmosphere, build rapport, and begin the interview with easy and non-threatening questions (Castillo-Montoya, 2016).
- Section 2: Transition question (i.e., What would you experience if you were to push yourself as hard as you can for a duration of four minutes in your sport?) to move the interview toward the key questions related to the purpose of the study. The four-

minute duration was chosen given that high-intensity endurance events (i.e., middle-distance events) typically last between 1.5 to 5 minutes (Sandford & Stellingwerff, 2019).

- Section 3: Questions related to the experience of EIP (e.g., What do you know about EIP? How would you define EIP? How and when do you experience EIP?). Information was provided as necessary to validate or clarify the definition of EIP to ensure participants did not provide information related to their experience of perceived effort or fatigue as these constructs are different than EIP (Pageaux, 2016).
- Section 4: Questions related to the management of EIP before, during, and after training sessions and competitions (e.g., How do you prepare yourself to experience EIP in training and/or competition settings? When you are experiencing EIP, what strategies do you use to manage it? After training and/or competing, how do you evaluate the effectiveness of the strategies you used to manage EIP?).
- Section 5: Closing questions (e.g., What do you take away from this interview? Is there anything else you would like to add?) to conclude the interview and thank participants.

Data Analysis

All interviews were transcribed verbatim, yielding 254 single-spaced pages of data. A codebook thematic analysis was performed to analyze the data given its pragmatic advantages and suitability for applied research (Braun & Clarke, 2021). Using codebook thematic analysis allowed for the conceptualization of themes as domain summaries (Braun et al., 2019). Themes related to the *management* of EIP were developed before performing the analysis based on the SCMSR, whereas the subthemes were either generated based on the SCMSR or inductively

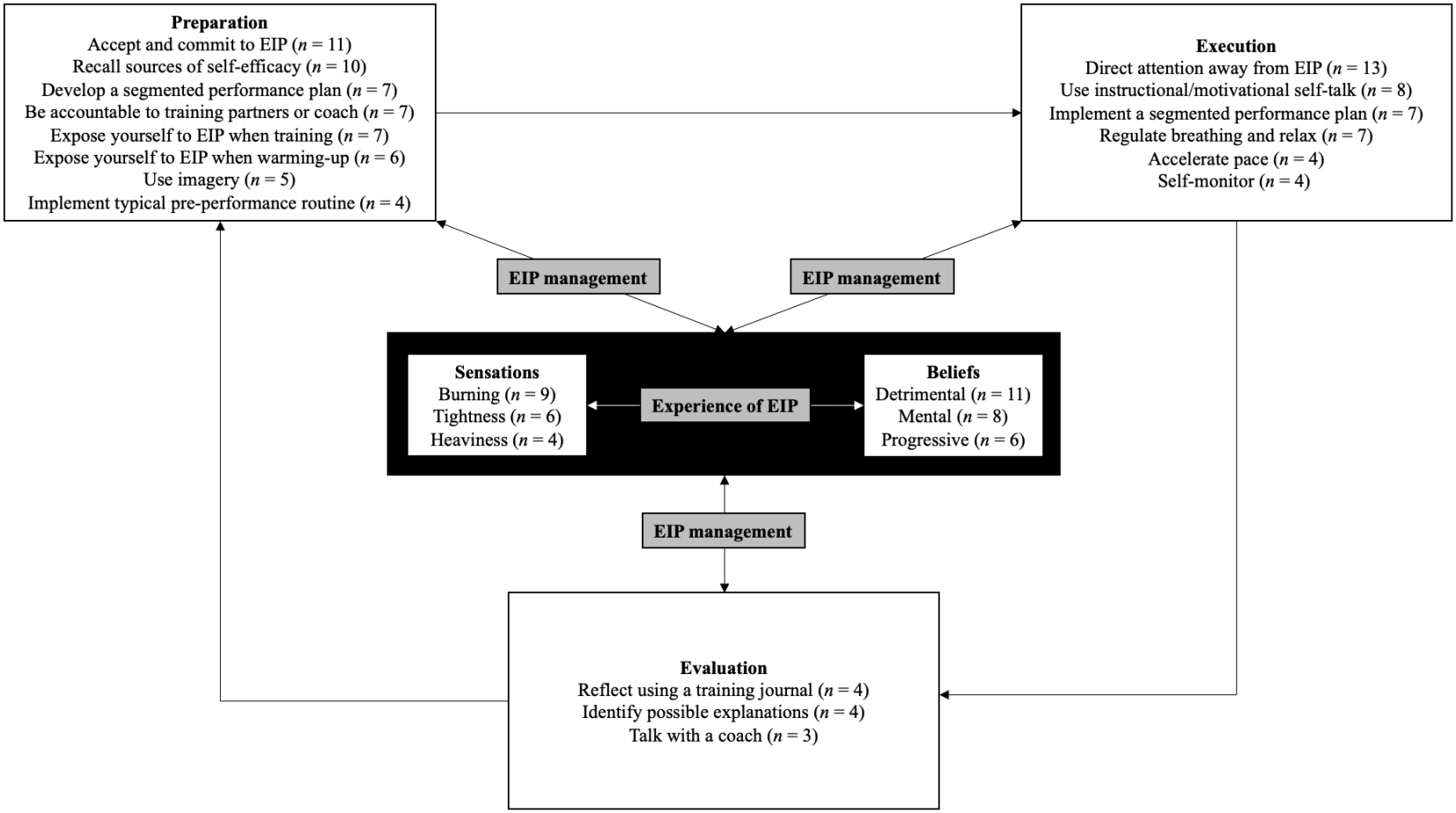
created to account for context-specific data and data that did not fit the SCMSR. Given that there is no specific model addressing the *experience* of EIP in sport, themes and subthemes related to the experience of EIP were inductively generated. For a theme and subtheme to be included, it had to be mentioned by at least two participants. Thematic mapping was used to visualize how the themes and subthemes fit together and how the overall representation of the data could be conveyed, which resulted in the creation of Figure 1 (Braun et al., 2019). Additionally, thematic mapping ensured that themes and subthemes did not overlap (Braun et al., 2019). To ensure methodological rigor, the main researcher shared his interpretation of the data with the second researcher and five other research colleagues who offered critical feedback and encouraged reflexivity (Smith & McGannon, 2018). The final step consisted of selecting quotes that best represented how participants experienced and managed EIP.

Results

The codebook thematic analysis generated (a) two themes and six subthemes related to the experience of EIP and (b) three themes and 17 subthemes related to the management of EIP. Figure 1 presents these themes and subthemes along with their interrelationships, which are represented by the arrows between EIP experience and management (i.e., preparation, execution, and evaluation strategies). The arrows between preparation, execution, and evaluation reflect the cyclical nature of self-regulation. Quotes are provided to illustrate the data and they were edited for flow and grammatical errors. To maintain anonymity and confidentiality, identification codes were created for each participant (i.e., SCK = sprint canoe kayak athletes, MDR = middle-distance runners, SW = swimmers).

Figure 1.

Elite Endurance Athletes' Experience and Management of EIP



Note. The number in brackets at the right of each subtheme represents the number of participants who addressed it during the interview.

Experience of EIP

All 15 participants shared responses related to the experience of EIP. The themes and subthemes related to the experience of EIP were inductively created given that there is no specific model addressing the experience of EIP in sport. Within each of the two themes (i.e., sensations, beliefs), the six subthemes are presented based on the frequency with which participants addressed them (i.e., highest to lowest frequency). Due to space constraints, only two quotes are provided for each subtheme.

Sensations

Sensations refers to what the participants felt physically when experiencing EIP in training sessions and competitions.

Burning. Nine out of fifteen (60%) participants reported experiencing a burning sensation in their muscles and lungs. For example, MDR2 explained: “It’s like an uncomfortable burning”. Further, SCK5 discussed the lung burning sensation right after crossing the finish line of a 1000-meter race: “I finish and I feel like I’ve smoked a pack of cigarettes. I’ve never smoked before, but my lungs are burning so much”.

Tightness. Six participants (40%) indicated experiencing tightness in their muscles. For instance, SCK1 stated: “Your arms become hard. You feel like you are not able to hold your oar anymore…. You are like a statue at this point”. Additionally, MDR1 explained: “[EIP] feels like everything is constricting”.

Heaviness. Four participants (27%) reported experiencing heaviness in their muscles. For example, MDR4 stated: “Your legs kind of feel like you’re running through mud and you can’t move them as well as normally…. Your legs just feel heavy and it’s harder to get your knees

high". Similarly, SCK2 explained: "Sometimes, [EIP] makes my muscles feel heavy…. They don't have as much spring in them".

Beliefs

Beliefs refer to the convictions that participants expressed in relation to their experience of EIP when training and competing.

Detrimental. Eleven participants (73%) indicated that EIP impedes performance-related components (e.g., technique, form, stroke rate, pacing). For instance, SW2 alluded to how technique breaks down under high levels of EIP: "When you're racing, it's who breaks down the least and who stays the most efficient for the longest amount of time". Further, MDR2 described the impact of EIP on pacing:

> When experiencing that pain, you're trying so hard just to get your legs to keep on turning over and you're fighting your own body's will to stop or slow down because that would be your natural inclination to stop running so hard.

Mental. Eight participants (53%) reported that experiencing EIP was more mental than physical. For example, MDR1 stated: "I'm realizing that a lot of the pain that I feel is more in my head than it is in my body…. The intensity can be up here [referring to their head]". Additionally, MDR2 explained:

> Honestly, I think [EIP] is more psychological than it is physical because everyone hurts and it hurts every day when you're training but whoever can kind of manipulate their mind, do what they want to do, is going to be the one who prevails at the end of the race.

Progressive. Six participants (40%) reported that EIP gradually builds-up and progressively gets worse until the end of their effort. For example, MDR1 explained: "It usually builds up over the course of the race and progressively gets worse until I either cross the line or

my body fails before the line". MDR3 described how she believes EIP is comprised of different pain thresholds:

> At a certain point, there is a pain that you perceive but you are able to live with it. You are fine. After that, the pain is really present and it starts to get more difficult technically and it becomes very difficult to maintain the same speed. I also think that at a certain point, you reach your peak. At that point, your technique will really decrease and you will slow down.

Management of EIP

All 15 participants provided responses related to the management of EIP. The themes related to the management of EIP were generated based on the SCMSR, whereas the subthemes were either developed based on the SCMSR or they were inductively created to account for context-specific data and data that did not fit the SCMSR. Within each of the three themes (i.e., preparation, execution, evaluation), the 17 subthemes are presented based on the frequency with which participants addressed them (i.e., highest to lowest frequency). Given space constraints, only one quote is provided for each subtheme.

Preparation

Preparation refers to psychological strategies used to manage EIP before training or competition with the goal of achieving readiness to experience EIP. A total of eight psychological strategies were reported.

Accept and Commit to EIP. Eleven participants (73%) indicated accepting (i.e., allowing EIP to occur and making room for it without judging it) and committing (i.e., embracing rather than avoiding EIP) to EIP. For instance, MDR2 explained: "You accept and embrace [EIP] because when you are running, everyone is feeling the way you are".

Recall Sources of Self-Efficacy. Ten participants (67%) described reminding themselves of their own capabilities to withstand EIP effectively in order to optimally perform. They prepared to experience EIP by remembering past successes in managing it and vicarious learning experiences involving seeing other endurance athletes persevere through it. They also revisited their training journal to acknowledge their preparation in order to reinforce their perceived readiness. Knowing how EIP feels and recognizing that they can handle it was important. For example, SW2 stated:

> I know what [EIP] is going to feel like and I know that I can always swim through it. So that's really how I do it. I'm never afraid of that pain. I'm always ready to feel EIP…. I'm someone who can deal with that pain very well…. Our coach used to give us the toughest sets and we would always die in all of them. We would always feel the pain and always struggle to get through them. But it made us realize that we could always get through it.

Develop a Segmented Performance Plan. Seven participants (47%) reported developing a plan that breaks down their performance into manageable segments, specifying the required effort and a specific focus cue. For instance, SW3 explained: "I break my race into 50-meter segments and I have a word in my head that I say for each segment. I'm focusing on those cues instead of thinking about the pain".

Be Accountable to Training Partners or Coach. Seven participants (47%) discussed how not wanting to let their training partners or coach down generates a sense of responsibility, which increases their willingness to experience higher levels of EIP. For example, MDR5 stated:

> There is something too with the camaraderie of doing something really hard with someone else. You don't want to drop out of the workout because it's going to affect their

> workout. You don't want to slow down because it's going to ruin their rep. You want to be able to lift each other up and help each other throughout it. If it's just yourself, it's okay if you don't hit the split because it's just affecting you, whereas if you're with someone else, if you don't hit the split, then it's affecting them too.

Expose Yourself to EIP When Training. Seven participants (47%) discussed the significance of experiencing EIP in training sessions to learn how to best respond to it in competitions. For instance, SW2 explained:

> I really do think that your ability to deal with EIP effectively correlates with the amount that you put yourself in that position when training. The more you put yourself in that position, the better equipped you are when you are in that position when racing. You're better physically, mentally, and technically.

Expose Yourself to EIP When Warming-Up. Six participants (40%) described the importance of including a high-intensity segment in their warm-up to feel mentally and physically ready to experience EIP. For example, SCK3 stated: "Feeling a little bit of that pain in my warm-up helps me mentally because I feel ready for the workout".

Use Imagery. Five participants (33%) indicated using imagery to rehearse their reactions to EIP. For instance, SCK1 explained the technical aspects on which to focus when experiencing EIP: "I visualize myself attacking with my legs, lifting up my boat, staying tall, and reaching far with my roar".

Implement Typical Pre-Performance Routine. Four participants (27%) reported engaging in their typical pre-performance routine to not think about the EIP they are about to experience. For example, SCK2 stated:

> I know exactly what I want to eat for breakfast, when to get up, when to go to the course, when to go on the water for the first time, when and how to warm-up. I think focusing on those things, beforehand, can make it so that I'm not thinking about how much it's going to hurt.

Execution

Execution refers to psychological strategies used to reduce the aversive effects of EIP on endurance performance during training and competition. Six psychological strategies were discussed.

Direct Attention Away From EIP. Thirteen participants (87%) described directing their attention on performance-relevant cues (e.g., technique, form, stroke rate, race plan), the present moment (i.e., one repetition/segment at a time), external-narrow cues (e.g., ponytail of the runner right in front), or non-performance cues (e.g., TV show, counting strokes 1 to 10 or 10 to 1) rather than directing their attention on EIP to not magnify its perceived intensity. For example, SW4 stated: "If I'm doing a set, and I'm feeling the [EIP], then I just make sure that I'm doing the stroke the way I want to do it, the way I have to do it, rather than focusing on how much it hurts".

Use Instructional/Motivational Self-Talk. Eight participants (53%) indicated using instructional self-talk (e.g., "relax", "keep going", "pump your arms") and/or motivational self-talk (e.g., "you can do this", "it's worth it") to manage EIP when experiencing it during performance. Participants engaged predominantly in instructional self-talk. For instance, SW5 discussed using keywords to keep her technique together when experiencing EIP in the 200-meter individual medley:

> In the butterfly, I say to myself "relax" because when you tense up, you'll usually go slower. Then for backstroke, "head back" and "arms, arms, arms". And then breaststroke, I say to myself "squeeze" because I need to squeeze my arms to my sides. That will help me lengthen out my stroke, which will enable me to feel the burning less. Finally, in freestyle, I say to myself "just go, just go".

Implement a Segmented Performance Plan. Seven participants (47%) reported implementing a plan that breaks down their workout or race and the effort required into manageable pieces. For instance, MDR3 explained how she segmented the last all-out 200 meters of a strenuous workout despite experiencing high levels of EIP:

> Just starting will be hard. So, I segment. I focus on being super explosive at the beginning and then on accelerating every 50 meters…. Segmenting helps me to see it as less big. It's also less scary and it goes by faster.

Regulate Breathing and Relax. Seven participants (47%) reported deliberately calming their breathing and relaxing themselves to reduce the tightness generated by EIP. For example, SCK2 explained:

> I find when you go really hard, your breathing can almost get out of control. So in the last 250 meters, I think about bringing back my breathing rather than letting it get out of control and that helps me to relax.

Accelerate Pace. Four participants (27%) discussed increasing their cadence or their stroke rate when experiencing EIP to generate more speed. For instance, MDR2 stated:

> If you condition your brain to go faster once it starts hurting, this is how you become a good racer…. As soon as EIP hits, you go, you switch gear…and breakthrough that wall to buy more time to get to the finish line.

Self-Monitor. Four participants (27%) described monitoring their sensations to decrease the perceived intensity of EIP. For example, SCK3 indicated: “I monitor how soon I feel EIP. If I feel it sooner, then I know I need to use a little bit more of my strategies to bring it back down”.

Evaluation

Evaluation refers to psychological strategies used to learn from the implementation of EIP management strategies during performance (i.e., execution) and to adapt them as necessary for upcoming workouts and competitions. Three psychological strategies were reported.

Reflect Using a Training Journal. Four participants (27%) discussed reflecting on the EIP management strategies used when performing and taking notes of their thoughts, feelings, sensations, and actions in their training journal. For example, MDR5 stated: “I’m pretty honest in my log about how I was feeling during workouts and things that I said to myself that helped”.

Identify Possible Explanations. Four participants (27%) described reflecting on the reasons they were able or unable to manage EIP effectively during their performance. For instance, SCK1 explained:

> I did not feel tall enough in my boat and was unable to lift my boat at the beginning of the race. I did that badly and it undermined me for the rest of the race. I was searching for cadence. I did not succeed in confronting EIP. It’s like a demon and I’m trying to defeat it.

Talk with a Coach. Three participants (20%) reported discussing with their coach after training or competing to assess the effectiveness of their EIP management strategies. For example, SCK3 stated:

> I talk to my coach a lot and he's pretty good at knowing if I died in the last 50 meters or if I wasn't moving as well…. What the coach sees on the sidelines is another way that I can evaluate [the effectiveness of my EIP management strategies].

Discussion

The purpose of this study was to examine how elite endurance athletes experience and manage EIP in training and competition settings, using an applied self-regulation lens to help inform the work of MPCs. There is a lack of empirical evidence showcasing the psychological strategies prioritized by elite athletes to manage EIP in endurance sports. To the authors' knowledge, this was the first study to integrate a self-regulation framework and a multisport sample composed of female and male athletes who were still competing at the elite level to provide more insight into this topic. Prior to this study, only Kress and Statler (2007) investigated this phenomenon using a sample of former male Olympic cyclists.

In terms of experience, EIP is frequently associated with a burning sensation, dull ache, or heaviness in the muscles (Cook et al., 1997; Miles & Clarkson, 1994). The findings of this study corroborate the aforementioned information, but they also suggest that EIP can be associated with tightness. Almost half of the participants emphasized this feeling that extended typical muscle tension, equating it to feeling like a statue or a rock. This suggests that such tightness may hinder movement efficiency, which is a major determinant of endurance performance (Joyner & Coyle, 2008). Almost 75% of the participants reported that they perceived the experience of EIP to be detrimental to various performance-related components (e.g., technique, form, stroke rate, pacing), which supports this common belief of endurance athletes (e.g., McCormick et al., 2016). This underscores the importance of learning how to effectively manage EIP.

Participants in this study reported using a comprehensive set of strategies (n = 17) to manage EIP when training and competing. Preparation strategies (n = 8) seem to be a priority as they were the most commonly discussed among the participants. Execution strategies (n = 6) were also frequently described while evaluation strategies (n = 3) were not as prevalent. Given that elite athletes are known to engage in more frequent and more sophisticated self-regulatory processes than less elite athletes (McCardle et al., 2019), it may be valuable for MPCs to prioritize the development and application of preparation and execution strategies to manage EIP when working with similar or lower level endurance athletes who struggle with EIP (e.g., underperform when experiencing it, unable to consistently regulate it over time).

Additionally, given the paucity of evaluation strategies discussed by the participants in the current study and given that the evaluation phase of self-regulation is paramount to learning and making adaptations to optimize performance (Zimmerman, 2000), more attention should be dedicated to exploring ways to maximize learning (i.e., assess experience and management of EIP). For example, MPCs may want to develop a brief guided self-reflection tool that endurance athletes can use to review EIP management after completing high-intensity workouts or after competing (e.g., What was my experience of EIP? How well did I manage EIP? What strategies facilitated and/or hindered my response to EIP? What am I willing to try, learn, or adapt to improve my ability to manage EIP?). Additionally, it would be worthwhile to encourage endurance athletes to periodically reflect on their reflections (i.e., take a step back to examine lessons learned regarding EIP management over a certain period of time) throughout a competitive season as this could help them determine the best course of action to successfully manage EIP across a variety of situations (Durand-Bush et al., 2015).

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The two most frequently reported strategies in this study were “direct attention away from EIP” and “accept and commit to EIP”, which support Kress and Statler’s (2007) findings with former Olympic cyclists. Attention and acceptance can be linked to mindfulness in which a structured mindset is adopted to be aware of the present moment in an accepting, non-judging, and non-avoiding way (Kabat-Zinn, 1994). Mindfulness has been found to significantly attenuate the subjective experience of pain in experimental and clinical settings (Zeidan & Vago, 2016). Brick et al. (2019) also recently postulated that mindfulness is a potentially effective attentional strategy to improve movement efficiency in endurance sports.

The acceptance component of mindfulness, which involves allowing internal experiences (e.g., EIP) to be as they are and making room for them, whether they are pleasant or painful, seems critical in endurance sports (Fitzgerald, 2015). The use of Acceptance and Commitment Therapy (ACT; Hayes et al., 1999) in this context merits further investigation as several systematic reviews and meta-analyses support the effectiveness of ACT for chronic pain management (for a review, see Feliu-Soler et al., 2018). On another note, various self-regulatory strategies (e.g., focusing on cadence, optimising technique, relaxing) have been found to aid endurance performance (Brick et al., 2014, 2019). Given the aforementioned information and the notion that paying close attention to pain sensations may increase pain intensity (Grant & Rainville, 2009), MPCs are encouraged to help endurance athletes focus on performance-relevant cues (e.g., cadence, technique, race plan) and the present moment (e.g., one task at a time) when experiencing EIP rather than the pain itself.

Recalling sources of self-efficacy was the second most popular strategy used to prepare to experience EIP. Self-efficacy refers to the “belief in one’s capabilities to organize and execute the courses of action required to produce given attainments” (Bandura, 1997, p. 3). Major

sources of self-efficacy include past performance experiences, vicarious influences, social and verbal persuasions, and perception of physiological and emotional states (Samson & Solmon, 2011). Additionally, endurance athletes use several sources of self-efficacy specific to endurance sports, especially cumulative experiences, experiences of challenge and adversity, and a sense of physical familiarity (Anstiss et al., 2020). A positive relationship between self-efficacy and endurance performance has been observed in several studies (e.g., Miller, 1993). Further, self-efficacy has been associated with improved pain tolerance in endurance athletes (Johnson et al., 2012). According to Peerdeman et al. (2016), self-efficacy can enhance pain tolerance as it promotes the use of more adaptive coping strategies. Given that improved EIP tolerance leads to superior endurance performance (Astokorki & Mauger, 2017), cultivating self-efficacy specifically related to EIP management seems to be an important avenue for MPCs working with endurance athletes.

More than half of the participants reported engaging in instructional and motivational self-talk to manage EIP while training or competing. Athletes indicated engaging predominantly in instructional self-talk, which is in line with their aim to focus their attention on performance-related cues such as cadence, technique, and segmented race plans. Given the paucity of intervention studies investigating the impact of this type of self-talk on endurance performance (McCormick & Hatzigeorgiadis, 2019), further research is warranted. Interestingly, some studies have shown that motivational self-talk can decrease perception of effort (e.g., Blanchfield et al., 2014) or augment pace without increasing perception of effort (e.g., Barwood et al., 2015). However, these studies did not address EIP tolerance. This requires attention as higher EIP tolerance produces superior endurance performance (Astokorki & Mauger, 2017).

Novel strategies were reported by the participants to prepare to experience EIP (i.e., exposing themselves to EIP when warming-up, being accountable to training partners or coach, using imagery to rehearse their reactions to EIP) and reduce the aversive effects of EIP while performing (i.e., accelerating pace). It is noteworthy that the athletes reported using imagery prior to performance rather than during performance (i.e., phase in which it is typically applied in the SCMSR model). MPCs should therefore be open to exploring various strategies across the different phases of self-regulation to help athletes manage EIP. Even though common strategies were reported, there are nuances across the sample that must be taken into consideration (e.g., use EIP exposure during warm-up). All in all, according to the findings of this study, it appears that using a combination of both self-regulation (intentional control; e.g., accelerate pace, calm down breathing) and mindfulness (non-judgmental acceptance; e.g., embrace EIP) strategies is valuable to successfully manage EIP.

Finally, given that more than 50% of the participants described EIP as being more mental than physical, psychological intervention studies aiming to enhance EIP management in endurance athletes are warranted. According to McCormick et al. (2020), endurance athletes use the Internet to find ways to cope with the psychological demands of their sport (e.g., EIP). Hence, developing and offering self-directed online psychological interventions (e.g., self-regulation, mindfulness) specifically tailored to EIP management and informed by the findings of the current study may help to maximize the reach and support for endurance athletes who often have little free time (McCormick et al., 2020). For example, interventions could include modules explaining EIP as well as exercises targeting acceptance, attention, self-efficacy, and self-talk, to share a few strategies revealed in this study. However, unlike traditional or general

sport psychology interventions, these online exercises would be specifically designed to optimize athletes' experience and management of EIP.

Strengths, Limitations, and Future Directions

The use of the SCMSR model to guide this study was considered a strength as it led to the development of Figure 1, which can be used by researchers and MPCs to guide their work in the future. No model or framework exists thus far to represent and inform the experience and management of EIP in sport. The model allowed the researchers to investigate and include a breadth of information related to EIP in a clear and organized manner. Researchers should further examine its applicability in other endurance sport contexts. Another strength of this study resides in the participants who were current senior national team athletes competing in high-intensity international endurance events. This was deemed essential to discuss the topic of investigation and learn from those having achieved high levels of success. Participants were recruited from three endurance sports to provide breadth in the researchers' attempt to understand the experience and management of EIP. However, only summer sports were included. Researchers are therefore encouraged to investigate the experience and management of EIP in winter sports (e.g., speed skating).

African American individuals have been shown to use pain management strategies more frequently than Caucasian individuals (Meints et al., 2016). Additionally, ethnic-related differences in pain management have been observed in a broad array of settings (Campbell & Edwards, 2012). Future studies should therefore examine potential race and ethnic-related differences in EIP management as the sample of this study was entirely comprised of Caucasian athletes and data on ethnicity were not collected. Moreover, given the large proportion of women in the sample (i.e., 75%) and given that gender-related differences exist in pain responses and

coping strategies (Bartley et Fillingim, 2013), further studies are warranted to explore potential gender-related differences in EIP management. Finally, the findings of this study are specific to middle-distance events and may therefore not be applicable to longer distance events (e.g., marathon, ultramarathon). Caution should be exercised when drawing parallels between strategies used to manage EIP in these two types of endurance contexts.

Conclusion

This study examined how elite endurance athletes experience and manage EIP in training and competition settings, using an applied self-regulation lens to help inform the work of MPCs. In terms of the number of reported psychological strategies, findings suggest that those used to prepare to experience EIP seem to be a priority. In general, the most popular strategies pertained to accepting and committing to experiencing EIP and directing attention away from EIP. Novel strategies not typically reported in the literature included exposing oneself to EIP when warming-up, being accountable to training partners or coaches, using imagery to rehearse reactions to EIP, and accelerating one's pace. Importantly, combining self-regulation and mindfulness strategies appears to be key to effectively manage EIP. Given that improved EIP tolerance leads to superior endurance performance (Astokorki & Mauger, 2017), MPCs can use the findings of this study to facilitate the preparation, execution, and evaluation of EIP management strategies with endurance athletes.

Data Availability Statement

The data that support the findings of this study are available upon reasonable request from the corresponding author, JL. The data are not publicly available because they contain information that could compromise the privacy of the participants.

References

Anstiss, P. A., Meijen, C., & Marcora, S. M. (2020). The sources of self-efficacy in experienced and competitive endurance athletes. *International Journal of Sport and Exercise Psychology, 18*(5), 622-638. https://doi.org/10.1080/1612197X.2018.1549584

Astokorki, A. H. Y., & Mauger, A. R. (2017). Tolerance of exercise-induced pain at a fixed rating of perceived exertion predicts time trial cycling performance. *Scandinavian Journal of Medicine & Science in Sports, 27*(3), 309-317. https://doi.org/10.1111/sms.12659

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Bartley, E. J., & Fillingim, R. B. (2013). Sex differences in pain: A brief review of clinical and experimental findings. *British Journal of Anaesthesia, 111*(1), 52-58. https://doi.org/10.1093/bja/aet127

Barwood, M. J., Corbett, J., Wagstaff, C. R. D., McVeigh, D., & Thelwell, R. C. (2015). Improvement of 10-km time-trial cycling with motivational self-talk compared with neutral self-talk. *International Journal of Sports Physiology and Performance, 10*(2), 166-171. https://doi.org/10.1123/ijspp.2014-0059

Birrer, D., & Morgan, G. (2010). Psychological skills training as a way to enhance an athlete's performance in high-intensity sports. *Scandinavian Journal of Medicine & Science in Sports, 20*(2), 78-87. https://doi.org/10.1111/j.1600-0838.2010.01188.x

Bishop, F. L. (2015). Using mixed methods in health research: Benefits and challenges. *British Journal of Health Psychology, 20*(1), 1-4. https://doi.org/10.1111/bjhp.12126

Blanchfield, A. W., Hardy, J., de Morree, H. M., Staiano, W., & Marcora, S. M. (2014). Talking yourself out of exhaustion: The effects of self-talk on endurance performance. *Medicine &*

Science in Sports & Exercise, 46(5), 998-1007. https://doi.org/10.1249/mss.0000000000000184

Braun, V., & Clarke, V. (2019). To saturate or not to saturate? Questioning data saturation as a useful concept for thematic analysis and sample-size rationales. *Qualitative Research in Sport, Exercise and Health*, 1-16. https://doi.org/10.1080/2159676X.2019.1704846

Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis?, *Qualitative Research in Psychology, 18*(3), 328-352. https://doi.org/10.1080/14780887.2020.1769238

Braun, V., Clarke, V., Hayfield, N., & Terry, G. (2019). Thematic analysis. In P. Liamputtong (Ed.), *Handbook of Research Methods in Health Social Sciences* (pp. 843-860). Singapore: Springer.

Brick, N., MacIntyre, T., & Campbell, M. (2014). Attentional focus in endurance activity: New paradigms and future directions. *International Review of Sport and Exercise Psychology, 7*(1), 106-134. https://doi.org/10.1080/1750984X.2014.885554

Brick, N., MacIntyre, T., & Schücker, L. (2019). Attention focus and cognitive strategies during endurance activity. In C. Meijen (Ed.), *Endurance performance in sport: Psychological theory and interventions* (pp. 113-124). Abindgon, Oxon: Routledge.

Campbell, C. M., & Edwards, R. R. (2012). Ethnic differences in pain and pain management. *Pain Management, 2*(3), 219-230.

Castillo-Montoya, M. (2016). Preparing for interview research: The interview protocol refinement framework. *The Qualitative Report, 21*(5), 811-831.

Cook, D. B., O'Connor, P. J., Eubanks, S. A., Smith, J. C., & Lee, M. (1997). Naturally occurring muscle pain during exercise: Assessment and experimental evidence. *Medicine*

and Science in Sports and Exercise, 29(8), 999-1012. https://doi.org/10.1097/00005768-199708000-00004

Durand-Bush, N., McNeill, K., & Collins, J. (2015). The self-regulation of sport coaches: How coaches can become masters of their own destiny. In P. Davis (Ed.), *The psychology of effective coaching and management* (pp. 217-265). Hauppauge, NY: Nova Publishers.

Feilzer, M. Y. (2010). Doing mixed methods research pragmatically: Implications for the rediscovery of pragmatism as a research paradigm. *Journal of Mixed Methods Research, 4*(1), 6-16. https://doi.org/10.1177/1558689809349691

Feliu-Soler, A., Montesinos, F., Gutiérrez-Martínez, O., Scott, W., McCracken, L. M., & Luciano, J. V. (2018). Current status of acceptance and commitment therapy for chronic pain: A narrative review. *Journal of Pain Research, 11*, 2145-2159. https://doi.org/10.2147/JPR.S144631

Fitzgerald, M. (2015). *How bad do you want it? Mastering the psychology of mind over muscle*. Boulder, CO: Velopress.

Geva, N., & Defrin, R. (2013). Enhanced pain modulation among triathletes: A possible explanation for their exceptional capabilities. *Pain, 154*(11), 2317-2323. https://doi.org/10.1016/j.pain.2013.06.031

Giacobbi Jr, P. R., Poczwardowski, A., & Hager, P. (2005). A pragmatic research philosophy for sport and exercise psychology. *The Sport Psychologist, 19*(1), 18-31. https://doi.org/10.1123/tsp.19.1.18

Grant, J. A., & Rainville, P. (2009). Pain sensitivity and analgesic effects of mindful states in Zen meditators: A cross-sectional study. *Psychosomatic Medicine, 71*(1), 106-114. https://doi.org/10.1097/psy.0b013e31818f52ee

Hayes, S. C., Strosahl, K. D., &Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York, NY: Guilford.

Hughes, C. (2005, July 11). *Pain tolerance: Athlete journal by Clara Hughes*. Speed Skating Canada. https://www.speedskating.ca/news-and-info/news/pain-tolerance-athlete-journal-by-clara-hughes

Johnson, M. H., Stewart, J., Humphries, S. A., & Chamove, A. S. (2012). Marathon runners' reaction to potassium iontophoretic experimental pain: Pain tolerance, pain threshold, coping and self-efficacy. *European Journal of Pain, 16*(5), 767-774. https://doi.org/10.1002/j.1532-2149.2011.00059.x

Joyner, M. J., & Coyle, E. F. (2008). Endurance exercise performance: The physiology of champions. *The Journal of Physiology, 586*(1), 35-44. https://doi.org/10.1113/jphysiol.2007.143834

Kabat-Zinn, J. (1994). *Wherever you go there you are*. New York: Delta.

Kaushik, V. & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences, 8*(9), 255. https://doi.org/10.3390/socsci8090255

Kitsantas, A., Kavussanu, M., Corbatto, D. B., & van de Pol, P. K. C. (2018). Self-regulation in athletes: A social cognitive perspective. In D. H. Schunk & J. A. Greene (Eds.), *Educational psychology handbook series. Handbook of self-regulation of learning and performance* (pp. 194-207). New York, NY: Routledge.

Kress, J. L., & Statler, T. (2007). A naturalistic investigation of former Olympic cyclists' cognitive strategies for coping with exertion pain during performance. *Journal of Sport Behavior, 30*(4), 428-452.

Mauger, A. R. (2019). Exercise-induced pain. In C. Meijen (Ed.), *Endurance performance in sport: Psychological theory and interventions* (pp. 35-46). Abindgon, Oxon: Routledge.

McCardle, L., Young, B. W., & Baker, J. (2019). Self-regulated learning and expertise development in sport: Current status, challenges, and future opportunities. *International Review of Sport and Exercise Psychology, 12*(1), 112-138. https://doi.org/10.1080/1750984X.2017.1381141

McCormick, A., Anstiss, P. A., & Lavallee, D. (2020). Endurance athletes' current and preferred ways of getting psychological guidance. *International Journal of Sport and Exercise Psychology, 18*(2), 187-200. https://doi.org/10.1080/1612197X.2018.1486874

McCormick, A., & Hatzigeorgiadis, A. (2019). Self-talk and endurance performance. In C. Meijen (Ed.), *Endurance performance in sport: Psychological theory and interventions* (pp. 153-167). Abindgon, Oxon: Routledge.

McCormick, A., Meijen, C., Anstiss, P. A., & Jones, H. S. (2019). Self-regulation in endurance sports: Theory, research, and practice. *International Review of Sport and Exercise Psychology, 12*(1), 235-264. https://doi.org/10.1080/1750984X.2018.1469161

McCormick, A., Meijen, C., & Marcora, S. (2015). Psychological determinants of whole-body endurance performance. *Sports Medicine, 45*(7), 997-1015. https://doi.org/10.1007/s40279-015-0319-6

McCormick, A., Meijen, C., & Marcora, S. (2016). Psychological demands experienced by recreational endurance athletes. *International Journal of Sport and Exercise Psychology, 16*(4), 415-430. https://doi.org/10.1080/1612197X.2016.1256341

Meints, S. M., Miller, M. M., & Hirsh A. T. (2016). Differences in pain coping between black and white Americans: A meta-analysis. *The Journal of Pain, 17*(6), 642-653. https://doi.org/10.1016/j.jpain.2015.12.017

Miles, M. P., & Clarkson, P. M. (1994). Exercise-induced muscle pain, soreness, and cramps. *The Journal of Sports Medicine and Physical Fitness, 34*(3), 203-216.

Miller, M. (1993). Efficacy strength and performance in competitive swimmers of different skill levels. *International Journal of Sport Psychology, 24*(3), 284-296.

Mislawchuk, T. (2018, May 23). *Training the brain for the perfect race*. CBC. https://www.cbc.ca/playersvoice/entry/training-the-brain-for-the-perfect-race

Pageaux, B. (2016). Perception of effort in exercise science: Definition, measurement and perspectives. *European Journal of Sport Science, 16*(8), 885-894. https://doi.org/10.1080/17461391.2016.1188992

Peerdeman, K. J., van Laarhoven, A. I. M., Peters, M. L., & Evers, A.W. M. (2016). An integrative review of the influence of expectancies on pain. *Frontiers in Psychology, 7*, 1270. https://doi.org/10.3389/fpsyg.2016.01270

Samson, A., & Solmon, M. (2011). Examining the sources of self-efficacy for physical activity within the sport and exercise domains. *International Review of Sport and Exercise Psychology, 4*(1), 70-89. https://doi.org/10.1080/1750984X.2011.564643

Sandford, G. N., & Stellingwerff, T. (2019). "Question your categories": The misunderstood complexity of middle-distance running profiles with implications for research methods and application. *Frontiers in Sports and Active Living, 1*, 28. https://doi.org/10.3389/fspor.2019.00028

Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology, 11*(1), 101-121. https://doi.org/10.1080/1750984X.2017.1317357

Stevens, C. J., Mauger, A. R., Hassmèn, P., & Taloy, L. (2018). Endurance performance is influenced by perceptions of pain and temperature: Theory, applications and safety considerations. *Sports Medicine, 48*(3), 525-537. https://doi.org/10.1007/s40279-017-0852-6

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The pain catastrophizing scale: Development and validation. *Psychological Assessment, 7*(4), 524-532. https://doi.org/10.1037/1040-3590.7.4.524

Zeidan, F., & Vago, D. R. (2016). Mindfulness meditation-based pain relief: A mechanistic account. *Annals of the New York Academy of Sciences, 13731*(1), 114-127. https://doi.org/10.1111/nyas.13153

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-39). San Diego, CA: Academic Press.

Article 2: Effectiveness of an Online Self-Regulation and Mindfulness Intervention in Improving Exercise-Induced Pain Catastrophizing, Mental Performance, Mental Health, and Mental Illness Symptoms in Middle-Distance Runners: A Randomized Controlled Trial

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Abstract

The purpose of this study was to compare the effectiveness of an online self-regulation and mindfulness intervention in improving exercise-induced pain catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners. This study fills a significant gap because no research has compared the impact of online sport psychology (i.e., mental performance) interventions on various outcomes affecting endurance athletes, while employing an active control group. Using a pre-post experimental design, 61 middle-distance runners were allocated to either a self-regulation, mindfulness, or active control group using stratified randomization. Athletes completed a pre-intervention survey measuring exercise-induced pain catastrophizing, mental performance (i.e., self-regulation capacity, dispositional mindfulness), mental health, and mental illness symptoms (i.e., anxiety, depression, and eating disorder). A final sample of 52 participants (i.e., 17 self-regulation, 19 mindfulness, and 16 active control) completed the interventions and a post-intervention survey measuring the same outcomes addressed in the pre-intervention survey. Contrary to hypotheses, results from multiple mixed ANOVAs indicated that while mean scores trended in the positive direction between Time 1 and Time 2, the self-regulation and mindfulness interventions did not significantly differ from the active control intervention on the targeted outcomes. Interestingly, when excluding athletes who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder), the active control intervention was more effective in reducing anxiety symptoms than the mindfulness intervention. Overall, the self-regulation and mindfulness interventions were not any more effective than the active control intervention in improving the selected outcomes.

Keywords: mental skills, ACT, MAC, endurance athletes, COVID-19

Effectiveness of an Online Self-Regulation and Mindfulness Intervention in Improving Exercise-Induced Pain Catastrophizing, Mental Performance, Mental Health, and Mental Illness Symptoms in Middle-Distance Runners: A Randomized Controlled Trial

Delivering in-person mental performance services was the norm before the COVID-19 pandemic halted competitive sport across the globe. To continue to support athletes safely during the COVID-19 pandemic, Mental Performance Consultants (MPCs) had to quickly adapt to an online mode of delivery (Hurley, 2021). To date, only few studies have compared the effectiveness of in-person mental performance interventions with athletes (e.g., mindfulness; Gross et al., 2018), and even fewer studies have examined the impact of online interventions (e.g., self-talk; Latinjak et al., 2019).

One particular context in which athletes could benefit from mental performance interventions is that of endurance sports. Endurance athletes face several psychological demands and may gain from additional support to cope with these demands. Some reviews have shown that mindfulness (e.g., Corbally et al., 2020) and self-regulation (e.g., McCormick et al., 2019) may be useful skills to include in mental performance interventions to optimize performance in this context. Lasnier and Durand-Bush (2021) corroborated these findings by showing that high intensity endurance athletes (e.g., middle-distance runners) use a combination of mindfulness and self-regulation strategies, in particular to successfully manage pain. Given the limited research in this area and the potential merit of offering evidence-informed online resources to athletes during by the COVID-19 pandemic, the authors sought to investigate the effectiveness of two different types of online mental performance interventions focusing on skills used by endurance athletes, that is self-regulation and mindfulness. To the authors' knowledge, no study

to date has compared the impact of a mindfulness and self-regulation intervention integrating an online mode of delivery.

Self-Regulation

Endurance athletes engage in self-regulation processes that either facilitate or hinder the achievement of preferred states and goals in training and competition (McCormick et al., 2019). Developing the ability to effectively manage such states is an essential feature of self-regulation (Durand-Bush et al., 2015; Zimmerman, 2000). Athletes must be able to plan, generate, evaluate, and adapt their thoughts, feelings, and actions in order to achieve their personal standards and goals in their constantly changing environment. To this end, they engage in three cyclical self-regulatory phases that are impacted by their self-motivational beliefs: forethought (i.e., preparation), performance (i.e., execution), and self-reflection (i.e., evaluation; Durand-Bush et al., 2015; Zimmerman, 2000). These three phases, which are depicted in Zimmerman's (2000) social cognitive model of self-regulation (SCMSR), essentially drive athletes' performance and learning.

One study has shown preliminary evidence of the effectiveness of self-regulation interventions with athletes that was informed by the SCMSR (Dubuc-Charbonneau & Durand-Bush, 2015). More specifically, Dubuc-Charbonneau and Durand-Bush (2015) investigated an in-person self-regulation intervention individually conducted with eight varsity student-athletes experiencing moderate to high levels of burnout. The authors found that the flexible person-centered intervention led to decreased stress and burnout symptoms, and increased self-regulation capacity and mental health within the sample of athletes. These results are promising, however, more studies are warranted. Future scholars could build on this study and include more participants as well as a structured intervention.

Mindfulness

Mindfulness, which involves adopting a structured mindset of being aware of the present moment in an accepting, non-judging, and non-avoiding way (Kabat-Zinn, 1994), is another important mental skill in endurance sport (Thienot & Adams, 2019). The Mindfulness-Acceptance-Commitment (MAC) approach is currently the most cited mindfulness intervention specifically designed for athletes (Gardner & Moore, 2020). The MAC approach, which is based primarily on the principles of Acceptance and Commitment Therapy (ACT; Hayes et al., 1999), aims to enhance mindful awareness and non-judgmental acceptance of internal experiences (e.g., thoughts, feelings, sensations), as well as align behaviors with personal values (Gardner & Moore, 2007). Athletes have also participated in ACT interventions, which aims to increase psychological flexibility by focusing on defusion, acceptance, contacting the present moment, self-as-context, values, and committed action (Henriksen et al., 2020).

MAC and ACT interventions implemented with athletes have typically generated positive results (Gross et al., 2018; Josefsson et al., 2019; Lundgren et al., 2021). For instance, in Gross et al. (2018)'s randomized controlled trial (RCT), a MAC intervention delivered in person with varsity student-athletes was more effective in improving performance and decreasing mental illness symptoms (i.e., substance use, hostility, and emotion dysregulation) over time compared to a traditional PST intervention. Although these results are promising, the sample size was relatively small (i.e., $n = 22$) and only comprised of African American women. Further, participants were not randomly selected and the MAC and PST interventions were delivered by two different individuals, which may have confounded results. The authors recommended using an online format for delivering ACT interventions to reach more athletes. In another RCT conducted with 69 athletes, Josefsson et al. (2019) found that an in-person MAC group

intervention significantly improved perceived performance and reduced emotion regulation difficulties compared to a PST group intervention (i.e., control group). Similar to Gross et al.'s (2018) RCT, different individuals implemented the intervention, which is an important limitation. Finally, in a third RCT, an in-person ACT intervention significantly improved the performance, focus, and commitment of 34 ice hockey players compared to a wait-list control group (Lundgren et al., 2021). A limitation of this RCT is that it did not include a control group. In sum, these three RCTs demonstrate the benefits of MAC and ACT interventions with athletes. Notwithstanding this, future studies should focus on other relevant outcomes and consider integrating an online format.

Mental Health and Mental Illness

Mental health and mental illness are important constructs to consider in the context of any sport given that they contribute to athletes' overall functioning (Durand-Bush & Van Slingerland, 2021). Mental health refers to a state of emotional, psychological, and social well-being in which individuals are able to feel, think, and behave in ways that allow them to manage the normal stresses of life, work productively, contribute to their community, savor life, and fulfill their potential (Van Slingerland et al., 2019; World Health Organization, 2004). On the other hand, mental illness is a health condition characterized by significant distress and impaired functioning in personal and professional activities due to alterations in the way individuals feel, think, and behave; it includes all diagnosable psychological disorders (Van Slingerland et al., 2019; World Health Organization, 2004). Keyes' (2002) two-continua model shows that mental health and mental illness co-exist as related but distinct phenomena. One continuum indicates the presence or absence of mental health while the other indicates the presence or absence of mental illness. Importantly, there is a paucity of research aiming to improve mental health and mental

illness symptoms in endurance athletes. Furthermore, studies investigating the impact of mental performance interventions on mental health and mental illness symptoms in sport, including those requiring endurance, are scarce (e.g., Bertollo et al., 2021).

Exercise-Induced Pain and Pain Catastrophizing

Exercise-induced pain (EIP) is a prominent characteristic of high intensity endurance sports with which athletes must contend (Lasnier & Durand-Bush, 2021). EIP differs from the pain that athletes experience from an injury or from the micro-trauma and inflammation arising from delayed onset muscles soreness. It does not cause lasting damages and usually disappears shortly after intensity is reduced or exercise is ceased (Mauger, 2019). Lasnier and Durand-Bush (2021) found that the experience of EIP is highly cognitive and generally perceived as detrimental to performance if not effectively managed.

Pain catastrophizing is a possible by-product of mismanaged pain and consists of a negative and exaggerated psychological response (i.e., helplessness, rumination, and magnification) to actual or anticipated pain (Sullivan et al., 1995). There is a negative correlation between pain catastrophizing and pain tolerance in endurance athletes (Geva & Defrin, 2013). Further, pain catastrophizing has been shown to predict pain intensity (i.e., sensory experience of pain) and pain unpleasantness (i.e., affective experience of pain) in endurance athletes (Gagnon-Dolbec et al., 2021). Psychological interventions aiming to enhance EIP management in high intensity endurance athletes (e.g., middle-distance runners) are needed (Lasnier & Durand-Bush, 2021). Given that ACT can reduce pain catastrophizing in adults with chronic pain (Schütze et al., 2018), it is a worthy approach to consider in the context of sport. No study to date has compared the effectiveness of mental performance interventions to improve EIP catastrophizing in athletes.

Rationale and Purpose

In sum, given the absence of online intervention studies aiming to enhance important outcomes such as mental health, mental illness, and EIP catastrophizing in endurance athletes, and given the potential benefits of self-regulation and mindfulness interventions to improve such outcomes in sport, the current study was carried out. A pre-post experimental design integrating an active control group was used to compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners. Overall, it was hypothesized that the self-regulation and mindfulness interventions would significantly improve EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms from Time 1 to Time 2, in comparison to the active control intervention. Given that self-regulation and mindfulness interventions designed to improve the aforementioned outcomes for endurance athletes have never been empirically compared, and given that both self-regulation and mindfulness strategies have been deemed useful by endurance athletes (Lasnier & Durand-Bush, 2021), no hypothesis was put forth to predict the most effective intervention out of the two.

Method

Design, Recruitment, and Randomization

The pre-post experimental design included three intervention groups (i.e., self-regulation, mindfulness, active control). The active control group was integrated into the design to address some of the limits of previous RCTs that did not include this type of control (e.g., Lundgren et al., 2021). The active control group received an online intervention focused on nutrition rather than mental performance and required the same amount of time and attention than the other two

intervention groups (Melnyk et al., 2012). Stratified randomization was used to provide an even distribution of both participants and potential confounding variables to the three groups (Kendall, 2003).

An a priori power analysis for a mixed ANOVA with three groups (i.e., self-regulation, mindfulness, active control group) and two measurements (i.e., pre- and post-intervention) was conducted using G*Power to determine a sufficient sample size using an alpha of 0.05, a power of 0.80, and an effect size of 0.40 (Faul et al., 2007). The power analysis indicated that a sample size of 51 participants was desired to detect a large effect size with a power of 0.80. Recruitment commenced after obtaining ethical approval from the first two authors' university. Athletes were recruited through social media (i.e., Instagram), Athletics Canada and its provincial branches, as well as organizations promoting Canadian track and field content (e.g., Trackie). They were given a bilingual (i.e., French and English) information package containing a description of the study, requirements to participate, and a consent form.

To be eligible, athletes had to be (a) between 16 to 35 years of age (i.e., typical competitive and high performance age range), (b) provincial, national, or international middle-distance runners (i.e., 600 meters to the mile), and (c) able to read in English given that the content of the interventions was in English only. A total of 61 individuals out of the 65 who showed interest met the inclusion criteria and they were selected on a first-come, first-serve basis due to the time and resources allocated to conduct the study. Participants signed the consent form before completing a pre-intervention survey and no incentives or compensation were provided for taking part in the study.

The nature of the different online interventions was not disclosed prior to randomization. In preparation for this, athletes completed a pre-intervention survey between the second and third

week of March 2020[1]. Survey scores and gender were used to randomize the athletes into three groups (i.e., self-regulation, mindfulness, active control). More specifically, gender (i.e., female or male; first round of stratification), level of experience in middle-distance running (i.e., low = 4 years of less; high = 5 years or more; second round of stratification), level of mental health (i.e., low = under median score; high = above median score; third round of stratification), and level of EIP catastrophizing (i.e., low = under median score; high = above median score; fourth round of stratification) were used for the stratified randomization. Level of mental health was measured based on a global mental health score, which was calculated by subtracting the summation of the mental illness scores from the mental health score. Following the fourth round of stratification, simple randomization was employed to allocate the participants of each strata to one of the three groups.

Based on ethical guidelines, the authors followed up with 10 athletes who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder) to assess their overall mental health functioning and support, and refer them to appropriate resources. Five of the athletes were currently working with a mental health practitioner and the other five who were not were invited to consider this. The 10 athletes were eager to participate in the study and upon discussing with sport psychologists the benefits and risks of including them, it was concluded that benefits outweighed the risks. The 10 athletes were therefore included as a subset of the sample but they were randomized into the self-regulation or mindfulness groups only because the researchers and psychologists felt they should not be allocated to the control group

[1] Half of the sample completed the pre-intervention survey one to two days before COVID-19 was declared a global pandemic and the second half of the sample completed it in the following days. Independent t-tests were used to compare the means (i.e., before and during COVID-19) for each scale at Time 1. No significant differences were found between participants who completed the pre-intervention survey before or during the COVID-19 pandemic. Thus, the timing of completion (i.e., before or during COVID-19) was not included as a covariate in the analyses.

given their vulnerability. The rest of the sample (i.e., other 51 participants) were randomized into the self-regulation, mindfulness, or control group.

The initial sample was comprised of 61 participants (i.e., 22 self-regulation, 22 mindfulness, 17 active control). However, nine participants left the study due to overload with schoolwork (i.e., two participants), training cessation (i.e., one participant), lack of interest (i.e., one participant), or reasons not disclosed (i.e., five participants). The final sample included 52 participants (i.e., 17 self-regulation, 19 mindfulness, 16 active control) who were between 16 to 25 years of age (M_{age} = 21.25, *SD* = 2.31). Participants, who identified as female (*n* = 33, 63.46%) or male (*n* = 19, 36.54%), were varsity student-athletes (*n* = 49, 94.23%), high school athletes (*n* = 2, 3.85%), or professional athletes (*n* = 1, 1.92%). Further, they identified as English Canadian (*n* = 23, 44.23%), French Canadian (*n* = 22, 42.31%), Arabic (*n* = 2, 3.85%), French (*n* = 2, 3.85%), Asian (*n* = 1, 1.92%), British (*n* = 1, 1.92%), or South American (*n* = 1, 1.92%). Participants had 1 to 11 years of experience in middle-distance running (M_{years} = 5.86, *SD* = 2.22) and were competing at the provincial (*n* = 20, 38.46%), national (*n* = 30, 57.69%), or international (*n* = 2, 3.85%) level. Some participants were injured (*n* = 9, 17.31%) and others were diagnosed with a mental illness in the past (*n* = 8, 15.38%).

Interventions

The online interventions, which took place between the first week of April and the third week of May 2020, were self-directed, lasted 8 consecutive weeks, and consisted of completing a 30-minute weekly workbook module. Each module was completed directly into Word using a computer. Internet was required as some modules contained hyperlinks to video and audio files. Participant had a week to email back each completed module to the first author to receive the subsequent one. The first author verified each module before sending the ensuing one. No

feedback was provided on participants' responses to maintain consistent interactions across participants. Further, modules were not used as a source of data. Lastly, participants completed either the French or English post-intervention survey during the first two weeks following completion of the interventions (i.e., between the last week of May and the first week of June 2020).

The self-regulation intervention was informed by the SCMSR (Zimmerman, 2000) and covered topics such as personal standards, goal setting, strategic planning, self-efficacy, motivation, self-talk, focus, imagery, self-monitoring, and self-reflection. The mindfulness intervention was informed primarily by ACT (Harris, 2009) and secondarily by the MAC approach (Gardner & Moore, 2007). Topics included defusion, acceptance, contacting the present moment, self-as-context, values, and committed action. Both of these interventions were designed specifically (i.e., content, exercises, examples) to address the demands of middle-distance running (e.g., EIP management; McCormick et al., 2015) by the first two authors who are MPCs and Professional Members of the Canadian Sport Psychology Association. The active control intervention, which was based on an endurance sports nutrition textbook (Eberle, 2014), consisted of reading a chapter each week and reflecting on its content by answering three questions (i.e., What will you start doing? What will you stop doing? What will you continue doing?).

Measures

Exercise-Induced Pain Catastrophizing

EIP catastrophizing was measured using an adapted version of the Pain Catastrophizing Scale (PCS; Sullivan et al., 1995). A definition of EIP was inserted at the beginning of the scale and the word pain was replaced by EIP throughout the scale. This 13-item measure has three

subscales (i.e., rumination, magnification, and helplessness), and asks respondents to reflect on past painful experiences and indicate how often they experienced particular thoughts of feelings when experiencing pain (e.g., I keep thinking about how much it hurts). Participants respond using a 5-point Likert scale ranging from 0 (not at all) to 4 (all the time). A global score ranging from 0 to 52 is determined by adding the score of each subscale. Higher scores reflect higher levels of pain catastrophizing. Sullivan et al. (1995) reported high internal consistency ($\alpha = 0.87$) for the PCS.

Self-Regulation

Self-regulation capacity was measured using the Short Version of the Self-Regulation Questionnaire (SSRQ; Carey et al., 2004). The SSRQ includes 31 items and asks respondents to rate their level of agreement with each of the items (e.g., I set goals for myself and keep track of my progress) using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate higher self-regulation capacity. Carey et al. (2004) reported high internal consistency ($\alpha = 0.92$) for the SSRQ.

Mindfulness

Dispositional mindfulness was measured using the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman et al., 2007). The CAMS-R, which includes 12 items, assesses four dimensions of mindfulness (i.e., attention, present-focus, awareness, and acceptance). Respondents rate how each statement applies to them (e.g., I am able to focus on the present moment) using a 5-point Likert scale ranging from 1 (rarely/not at all) to 4 (almost always). Higher scores indicate higher levels of dispositional mindfulness. Feldman et al. (2007) reported acceptable internal consistency ($\alpha = 0.74$-0.77) for the CAMS-R.

Mental Health

Mental health was measured using the Mental Health Continuum Short Form (MHC-SF; Keyes et al., 2008). The MHC-SF includes 14 items across three subscales (i.e., emotional, psychological, and social well-being). The MHC-SF also categorizes respondents as either flourishing, languishing, or moderately mentally healthy. Respondents rate how they have been feeling during the past month using a 6-point Likert scale ranging from 0 (never) to 5 (every day). Keyes et al. (2008) reported acceptable internal consistency ($\alpha = 0.74$) for the MHC-SF.

Mental illness

Anxiety symptoms were measured using the Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006). The GAD-7 is a 7-item scale and asks respondents to rate how often they have been bothered by particular problems (e.g., feeling nervous, anxious, or on edge) in the past two weeks on a 4-point Likert scale ranging from 0 (not at all sure) to 3 (nearly every day). A cut-off score ranging from 10 to 14 indicates moderate levels of anxiety, while a score of 15 or more indicates severe levels of anxiety (i.e., threshold score for follow-up in this study). Spitzer et al. (2006) reported high internal consistency ($\alpha = 0.92$) for the GAD-7.

Symptoms of depression were measured using the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977). The CES-D includes 20 items and respondents rate how often they have felt a particular way (e.g., I felt depressed) in the past week using a 4-point Likert scale ranging from 0 (rarely or none of the time [less than one day]) to 3 (most or all of the time [5-7 days]). A cut-off score ranging from 16 to 20 indicates mild to moderate levels of depression. A score of 21 or more indicates severe levels of depression (i.e., threshold score for follow-up in this study). Radloff (1977) reported high internal consistency ($\alpha = 0.85$-0.90) for the CES-D.

Eating disorder symptoms were measured using the Eating Attitudes Test (EAT-26; Garner et al., 1982), which includes 26 items. The EAT-26 is divided into three subscales (i.e., dieting, bulimia and food preoccupation, and oral control) and asks respondents to rate their level of agreement with statements concerning weight and food (e.g., I feel that food controls my life) using a 6-point Likert scale ranging from 3 (always) to 0 (Never). A score of 20 or more indicates a need to be referred to assess the presence of an eating disorder (i.e., threshold score for follow-up in this study). Garner et al. (1982) reported high internal consistency ($\alpha = 0.90$) for the EAT-26.

Preliminary Analyses

The percentage of missing data was very small (i.e., 0.45%). The Little's Missing Completely at Random (MCAR) Test was non-significant for each questionnaire at each time point, indicating that data were missing completely at random. Missing values were replaced using multiple imputations with an expectation-maximization method. Outliers were detected using the outlier labeling rule with a multiplier of 2.2 (Hoaglin et al., 1986). Outliers were winsorized to keep scores within the normal range (Tabachnick & Fidell, 2013). Total scores for each questionnaire were screened at each time point for normality using skewness, kurtosis, and the Shapiro-Wilk Test. Normality was violated. Multiple mixed analyses of variances (ANOVA) were used for the main analyses given their robustness to violations of normality (Tabachnick & Fidell, 2013).

Main Analyses

Multiple mixed ANOVAs were conducted (i.e., one for each measure) to test the main effect of time and group, as well as the interaction effect between time and group on the outcomes of interest. Each of these analyses were performed twice: (a) *without* the subset of nine

participants screening positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder) (i.e., $n = 43$) and (b) *with* the subset of nine participants (i.e., $n = 52$). The authors believed it was important to do this because this subset presented with different characteristics compared to the rest of the sample and were randomized to two groups only, which could potentially influence results. Partial eta squared (ηp^2) were used to interpret the effect sizes. Values greater than .01, .06, and .14 respectively represent small, medium, and large effect sizes (Cohen, 1988).

Results

All mixed ANOVA assumptions were tested. Homogeneity of variance was not violated as Levene's Test was non-significant for all dependent variables (i.e., all $ps > .05$). Sphericity did not apply as there were only two levels of the within-subjects factor. The mean scores and standard deviations of each scale at each time point for each group are summarized in Table 1. Overall, results demonstrate changes in the expected direction from Time 1 to Time 2. The mixed ANOVA findings are summarized in Table 2 (i.e., without the subset of nine participants) and Table 3 (i.e., with the subset of nine participants).

Table 1.

Mean Scores and Standard Deviations

		Without the Subset of Nine Participants			With the Subset of Nine Participants		
	T	SR Group Mean (SD)	MI Group Mean (SD)	AC Group Mean (SD)	SR Group Mean (SD)	MI Group Mean (SD)	AC Group Mean (SD)
PCS	1	10.00 (6.07)	14.14 (8.88)	13.75 (6.66)	11.24 (5.97)	14.00 (8.62)	13.75 (6.66)
	2	10.54 (7.75)	9.86 (7.23)	11.06 (6.64)	10.47 (7.03)	9.84 (6.84)	11.06 (6.64)
SSRQ	1	125.92 (9.15)	116.57 (16.19)	115.63 (12.13)	122.59 (10.93)	112.05 (17.01)	115.63 (12.13)
	2	127.23 (11.97)	116.93 (10.43)	120.50 (16.31)	124.59 (11.50)	118.37 (10.73)	120.50 (16.31)
CAMS-R	1	35.15 (3.69)	33.71 (4.66)	33.31 (4.76)	33.29 (5.35)	30.68 (6.95)	33.31 (4.76)
	2	35.08 (5.28)	35.07 (3.75)	35.25 (4.63)	33.88 (5.63)	34.79 (3.69)	35.25 (4.63)
MHC-SF	1	55.62 (5.22)	51.64 (6.73)	54.88 (6.90)	51.12 (10.20)	47.79 (10.58)	54.88 (6.90)
	2	57.54 (7.96)	50.50 (9.63)	55.81 (6.61)	54.24 (10.59)	50.89 (9.58)	55.81 (6.61)
GAD-7	1	4.69 (3.54)	3.07 (2.02)	6.06 (2.98)	5.88 (5.27)	5.84 (5.90)	6.06 (2.98)
	2	2.85 (1.86)	3.29 (2.49)	3.31 (2.55)	3.35 (2.76)	3.95 (3.60)	3.31 (2.55)
CES-D	1	8.23 (4.48)	8.21 (4.23)	8.31 (5.21)	13.00 (9.99)	12.42 (9.43)	8.31 (5.21)
	2	6.54 (4.68)	8.79 (5.35)	8.00 (5.15)	8.71 (6.74)	10.11 (6.43)	8.00 (5.15)
EAT-26	1	4.85 (5.21)	4.36 (4.57)	4.38 (3.56)	5.59 (5.99)	5.84 (6.39)	4.38 (3.56)
	2	4.23 (3.90)	3.50 (3.30)	3.38 (2.85)	4.53 (4.53)	4.11 (3.91)	3.38 (2.85)

Note. PCS = Pain Catastrophizing Scale; SSRQ = Short Version of the Self-Regulation Questionnaire; CAMS-R = Cognitive and Affective Mindfulness Scale-Revised; MHC-SF = Mental Health Continuum Short Form; GAD-7 = Generalized Anxiety Disorder Scale; CES-D = Center for Epidemiological Studies Depression Scale; EAT-26 = Eating Attitudes Test; T = time; SR = self-regulation; MI = mindfulness; AC = active control; SD = standard deviation; Green colour = positive pre-post intervention change; Red colour = negative pre-post intervention change.

Table 2.

Mixed ANOVA Findings for Each Measure (Without the Subset of Nine Participants)

	Main Effect of Time				Main Effect of Group				Interaction Effect			
	df (Error)	*F*	*p*	ηp^2	df (Error)	*F*	*p*	ηp^2	df (Error)	*F*	*p*	ηp^2
PCS	1 (40)	3.94	.054	.090	2 (40)	.446	.644	.022	2 (40)	1.63	.209	.075
SSRQ	1 (40)	1.66	.204	.040	2 (40)	2.72	.078	.120	2 (40)	.704	.500	.034
CAMS-R	1 (40)	3.17	.082	.073	2 (40)	.172	.843	.009	2 (40)	.972	.387	.046
MHC-SF	1 (40)	.251	.619	.006	2 (40)	2.94	.064	.128	2 (40)	.601	.553	.029
GAD-7	1 (40)	16.33	.001*	.290	2 (40)	1.57	.222	.073	2 (40)	6.07	.005*	.233
CES-D	1 (40)	.378	.542	.009	2 (40)	.251	.779	.012	2 (40)	.678	.513	.033
EAT-26	1 (40)	3.64	.064	.083	2 (40)	.139	.871	.007	2 (40)	.067	.935	.003

Note. *$p < .05$. For ηp^2: small effect size = values greater than .01, medium effect size = values greater than .06, and large effect size = values greater than .14.

Table 3.

Mixed ANOVA Findings for Each Measure (With the Subset of Nine Participants)

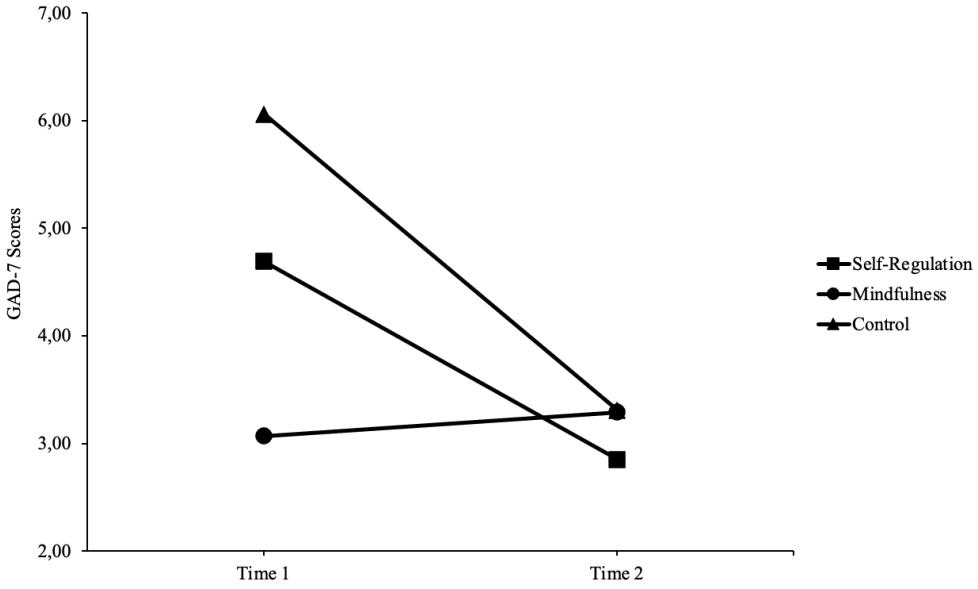
	Main Effect of Time				Main Effect of Group				Interaction Effect			
	df (Error)	*F*	*p*	ηp^2	df (Error)	*F*	*p*	ηp^2	df (Error)	*F*	*p*	ηp^2
PCS	1 (49)	7.27	.010*	.129	2 (49)	.276	.760	.011	2 (49)	1.13	.331	.044
SSRQ	1 (49)	6.82	.012*	.122	2 (49)	2.27	.114	.085	2 (49)	.583	.562	.023
CAMS-R	1 (49)	11.01	.002*	.183	2 (49)	.471	.627	.019	2 (49)	2.48	.094	.092
MHC-SF	1 (49)	3.29	.076	.063	2 (49)	2.47	.095	.091	2 (49)	.292	.748	.012
GAD-7	1 (49)	19.36	.001*	.283	2 (49)	.029	.972	.001	2 (49)	.230	.795	.009
CES-D	1 (49)	5.80	.020*	.106	2 (49)	1.09	.345	.042	2 (49)	1.38	.262	.053
EAT-26	1 (49)	7.29	.009*	.130	2 (49)	.363	.697	.015	2 (49)	.266	.767	.011

Note. *$p < .05$. For ηp^2: small effect size = values greater than .01, medium effect size = values greater than .06, and large effect size = values greater than .14

Contrary to hypotheses, there were no significant interaction effects between time and group when the subset was included in the analyses. However, without the subset, there was a significant interaction effect between time and group for anxiety symptoms, $F(2, 40) = 6.07$, $p = .005$, $\eta p^2 = .233$, indicating that the anxiety symptoms of athletes between Time 1 and Time 2 differed according to whether they were part of the self-regulation, mindfulness, or control group. The effect size of this interaction was large (Cohen, 1988). To break down this interaction, simple contrasts were performed to compare the groups. Contrary to what was hypothesized, no significant difference between the control group and the self-regulation group was found at Time 1 ($p = .213$) and Time 2 ($p = .597$), nor the mindfulness group and the self-regulation group at Time 1 ($p = .155$) and Time 2 ($p = .629$). However, a significant difference between the control group and the mindfulness group was found at Time 1 ($p = .007$), but not at Time 2 ($p = .975$) and not in the anticipated direction. The interaction plot (see Figure 1) shows that the control group participants experienced a reduction in anxiety symptoms between Time 1 and Time 2, whereas the participants in the mindfulness group experienced a slight increase in anxiety symptoms between Time 1 and Time 2. These findings surprisingly suggest that the active control intervention had a greater impact on reducing anxiety symptoms than the mindfulness intervention when the subset of participants screening positive for mental illness symptoms were excluded.

Figure 1.

Interaction Plot for Anxiety Symptoms



Discussion

The purpose of this study was to compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners. This is the first known study to compare online mental performance interventions to improve key outcomes for endurance athletes, using an active control group. This study is novel given its focus on enhancing mental health and mental illness symptoms in endurance athletes, rather than endurance performance – which has been the predominant focus in the literature (e.g., McCormick et al., 2015). Strengthening mental health and reducing mental illness symptoms may lead to superior endurance performance given that these variables are known to influence performance and overall functioning (Durand-Bush & Van Slingerland, 2021; Reardon et al., 2019).

A scan of Table 1 demonstrates that mean scores from Time 1 to Time 2 generally shifted in the expected direction for all three groups, which is promising, although changes were not statistically significant for the most part. This is surprising given that self-regulation (e.g., Dubuc-Charbonneau & Durand-Bush, 2015) and mindfulness (e.g., Gross et al., 2018) interventions have been shown to significantly improve mental performance, mental health, and/or mental illness outcomes in athletes. Furthermore, endurance athletes in Lasnier and Durand-Bush's (2021) study reported using both self-regulation and mindfulness strategies to manage EIP so one would have expected more significant gains from interventions specifically designed to improve these outcomes. Additional research is needed to determine if these types of online mental performance interventions are effective with other samples of athletes. Another option is to compare the effectiveness of a blended intervention (i.e., combination of both self-regulation and mindfulness strategies) to standalone self-regulation and mindfulness interventions.

Contrary to what was hypothesized, the mean scores for degree of change for the active control group were similar to that of the self-regulation and/or mindfulness group on almost all outcomes of interest. This may indicate the presence of a placebo effect, which is a desirable outcome resulting from a participant's expected and/or learned response to an intervention or situation (Beedie et al., 2018). This result also highlights the need to assess expectations of participants when examining and comparing the effectiveness of interventions. For example, participants could rate their level of expected direction (i.e., positive or negative) and degree of change for each measure using a Likert scale ranging from -3 (large decrease) to +3 (large increase) when completing a pre-intervention survey.

When excluding participants who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder), one surprising finding was that the active control intervention (i.e., nutrition for endurance athletes) was statistically more effective in reducing anxiety symptoms than the mindfulness intervention. Four potential reasons are offered to explain this paradoxical result. First, according to the review of Kris-Etherton et al. (2021), developing healthy eating patterns that meet food-based dietary recommendations and nutrient requirements can assist in the prevention and treatment of anxiety. Given that the active control intervention was focused on nutrition, it is possible that the newly acquired knowledge allowed the participants to optimize their nutrition, which may have led to a reduction in anxiety symptoms. Second, uncertainty was a prevailing theme in almost all facets of life during the COVID-19 pandemic, and nutrition was arguably an important sport-related factors over which athletes had some level of control. Given that higher perceived control is associated with lower anxiety (Gallagher et al., 2014), it is possible that participants who were part of the control group benefited from increased feelings of control, which may have led to a reduction in anxiety symptoms. Third, it is also possible that a regression to the mean occurred, which reflects the tendency of scores to come closer to a population mean over time (Barnett et al., 2005). Specifically, the anxiety mean score for the control group was high (i.e., 6.06) at Time 1 compared to the one for the self-regulation group (i.e., 4.69) and mindfulness group (i.e., 3.07). Fourth, the low anxiety mean score at Time 1 for the mindfulness group may have created a ceiling effect that left little room for possible positive change in the mean score at Time 2.

Interestingly, when including participants who screened positive for mental illness symptoms, mean scores between Time 1 and Time 2 did not differ according to whether or not participants were part of the self-regulation, mindfulness, or control group. Adding the subset

increased the anxiety mean score at Time 1 for the mindfulness group and made it more similar to that of the control group. This may explain why there was no significant difference between these two groups pre- and post-intervention.

The findings of this study must be considered within the context in which it was carried out. The COVID-19 pandemic halted and/or compromised both training and competitions for athletes. Therefore, it is likely that the periodization of training was modified (e.g., shift to high volume and low intensity). Limited exposure to EIP due to a decrease in intensity may have influenced the results of this study, particularly EIP catastrophizing scores. Future studies should ensure that participants are exposed to EIP before and during interventions to measure their impact of this outcome. Additionally, most of the participants in this study were varsity student-athletes (n = 49, 94.23%) and they had completed their semester for almost a month by the time they completed the post-intervention survey. Thus, mental illness symptom scores may have been lower at Time 2 due to decreased academic demands and stressors (Pascoe et al., 2020).

The timing of completion of the post-intervention survey may be a general limitation of this study as it occurred only one to two weeks after the intervention. Non-significant findings may potentially be attributed to participants not having enough time to reflect on and apply what they learned in the study. Researchers are encouraged to survey participants at more than one time point after an intervention to determine both short- and long-term effects.

Although five participants from the subset reported currently working with a mental health practitioner, it is unknown if other participants were working with a MPC and/or mental health practitioner while participating in this study. Participants supported by a MPC and/or mental health practitioner could have developed skills, techniques, attitudes, perspectives, and processes that resulted in improved outcomes compared to the participants who did not have this

opportunity. Also, the self-directed nature of the self-regulation and mindfulness interventions in the current study may have limited the benefits derived in comparison to other self-regulation and mindfulness interventions that involved an active facilitator (e.g., Dubuc-Charbonneau & Durand-Bush, 2015; Gross et al., 2018).

Lastly, nine participants (i.e., 4 self-regulation, 3 mindfulness, 2 active control group) reported being physically injured at the onset of the study, and it is known that mental illness symptoms (e.g., anxiety, depression, and eating disorder) can be triggered by problematic responses to injuries (Putukian, 2016). Futures studies investigating the impact of mental performance interventions on mental illness symptoms are encouraged to screen for physical injuries in both pre- and post-intervention surveys and assess whether or not such injuries have an impact on outcomes.

Conclusion

This study was the first to compare the effectiveness of two different online mental performance interventions designed for endurance athletes. It was also the first study aiming to improve EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness outcomes in endurance athletes using a pre-post experimental design that integrated an active control group. Contrary to hypotheses, the self-regulation and mindfulness interventions did not lead to significant improvements in the targeted outcomes when the full sample was considered, although positive changes in expected directions were noted. However, when excluding participants who screened positive for mental illness symptoms, the active control intervention was statistically more effective in reducing anxiety symptoms than the mindfulness intervention. From a humanistic and ethical standpoint, individuals experiencing mental illness challenges should be included in mental performance

interventions as they can potentially benefit from them. However, researchers should ensure that they have appropriate mental health support while doing so and survey their expectations prior to commencing an intervention.

Integrating quantitative and qualitative findings through data triangulation may help to more accurately assess the effectiveness of mental performance interventions. Qualitative studies exploring athletes' experiences, perceived changes, and contextual factors affecting outcomes (e.g., modified training due to pandemic) of partaking in online mental performance interventions are therefore warranted. Determining the benefits and drawbacks of online mental performance interventions is essential given the context in which athletes and practitioners have had to operate throughout the COVID-19 pandemic. Findings may lead to improvements in both content and delivery, which is necessary to maximize effectiveness.

Data Availability Statement

The data that support the findings of this study are available upon reasonable request from the corresponding author, JL. The data are not publicly available because they contain information that could compromise the privacy of the participants in accordance with the Personal Information Protection and Electronic Documents Act and the Personal Health Information Protection Act.

References

Barnett, A. G., van der Pols, J. C., & Dobson, A. J. (2005). Regression to the mean: What it is and how to deal with it. *International Journal of Epidemiology, 34*(1), 215-220. https://doi.org/10.1093/ije/dyh299

Beedie, C., Benedetti, F., Barbiani, D., Camerone, E. C., Coleman, D., Davis, A., Elsworth-Edelsten, C., Flowers, E., Foad, A., Harvey, S., Hettinga, F., Hurst, P., Lane, A., Lindheimer, J., Raglin, J., Roelands, B., Schiphof-Godart, L., & Szabo, A. (2018). Consensus statement on placebo effects in sports and exercise: The need for conceptual clarity, methodological rigour, and the elucidation of neurobiological mechanisms. *European Journal of Sport Science, 18*(10), 1383-1389. https://doi.org/10.1080/17461391.2018.1496144

Bertollo, M., Forzini, F., Biondi, S., Di Liborio, M., Vaccaro, M. G., Georgiadis, E., & Conti, C. (2021). How does a sport psychological intervention help professional cyclists to cope with their mental health during the COVID-19 lockdown? *Frontiers in Psychology, 12*(607152), 1-16. https://doi.org/10.3389/fpsyg.2021.607152

Carey, K. B., Neal, D. J., & Collins, S. E. (2004). A psychometric analysis of the self-regulation questionnaire. *Addictive Behaviors, 29*(2), 253-260. https://doi.org/10.1016/j.addbeh.2003.08.001

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Corbally, L., Wilkinson, M., & Fothergill, M. A. (2020). Effects of mindfulness practice on performance and factors related to performance in long-distance running: A systematic

review. *Journal of Clinical Sport Psychology, 14*(4), 376-398. https://doi.org/10.1123/jcsp.2019-0034

Dubuc-Charbonneau, N., & Durand-Bush, N. (2015). Moving to action: The effects of a self-regulation intervention on the stress, burnout, well-being, and self-regulation capacity levels of university student-athletes. *Journal of Clinical Sport Psychology, 9*(2), 173-192. https://doi.org/10.1123/jcsp.2014-0036

Durand-Bush, N., & Van Slingerland, K. (2021). *Mental health strategy for high performance sport in Canada*. The Mental Health Partner Group [Canadian Centre for Mental Health and Sport, Canadian Olympic and Paralympic Sport Institute Network, Game Plan, and Own The Podium]. http://bit.ly/MHStrategyForHPSportInCanada

Eberle, S. G. (2014). *Endurance sports nutrition* (3rd ed.). Champaign, IL: Human Kinetics.

Faul, F., Erdfelder, E., Lang, A-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*(2), 175-191. https://doi.org/10.3758/bf03193146

Feldman, G. C., Hayes, A. M., Kumar, S.M., Greeson, J. M., & Laurenceau, J. P. (2007). Mindfulness and emotion regulation: The development and initial validation of the cognitive and affective mindfulness scale - revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment, 29*(3), 177-190. https://doi.org/10.1007/s10862-006-9035-8

Gagnon-Dolbec, A., Fortier, M., & Cormier, S. (2021). Pain intensity and pain unpleasantness in triathletes: A study examining their associations with pain catastrophizing and pain expectations. *Psychology of Sport & Exercise, 55*, 1-7. https://doi.org/10.1016/j.psychsport.2021.101928

Gallagher, M. W., Bentley, K. H., & Barlow, D. H. (2014). Perceived control and vulnerability to anxiety disorders: A meta-analytic review. *Cognitive Therapy and Research, 38*(6), 571-584. https://psycnet.apa.org/doi/10.1007/s10608-014-9624-x

Gardner, F. L., & Moore, Z. E. (2007). *The psychology of human performance: The mindfulness-acceptance-commitment approach*. New York, NY: Springer.

Gardner, F. L., & Moore, Z. E. (2020). Mindfulness in sport contexts. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of Sport Psychology* (4th ed.) (pp. 738-750). Hoboken, NJ: John Wiley & Sons.

Garner, D. M., Olmsted, M. P., Bohr, Y., & Garfinkel, P. E. (1982). The eating attitudes test: Psychometric features and clinical correlates. *Psychological Medicine, 12*(4), 871-878. https://doi.org/10.1017/s0033291700049163

Geva, N., & Defrin, R. (2013). Enhanced pain modulation among triathletes: A possible explanation for their exceptional capabilities. *Pain, 154*(11), 2317-2323. https://doi.org/10.1016/j.pain.2013.06.031

Gross, M., Moore, Z. E., Gardner, F. L., Wolanin, A. T., Pess, R., & Marks, D. R. (2018). An empirical examination comparing the mindfulness-acceptance-commitment approach and psychological skills training for the mental health and sport performance of female student athletes. *International Journal of Sport and Exercise Psychology, 16*(4), 431-451. https://doi.org/10.1080/1612197X.2016.1250802

Harris, R. (2009). *ACT made simple: An easy-to-read primer on acceptance and commitment therapy*. Oakland, CA: New Harbinger Publications.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York, NY: Guilford.

Henriksen, K., Hansen, J., & Larsen, C. H. (2020). *Mindfulness and acceptance in sport: How to help athletes perform and thrive under pressure*. New York, NY: Routledge.

Hoaglin, D. C., Iglewicz, B., & Tukey, J. W. (1986). Performance of some resistant rules for outlier labeling. *Journal of American Statistical Association, 81*(396), 991-999. https://doi.org/10.2307/2289073

Hurley, O. A. (2021). Sport cyberpsychology in action during the COVID-19 pandemic (opportunities, challenges, and future possibilities): A narrative review. *Frontiers in Psychology, 12*(621283), 1-15. https://doi.org/10.3389/fpsyg.2021.621283

Josefsson, T., Ivarsson, A., Gustafsson, H., Stenling, A., Lindwall, M., Tornberg, R., & Böröy, J. (2019). Effects of Mindfulness-Acceptance-Commitment (MAC) on sport-specific dispositional mindfulness, emotion regulation, and self-rated athletic performance in a multiple-sport population: An RCT study. *Mindfulness, 10*, 1518-1529. https://doi.org/10.1007/s12671-019-01098-7

Kabat-Zinn, J. (1994). *Wherever you go there you are*. New York: Delta.

Kendall, J. M. (2003). Designing a research project: Randomised controlled trials and their principles. *Emergency Medicine Journal, 20*(2), 164-168. http://doi.org/10.1136/emj.20.2.164

Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior, 43*(2), 207-222. https://doi.org/10.2307/3090197

Keyes, C. L. M., Wissing, M., Potgieter, J. P., Temane, M., Kruger, A., & van Rooy, S. (2008). Evaluation of the mental health continuum-short form (MHC-SF) in Setswana-speaking South Africans. *Clinical Psychology and Psychotherapy, 15*(3), 181-192. https://doi.org/10.1002/cpp.572

Kris-Etherton, P. M., Petersen, K. S., Hibbeln, J. R., Hurley, D., Kolick, V., Peoples, S., Rodriguez, N., & Woodward-Lopez, G. (2021). Nutrition and behavioral health disorders: depression and anxiety. *Nutrition Reviews, 79*(3), 247-260. https://doi.org/10.1093/nutrit/nuaa025

Lasnier, J., & Durand-Bush, N. (2021). *How elite endurance athletes experience and manage exercise-induced pain: Implications for mental performance consultants* [Manuscript submitted for publication].

Latinjak, A. T., Hernando-Gimeno, C., Lorido-Méndez, L., & Hardy, J. (2019). Endorsement and constructive criticism of an innovative online reflexive self-talk intervention. *Frontiers in Psychology, 10*(1819), 1-17. https://doi.org/10.3389/fpsyg.2019.01819

Lundgren, T., Reinebo, G., Fröjmark, M. J., Jäder, E., Näslund, M., Svartvadet, P., Samuelsson, U., & Parling, T. (2021). Acceptance and commitment training for ice hockey players: A randomized controlled trial. *Frontiers in Psychology, 12*(685260), 1-9. https://doi.org/10.3389/fpsyg.2021.685260

Mauger, A. R. (2019). Exercise-induced pain. In C. Meijen (Ed.), *Endurance performance in sport: Psychological theory and interventions* (pp. 35-46). Abindgon, Oxon: Routledge.

McCormick, A., Meijen, C., Anstiss, P. A., & Jones, H. S. (2019). Self-regulation in endurance sports: Theory, research, and practice. *International Review of Sport and Exercise Psychology, 12*(1), 235-264. https://doi.org/10.1080/1750984X.2018.1469161

McCormick, A., Meijen, C., & Marcora, S. (2015). Psychological determinants of whole-body endurance performance. *Sports Medicine, 45*(7), 997-1015. https://doi.org/10.1007/s40279-015-0319-6

Melnyk, B. M., Morrison-Beedy, D., & Moore, S. M. (2012). Nuts and bolts of designing intervention studies. In B. M. Melnyk & D. Morrison-Beedy (Eds.), *Intervention research: Designing, conducting, analyzing, and funding* (pp. 37-63). New York, NY: Springer Publishing Company.

Pascoe, M. C., Hetrick. S. E., & Parker, A. G. (2020). The impact of stress on students in secondary school and higher education. *International Journal of Adolescence and Youth, 25*(1), 104-112. https://doi.org/10.1080/02673843.2019.1596823

Putukian, M. (2016). The psychological response to injury in student athletes: A narrative review with a focus on mental health. *British Journal of Sports Medicine, 50*(3), 145-148. https://doi.org/10.1136/bjsports-2015-095586

Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement, 1*(3), 385-401. https://doi.org/10.1177/014662167700100306

Reardon, C. L., Hainline, B., Aron, C. M., Baron, D., Baum, A. L., Bindra, A., Budgett, R., Campriani, N., Castaldelli-Maia, J. M., Currie, A., Derevensky, J. L., Glick, I. D., Gorczynski, P., Gouttebarge, V., Grandner, M. A., Han, D. H., McDuff, D., Mountjoy, M., Polat, A., … Engebretsen, L. (2019). Mental health in elite athletes: International Olympic Committee consensus statement. *British Journal of Sports Medicine, 53*(11), 667-699. http://doi.org/10.1136/bjsports-2019-100715

Schütze, R., Rees, C., Smith, A., Slater, H., Campbell, J. M., & O'Sullivan, P. (2018). How can we best reduce pain catastrophizing in adults with chronic noncancer pain? A systematic review and meta-analysis. *The Journal of Pain, 19*(3), 233-256. https://doi.org/10.1016/j.jpain.2017.09.010

Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. *Archives of Internal Medicine, 166*(10), 1092-1097. https://doi.org/10.1001/archinte.166.10.1092

Sullivan, M. J. L., Bishop, S. R., & Pivik, J. (1995). The pain catastrophizing scale: Development and validation. *Psychological Assessment, 7*(4), 524-532. https://doi.org/10.1037/1040-3590.7.4.524

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics* (6th ed.). Boston, MA: Pearson.

Thienot, E., & Adams, D. (2019). Mindfulness in endurance performance. In C. Meijen (Ed.), *Endurance performance in sport: Psychological theory and interventions* (pp. 168-186). Abindgon, Oxon: Routledge.

Van Slingerland, K. J., Durand-Bush, N., Bradley, L., Goldfield, G., Archambault, R., Smith, D., Edwards, C., Delenardo, S., Taylor, S., Werthner, P., & Kenttä, G. (2019). Canadian Centre for Mental Health and Sport (CCMHS) position statement: Principles of mental health in competitive and high-performance sport. *Clinical Journal of Sport Medicine, 29*(3), 173-180. https://doi.org/10.1097/JSM.0000000000000665

World Health Organization. (2004). *Promoting mental health: Concepts, emerging evidence, practice*. https://www.who.int/mental_health/evidence/en/promoting_mhh.pdf

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation (pp. 13-39). San Diego, CA: Academic Press.

Article 3: The Impact of an Online Sport Psychology Intervention for Middle-Distance Runners: Should Self-Regulation or Mindfulness be Prioritized?

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Abstract

The purpose of this study was to qualitatively examine the impact of an online sport psychology intervention that focused on self-regulation (SI) or mindfulness (MI) and was designed to help endurance athletes improve exercise-induced pain (EIP) management, mental performance (i.e., self-regulation, mindfulness), and mental health. A sample of 16 middle-distance runners who participated in a 8-week SI or MI were purposefully selected based on their high, moderate, and low pre-post intervention evolution scores. Findings, which were generated by performing a codebook thematic analysis, suggest that both the SI and MI positively impacted EIP management, mental performance, and mental health. EIP literacy enabled the participants from both interventions to more effectively manage EIP. Furthermore, screening for mental illness symptoms and referring athletes in a timely manner to appropriate mental health practitioners was perceived as essential for them to receive the care and support they needed. Lastly, a hybrid delivery format may be the most effective when providing online sport psychology interventions.

Keywords: exercise-induced pain management, mental health, ACT, MAC, qualitative research

The Impact of an Online Sport Psychology Intervention for Middle-Distance Runners: Should Self-Regulation or Mindfulness be Prioritized?

Both self-regulation (McCormick et al., 2019) and mindfulness (Corbally et al., 2020) have been linked to performance enhancement in endurance sports. This is not surprising since endurance athletes require self-regulation to manage their internal experiences and keep progressing toward their goals (McCormick et al., 2019). From an applied perspective, self-regulation involves planning, generating, evaluating, and adapting one's thoughts, feelings, and actions in order to achieve personal standards and goals in one's constantly changing environment (Zimmerman, 2000). In a sport context, athletes rely on self-motivational beliefs and cognitive processes across three cyclical self-regulatory phases when managing their performance: (a) forethought (i.e., they prepare themselves by setting goals and strategically planning for their performance); (b) performance (i.e., they execute their plan, exert control, and self-monitor during their performance by using self-talk, attention focusing, imagery, and task strategies); and (c) self-reflection (i.e., they evaluate themselves after their performance by doing comparisons to personal standards and norms, explaining outcomes, and drawing conclusions about the need to adapt strategies in the future; Durand-Bush et al., 2015; Zimmerman, 2000).

Research on interventions with athletes in which Zimmerman's social cognitive lens is applied is scarce. However, one example is Dubuc-Charbonneau and Durand-Bush's (2018) multiple case study of four varsity student-athletes who completed an individual, in-person season-long self-regulation intervention to improve stress and burnout. Narratives were created to illustrate the unique experiences of each varsity student-athlete throughout the self-regulation intervention. Overall, the varsity student-athletes reported developing and implementing various self-regulation strategies (e.g., setting goals, managing time, conducting daily check-ins,

journaling, reappraising challenging situations) to navigate the demands and challenges they faced throughout their season, which led to improved mental health as well as reduced stress and burnout symptoms. Limitations to Dubuc-Charbonneau and Durand-Bush (2018)'s study include the small sample size and flexible procedures (e.g., variations in duration and content provided to each participant), which limited the generalizability of the results. Further, it was difficult to compare the experiences of each participant as they were competing in different sports (i.e., basketball, fencing, hockey, swimming) and the demands they faced as well as the length of their season varied. Given the lack of interventions designed for endurance athletes, it would be worthwhile to build on Dubuc-Charbonneau and Durand-Bush (2018)'s study to examine the effects of a self-regulation intervention for this population. With in-person restrictions associated with the COVID-19 pandemic, offering an online asynchronous intervention (i.e., self-directed at one's own pace and not occurring in real time; Price et al., 2020) would possibly help recruit a wider sample of athletes, reach more athletes from the same sport, and provide a more structured intervention to facilitate comparisons across athletes.

Contrary to self-regulation where athletes strive to control or change their internal experiences, mindfulness promotes a modified relationship with internal experiences (Gardner & Moore, 2020). More specifically, mindfulness interventions can help athletes to develop the capacity to view internal experiences as normal, non-threatening, time-limited, and not in need of reduction or control (Garner & Moore, 2007; Hayes et al., 1999). Mindfulness, which involves adopting a structured mindset of being aware of the present moment in an accepting, non-judging, and non-avoiding way (Kabat-Zinn, 1994), has been the focus of interventions for athletes. Examples include the Mindfulness-Acceptance-Commitment (MAC) approach (Gardner & Moore, 2007), Mindful Sport Performance Enhancement (MSPE; Kaufman et al., 2009),

Mindful Meditation Training for Sport (MMTS; Baltzell et al., 2014), and MMTS 2.0 (Baltzell & Summers, 2018). The MAC approach, which is rooted in Acceptance and Commitment Therapy (ACT; Hayes et al., 1999), is designed to help athletes enhance their capacity to non-judgmentally accept their internal experiences (e.g., thoughts, feelings, and sensations) and take actions that are aligned with their personal values (Gardner & Moore, 2007). Interestingly, Mental Performance Consultants (MPCs) are increasingly employing ACT when working with athletes to help them develop psychological flexibility (Henriksen et al., 2020). The main difference between MAC and ACT is that topics are covered in a specific order within the MAC approach, whereas ACT is nonlinear and therefore MPCs can work on any core processes (i.e., defusion, acceptance, contacting the present moment, self-as-context, values, and committed action) at any time with athletes (Harris, 2009).

Few quantitative studies such as that of Lundgren et al. (2021) have examined the effectiveness of MAC or ACT interventions in improving specific outcomes in athletes. Similarly, qualitative inquiries on mindfulness interventions with athletes are limited but growing. As an example, Cote et al. (2019) investigated the experiences of nine NCAA Division I tennis players who took part in a MMTS 2.0 in-person group intervention. Participants reported learning to respond more effectively to sport- and school-related challenges by observing, accepting, and expressing self-compassion toward unpleasant internal states. Limitations of this study include the small sample size (i.e., $n = 9$) and brief duration of the exit interview (i.e., average of 16.31 minutes). Longer interviews were recommended by Cote et al., (2019) to gain more insight into athletes' experiences. Contrary to Cote et al.' study, studies investigating the impact of mindfulness interventions have primarily focused on performance-related outcomes,

with only a few of them targeting mental health and/or mental illness symptoms in athletes (Noetel et al., 2017).

Mindfulness was found to be an important strategy in a recent qualitative study conducted with 15 elite endurance athletes competing in track and field, swimming, and canoe kayak (Authors, 2021a). More specifically, the authors found that the athletes used a combination of both mindfulness and self-regulation strategies to successfully manage exercise-induced pain (EIP). According to Mauger (2019), EIP is a type of pain that (a) naturally occurs when athletes engage in intense exercise, (b) does not cause lasting damages, and (c) usually disappears shortly after intensity is reduced or exercise is ceased. EIP differs from the pain athletes may experience from an acute injury (e.g., sprained ankle), a chronic injury (e.g., stress fracture), or from the micro-trauma and inflammation arising from delayed onset muscle soreness (Mauger, 2019). The intensity of EIP increases alongside exercise intensity (Mauger, 2019) and the experience of EIP is highly cognitive and generally perceived as detrimental to performance if not effectively managed (Authors, 2021a). According to McCormick et al. (2020), endurance athletes use the Internet to find ways to cope with the psychological demands of their sport such as EIP. Hence, developing and offering online asynchronous interventions that include relevant mental performance skills (e.g., self-regulation, mindfulness) and are tailored to EIP management may help to maximize the reach and support for endurance athletes who prefer accessing psychological support in times and locations of their choosing (McCormick et al., 2020).

The provision of online sport psychology services has rapidly increased due to the COVID-19 pandemic (Price et al., 2020). Additionally, the COVID-19 pandemic created new strains on athletes (Reardon et al., 2021), which can trigger or exacerbate mental illnesses (e.g., mood disorders, anxiety disorders; Edwards & Thornton, 2020). In the Spring of 2020, during

the span of a month, NCAA Research (2020) investigated the impact of the COVID-19 pandemic on the mental health of 37,658 student-athletes. Overall, participants reported experiencing high rates of mental distress since the outset of the COVID-19 pandemic. Further, the rates of mental health concerns experienced within this month were 1.5 to 2 times higher than what has been historically reported by NCAA student-athletes (NCAA Research, 2020). It is noteworthy that 85% of the participants reported a desire to receive mental health support and resources (NCAA Research, 2020), which supports the need for interventions.

According to Keyes' (2002) two-continua model, mental health and mental illness are related but distinct constructs that contribute to overall human functioning. One continuum indicates the presence or absence of mental health (i.e., a state of psychological, emotional, and social well-being in which individuals are able to feel, think, and behave in ways that allow them to manage the normal stresses of life, work productively, contribute to their community, savor life, and fulfill their potential; Van Slingerland et al., 2019; World Health Organization, 2004). The other continuum indicates the presence or absence of mental illness. Mental illness is a health condition characterized by significant distress and impaired functioning in personal and professional activities due to alterations to the ways individuals feel, think, and behave; it includes all diagnosable psychological disorders (Van Slingerland et al., 2019; World Health Organization, 2004). Given that MPCs are encouraged to facilitate the development of mental skills that support both performance and mental health in athletes (Durand-Bush & Van Slingerland, 2021; Fogaca, 2021), it is surprising that intervention studies focusing on improving mental health and mental illness symptoms in endurance athletes remain scarce (e.g., Bertollo et al., 2021).

Of note, Authors (2021b) conducted the first study to compare the effectiveness of an online asynchronous eight-week self-regulation and mindfulness intervention on key outcomes affecting endurance athletes. A pre-post experimental design including an active control group was used to examine how the SI and MI influenced EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms. The authors recruited a total of 52 middle-distance runners (i.e., 17 self-regulation, 19 mindfulness, 16 active control) and found that while mean scores trended in the positive direction from pre- to post-intervention, the SI and MI did not significantly differ from the active control intervention (i.e., focused on reading chapters in an endurance sports nutrition textbook) on the targeted outcomes. However, when excluding athletes who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder), the active control intervention was more effective in reducing anxiety symptoms than the MI. Overall, Authors (2021b) reported that the SI and MI were not any more effective than the active control intervention in improving the selected outcomes. Similar to the recommendation of Bertollo et al. (2021), they recommended that qualitative research be conducted to offer a more comprehensive view of the effectiveness of interventions.

In sum, given (a) the aforementioned gaps, (b) the relevance of self-regulation and mindfulness in [endurance] sports, (c) the absence of qualitative studies examining athletes' perceived changes from partaking in an online sport psychology intervention, and (d) the importance of integrating quantitative and qualitative findings to more accurately assess the effectiveness of sport psychology interventions, the current study was carried out. Its purpose was to investigate the impact of an online sport psychology intervention focusing on self-

regulation or mindfulness and designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation, mindfulness), and mental health.

Methodology

Pragmatism

This study is part of a larger research project (i.e., the first author's doctoral dissertation) in which mixed methods were employed to study competitive and high performance endurance athletes' experiences and management of EIP, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms. A pragmatic stance was adopted to integrate both qualitative and quantitative methods to comprehensively answer the research questions (Creswell & Plano Clark, 2018). Further, the pragmatic paradigm allowed the researchers to choose the methods and procedures that best met the needs and applied aims of the research project (Creswell & Creswell, 2018). According to Feilzer (2010), pragmatism is the most frequently identified paradigm on which mixed methods researchers based their work.

The current study consists of the third study conducted within the larger research project. In the first study, qualitative data were collected and analyzed to inform the content related to EIP management in the online SI and MI (see Authors, 2021a). In the second study, quantitative data were collected and analyzed at two time points (i.e., pre- and post-intervention) to investigate the effectiveness of the online SI and MI in improving specific outcomes (see Authors, 2021b). In this third study, qualitative data were collected and analysed two months after completion of the online interventions to examine participants' perceived impact of the SI and MI. It is noteworthy that data were collected sequentially throughout the larger research project.

Method

Participants

Participants were 16 middle-distance runners (i.e., 11 women and 5 men) aged between 18 to 25 years old (M_{age} = 21.31, *SD* = 2.18). They identified their ethnicity as English Canadian (*n* = 7), French Canadian (*n* = 5), Arabic (*n* = 2), and French (*n* = 2). They were all university student athletes (*n* = 15), except one who was a professional athlete (*n* = 1). Participants indicated currently competing at the provincial (*n* = 5), national (*n* = 10), and international (*n* = 1) levels.

Interventions

Both the SI and MI were asynchronous (i.e., self-directed and completed without interactions with a facilitator), lasted 8 weeks, and consisted of completing a weekly module that was part of a workbook, which took approximately 30 minutes. The interventions were specifically designed to address the demands of middle-distance running (e.g., EIP management) and the Internet was required as hyperlinks to video and audio files (e.g., self-regulation and mindfulness exercises) were included. The first author individually emailed the weekly module to participants, who in turn, emailed the module back to the first author after completion. Given the asynchronous nature of the interventions, the content of the workbook modules was not analyzed and feedback was not provided by the first author.

The SI was informed by Zimmerman's (2000) self-regulation model and included the following topics: self-regulation definitions and personal standards (i.e., module 1), goal setting (i.e., module 2), strategic planning (i.e., module 3), self-efficacy (i.e., module 4), motivation (i.e., module 4), self-talk (i.e., module 4), focus (i.e., module 5), imagery (i.e., module 6), self-monitoring (i.e., module 7), and self-reflection (i.e., module 8). The MI was informed primarily

by ACT (Harris, 2009) and secondarily by the MAC approach (Gardner & Moore, 2007). Topics covered in the mindfulness intervention included: Mindfulness and MAC definitions (i.e., module 1), defusion (i.e., module 2), acceptance (i.e., module 3), contacting the present moment (i.e., module 4), self-as-context (i.e., module 5), values (i.e., module 6), and committed action (i.e., modules 7 and 8). The purpose of the first module of both interventions was to introduce participants to either self-regulation or mindfulness. Further, each module, regardless of the intervention, was comprised of a mix of psychoeducation and practical exercises. Additionally, participants had to reflect on their biggest takeaways at the end of each module to consolidate their key learnings. Of note, each mindfulness module started with a brief centering exercise, which was not the case for the self-regulation modules. Lastly, the two interventions were designed by the authors of the current study who are MPCs and Professional Members of the Canadian Sport Psychology Association.

Procedure

Ethical approval was obtained from the Office of Research Ethics and Integrity of the authors' university. The participants were purposefully selected from the self-regulation (n = 17) and mindfulness (n = 19) groups of Authors (2021b)'s study. Given that the authors were interested in varied and inclusive perceptions and experiences, participants with high (n = 4), moderate (n = 2), and low (n = 2) scores on the outcome measures after completing the SI or MI were invited to take part in a follow-up interview by the first author who sent them an invitation email. The outcome measures of EIP catastrophizing, mental performance (i.e., self-regulation capacity, dispositional mindfulness), mental health, and mental illness symptoms (i.e., anxiety, depression, and eating disorder), were assessed via an online pre- and post-intervention survey in Authors (2021b)'s study. Selection was based on the calculation of an evolution score using

participants' responses on the measures, which was calculated by subtracting the sum of undesired score variations (i.e., pre to post negative changes) from the sum of desired score variations (i.e., pre to post positive changes). Evolution scores were calculated after Authors (2021b)'s study and informed the recruitment of participants for the current study. A breakdown of the evolution score of each participant who completed the follow-up interview can be found in Table 1. The intention behind recruiting athletes based on these scores was to obtain a diverse sample and not necessarily to analyze differences between the two groups, especially given the limited number of participants in each group.

In total, 45 athletes from Authors (2021b)'s study consented to participate in the interview. From this sample, 16 were initially contacted with an aim to recruit eight from each intervention based on whether they had high, moderate, or low scores. Three participants never replied to the invitation and one participant declined. Using the evolution score, the first author then invited the next athletes on the list to eventually create a sample of 16 participants (i.e., eight from the SI and eight from the MI). Of note, participants who screened positive for mental illness symptoms (see Authors, 2021b) had high evolution scores and four athletes from this subset (i.e., two per intervention) were included in the sample to represent their experiences. This explains why this category includes eight participants, rather than four like the moderate and low score categories (see Table 1). Participants signed the consent form before completing the interview and no incentives or compensation was provided for their participation in the study.

Table 1.

Evolution Score of Each Participant who Completed the Interview

	Evolution Score	Category
S1*	+120.60	H
S2*	+46.53	H
S3	+46.00	H
S4	+22.30	H
S5	-0.40	M
S6	+1.30	M
S7	-34.60	L
S8	-19.54	L
M1*	+81.8	H
M2*	+98.10	H
M3	+91.00	H
M4	+22.40	H
M5	+0.30	M
M6	+0.40	M
M7	-58.10	L
M8	-17.20	L

Note. S = Self-regulation intervention participants; M = Mindfulness intervention participants; * = Participants who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder) in Authors (2021b)'s study; H = High evolution score; M = Moderate evolution score; L = Low evolution score.

Data Collection

Data were collected via individual semi-structured interviews conducted face-to-face via the online Zoom platform. Interviews took place two months after participants had submitted the last module of their online intervention (i.e., August 2020) and lasted between 28 and 56 minutes (M_{minutes} = 40.32, *SD* = 7.11). A two-month post-intervention period was provided to athletes to give them a chance to assimilate the content and implement lessons learned before partaking in the interview. Interviews were audio-recorded and scheduled at a time that was convenient for

both the participants and first author. The bilingual first author conducted half of the interviews in English and the other half in French. His training and experience as a researcher and MPC allowed him to easily establish rapport and effectively converse with the participants to gain in-depth information. The interview guide included an introductory question (i.e., How did your journey in track and field begin?), questions related to participants' perceived changes as a result of participating in the intervention (e.g., To what extent did the online intervention improve your level of [self-regulation or mindfulness], your management of EIP, and your mental health?), questions related to recommendations to improve the intervention (e.g., What were benefits and drawbacks of participating in the online intervention? Would you change anything?), and closing questions to wrap up the interview (e.g., Do you have anything else to add?).

Data Analysis

All interviews were transcribed verbatim, yielding 203 single-spaced pages of data. A codebook thematic analysis was performed to analyze the data given its pragmatic advantages and suitability for applied research (Braun & Clarke, 2021). Using codebook thematic analysis allowed for the conceptualization of themes as domain summaries (i.e., themes summarizing what participants discussed in relation to a topic; Braun et al., 2019) and the integration of both deductive and inductive analytical means. Themes related to participants' perceived changes were generated before performing the analysis based on the variables under investigation in Authors (2021b)'s study (i.e., EIP management, mental performance [self-regulation, mindfulness], and mental health). The subthemes related to EIP management (e.g., reframing) and mental health (e.g., self-compassion) were inductively generated. Further, the subthemes related to mental performance skills common to both the SI and MI interventions were inductively created (e.g., motivation), while the mental performance skills specific to each

intervention were deductively developed based on Zimmerman's (2000) self-regulation model (e.g., self-efficacy) or ACT (Hayes et al., 1999; e.g., defusion) and MAC (Gardner & Moore, 2007; e.g., acceptance). Themes (e.g., delivery format) and subthemes (e.g., asynchronous) related to recommendations were inductively generated. For a theme and subtheme to be included, it had to be mentioned by at least two participants. Thematic mapping was employed to visualize how the themes and subthemes fit together and how the overall representation of the data could be conveyed (Braun et al., 2019). To ensure methodological rigor, the main author shared his interpretation of the data with the second author and three other research colleagues who offered critical feedback and encouraged reflexivity (Smith & McGannon, 2018). Lastly, quotes that best represented the participants' perceived changes and recommendations were selected.

Results

The codebook thematic analysis generated (a) three themes and 13 subthemes related to the participants' perceived changes and (b) three themes and seven subthemes related to participants' recommendations. Quotes, which were strategically included into tables to facilitate the comparison of data between the SI and MI, were edited for flow and grammatical errors. One quote per intervention group was provided for each subtheme (i.e., when applicable). To maintain anonymity and confidentiality, identification codes were created for each participant (i.e., S = self-regulation, M = mindfulness). The number after the letter S or M indicates if a participant had a high (i.e., 1, 2, 3, 4), moderate (i.e., 5, 6), or low (i.e., 7, 8) evolution score after partaking in either the SI or MI. It is noteworthy that S1, S2, M1, and M2 screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder) prior to completing the intervention in Authors (2021b)'s study and the authors met with them to ensure they had

appropriate resources and support before commencing the intervention. Overall, favourable changes and constructive recommendations were noted by participants from both interventions.

Perceived Changes

EIP Management

Athletes from both interventions indicated that a positive change from their participation involved reframing EIP. For example, participants from the SI reported how they now have a more positive perspective of EIP (i.e., seeing it lead to improvement rather than as a weakness and using it as a source of motivation rather than a source of dread), while participants from the MI discussed how they can now accept EIP (i.e., allow EIP to occur and make room for it), rather than be afraid of it or fight with it. Athletes from both interventions also explained that learning about EIP (e.g., what it is, why it happens) and its characteristics (e.g., it does not last forever) was game-changing in their ability to successfully manage it. Further, SI participants described now using different ways to talk to themselves when experiencing EIP (e.g., instructional and motivational self-talk) and breaking down their workouts into manageable segments. Quotes illustrating the subthemes related to EIP management (i.e., reframing, understanding, self-talk, and segmented performance plan) can be found in Table 2.

Table 2.

Quotes Illustrating the Subthemes Related to EIP Management

	Self-Regulation Intervention	Mindfulness Intervention
Reframing	S2: “I don’t see EIP as an enemy anymore, but rather as an ally”.	M7: “I now make room for EIP…. Rather than heading into time trials thinking it will hurt, I now have a more positive attitude about it…. I’m less scared about EIP”.

Quotes Illustrating the Subthemes Related to EIP Management (continued)

Understanding	S3: "EIP is not a permanent thing, it goes away. I'm hurting now, but I will feel fine soon".	M3: "Understanding what EIP was made me less reluctant to hit it and just keep going through it".
Self-Talk	S4: "I was talking to myself at the second person and found that it worked well…. I was also telling myself that I was good…. I put more emphasis on self-talk since I found that this is what helps me the most".	
Segmented Performance Plan	S6: "When I'm doing one-kilometer repeats, I will think of something different to focus on for each 200-meter segment".	

Mental Performance

Skills Common to Both Interventions. Participants from both interventions discussed improving their ability to regulate attention. For instance, athletes from the SI indicated that they are now better at directing their attention to appropriate cues, while those from the MI reported that they are now more present when talking with someone else or when running outside (e.g., pay attention to sounds of nature). Further, participants from both interventions explained how the intervention increased their motivation. For example, SI athletes described how completing the modules allowed them to rekindle their love for running, while participants from the MI discussed reconnecting with how important running is for them and how they value it. Quotes illustrating the subthemes related to mental performance skills common to both interventions (i.e., attention regulation and motivation) can be found in Table 3.

Skills Specific to Each Intervention. Participants from the SI indicated improving mental performance skills specific to self-regulation. They reported being more aware and able to track how they feel mentally and physically, and using deliberate strategies to fuel their

confidence to optimally perform. MI athletes described improving mental performance skills specific to mindfulness. They shared an improved capacity to accept failures, alternative outcomes, or environmental conditions, as well as create distance between them and their unproductive thoughts. Quotes illustrating the subthemes related to mental performance skills specific to self-regulation (i.e., self-monitoring and self-efficacy) and mindfulness (i.e., acceptance and defusion) can be found in Table 3.

Table 3.

Quotes Illustrating the Subthemes Related to Mental Performance

	Self-Regulation Intervention	Mindfulness Intervention
	Skills Common to Both Interventions	
Attention Regulation	S4: "The intervention gave me tools and strategies that helped me focus on the right things at the right time".	M4: "When I'm having a conversation with a person, I'm now in the present moment and that is the only thing I do. The other things will wait until later".
Motivation	S1: "[The intervention] just sort of brought back why I love running. It reintroduced me to running again, to why I started it in the first place, and to why I should keep pushing".	M6: "[The intervention] helped me find the things that I really like in the sport…. I realized how much running means to me and how much it affects my life".
	Skills Specific to Each Intervention	
Self-Monitoring	S4: "I now do check-ins with myself. I pay more attention to this and I try to listen more to how I'm feeling. This can make a difference in a workout".	
Self-Efficacy	S6: "When I second guess myself, I use 'I know' statements to remember that I have done the work, that I'm ready, and that I can put my best foot forward".	

Quotes Illustrating the Subthemes Related to Mental Performance (continued)

Acceptance	M4: "I would often let myself be affected by the weather or the wind. As soon as I was hitting a head wind or I was running on a hilly course, I would get discouraged and my workout would go downhill from there. Now, when I don't like the weather or when something is not ideal for me, I take it into consideration and accept it. [Acceptance] has helped me a lot because now I use it every time this happens".
Defusion	M7: "Telling myself that I'm noticing that I'm having a thought that it's hurting is a way to create distance with my negative thoughts. [Defusion] is something I did not know how to do before".

Mental Health

Participants from both interventions discussed being more self-compassionate as a result of partaking in the interventions. For example, SI athletes indicated being less harsh on themselves, while those in the MI reported how they can now let go of perceived failures more quickly. Additionally, participants from both interventions explained learning to make autonomous decisions based on what works best for them and to not feel bad about not conforming to what others (e.g., teammates) are doing. Importantly, athletes who were referred to mental health resources because they had screened positive for mental illness symptoms discussed the significance of meeting with the authors and then starting to work with a mental health practitioner in addition to completing the intervention. Quotes illustrating the subthemes related to mental health (i.e., self-compassion, autonomy, and support) can be found in Table 4.

Table 4.

Quotes Illustrating the Subthemes Related to Mental Health

	Self-Regulation Intervention	Mindfulness Intervention
Self-Compassion	S5: "I put less pressure on myself…. I'm less harsh on myself".	M3: "I recover a little faster from perceived failures…. You remember that circling negative thought? It's easier to let it go now…. Whereas it might have taken me a week to get over something in the past, now I can almost do it consistently in a day or two.
Autonomy	S6: "I look up to the girls that I train with very much…. They are doing this but should I be doing this as well? I have realized that we're different people and that I can do my own thing. It does not mean that it's right or wrong. It's just what works for me…. I have realized that you don't have to compare yourself to others".	M6: "It made me think about what works best for me rather than copying what works for my teammates".
Support	S1: "I did reach out to one of the resources that you sent me and I started talking to a counsellor from the Canadian Centre for Mental Health and Sport…. It has really helped me and I'm feeling better now…. Thank you for noticing that I was going through something and for sending me resources".	M2: "I actually ended up reaching out to [name of a mental health practitioner], which was a big thing for me because I never really thought about it…. I don't know if I would have done that had you guys not said anything. That was really significant, so thank you very much for that…. After just one conversation with her and pinpointing things that I'm struggling with from a nutrition standpoint, I already feel a million times better".

Recommendations

Delivery Format

Participants from both the MI and SI reported appreciating the asynchronous delivery format of the interventions (i.e., how the modules were accessible from anywhere and at any time of the day). They enjoyed being able to complete them on their own time whenever they felt like it and recommended to continue using this format. However, they also expressed a desire to include a synchronous component (e.g., have live interactions) as they believed this could lead to better retention and a more pleasant experience. Quotes illustrating the subthemes related to delivery format (i.e., asynchronous and synchronous) can be found in Table 5.

Table 5.

Quotes Illustrating the Subthemes Related to Delivery Format

	Self-Regulation Intervention	Mindfulness Intervention
Asynchronous	S8: "We had a week to complete each module so we took the time we wanted. We were not rushed … I could also do this on the road".	M4: "I could complete the modules whenever I wanted. They were accessible from anywhere and at any time, which was fun for me since I usually have a busy schedule".
Synchronous	S2: "It would have been nice to get together in a classroom once a week. You, the MPC, would make us complete the module and would help us reflect on its content … The fact that you can explain the questions and talk about the content of the module increases retention compared to if we are only reading it by ourselves. Sometimes, we may not understand what you wrote, even thought it was very well written. If we had questions, we would have been able to ask them right away. There would have been	M2: "The only thing that I would add would be face-to-face interactions".

	more dialogue, which in my opinion would have been interesting".	

Content

Participants from both interventions discussed how they appreciated using the strategies covered in the modules both within and outside of their sport context (e.g., at school, with friends or family). They also explained how the audio and video files integrated throughout the modules enhanced their learning experience. Further, they described how helpful the examples provided were in supporting their reflection. SI participants recommended including examples of actual elite athletes applying the strategies covered in the modules to increase the perceived legitimacy of the content, while MI participants mentioned to keep using the metaphors as they stood out for them. Quotes illustrating the subthemes related to content (i.e., applicability, audio and video files, examples, and metaphors) can be found in Table 6.

Table 6.

Quotes Illustrating the Subthemes Related to Content

	Self-Regulation Intervention	Mindfulness Intervention
Applicability	S6: "The thing that I really liked is that the modules aren't just applied to your athletic career, but they extend to your personal life, which was amazing".	M4: "I also applied the strategies in my daily life with those around me and I found it good for that too…. The intervention wasn't just about running and I really enjoyed that".
Audio and Video Files	S8: "I liked that we were immersed in concrete situations through the use of audio and video files…. We could project ourselves in other situations, rather than just write text".	M7: "I enjoyed the audio and video aids that were integrated throughout the modules. They helped me a lot".

Quotes Illustrating the Subthemes Related to Content (continued)

Examples	S5: "You could show us how elite athletes use these concepts. It would add weight to the intervention".	M8: "The examples of answers you provided were really good. They allowed me to answer questions appropriately based on my personal experience".
Metaphors		M1: "What I remember the most are the metaphors. They were so interesting".

Timing

Participants from both interventions were not able to test their learned strategies during competitions due to the COVID-19 pandemic. They were curious to see how the interventions would impact their performance during races and recommended that ideally, interventions should be delivered during the competitive season. Quotes illustrating the subtheme related to timing (i.e., alignment with competitive season) can be found in Table 7.

Table 7.

Quotes Illustrating the Subtheme Related to Timing

	Self-Regulation Intervention	Mindfulness Intervention
Alignment With Competitive Season	S3: "It would have been great to see how [the intervention] actually impacted my times".	M6: "It would be kind of nice to do a study like this during an actual track season, either outdoor or indoor, just to see how much it would affect my actual racing".

Discussion

The purpose of this study was to examine the impact of an online sport psychology intervention that focused on self-regulation or mindfulness and was designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation, mindfulness), and mental health. To the authors' knowledge, this inquiry was the first to compare an online SI and

MI using qualitative methods. Further, the sample included middle-distance runners from different track and field clubs across Canada, whereas previous qualitative studies focusing on self-regulation and mindfulness interventions were with athletes from the same team (e.g., MI with soccer athletes; Baltzell et al., 2014) or from different sports (e.g., SI with university athletes, Dubuc-Charbonneau & Durand-Bush, 2018; MI with university athletes, Mistretta et al., 2017) and the interventions were also conducted in person.

Participants from both interventions discussed positive perceived changes related to EIP management, which support the claim of Authors (2021a) that self-regulation and mindfulness strategies appear to be valuable to successfully manage EIP. Interestingly, learning about EIP and its characteristics was empowering and made EIP easier to manage, regardless of the intervention the participants completed. MPCs are therefore encouraged to increase the EIP literacy of endurance athletes and work with them to apply both self-regulation and mindfulness strategies specifically tailored to EIP management. It does not appear to be advantageous to favour one type of sport psychology intervention over the other; rather, findings suggest the use of a combination of approaches to help athletes learn to exert control in some situations (e.g., use instructional self-talk to focus on other aspects than EIP) and relinquish control in others (e.g., accept EIP and refrain from trying to change it).

Athletes also reported mental performance gains from the interventions, which supports previous results (e.g., Cote et al., 2019; Dubuc-Charbonneau & Durand-Bush, 2018). For instance, athletes who took part in the SI indicated improving their capacity to self-monitor, which is a key feature of self-regulation. Previous self-regulation studies with athletes (e.g., Dubuc-Charbonneau & Durand-Bush, 2018) and coaches (e.g., McNeill et al., 2020) have shown similar results. In terms of the MI, athletes reported enhancing their acceptance capability. This

corroborates the findings of previous mindfulness research with athletes (e.g., Baltzell et al., 2014; Cote et al., 2019). Overall, there is support for practitioners to target the key elements of Zimmerman's (2000) self-regulation model, ACT (Hayes et al., 1999), and the MAC approach (Gardner & Moore, 2007) to enhance athletes' mental performance.

Positive perceived changes related to mental health were equally reported by participants from both interventions. Athletes described engaging in more autonomous decision-making, which is a key dimension of psychological well-being (Ryff, 1989). They also showed more self-compassion, a precursor of positive mental health (Inwood & Ferrari, 2018). Practitioners are therefore encouraged to integrate principles of self-compassion in self-regulation and mindfulness training to support athletes' mental health. Given that mental performance training has been shown to significantly contribute to student-athletes' mental health (Dubuc-Charbonneau & Durand-Bush, 2018; Foster & Chow, 2020) and given that MPCs are increasingly encouraged to facilitate the development of mental skills that can foster athletes' mental health (e.g., Durand-Bush & Van Slingerland, 2021; Fogaca, 2021; Foster & Chow, 2020), MPCs should assist athletes in implementing self-regulation and mindfulness strategies that support both their performance and their psychological, emotional, and social well-being.

It is noteworthy that participants who screened positive for mental illness symptoms (i.e., anxiety, depression, and/or eating disorder) reported benefits from meeting with the authors to discuss mental health support and resources. Without screening and a follow-up meeting, these athletes would likely have not sought care from mental health practitioners or obtained additional support. Screening for mental health challenges should be regularly conducted in a safe and ethical manner to allow athletes to seek help in a timely manner (Durand-Bush & Van Slingerland, 2021). MPCs have a duty to develop their mental health literacy and play a role in

helping identify athletes who are struggling. Importantly, MPCs who are not clinically trained as psychologists or counsellors should refer athletes to licensed mental health practitioners when issues are outside of their scope of practice (Durand-Bush & Van Slingerland, 2021).

Participants from both interventions reported enjoying the flexibility of the asynchronous online delivery format (i.e., accessible from anywhere and at any time), which supports the claim that endurance athletes prefer accessing psychological support in times and locations of their choosing (McCormick et al., 2020). Notwithstanding this beneficial feature, one of their recommendations was to include a synchronous component (e.g., live interactions) to enhance their learning experience. To date, no study in the field of sport psychology has compared the effectiveness of asynchronous, synchronous, and hybrid (i.e., combination of both) delivery formats on specific outcomes of interests using the same intervention content. This merits further investigation given that it may lead to recommendations informing the provision of online sport psychology services, which has rapidly increased due to the COVID-19 pandemic (Price et al., 2020). Online learning platforms (e.g., Kajabi, Thinkific, Teachable) allow the use of various online delivery formats, thus researchers and practitioners may want to leverage these platforms to facilitate the provision of online interventions in their research and/or applied work. These platforms also accommodate the use of context-specific learning aids (e.g., audio and video files, examples) and timelines, which were deemed favourable by participants in this study.

Strengths, Limitations, and Future Research

While the current study generated several gains, some limitations must be acknowledged. The first limitation pertains to placebo and nocebo effects (Lindheimer et al., 2020), which refer to desirable and undesirable outcomes, respectively, resulting from a person's expected and/or learned response to an intervention or situation (Beedie et al., 2018). Given the aforementioned

information, it would be worthwhile to explore participants' expectations before starting interventions to assess if they are associated with changes on the outcomes of interest (Mistretta et al., 2017). A second limitation pertains to the timing and specificity of the interviews. Previous qualitative studies exploring the impact of a SI or MI involved conducting an interview a week (e.g., Baltzell et al., 2014), a month (e.g., Dubuc-Charbonneau & Durand-Bush, 2018), or within two months (e.g., Cote et al., 2019) of completing the intervention. Carrying out the interviews two months post-intervention was deemed important in the current study to assess perceived changes over a longer period of time. However, participants' ability to recall specific details may have been limited. As an example, participants provided less rich and nuanced answers when discussing perceived changes related to mental health in comparison to EIP. This may also have been due to potential lower levels of mental health literacy. Although the first author was careful not to lead participants, it may have been worthwhile to include more specific probes to delve into different aspects of mental health and mental illness symptoms and possibly refer to the content of the workbook to facilitate recall. Finally, it is possible that the athletes who screened positive for mental illness symptoms benefited more from the SI or MI compared to the other athletes given that they sought additional support from mental health practitioners who may have used self-regulation and mindfulness principles in their therapeutic work. Future studies should delve into mental health supports that could potentially impact athletes completing online sport psychology interventions.

Conclusion

The current study examined the impact of an online sport psychology intervention designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation, mindfulness), and mental health through either self-regulation or mindfulness

principles. Findings suggest that both the online SI and MI positively impacted EIP management, mental performance (e.g., attention regulation, motivation), and mental health thus self-regulation and mindfulness should be seen as complementary rather than conflicting or incompatible approaches. Furthermore, athletes reported that their EIP literacy and management skills were limited at the onset of the interventions. Consequently, similar to what was included in the workbook in the current study, an educational component should be integrated to provide an overview of EIP and possible mental performance skills to manage it. Given the prevalence of stressors and mental health challenges in competitive and high performance sport, screening for both positive mental health and mental illness symptoms is recommended to get a comprehensive view of athletes' functioning and allow them to obtain appropriate mental health care and support as needed. Finally, a hybrid delivery format incorporating both asynchronous and synchronous options may be the most effective when providing online sport psychology interventions.

Data Availability Statement

The data that support the findings of this study are available upon reasonable request from the corresponding author, JL. The data are not publicly available because they contain information that could compromise the privacy of the participants.

References

Baltzell, A., Caraballo, N., Chipman, K., & Hayden, L. (2014). A qualitative study of the mindfulness meditation training for sport: Division I female soccer players' experience. *Journal of Clinical Sport Psychology, 8*(3), 221-244. https://doi.org/10.1123/jcsp.2014-0030

Baltzell, A., & Summers, J. (2018). *The power of mindfulness: Mindfulness meditation training in sport (MMTS)*. New York, NY: Springer International.

Beedie, C., Benedetti, F., Barbiani, D., Camerone, E. C., Coleman, D., Davis, A., Elsworth-Edelsten, C., Flowers, E., Foad, A., Harvey, S., Hettinga, F., Hurst, P., Lane, A., Lindheimer, J., Raglin, J., Roelands, B., Schiphof-Godart, L., & Szabo, A. (2018). Consensus statement on placebo effects in sports and exercise: The need for conceptual clarity, methodological rigour, and the elucidation of neurobiological mechanisms. *European Journal of Sport Science, 18*(10), 1383-1389. https://doi.org/10.1080/17461391.2018.1496144

Bertollo, M., Forzini, F., Biondi, S., Di Liborio, M., Vaccaro, M. G., Georgiadis, E., & Conti, C. (2021). How does a sport psychological intervention help professional cyclists to cope with their mental health during the COVID-19 lockdown? *Frontiers in Psychology, 12*(607152), 1-16. https://doi.org/10.3389/fpsyg.2021.607152

Braun, V., & Clarke, V. (2021). One size fits all? What counts as quality practice in (reflexive) thematic analysis? *Qualitative Research in Psychology, 18*(3), 328-352. https://doi.org/10.1080/14780887.2020.1769238

Braun, V., Clarke, V., Hayfield, N., & Terry, G. (2019). Thematic analysis. In P. Liamputtong (Ed.), *Handbook of Research Methods in Health Social Sciences* (pp. 843-860). Singapore: Springer.

Corbally, L., Wilkinson, M., & Fothergill, M. A. (2020). Effects of mindfulness practice on performance and factors related to performance in long-distance running: A systematic review. *Journal of Clinical Sport Psychology, 14*(4), 376-398. https://doi.org/10.1123/jcsp.2019-0034

Cote, T., Baltzell, A., & Diehl, R. (2019). A qualitative exploration of Division I tennis players completing the Mindfulness Meditation Training for Sport 2.0 program. *The Sport Psychologist, 33*(3), 203-212. https://doi.org/10.1123/tsp.2017-0155

Creswell, J. W., & Creswell, J. D. (2018). *Research Design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, CA: SAGE Publications.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Thousand Oaks, CA: SAGE Publications.

Dubuc-Charbonneau, N., & Durand-Bush, N. (2018). Helping student-athletes learn to self-regulate to alleviate burnout: A multiple case study showcasing their challenging but altering experiences. *Qualitative Research in Sport, Exercise and Health, 10*(3), 273-290. https://doi.org/10.1080/2159676X.2018.1433226

Durand-Bush, N., McNeill, K., & Collins, J. (2015). The self-regulation of sport coaches: How coaches can become masters of their own destiny. In P. Davis (Ed.), *The psychology of effective coaching and management* (pp. 217-265). Hauppauge, NY: Nova Publishers.

Durand-Bush, N., & Van Slingerland, K. (2021). *Mental health strategy for high performance sport in Canada*. The Mental Health Partner Group [Canadian Centre for Mental Health

and Sport, Canadian Olympic and Paralympic Sport Institute Network, Game Plan, and Own The Podium]. http://bit.ly/MHStrategyForHPSportInCanada

Edwards, C., & Thornton, J. (2020, March 25). *Athlete mental health and mental illness in the era of COVID-19: shifting focus with a new reality*. British Journal of Sports Medicine Blog. https://blogs.bmj.com/bjsm/2020/03/25/athlete-mental-health-and-mental-illness-in-the-era-of-covid-19-shifting-focus-a-new-reality/

Feilzer, M. Y. (2010). Doing mixed methods research pragmatically: Implications for the rediscovery of pragmatism as a research paradigm. *Journal of Mixed Methods Research, 4*(1), 6-16. https://doi.org/10.1177/1558689809349691

Fogaca, J. L. (2021). Combining mental health and performance interventions: Coping and social support for student-athletes. *Journal of Applied Sport Psychology, 33*(1), 4-19. https://doi.org/10.1080/10413200.2019.1648326

Foster, B. J., & Chow, G. C. (2020). The effects of psychological skills and mindfulness on well-being of student-athletes: A path analysis. *Performance Enhancement & Health, 8*(2-3), 1-8. https://doi.org/10.1016/j.peh.2020.100180

Gardner, F. L., & Moore, Z. E. (2007). *The psychology of human performance: The mindfulness-acceptance-commitment approach*. New York, NY: Springer.

Gardner, F. L., & Moore, Z. E. (2020). Mindfulness in sport contexts. In G. Tenenbaum & R. C. Eklund (Eds.), *Handbook of Sport Psychology* (4th ed.) (pp. 738-750). Hoboken, NJ: John Wiley & Sons.

Harris, R. (2009). *ACT made simple: An easy-to-read primer on acceptance and commitment therapy* (1st ed.). Oakland, CA: New Harbinger Publications.

Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York, NY: Guilford.

Henriksen, K., Hansen, J., & Larsen, C. H. (2020). *Mindfulness and acceptance in sport: How to help athletes perform and thrive under pressure*. New York, NY: Routledge.

Inwood, E., & Ferrari, M. (2018). Mechanisms of change in the relationship between self-compassion, emotion regulation, and mental Health: A systematic review. *Applied Psychology: Health and Well-Being, 10*(2), 215-235. https://doi.org/10.1111/aphw.12127

Kabat-Zinn, J. (1994). *Wherever you go there you are*. New York: Delta.

Kaufman, K. A., Glass, C. R., & Arnkoff, D. B. (2009). Evaluation of Mindful Sport Performance Enhancement (MSPE): A new approach to promote flow in athletes. *Journal of Clinical Sport Psychology, 3*(4), 334-356. https://doi.org/10.1123/jcsp.3.4.334

Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior, 43*(2), 207-222. https://doi.org/10.2307/3090197

[Authors, 2021a] Details omitted for blind reviewing.

[Authors, 2021b] Details omitted for blind reviewing.

Lindheimer, J. B., Szabo, A., Raglin, J. S., & Beedie, C. (2020). Advancing the understanding of placebo effects in psychological outcomes of exercise: Lessons learned and future directions. *European Journal of Sport Science, 20*(3), 326-337. https://doi.org/10.1080/17461391.2019.1632937

Lundgren, T., Reinebo, G., Fröjmark, M. J., Jäder, E., Näslund, M., Svartvadet, P., Samuelsson, U., & Parling, T. (2021). Acceptance and commitment training for ice hockey players: A randomized controlled trial. *Frontiers in Psychology, 12*(685260), 1-9. https://doi.org/10.3389/fpsyg.2021.685260

Mauger, A. R. (2019). Exercise-induced pain. In C. Meijen (Ed.), *Endurance performance in sport: Psychological theory and interventions* (pp. 35-46). Abindgon, Oxon: Routledge.

McCormick, A., Anstiss, P. A., & Lavallee, D. (2020). Endurance athletes' current and preferred ways of getting psychological guidance. *International Journal of Sport and Exercise Psychology, 18*(2), 187-200. https://doi.org/10.1080/1612197X.2018.1486874

McCormick, A., Meijen, C., Anstiss, P. A., & Jones, H. S. (2019). Self-regulation in endurance sports: Theory, research, and practice. *International Review of Sport and Exercise Psychology, 12*(1), 235-264. https://doi.org/10.1080/1750984X.2018.1469161

McNeill, K., Durand-Bush, N., & Lemyre, P-N. (2020). Can learning self-regulatory competencies through a guided intervention improve coaches' burnout symptoms and well-being*? Journal of Clinical Sport Psychology, 14*(2), 149-169. https://doi.org/10.1123/jcsp.2018-0019

Mistretta, E. G., Glass, C. R., Spears, C. A., Perskaudas, R., Kaufman, K. A., & Hoyer, D. (2017). Collegiate athletes' expectations and experiences with mindful sport performance enhancement. *Journal of Clinical Sport Psychology, 11*(3), 201-221. https://doi.org/10.1123/jcsp.2016-0043

NCAA Research. (2020). *NCAA student-Athlete COVID-19 well-being survey (Spring 2020)*. https://ncaaorg.s3.amazonaws.com/research/other/2020/2020RES_NCAASACOVID-19SurveyReport.pdf

Noetel, M., Ciarrochi, J., Van Zanden, B., & Lonsdale, C. (2017). Mindfulness and acceptance approaches to sporting performance enhancement: A systematic review. *International Review of Sport and Exercise Psychology, 12*(1), 139-175. https://doi.org/10.1080/1750984X.2017.1387803

Price, D., Wagstaff, C. R. D., & Thelwell, R. C. (2020). Opportunities and considerations of new media and technology in sport psychology service delivery. *Journal of Sport Psychology in Action*. 1-12. https://doi.org/10.1080/21520704.2020.1846648

Reardon, C. L., Bindra, A., Blauwet, C., Budgett, R., Campriani, N., Currie, A., Gouttebarge, V., McDuff, D., Mountjoy, M., Purcell, R., Putukian, M., Rice, S., & Hainline, B. (2021). Mental health management of elite athletes during COVID-19: A narrative review and recommendations. *British Journal of Sports Medicine, 55*(11), 608-615. https://doi.org/10.1136/bjsports-2020-102884

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology, 57*(6), 1069-1081. https://doi.org/10.1037/0022-3514.57.6.1069

Smith, B., & McGannon, K. R. (2018). Developing rigor in qualitative research: Problems and opportunities within sport and exercise psychology. *International Review of Sport and Exercise Psychology, 11*(1), 101-121. https://doi.org/10.1080/1750984X.2017.1317357

Van Slingerland, K. J., Durand-Bush, N., Bradley, L., Goldfield, G., Archambault, R., Smith, D., Edwards, C., Delenardo, S., Taylor, S., Werthner, P., & Kenttä, G. (2019). Canadian Centre for Mental Health and Sport (CCMHS) position statement: Principles of mental health in competitive and high-performance sport. *Clinical Journal of Sport Medicine, 29*(3), 173-180. https://doi.org/10.1097/JSM.0000000000000665

World Health Organization. (2004). *Promoting mental health: Concepts, emerging evidence, practice*. https://www.who.int/mental_health/evidence/en/promoting_mhh.pdf

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 13-39). San Diego, CA: Academic Press.

PART IV

General Discussion

Research Aims Revisited

The overall aim of this doctoral research was to study competitive and high performance endurance athletes' experiences and management of EIP, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms. A mixed methods experimental design guided by the pragmatic stance was employed across three studies to (a) investigate how elite endurance athletes experience and manage exercise-induced pain (EIP), (b) compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners, and (c) qualitatively examine the impact of the online psychology intervention focusing on self-regulation or mindfulness that was designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation, mindfulness), and mental health.

The following section integrates the quantitative and qualitative findings of the current doctoral research and highlights significant theoretical, methodological, and practical contributions. The strengths and limitations of research are reviewed and recommendations for future research and applied practice are provided throughout the discussion.

Integration of Quantitative and Qualitative Findings

EIP Management

Prior to conducting Study 1, a paucity of studies had examined the experience and management of EIP in endurance sports (Kress & Statler, 2007). In terms of experience, EIP is usually associated with a burning sensation, dull ache, or heaviness in the muscles (Cook et al.,

1997; Miles & Clarkson, 1994). The findings of Study 1 corroborate the aforementioned information, but they also suggest that EIP can be associated with excessive muscle tightness. Almost half of the elite endurance athletes emphasized this feeling that extended beyond typical muscle tension, equating it to feeling like a statue or a rock. This suggests that such tightness may hinder movement efficiency, which is a major determinant of endurance performance (Joyner & Coyle, 2008). To prevent such negative effects, endurance athletes could work with MPCs to learn how to decrease this unnecessary tension in the muscles created by EIP during training and competitions. Further, almost 75% of the participants reported that they perceived the experience of EIP to be detrimental to various performance-related components (e.g., technique, form, stroke rate, pacing), which supports a common belief amongst endurance athletes (e.g., McCormick et al., 2016). This again underscores the importance of learning how to effectively manage EIP. It is recommended that practitioners supporting the mental performance of endurance athletes have specific EIP literacy to prevent and address potential debilitative consequence of EIP.

Participants in Study 1 indicated using a comprehensive set of strategies (n = 17) to manage EIP, which coincide with the three cyclical phases of self-regulation used to optimize performance and learning (i.e., preparation, execution, evaluation; Durand-Bush et al., 2015; Zimmerman, 2000). Preparation strategies (n = 8) seem to be a priority as they were the most discussed by the participants. Execution strategies (n = 6) were also frequently described while evaluation strategies (n = 3) were not as prevalent. In general, the most popular strategies pertained to accepting and committing to experiencing EIP and directing attention away from EIP (i.e., focus on performance-relevant cues and the present moment). Additionally, participants discussed novel strategies typically not reported in the literature to prepare to experience EIP

(i.e., exposing themselves to EIP when warming up, being accountable to training partners or coach, using imagery to rehearse their reactions to EIP) and reduce the aversive effects of EIP while performing (i.e., accelerating the pace). Importantly, according to the findings of Study 1, both self-regulation and mindfulness strategies appear to be key to effectively manage EIP.

If EIP is not adequately managed, it can lead to EIP catastrophizing, which is a negative and exaggerated psychological response that can lead athletes to feel helpless and to ruminate on or magnify the pain (Sullivan et al., 1995). This response can decrease their pain tolerance (Geva & Defrin, 2013) and therefore jeopardize their endurance performance (Astokorki & Mauger, 2017). As such, EIP catastrophizing was a variable of interest in Study 2 and it was measured using an adapted version of the Pain Catastrophizing Scale (PCS; Sullivan et al., 1995). Overall, EIP catastrophizing mean scores decreased after the athletes completed the online self-regulation and mindfulness interventions, albeit the pre-post changes were not statistically significant. Nonetheless, given that EIP affects performance outcomes (Mauger, 2019), these types of improvements reflecting athletes' more functional responses to EIP are promising and warrant further investigation.

In Study 3, participants from both the online self-regulation and mindfulness interventions reported positive perceived changes related to EIP management, which demonstrates the benefits that endurance athletes can derive from an online mental performance intervention. For instance, participants from both interventions felt more equipped to deal with EIP rather than feel helpless and focus on the negative aspects of it (e.g., catastrophize EIP). They reported reframing EIP in more facilitative ways to accept and cope with this type of pain typically encountered in endurance sports. Furthermore, similar to the elite athletes in Study 1, the middle-distance runners from the self-regulation intervention in Study 3 valued the use of

self-talk and segmentation to regulate EIP, which has implications for practitioners developing mental performance programs for endurance athletes. Interestingly, participants from both interventions also explained that learning about EIP and its characteristics was important, which suggests that EIP literacy should be prioritized in interventions.

Overall, when integrating the findings of Studies 1, 2, and 3, it appears that EIP management can be enhanced by using self-regulation and mindfulness strategies. Future research should examine the effectiveness of an intervention that blends both self-regulation and mindfulness strategies in improving EIP management in endurance athletes compared to a standalone self-regulation or mindfulness intervention. One possible way to do this would be to include mindfulness strategies and EIP literacy in the different phases of Zimmerman (2000)'s self-regulation model. For example, the principle of acceptance could be addressed in the forethought (i.e., preparation) phase, whereas attention to the present moment (e.g., directing attention to one repetition/segment at a time) could be implemented in the performance (i.e., execution) phase to complement the attention focusing component that is already included in Zimmerman (2000)'s self-regulation model. Finally, self-as-context, which involves taking a step back to observe internal experiences (e.g., thoughts, feelings, sensations) from a safe place or viewpoint (Harris, 2009), could fit well in the self-reflection (i.e., evaluation) phase to ensure that a blend of mindfulness and self-regulation strategies and principles are targeted across all three cyclical phases.

Mental Performance

Self-Regulation. Taken altogether, the findings of this doctoral research suggest that Zimmerman' s (2000) self-regulation model appears to be a valuable model to examine EIP management in endurance athletes but also to develop interventions specifically designed to help

endurance athletes successfully manage this pain. In particular, the two qualitative studies (Studies 1 and 3) have brought to light specific self-regulation skills that contribute to endurance athletes' mental performance to perform this task. Interestingly, the elite endurance athletes from Study 1 discussed using imagery prior to performance rather than during performance (i.e., phase in which it is usually applied in Zimmerman's model). Using imagery prior to performance allowed the athletes to rehearse their reactions to EIP. Pain management imagery, which refers to athletes imagining themselves coping with injury-related pain, is usually used in the rehabilitation domain (Miller & Munroe-Chandler, 2019). However, according to the findings of Study 1, it appears that imagery can also be used to manage EIP. Given that EIP differs from the pain athletes may experience from an acute or chronic injury, future research should examine how imagery can be leveraged to help endurance athletes improve their ability to manage different types of pain, including EIP. This could lead to the advancement of best practices related to EIP management imagery, which would be helpful for endurance athletes and MPCs working with them.

On another note, McCormick et al. (2018) concluded in their review on self-regulation in endurance sports that future research should be conducted on the self-reflection (i.e., evaluation) phase, which the findings of Study 1 support. As recommended in Study 1, a guided self-reflection tool may be helpful for endurance athletes to evaluate their EIP management and continuously learn from their experiences. According to the results of Study 3 and that of McCormick et al. (2020), endurance athletes appreciate receiving mental performance support when and where they desire (i.e., asynchronous delivery format). It may therefore be valuable to create and upload the aforementioned guided self-reflection tool online so that endurance athletes can use it on their own time, regardless of where they are training and competing. For instance,

athletes could answer questions (e.g., How would you describe your experience of EIP? How effective were you in managing EIP? What strategies were helpful and/or unhelpful in managing EIP? What will you start, stop, and or continue doing to successfully manage EIP?) on a Google Form and automatically receive a copy of their answers by email once they submit them. Additionally, the athletes' reflections could be automatically populated in an Excel file associated with their Google Form, which would allow them to review and reflect on their reflections over time.

Findings from Study 2 showed no significant differences between the self-regulation, mindfulness, and active control intervention in improving self-regulation capacity. However, means across all three groups trended in the positive direction from pre- to post-intervention. Furthermore, when examining the impact of the self-regulation intervention from a qualitative lens in Study 3, participants perceived an increase in their self-regulation capacity. For instance, with regards to self-monitoring, they reported being more aware and able to track how they feel mentally and physically, which is necessary for making adaptive changes to reduce discrepancies between current and ideal states and enrich performance (Durand-Bush et al., 2015). Previous studies with athletes and coaches have shown that in-person self-regulation interventions can lead to improvements in their self-regulation capacity, including their self-monitoring skills (Dubuc-Charbonneau & Durand-Bush, 2018; McNeill et al., 2020). Combined with the findings of the current research, it is becoming apparent that both in person and online types of interventions may benefit athletes' capability to manage themselves.

Participants from the self-regulation group in Study 3 also explained learning how to enhance their self-efficacy, which is a core component of self-regulation that influences all three performance phases (Zimmerman, 2000). Cultivating self-efficacy specifically tailored to EIP

management is important given that it (a) promotes the use of more adaptive coping strategies (Peerdeman et al., 2016), (b) is associated with improved pain tolerance in endurance athletes (e.g., Johnson et al., 2012), and (c) is a popular strategy employed by elite endurance athletes to prepare to experience EIP (see Study 1). Research on EIP management self-efficacy is in its infancy, thus more studies are warranted. From an applied standpoint, self-efficacy is a fundamental skill for consistent, high level athletic performance (e.g., Durand-Bush et al., 2021; Hays et al., 2009) and results of the current research point to the importance of MPCs building situational or contextual efficacy with athletes to optimize their regulation of EIP.

Another important element of self-regulation in the context of sport is attentional control (Durand-Bush et al., 2015; Durand-Bush et al., 2021). Findings from Study 1 corroborate this and suggest a link between attentional control and EIP in endurance sports. More specifically, elite endurance athletes in Study 1 reported focusing on performance-relevant cues (e.g., cadence, technique, relaxing, race plan) and the present moment (e.g., one repetition/segment at a time) when striving to manage EIP. This supports Brick et al.' (2019) findings that endurance athletes engage in various attentional strategies to optimize performance. Study 3 extends these results by demonstrating that attention regulation is not only important but may also be increased as a result of participating in an online mental performance intervention. Interestingly, endurance athletes from both the self-regulation and mindfulness interventions in Study 3 reported this. Participants in the self-regulation group indicated an increased ability to direct their attention to appropriate cues while those in the mindfulness group perceived being more skilled at keeping their attention in the present moment. While self-regulation and mindfulness are often portrayed as opposite constructs, they have attention regulation as a core element, at least according to some scholars who cite the self-regulation of attention as a dimension of mindfulness (Bishop et

al., 2004). Additionally, according to Harris (2009), mindfulness involves flexibility of attention, which is the ability to consciously direct, broaden, or focus attention on different aspects of an experience. From this perspective, being able to direct and maintain attention in the present moment and flexibly shift it as necessary requires self-control, which shows the interplay between self-regulation and mindfulness. Given the aforementioned information and the salience of attentional regulation in this research project as well as broader sport, scholars and MPCs working with endurance athletes are encouraged to continue exploring and testing the benefits of combining both self-regulation and mindfulness strategies to optimize their capacity to manage attention.

Mindfulness. Findings from this doctoral research, and particularly Studies 1 and 3, provide support for the positive contributions of mindfulness in endurance sports. While Study 2 showed no significant differences between the self-regulation, mindfulness, and active control intervention in improving dispositional mindfulness, athletes' mean average scores within the three groups show improvement trends from pre- to post-intervention, which is encouraging. Moreover, Study 1 findings showed that acceptance of EIP was the second most reported strategy employed by elite endurance athletes to manage this type of pain. It thus seems that the more athletes can accept and welcome uncomfortable states caused by EIP, the more they will be able to persevere and reach their goals. Finally, Study 3 provided insight into athletes' perceived favourable changes from completing the mindfulness intervention. In particular, they shared an improved capacity to accept failures, alternative outcomes, and environmental conditions (i.e., acceptance), and to create distance between themselves and their unproductive thoughts (i.e., defusion). Acceptance and defusion are key mindfulness processes helping athletes to free their attention and invest it in the present moment, rather than using it to alter or struggle with internal

experiences (Birrer et al., 2020). These findings were not surprising given that both ACT and MAC approaches aim to improve acceptance and defusion (Gardner & Moore, 2007; Harris, 2009) and have been reported as benefits by other scholars investigating mindfulness interventions (Baltzell et al., 2014; Cote et al., 2019). Interestingly, mindfulness was suggested as a potential skill to improve movement efficiency in endurance sports (Brick et al. 2019), which can largely influence endurance performance (Joyner & Coyle, 2008). Researchers should look into assessing physical aspects of performance as an outcome of mindfulness interventions in addition to psychological ones. This may, however, be difficult to do during a pandemic if training and competitions are severely compromised and athletes and researchers are not engaging in regular in-person activities. When considering all three studies within the current research project, findings regarding mindfulness are promising and more studies are needed to advance comprehensive mental performance programs for endurance athletes that help address key demands like EIP.

Mental Health and Mental Illness

The current doctoral research brings to light important information regarding mental health and mental illness in a sample of endurance athletes. In general, the findings from Study 2 show that mean scores for mental health and mental illness symptoms (i.e., anxiety, depression, and/or eating disorder) trended in the positive direction between Time 1 and Time 2. However, these changes were not statistically significant for the most part. The researchers were compelled to show the differences in scores when including and excluding a sub-sample of athletes who screened positive for mental illness symptoms. All in all, this sub-group of athletes showed markable improvements from completing the self-regulation and mindfulness interventions, as indicated by their evolution scores, in comparison to that of the other athletes (see Table 1 in

Article 3). However, these improvements did not generate statistical significance in the mixed ANOVAs, except for when the sub-sample of participants was excluded from the analysis for the anxiety measure. Surprisingly, the active control intervention (i.e., nutrition for endurance athletes) was statistically more effective in reducing the anxiety symptoms of athletes than the mindfulness intervention. Plausible reasons for this may be that participants from the active control group (a) developed healthy eating patterns that met food-based dietary recommendations and nutrient requirements, which has been shown to support the prevention and treatment of anxiety (Kris-Etherton et al., 2021), and (b) increased their feelings of control, which has been associated with lower anxiety (Gallagher et al., 2014). Other reasons include a possible regression to the mean and ceiling effect (see Article 2 in the Results section).

Irrespective of the results of Study 2, Study 3 revealed that participants from both the self-regulation and mindfulness interventions perceived positive changes regarding their mental health two months post-intervention. This suggests that both self-regulation and mindfulness skills and strategies may help strengthen athletes' mental health. For example, athletes reported improving their autonomy, self-compassion, and sources of support, which have been shown to positively influence mental health (Inwood & Ferrari, 2018; Ryff, 1989). MPCs, who are key members of athletes' integrated support team, are therefore encouraged to integrate principles of self-compassion in self-regulation and mindfulness training to foster mental health. When considering that mental health is characterized by emotional, psychological, and social well-being (Van Slingerland et al., 2019; World Health Organization, 2004), it was surprising that athletes did not address additional mental health dimensions (e.g., emotional regulation, purpose in life, social integration) and delve into specific mental illness symptoms during the interviews. However, this may point to persisting barriers in sport such as stigma and low mental health

literacy (Durand-Bush & Van Slingerland, 2021). In future studies, it would be helpful to take additional time at the onset of interviews to create psychological safety and find ways to unobtrusively probe for details and examples regarding these sensitive topics. Researchers should ensure to have a strong foundation of mental health literacy to comfortably converse with athletes and put them at ease to disclose potentially difficult information. In this context, mental health literacy refers to the proficiency with which individuals understand the signs and symptoms of mental health and mental illness and how they can be improved, how stigma can be decreased, and how help-seeking and self-management capabilities can be enhanced (Kutcher et al., 2016).

Findings from Study 3 showcase the importance of screening athletes for mental health and mental illness symptoms in a safe and ethical manner. Although it is currently not the norm to conduct such screening procedures in competitive and high performance sport in Canada, screening is recommended to detect challenges early and allow athletes to seek help in a timely manner (Durand-Bush & Van Slingerland, 2021). Further, the results from Study 3 show the value of introducing and cultivating mental health literacy within the sport community (e.g., athletes, coaches, support staff). The athletes who met with the researchers (i.e., MPCs well versed in the area of sport and mental health) because they scored above recommended norms for mental illness symptoms shared their appreciation for having had the opportunity to do this. More emphasis could be put on mental health literacy in the education and training of MPCs in Canada. To this end, more academic courses and professional development opportunities should be offered to improve current gaps. For instance, all MPCs should complete a course in psychopathology (Association for Applied Sport Psychology, 2021) and mental health first aid (Mental Health Commission of Canada, 2021) to understand and recognize different mental

illness symptoms and know how to respond in crisis situations and refer athletes to clinical practitioners. MPCs spend considerable time on and off the field with athletes and coaches and are often the first point of contact to detect mental health challenges and direct these individuals to appropriate sources (Durand-Bush & Van Slingerland, 2021).

When integrating the findings of Study 2 (i.e., positive trends) and Study 3 (i.e., perceived favourable changes), it appears that mental health may be enhanced by mental performance interventions. Mental skills training targeting self-regulation and mindfulness has been shown to significantly contribute to student-athletes' mental health (Dubuc-Charbonneau & Durand-Bush, 2018; Foster & Chow, 2020). Given that MPCs are increasingly encouraged to facilitate the development of mental skills that can foster not only athletic performance but also mental health (e.g., Durand-Bush & Van Slingerland, 2021; Fogaca, 2021; Foster & Chow, 2020), MPCs should consider tailoring their programs to support athletes' overall functioning (e.g., psychological, emotional, and social well-being), all the while respecting their scope of practice. To accomplish this, they should utilize well supported mental performance and mental health assessment tools to assess strengths and weaknesses (Durand-Bush et al., 2021; Durand-Bush & Van Slingerland, 2021). From both a research and practice standpoint, assessing athletes' total functioning (when one has the qualifications to do so) will help the sport community gain further insight into the impact of mental performance interventions for strengthening mental health and preventing and reducing mental illness symptoms in the athletic population.

Contributions

Theoretical Contributions

This doctoral research was informed by conceptual models addressing the variables of interest such as self-regulation, mindfulness, mental health, and mental illness. Unfortunately, there are no known frameworks that pertain to EIP, however, this is understandable as this area of research is still in its infancy.

With regards to self-regulation, overall findings provide support for the use of Zimmerman's (2000) model to investigate and explain the management of EIP in endurance sports. Results of Study 1 demonstrate how EIP is addressed across the three well-known phases of performance in sport, that is, preparation, execution, and evaluation (Durand-Bush et al., 2015). Zimmerman's model allowed the researchers to uncover, using a temporal standpoint, a variety of strategies used by elite athletes when encountering EIP in training and competitions. In Study 1, it was interesting to note how certain strategies were relevant across more than one phase of performance (e.g., develop [preparation] and implement [execution] a segmented performance plan) while others were quite distinct across each phase (e.g., implement typical pre-performance routine [preparation], regulate breathing and relax [execution], talk with a coach [evaluation]). The diversity of self-regulation strategies, depending on the phase of sport performance, has been reported in other research in which Zimmerman's self-regulation model was used to guide the inquiry (e.g., Collins & Durand-Bush, 2014; McNeill et al., 2020).

The codebook thematic analysis performed in Studies 1 and 3 permitted the use of both deductive (e.g., based on Zimmerman's model) and inductive reasoning, which was important as it brought to light the salience of mindfulness strategies to manage EIP and nurture mental performance and mental health. Given that both mindfulness and self-regulation were

emphasized as being key mental performance skills to regulate EIP in the two qualitative studies, there is value in exploring how mindfulness principles and strategies could be included in the different phases of Zimmerman's (2000) self-regulation model to enhance EIP management in endurance athletes. This would show how the two mental performance constructs, which can be seen as paradoxical, can co-exist in theory and practice. Overall, it seems that using a more holistic approach that combines self-regulation and mindfulness is preferable to help endurance athletes cope with non-threatening pain in their sport. Having said this, it is important to acknowledge potential tensions that could arise in the empirical study and application of differing theories such as self-regulation and mindfulness. MPCs are trained to integrate various counselling approaches and theories to inform their mental performance work and can borrow from different traditions to do so (e.g., first, second, and third wave Cognitive Behavioural Approaches; Durand-Bush et al., 2021). All in all, it is the responsibility of practitioners to recognize the contributions and limitations of the consulting frameworks they use and strive to remain client-centered and ethical in their decision-making when implementing strategies to improve performance and mental health.

This doctoral research also advances the literature on the use of ACT and the MAC approach to conduct intervention studies targeting mindfulness. While these frameworks are not theories per se, they have been empirically supported by scholars and linked to positive outcomes in and outside of sport (Gloster et al., 2020; Henriksen et al., 2020; Huffman et al., 2020; Noetel et al., 2017). ACT and the MAC approach both have commonalities and differences and the current researchers opted to combine them to offer a comprehensive mindfulness intervention that included eight modules to mirror that of the self-regulation intervention. The mindfulness intervention was theoretically informed by all key components of

ACT and the MAC approach (e.g., all six core processes [defusion, acceptance, contacting the present moment, self-as-context, values, committed action], conceptual definitions, specific exercises) but the pre-determined and systematic structure used to deliver the intervention in this project was not particularly aligned with ACT and more so with MAC (Gardner & Moore, 2007; Harris, 2009). This was deemed essential to respect RCT guidelines and limit any potential confounding factors. Another uniqueness of the mindfulness intervention pertained to the specific content related to endurance athletes and EIP. According to the findings of Study 3, athletes reported benefitting from this specialized lens thus scholars and practitioners interested in endurance sport contexts stand to learn from this. All in all, the current research shows that both ACT and the MAC approach have merit and it is possible to integrate and adapt them to design and deliver context-specific interventions targeting specific outcomes such as EIP. To the researchers' knowledge, compared to previous inquiries that have integrated sport psychology interventions based solely on ACT or the MAC approach, the current research was the first one in which both ACT and the MAC approach were combined to inform a mindfulness intervention.

The findings of the current dissertation also illustrate the value of employing Keyes' (2002) two-continua model when investigating the constructs of mental health and mental illness in the context of competitive and high performance endurance sports. It is important to clearly distinguish between mental health and mental illness variables and assess them using different measures. Previous studies have been criticized for assessing mental health based on the presence or absence of mental illness (e.g., Gross et al., 2018). However, according to contemporary views and recent research, this is no longer recommended (Keyes, 2002; Van Slingerland, 2018). Although Study 2 did not generate significant statistical results for the most part, it was beneficial to assess mental health based on its three dimensions of well-being, as well

as symptoms of three common and well-cited mental illnesses affecting athletes, that is, anxiety, depression and eating disorders (Golding et al., 2020; Gouttebarge et al., 2019; Joy et al., 2016; Reardon et al., 2019; Rice et al., 2016, 2019). This enabled the researchers to see, based on raw scores, that while some athletes were flourishing, others scored above the recommended thresholds for mental illness symptoms and required follow-up. This brings to light the critical aspects of reality and humanity behind any research project, particularly when studying human behaviour.

Mental performance was another key construct in the current dissertation that can be linked to mental health and mental illness. Recently, Van Slingerland (2021) proposed to extend Keyes' (2002) two-continua model by including a mental performance axis (see Figure 4). According to Van Slingerland (2021), the inclusion of mental performance in an extended three-dimensional model would help to account for the interplay between mental health, mental illness, and mental performance, for which empirical evidence is accruing in sport (Durand-Bush et al., 2021; Durand-Bush & Van Slingerland, 2021). The findings of the current doctoral research show support for the integration of a mental performance axis in Keyes' (2002) model. For instance, significant inter-relationships were found between mental performance, mental health, and mental illness symptoms. More specifically, the Pearson correlation coefficients calculated at both time points with and without the subset of nine participants who screened positive for mental illness symptoms (see Tables 6, 7, 8, and 9 in Part II) showed significant positive relationships between:

(a) mental performance variables (i.e., self-regulation and mindfulness);

(b) mental performance (i.e., self-regulation) and mental health;

(c) mental illness symptoms (i.e., anxiety and depression).

Furthermore, significant negative relationships were found between:

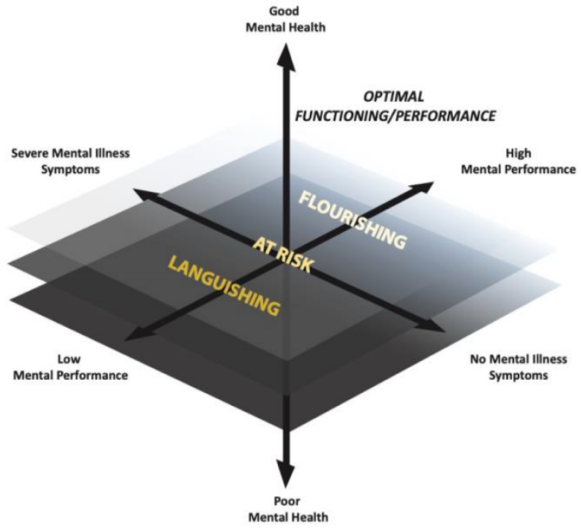
(a) mental performance (i.e., mindfulness) and mental illness symptoms (i.e., anxiety);

(b) mental health and mental illness symptoms (i.e., depression).

In addition, Study 3 revealed that strengthening the mental performance skills of self-regulation and mindfulness positively contributed to athletes' mental health. Employing Van Slingerland (2021)'s three-dimensional model of mental health, mental illness, and mental performance would allow researchers to investigate the extent to which the three aforementioned constructs interact to influence functioning and performance in athletes. Additionally, this model may help researchers and MPCs to develop and implement interventions that simultaneously target mental health and mental performance enhancement as well as mental illness prevention and recovery (Van Slingerland, 2021). Future qualitative researchers investigating the perceived impact of such interventions could also use this model to be more strategic, comprehensive, and precise when interviewing participants.

Figure 4.

Three-Dimensional Model of Mental Health, Mental Illness, and Mental Performance (Van Slingerland, 2021)



Methodological Contributions

The current doctoral research makes several methodological contributions. First, although mixed methods research is increasingly being used in the field of sport psychology (Ryba et al., 2020), few studies have employed complex mixed methods designs such as the mixed methods experimental design used in the current project. Prior to the current RCT, only three other RCTs investigated the effectiveness of ACT or MAC interventions in improving specific outcomes in athletes (i.e., one for ACT [Lundgren et al., 2021) and two for MAC [Gross et al., 2018; Josefsson et al., 2019). The current RCT was novel given that it focused on comparing the effectiveness of online (i.e., rather than in-person) interventions and included three (i.e., rather than two) groups. The use of an active control group to assess the effectiveness of the online interventions, which was recommended in previous reviews (e.g., Carraça et al., 2018; Van Dam et al., 2018) is a strength of Study 2. To date, intervention studies have seldom included an active control group in which participants received an intervention of equal time and attention in comparison to the other intervention group(s). Indeed, RCTs in the sport psychology literature have usually included a wait-list control group rather than an active control group (e.g., Lundgren et al., 2021). Considering the overall results of Study 2, it is important to further reflect on the content of interventions administered to active control groups in future investigations. Nutrition is an important topic for endurance athletes, which provided the rationale for targeting this topic for the control group as the researchers believed it would promote engagement and retention. However, for reasons unanticipated by the researchers (e.g., COVID pandemic and salience of mental health), this intervention ended up benefitting the control group just as much as the self-regulation and mindfulness interventions did for the athletes in the other two groups. As such, it is recommended that researchers consider utilizing a different topic than nutrition as a

control intervention in future studies of this type to better assess the impact of mental performance interventions.

Another methodological contribution of this research is the sequential design used for Studies 1, 2, and 3. It is noteworthy that Studies 2 and 3 were the first to compare an online self-regulation and mindfulness intervention for endurance athletes using quantitative and qualitative methods, respectively. The use of the results of Study 1 to inform the self-regulation and mindfulness interventions developed and implemented in Study 2 arguably contributed to the ecological validity of these interventions (Nastasi & Schensul, 2005). Notwithstanding this strength, one way to have enhanced the methodological design of Studies 2 and 3 would have been to assess athletes' expectations regarding the anticipated effectiveness of the interventions, given a common limitation associated with placebo and nocebo effects. For example, researchers conducting quantitative studies can use a Likert scale for each variable included in the pre-intervention survey that measures anticipated changes. In qualitative studies, researchers can include a short pre-intervention interview to explore with participants what they hope to gain from completing the intervention. All in all, assessing expectations of participants prior to commencing the intervention would have enabled the researchers to see if expectations were associated with changes on the outcomes of interest.

Lastly, the measures used to assess the variables in Study 2 are well supported in the literature. However, some of the reliability coefficients reported in Table 5 in Part II of the dissertation (e.g., GAD-7 and EAT-26 at Time 2, for the sample without the subset of participants screening positive for mental illness symptoms) were below the acceptable norm. Consequently, researchers should further review these scales before considering integrating them in future studies with endurance athletes. On another note, the current project was the first to

include an adaptation of the Pain Catastrophizing Scale (PCS; Sullivan et al., 1995) to quantify EIP catastrophizing. Given the high internal consistency of this scale (i.e., $\alpha = 0.84\text{-}0.87$), scholars are encouraged to use this adapted version of the PCS by inserting the definition of EIP at the beginning of the scale and by replacing the word "pain" by "EIP" throughout.

Contributions to Applied Practice

Several practical recommendations can be drawn from the current doctoral research. First, findings from Study 1 led to the creation of a map of concrete strategies that endurance athletes utilize to manage EIP (i.e., see Figure 1 in Article 1). This map can be valuable for MPCs working with endurance athletes given that no model or framework exists thus far to represent and inform the experience and management of EIP in sport. In particular, MPCs can use this to generate discussion with athletes and help them periodize the development and implementation of strategies based on phases of performance (i.e., before, during, after performance). Given the prevalence and salience of the strategies reported by the elite athletes in Study 1, MPCs are encouraged to (a) emphasize the development of preparation strategies to manage EIP, especially acceptance of EIP, (b) help athletes direct their attention on performance-relevant cues and the present moment when experiencing EIP, and (c) develop a self-reflection tool that athletes can use to assess their experiences and management of EIP. Further, it is recommended that MPCs assist endurance athletes in improving their EIP literacy and implement a combination of both self-regulation and mindfulness strategies specifically tailored to EIP management.

Other practical contributions of this research pertain to the self-regulation and mindfulness interventions that were specifically designed for endurance athletes and the regulation of EIP. MPCs can utilize the self-regulation and mindfulness content and exercises

provided in Appendix H and Appendix I of this dissertation to improve EIP management, mental performance, and mental health in endurance athletes. The modules could be applied when doing individual or team work, delivering workshops or webinars, or creating resources for endurance sport organizations. For instance, an MPC aiming to help a speed skater (i.e., competing in the 1000 meters and 1500 meters) to improve their capacity to withstand EIP in preparation for an important race coming up in two months could use a combination of the self-regulation and mindfulness topics and exercises and periodize them over four weeks to achieve specific goals and outcomes. After assessing the skater's EIP experiences and management skills (e.g., via EIP catastrophizing, self-regulation, and mindfulness scales), the MPC could structure an online intervention based on identified needs and gaps (see Table 10).

Table 10.

Example of an Online Blended Self-Regulation and Mindfulness Intervention With a Speed Skater

Self-Regulation	Mindfulness
Week 1	
Monday Topic: Strategic planning Exercise: 3.3 part B (segmented performance plan) Delivery format: Asynchronous	Thursday Topic: Defusion Exercise: 2.3 (I'm noticing that I'm having the thought that …) Delivery format: Synchronous
Week 2	
Monday Topic: Self-talk Exercise: 4.4 (motivational self-talk) Delivery format: Asynchronous	Thursday Topic: Acceptance Exercise: 3.2 part D (allowing the sensation of EIP to simply sit there) Delivery format: Synchronous

Example of an Online Blended Self-Regulation and Mindfulness Intervention With a Speed Skater (continued)

Week 3	
Monday	Thursday
Topic: Focus	Topic: Acceptance
Exercise: 5.2 part C (narrow-external focus)	Exercise: 3.3 part A (quicksand metaphor)
Delivery format: Synchronous	Delivery format: Asynchronous
Week 4	
Monday	Thursday
Topic: Imagery	Topic: Contacting the present moment
Exercise: 6.4 (practicing how to effectively respond to EIP using imagery)	Exercise: 4.6 (5-4-3-2-1)
Delivery format: Synchronous	Delivery format: Asynchronous

Note. MPCs should practice performing the self-regulation and mindfulness exercises first in order to familiarize themselves and be comfortable teaching or discussing them with athletes.

Finally, this doctoral research advances knowledge and practice regarding online interventions. Very few studies have examined the effectiveness of online mental performance interventions, which is an important gap, particularly as one considers the current COVID-19 pandemic and the need for practitioners to use virtual means to provide support and services to athletes. Results of Study 3 provide support for implementing asynchronous interventions with endurance athletes. Participants in both groups who completed the self-regulation or mindfulness intervention reported benefits, including improved motivation, attention, autonomy, and self-compassion. Having said this, the athletes also recommended adding a synchronous component to optimize experiences – a recommendation that was also highlighted by McNeill et al. (2020) in their self-regulation intervention study with coaches. It appears that a hybrid delivery format

may be the best option when providing online mental performance interventions. Scholars and MPCs interested in offering interventions should therefore explore the use of online learning platforms (e.g., Kajabi, Thinkific, Teachable) because they are secure and they allow the use of asynchronous, synchronous, and hybrid delivery formats. Offering flexibility when working with athletes is important and in line with humanistic approaches to helping (Corey, 2015). In the current COVID-19 pandemic climate, practitioners may be overly relying on synchronous interventions delivered through video conference (e.g., Zoom) when in-person interactions are prohibited, which can cause Zoom fatigue (i.e., fatigue associated with video conference use including general fatigue, visual fatigue, social fatigue, motivational fatigue, and emotional fatigue; Fauville et al., 2021). Employing a hybrid delivery format would allow athletes to work on strengthening their mental performance and mental health at their own pace, while being able to virtually meet with MPCs as necessary. All in all, this could enhance the effectiveness of online mental performance interventions while protecting both athletes and MPCs from Zoom fatigue, which has implications for performance and mental health (Fauville et al., 2021).

Limitations and Future Research

Notwithstanding the contributions of the current doctoral research, there are limitations that must be considered. First, Caucasian athletes as well as English- and French-Canadian athletes were overrepresented in the samples in this research. The sample in Study 1 was comprised entirely of Caucasian athletes and the samples in Study 2 and 3 were primarily comprised of French and English Canadian athletes (i.e., 86.54% and 75%, respectively). Researchers should make an effort in recruiting diverse samples to examine potential race- and ethnic-related differences and include varied and inclusive perceptions and experiences. Another limitation pertains to the COVID-19 pandemic and the confounding variables it may have

generated (e.g., limited exposure to EIP due to modified training periodization, increased strains on athletes that can trigger or exacerbate mental health challenges and illnesses). Before commencing the online interventions, stratified randomization was used to distribute potential confounding variables more evenly among the groups than chance alone could have otherwise assured. Despite this deliberate effort, the COVID-19 pandemic hit the world and dramatically changed how both sport and life were and are still today being experienced. Unfortunately, it is difficult to know if and to what extent the effects regarding the outcomes of interest observed in Studies 2 and 3 have been influenced by the global disaster. Overall, this weakens the internal validity of the current research project.

The timing of the post-intervention survey in Study 2 and the interviews in Study 3 also represents a limitation of the current research. Non-significant findings in Study 2 may potentially be attributed to participants not having enough time to assimilate what they learned in the study. Researchers are therefore encouraged to survey participants at more than one time point after an intervention to determine both short- and long-term effects. Conducting the interviews two months post-intervention in Study 3 was deemed important to assess perceived changes over a longer period of time. However, participants' ability to recall specific details may have been limited. Despite the doctoral candidate's effort to not lead participants, it may have been worthwhile to prompt the participants on specific aspects of mental health and mental illness symptoms.

Another limitation pertains to sample size and the impact of this on data analyses. Given the limited sample size in Study 2 and the high number of dependent variables, the researchers decided to include a global score to measure EIP catastrophizing based on the adapted PCS (Sullivan et al., 1995) and a global score to measure mental health using the MHC-SF (Keyes et

al., 2008). In future intervention studies with larger sample sizes, the impact of psychological interventions on EIP catastrophizing and mental health should be assessed using the subscales scores of the PCS (i.e., rumination, magnification, and helplessness) and MHC-SF (i.e., emotional, psychological, and social well-being). This initiative may help to further nuance the effectiveness of mental performance interventions in improving these outcomes of interest. Similarly, it would have been ideal to ask participants in Study 3 questions related to each subscale of the PCS and MHC-SF when conducting the semi-structured interviews. This may have incited participants to provide more in-depth answers. Furthermore, it would have been interesting to equally conduct interviews with participants who completed the control (i.e., nutrition) intervention to get insight into possible factors leading the participants to improvements.

Lastly, there are limitations pertaining to the use of self-reported measures in Study 2, which are susceptible to response biases including social desirability (Van de Mortel, 2008). Social desirability, which refers to the tendency for individuals to present a favourable image of themselves when completing questionnaires (Van de Mortel, 2008), is most likely to occur in responses to socially sensitive questions (King & Bruner, 2000). Additionally, this bias affects the validity of a questionnaire (Huang et al., 1998) and therefore the validity of the results (Van de Mortel, 2008). It is possible that athletes from Study 2 responded to the measures in a more socially acceptable manner. For instance, they may have underreported their mental illness symptoms. The opposite effect may also have happened where athletes may have overestimated the effectiveness of the intervention. Future intervention studies assessing the effectiveness of psychological interventions using self-reported measures should include a social desirability scale to detect and control for social desirability to improve the validity of the research. The most

widely used scale to detect social desirability is the 33-item Marlowe-Crowne Social Desirability Scale (MCSDS; Crowne & Marlowe, 1960).

PART V

Conclusion

Endurance athletes must learn how to withstand EIP. However, the literature focusing on psychological strategies to manage EIP is limited. Endurance athletes are also susceptible to experiencing mental health challenges, particularly since they face many complex demands including EIP. To develop sound mental performance interventions that can help endurance athletes successfully manage EIP and sustain mental performance and mental health, there is a need for greater insight into how EIP is experienced and managed by accomplished endurance athletes. Given the busy schedules of athletes and the limitations caused by the current pandemic, there is also a need for online interventions. This provided the rationale for conducting this doctoral research of which the aim was to study competitive and high performance endurance athletes' experiences and management of EIP, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms. The findings of the three studies conducted within this project are summarized below:

Study 1: Investigate how elite endurance athletes experience and manage EIP.

Findings from Study 1 suggest that the experience of EIP is highly cognitive and generally perceived as detrimental to performance if not effectively managed. Elite endurance athletes reported using several psychological strategies to manage EIP across different phases of performance (i.e., preparation, execution, and evaluation). Further, findings suggest that preparation strategies seem to be a priority. In general, the most popular strategies pertained to accepting and committing to experience EIP and directing attention away from EIP. Exposing oneself to EIP when warming up, being accountable to training partners or coaches, using imagery to rehearse reactions to EIP, and accelerating one's pace were novel strategies typically

not reported in the literature. Importantly, combining self-regulation and mindfulness strategies appears to be key to effectively regulate EIP.

Study 2: Compare the effectiveness of an online self-regulation and mindfulness intervention in improving EIP catastrophizing, mental performance (i.e., self-regulation, mindfulness), mental health, and mental illness symptoms in middle-distance runners.

Findings from Study 2 indicate that contrary to hypotheses, the self-regulation and mindfulness interventions did not lead to significant improvements in the targeted outcomes (i.e., EIP catastrophizing, self-regulation, mindfulness, mental health, mental illness symptoms [i.e., anxiety, depression, eating disorders]) when the full sample was considered, although positive changes in expected directions were noted. Interestingly, when excluding athletes who screened positive for mental illness symptoms, the active control intervention was more effective in reducing anxiety symptoms than the mindfulness intervention. Overall, the self-regulation and mindfulness interventions were not any more effective than the active control intervention in improving the selected outcomes. Including an active control group within a mixed methods experimental design is recommended in future research, however, the content of the control intervention should be carefully considered.

Study 3: Qualitatively examine the impact of an online psychology intervention focusing on self-regulation or mindfulness and designed to help endurance athletes improve EIP management, mental performance (i.e., self-regulation and mindfulness), and mental health.

According to the findings of Study 3, both the self-regulation and mindfulness interventions positively influenced EIP management, mental performance, and mental health. Hence, self-regulation and mindfulness should be seen as complementary rather than conflicting

or incompatible approaches. Combining both self-regulation and mindfulness principles as well as EIP literacy and EIP management strategies in future interventions with endurance athletes is encouraged. Screening and providing support to athletes who are experiencing mental illness symptoms as well as assessing expected changes at the onset of interventions are highly recommended. Lastly, while there are benefits to completing asynchronous mental performance interventions, a hybrid format integrating both self-directed and live elements may be the most effective when providing online sport psychology support.

PART VI

References and Appendices

This section includes a list of the references cited in the current doctoral dissertation that are not already included in the reference list of the three articles provided in Part III. Appendices that were referenced throughout the doctoral dissertation follow this reference list.

References

Aron, C. M., Harvey, S., Hainline, B., Hitchcock, M. E., & Reardon, C. L. (2019). Post-traumatic stress disorder (PTSD) and other trauma-related mental disorders in elite athletes: A narrative review. *British Journal of Sports Medicine, 53*(12), 779-784. https://doi.org/10.1136/bjsports-2019-100695

Association for Applied Sport Psychology. (2021). *Certified Mental Performance Consultant (CMPC) Certification Program Candidate Handbook*. https://appliedsportpsych.org/site/assets/files/30025/cmpccandidatehandbook-12_21.pdf

Astokorki, A., Flood, A., & Mauger, A. (2021). Images depicting human pain increase exercise-induced pain and impair endurance cycling performance. *Journal of Sports Sciences, 39*(2), 138-146. https://doi.org/10.1080/02640414.2020.1809162

Bai, Z., Luo, S., Zhang, L., Wu, S. & Chi, I. (2020). Acceptance and Commitment Therapy (ACT) to reduce depression: A systematic review and meta-analysis. *Journal of Affective Disorders, 260*(1), 728-737. https://doi.org/10.1016/j.jad.2019.09.040

Baltzell, A.L., & Summers, J. (2016). The future of mindfulness and performance across disciplines. In A. L. Baltzell (Ed.), *Mindfulness and performance* (pp. 515-541). New York, NY: Cambridge University Press.

Birrer, D, Diment, G., & Schmid, O. (2020). Helping athletes defuse and accept: Thoughts and emotions are not the enemies. In K. Henriksen, J. Hansen, & C. H. Larsen (Eds.), *Mindfulness and acceptance in sport: How to help athletes perform and thrive under pressure* (pp. 59-71). New York, NY: Routledge.

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., Segal, Z. V., Abbey, S., Speca, M., Velting, D., & Devins, G. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3), 230-241. https://doi.org/10.1093/clipsy.bph077

Breslin, G., Smith, A., Donohue, B., Donnelly, P., Shannon, S., Haughey, T. J., Vella, S. A., Swann, C., Cotterill, S., Macintyre, T., Rogers, T., & Leavey, G. (2019). International consensus statement on the psychosocial and policy-related approaches to mental health awareness programmes in sport. *BMJ Open Sport & Exercise Medicine, 5*(1), 1-7. http://doi.org/10.1136/bmjsem-2019-000585

Brick, N. E., MacIntyre, T. E., & Campbell, M. J. (2016). Thinking and action: A cognitive perspective on self-regulation during endurance performance. *Frontiers in Physiology, 7*(159), 1-7. https://doi.org/10.3389/fphys.2016.00159

Canadian Mental Health Association. (2021, July 19). *Fast facts about mental health and mental illness*. https://cmha.ca/brochure/fast-facts-about-mental-illness/

Carraça, B., Serpa, S., Palmi, J., & Rosado, A. (2018). Enhance sport performance of elite athletes: The mindfulness-based interventions. *Cuadernos de Psicología del Deporte, 18*(2), 79-109.

Castaldelli-Maia, J. M., Gallinaro, J., Falcão, R. S., Gouttebarge, V., Hitchcock, M. E., Hainline, B., Reardon, C. L., & Stull, T. (2019). Mental health symptoms and disorders in elite

athletes: A systematic review on cultural influencers and barriers to athletes seeking treatment. *British Journal of Sports Medicine, 53*(11), 707-721. https://doi.org/10.1136/bjsports-2019-100710

Chang, C., Putukian, M., Aerni, G., Diamond, A., Hong, G., Ingram, Y., Reardon, C. L., & Wolanin, A. (2020). Mental health issues and psychological factors in athletes: Detection, management, effect on performance and prevention: American Medical Society for Sports Medicine Position Statement—Executive Summary. *British Journal of Sports Medicine, 54*(4), 216-220. http://doi.org/10.1136/bjsports-2019-101583

Collins, J., & Durand-Bush, N. (2014). Strategies used by an elite curling coach to nurture athletes' self-regulation: A single case study. *Journal of Applied Sport Psychology, 26*(2), 211-224. https://doi.org/10.1080/10413200.2013.819823

Collins, D., MacNamara, Á, & Cruickshank, A. (2019). Research and practice in talent identification and development: Some thoughts on the state of play. *Journal of Applied Sport Psychology, 31*(3), 340-351. https://doi.org/10.1080/10413200.2018.1475430

Corey, G. (2015). *Theory and practice of counseling & psychotherapy* (10th ed.). Belmont, CA: Thomson/Brooks/Cole.

Craner, J. R., Gilliam, W. P., & Sperry, J. A. (2016). Rumination, magnification, and helplessness: How do different aspects of pain catastrophizing relate to pain severity and functioning? *The Clinical Journal of Pain, 32*(12), 1028-1035. https://doi.org/10.1097/ajp.0000000000000355

Creswell, J. W. (2015). Revisiting mixed methods and advancing scientific practices. In S. H. Hesse-Biber & R. B. Johnson (Eds.), *The Oxford handbook of multimethod and mixed methods research inquiry* (pp. 1-24). New York, NY: Oxford University Press.

Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology, 24*(4), 349-354. https://doi.org/10.1037/h0047358

Currie, A., Gorczynski, P., Rice, S. M., Purcell, R., McAllister-Williams, R. H., Hitchcock, M. E., Hainline, B., & Reardon, C. L. (2019). Bipolar and psychotic disorders in elite athletes: A narrative review. *British Journal of Sports Medicine, 53*(12), 746-753. https://doi.org/10.1136/bjsports-2019-100685

Day, M. A., Smitherman, A., Ward, L. C., & Thorn, B. E. (2015). An investigation of the associations between measures of mindfulness and pain catastrophizing. *The Clinical Journal of Pain, 31*(3), 222-228. https://doi.org/10.1097/ajp.0000000000000102

Durand-Bush, N., Baker, J., van den Berg, F., Richard, V., & Bloom, G. (2021). *Gold medal profile for sport psychology (GMP-SP)* [Manuscript submitted for publication].

Durand-Bush, N., Kenttä, G., & Roberts, C.-M. (2021). Application of theories and principles of counseling and consulting. In S. Carson-Sackett, N. Durand-Bush, & L. Tashman (Eds.), *The essential guide for mental performance consultants [digital resource].* Champaign, IL: Human Kinetics.

Durand-Bush, N., McNeill, K., Harding, M., & Dobransky, J. (2015). Investigating stress, psychological well-being, mental health functioning, and self-regulation capacity among university undergraduate students: Is this population optimally functioning? *Canadian Journal of Counselling and Psychotherapy/Revue Canadienne de Counseling et de Psychothérapie, 49*(3), 253-274.

Fauville, G., Luo, M., Queiroz, A. C. M., Bailenson, J. N., & Hancock, J. (2021). Zoom exhaustion & fatigue scale. *Computers in Human Behavior Reports, 4*, 1-10. https://doi.org/10.1016/j.chbr.2021.100119

Foster, J., Taylor, L., Chrismas, B. C., Watkins, S. L., & Mauger, A. R. (2014). The influence of acetaminophen on repeated sprint cycling performance. *European Journal of Applied Physiology, 114*(1), 41-48. https://doi.org/10.1007/s00421-013-2746-0

Gagnon, M-C., Durand-Bush, N., & Young, B. W. (2016). Self-regulation capacity enhances well-being and reduces burnout in physicians and medical residents: Implications for nurturing self-help skills. *International Journal of Well-Being, 6*(1), 101-116. https://doi.org/10.5502/ijw.v6i1.425

Geva, N., Pruessner, J., & Defrin, R. (2017). Triathletes lose their advantageous pain modulation under acute psychosocial stress. *Medicine & Science in Sports & Exercise, 49*(2), 333-341. https://doi.org/10.1249/mss.0000000000001110

Gibson, K. (2016). Mixed methods research in sport and exercise. In B. Smith & A. C. Sparkes (Eds.), *Routledge handbook of qualitative research methods in sport and exercise* (pp. 382-396). New York, NY: Routledge.

Gloster, A. T., Walder, N., Levin, M. E., Twohig, M. P., & Karekla, M. (2020). The empirical status of acceptance and commitment therapy: A review of meta-analyses. *Journal of Contextual Behavioral Science, 18*, 181-192. https://doi.org/10.1016/j.jcbs.2020.09.009

Golding, L., Gillingham, R. G., & Perera, N. K. P. (2020). The prevalence of depressive symptoms in high-performance athletes: A systematic review. *The Physician and Sportsmedicine, 48*(3), 247-258. https://doi.org/10.1080/00913847.2020.1713708

Gouttebarge, V., Castaldelli-Maia, J. M., Gorczynski, P., Hainline, B., Hitchcock, M. E., Kerkhoffs, G. M., Rice, S. M., & Reardon, C. L. (2019). Occurrence of mental health symptoms and disorders in current and former elite athletes: A systematic review and meta-analysis. *British Journal of Sports Medicine, 53*(11), 700-706. http://doi.org/10.1136/bjsports-2019-100671

Gratz, K. L., & Roemer, L. (2004). Multidimensional assessment of emotion regulation and dysregulation: Development, factor structure, and initial validation of the difficulties in emotion regulation scale. *Journal of Psychopathology and Behavioral Assessment, 26*(1), 41-54. https://psycnet.apa.org/doi/10.1023/B:JOBA.0000007455.08539.94

Hays, K., Thomas, O., Maynard, I., & Bawden, M. (2009). The role of confidence in world-class sport performance. *Journal of Sports Sciences, 27*(11), 1185-1199. https://doi.org/10.1080/02640410903089798

Huang, C. Y., Liao, H. Y., & Chang, S. H. (1998). Social desirability and the clinical self-report inventory: Methodological reconsideration. *Journal of Clinical Psychology, 54*(4), 517-528. https://doi.org/10.1002/(SICI)1097-4679(199806)54:4%3C517::AID-JCLP13%3E3.0.CO;2-I

Huffman, J. M., Provorse, D., Hockett, J., & Kerr, B. A. (2020). College students' test anxiety and listening test scores: CB and MAC-based psychoeducation vs. no treatment control. *Journal of Creativity in Mental Health.* Advance online publication. https://doi.org/10.1080/15401383.2020.1848678

Hughes, L., & Leavey, G. (2012). Setting the bar: Athletes and vulnerability to mental illness. *The British Journal of Psychiatry, 200*(2), 95-96. https://doi.org/10.1192/bjp.bp.111.095976

Jones, M. I., & Parker, J. K. (2016). A conditional process model of the effect of mindfulness on 800-m personal best times through pain catastrophising. *Journal of Sports Sciences, 34*(12), 1132-1140. https://doi.org/10.1080/02640414.2015.1093648

Jones, M. I., & Parker, J. K. (2018). Mindfulness mediates the relationship between mental toughness and pain catastrophizing in cyclists. *European Journal of Sport Science, 18*(6), 872-881. https://doi.org/10.1080/17461391.2018.1478450

Josefsson, T., Tornberg, R., Gustafsson, H., & Ivarsson, A. (2020). Practitioners' reflections of working with the Mindfulness-Acceptance-Commitment (MAC) approach in team sport settings. *Journal of Sport Psychology in Action, 11*(2), 92-102. https://doi.org/10.1080/21520704.2018.1549641

Joy, E., Kussman, A., & Nattiv, A. (2016). 2016 update on eating disorders in athletes: A comprehensive narrative review with a focus on clinical assessment and management. *British Journal of Sports Medicine, 50*(3), 154-162. https://doi.org/10.1136/bjsports-2015-095735

Kashdan, T. B., & Rottenberg, J. (2010). Psychological flexibility as a fundamental aspect of health. *Clinical Psychology Review, 30*(7), 865-878. https://doi.org/10.1016/j.cpr.2010.03.001

Keyes, C. L. M. (1998). Social well-being. *Social Psychology Quarterly, 61*(2), 121-140. https://doi.org/10.2307/2787065

Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology, 73*(3), 539-548. https://doi.org/10.1037/0022-006x.73.3.539

Keyes, C. L. M., & Michalec, B. (2010). Viewing mental health from the complete state paradigm. In T. L. Sheid & T. Brown (Eds.), *A handbook for the study of mental health: Social contexts, theories, and systems* (pp. 125-134). New York, NY: Cambridge University Press.

King, M. F., & Bruner, G. C. (2000). Social desirability bias: A neglected aspect of validity testing. *Psychology & Marketing, 17*(2), 79-103. https://doi.org/10.1002/(SICI)1520-6793(200002)17:2%3C79::AID-MAR2%3E3.0.CO;2-0

Krebs, P. A., Dennison, C. R., Kellar, L., & Lucas, J. (2019). Gender differences in eating disorder risk among NCAA Division I cross country and track student-athletes. *Journal of Sports Medicine, 5035871*, 1-5. https://doi.org/10.1155/2019/5035871

Kuettel, A., & Larsen, C. H. (2020). Risk and protective factors for mental health in elite athletes: A scoping review. *International Review of Sport and Exercise Psychology, 13*(1), 231-265. https://doi.org/10.1080/1750984X.2019.1689574

Kutcher, S., Wei, Y., & Coniglio, C. (2016). Mental health literacy: Past, present, and future. *Canadian Journal of Psychiatry, 61*(3), 154-158. https://doi.org/10.1177/0706743715616609

Landy, L. N., Schneider, R. L., & Arch, J. J. (2015). Acceptance and commitment therapy for the treatment of anxiety disorders: A concise review. *Current Opinion in Psychology, 2*, 70-74. https://doi.org/10.1016/j.copsyc.2014.11.004

Linardon, J., Fairburn, C. G., Fitzsimmons-Craft, E. E., Wilfley, D. E., & Brennan, L. (2017). The empirical status of the third-wave behaviour therapies for the treatment of eating disorders: A systematic review. *Clinical Psychology Review, 58*, 125-140. https://doi.org/10.1016/j.cpr.2017.10.005

Locke, B. D., Buzolitz, J. S., Lei, P. W., Boswell, J. F., McAleavey, A. A., Sevig, T. D., Dowis, J. D., & Hayes, J. A. (2011). Development of the counseling center assessment of psychological symptoms-62 (CCAPS-62). *Journal of Counseling Psychology, 58*(1), 97-109. https://doi.org/10.1037/a0021282

Magyar, J. L., & Keyes, C. L. M. (2019). Defining, measuring, and applying subjective well-being. In M. W. Gallagher & S. J. Lopez (Eds.), *Positive psychological assessment: A handbook of models and measures* (2nd ed., pp. 389-415). Washington, DC: American Psychological Association.

Mattern, J., & Bauer, J. (2014). Does teachers' cognitive self-regulation increase their occupational well-being? The structure and role of self-regulation in the teaching context. *Teaching and Teacher Education, 43*, 58-68. https://doi.org/10.1016/j.tate.2014.05.004

Mauger, A. R., Jones, A. M., & Williams, C. A. (2010). Influence of acetaminophen on performance during time trial cycling. *Journal of Applied Physiology, 108*(1), 98-104. https://doi.org/10.1152/japplphysiol.00761.2009

McNeill, K., Durand-Bush, N., & Lemyre, P-N. (2018). Thriving, depleted, and at-risk Canadian coaches: Profiles of psychological functioning linked to self-regulation and stress. *The International Sport Coaching Journal, 5*(2), 145-155. https://doi.org/10.1123/iscj.2017-0042

Meagher, M. W., Arnau, R. C., & Rhudy, J. L. (2001). Pain and emotion: Effects of affective picture modulation. *Psychosomatic Medicine, 63*(1), 79-90. https://doi.org/10.1097/00006842-200101000-00010

Meng, J., Hu, L., Shen, L., Yang, Z., Chen, H., Huang, X., & Jackson, T. (2012). Emotional primes modulate the responses to others' pain: An ERP study. *Experimental Brain Research, 220*(3), 277-286. https://doi.org/10.1007/s00221-012-3136-2

Mental Health Commission of Canada. (2021). *Mental Health First Aid*. https://www.mhfa.ca/en/course-type/standard

Miller, M., & Munroe-Chandler, K. (2019). Imagery use for injured adolescent athletes: Applied recommendations. *Journal of Sport Psychology in Action, 10*(1), 38-46. https://doi.org/10.1080/21520704.2018.1505677

Moesch, K., Kenttä, G., Kleinert, J., Quignon-Fleuret, C., Cecil, S., & Bertollo, M. (2018). FEPSAC position statement: Mental health disorders in elite athletes and models of service provision. *Psychology of Sport and Exercise, 38*, 61-71. https://doi.org/10.1016/j.psychsport.2018.05.013

Moran, A. P., Matthews, J. J., & Kirby, K. (2011). Whatever happened to the third paradigm? Exploring mixed methods research designs in sport and exercise psychology. *Qualitative Research in Sport, Exercise and Health, 3*(3), 362-369. https://doi.org/10.1080/2159676X.2011.607843

Nastasi, B. K., & Schensul, S. L. (2005). Contributions of qualitative research to the validity of intervention research. *Journal of School Psychology, 43*(3), 177-195. https://doi.org/10.1016/j.jsp.2005.04.003

Nixdorf, I., Frank, R., & Beckmann, J. (2016). Comparison of athletes' proneness to depressive symptoms in individual and team sports: Research on psychological mediators in junior elite athletes. *Frontiers in Psychology, 7*, 893-900. https://doi.org/10.3389/fpsyg.2016.00893

Nunnally, J. C. (1978). *Psychometric Theory*. New York, NY: McGraw-Hill.

Pankow, K., McHugh, T-L. F., Mosewich, A. D., & Holt, N. L. (2021). Mental health protective factors among flourishing Canadian women university student-athletes. *Psychology of Sport & Exercise, 52*(101847), 1-9. https://doi.org/10.1016/j.psychsport.2020.101847

Quartana, P. J., Campbell, C. M., & Edwards, R. R. (2009). Pain catastrophizing: A critical review. *Expert Review of Neurotherapeutics, 9*(5), 745-758.

Rice, S. M., Gwyther, K., Santesteban-Echarri, O., Baron, D., Gorczynski, P., Gouttebarge, V., Reardon, C. L., Hitchcock, M. E., Hainline, B., & Purcell, R. (2019). Determinants of anxiety in elite athletes: A systematic review and meta-analysis. *British Journal of Sports Medicine, 53*(11), 722-730. https://doi.org/10.1136/bjsports-2019-100620

Rice, S. M., Purcell, R., De Silva, S., Mawren, D., McGorry, P. D., & Parker, A. G. (2016). The mental health of elite athletes: A narrative systematic review. *Sports Medicine, 46*(9), 1333-1353. https://doi.org/10.1007/s40279-016-0492-2

Ryba, T. V., Wiltshire, G., North, J., & Ronkainen, N. J. (2020). Developing mixed methods research in sport and exercise psychology: Potential contributions of a critical realist perspective. *International Journal of Sport and Exercise Psychology*, 1-21. https://doi.org/10.1080/1612197X.2020.1827002

Schinke, R. J., Stambulova, N. B., Si, G., & Moore, Z. (2018). International society of sport psychology position stand: Athletes' mental health, performance, and development. *International Journal of Sport and Exercise Psychology, 16*(6), 622-639. https://doi.org/10.1080/1612197X.2017.1295557

Sciascia, A., Waldecker, J., & Jacobs, C. (2020). Pain catastrophizing in college athletes. *Journal of Sport Rehabilitation, 29*(2), 168-173. https://doi.org/10.1123/jsr.2018-0137

Simon, C. R., & Durand-Bush, N. (2014). Does self-regulation capacity predict psychological well-being in physicians? *Psychology, Health & Medicine, 20*(3), 311-321. https://doi.org/10.1080/13548506.2014.936887

Slawek, D. E., Syed, M., Cunningham, C. O., Zhang, C., Ross, J., Herman, M., Sohler, N., Minami, H., Levin, F. R., Arnsten, J. H., & Starrels, J. L. (2021). Pain catastrophizing and mental health phenotypes in adults with refractory chronic pain: A latent class analysis. *Journal of Psychiatric Research, 154*, 102-110. https://doi.org/10.1016/j.jpsychires.2021.12.001

Sullivan, M. J. L., Thorn, B., Haythornthwaite, J. A., Keefe, F., Martin, M., Bradley, L. A., & Lefebvre, J. C. (2001). Theoretical perspectives on the relation between catastrophizing and pain. *The Clinical Journal of Pain, 17*(1), 52-64. https://doi.org/10.1097/00002508-200103000-00008

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches*. Thousand Oaks, CA: SAGE Publications.

Van Dam, N. T., van Vugt, M. K., Vago, D. R., Schmalzl, L., Saron, C. D., Olendzki, A., Meissner, T., Lazar, S. W., Kerr, C. E., Gorchov, J., Fox, K. C. R, Field, B. A., Britton, W. B., Brefczynski-Lewis, J. A., & Meyer, D. E. (2018). Mind the hype: A critical evaluation and prescriptive agenda for research on mindfulness and meditation. *Perspectives on Psychological Science, 13*(1), 36-61. https://doi.org/10.1177/1745691617709589

Van de Mortel, T. F. (2008). Faking it: Social desirability response bias in self-report research. *Australian Journal of Advanced Nursing, 25*(4), 40-48.

Van Slingerland, K. J. (2021). *Design, implementation, and evaluation of a sport-focused mental health service delivery model within a Canadian centre for mental health and sport*.

[Doctoral dissertation, University of Ottawa]. uO Research. http://dx.doi.org/10.20381/ruor-27009

Van Slingerland, K., Durand-Bush, N., & Rathwell, S. (2018). Levels and prevalence of mental health functioning in Canadian university student-athletes. *Canadian Journal of Higher Education, 48*(2), 149-168. https://doi.org/10.47678/cjhe.v48i2.188105

Vella, S. A., Schweickle, M. J., Sutcliffe, J. T., & Swann, C. (2021). A systematic review and meta-synthesis of mental health position statements in sport: Scope, quality and future directions. *Psychology of Sport & Exercise, 55*(101946), 1-11. https://doi.org/10.1016/j.psychsport.2021.101946

Westerhof, G. J., & Keyes, C. L. M. (2010). Mental illness and mental health: The two continua model across the lifespan. *Journal of Adult Development, 17*(2), 110-119. https://doi.org/10.1007%2Fs10804-009-9082-y

Wolanin, A. T. (2005). Mindfulness-acceptance-commitment (MAC) based performance enhancement for division I collegiate athletes: A preliminary investigation. *Dissertation Abstracts International-B, 65*, 3735-3794.

Wolanin, A. T., Hong, E., Marks, D., Panchoo, K., & Gross, M. (2016). Prevalence of clinically elevated depressive symptoms in college athletes and differences by gender and sport. *British Journal of Sports Medicine, 50*(3), 167-171. https://doi.org/10.1136/bjsports-2015-095756

Zeidan, F., Salomons, T., Farris, S. R., Emerson, N. M., Adler-Neal, A., Jung, Y., & Coghill, R. C. (2018). Neural mechanisms supporting the relationship between dispositional mindfulness and pain. *Pain, 159*(12), 2477-2485. https://doi.org/10.1097/j.pain.0000000000001344

Appendix A: Certificate of Ethics Approval

19/02/2020

Université d'Ottawa
Bureau d'éthique et d'intégrité de la recherche

University of Ottawa
Office of Research Ethics and Integrity

CERTIFICAT D'APPROBATION ÉTHIQUE I CERTIFICATE OF ETHICS APPROVAL

Numéro du dossier / Ethics File Number	H-09-19-4750
Titre du projet / Project Title	Investigating the interplay between exercise-induced pain management, performance, and mental health in competitive and high-performance endurance athletes
Type de projet / Project Type	Thèse de doctorat / Doctoral thesis
Statut du projet / Project Status	Approuvé / Approved
Date d'approbation (jj/mm/aaaa) / Approval Date (dd/mm/yyyy)	19/02/2020
Date d'expiration (jj/mm/aaaa) / Expiry Date (dd/mm/yyyy)	13/11/2020

Équipe de recherche / Research Team

Chercheur / Researcher	Affiliation	Role
Jonathan LASNIER	École des sciences de l'activité physique / School of Human Kinetics	Chercheur Principal / Principal Investigator
Natalie DURAND-BUSH	École des sciences de l'activité physique / School of Human Kinetics	Superviseur / Supervisor

Appendix B: French Recruitment Text - Study 1

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Cher athlète,

Vous êtes invité à participer à la première phase de notre projet de recherche qui vise à comprendre comment les athlètes d'endurance des équipes nationales senior gèrent la douleur provoquée par l'exercice (DPE) en entraînement et en compétition. Cette étude est importante puisque peu de recherche existe à ce sujet. Celle-ci permettra de mieux comprendre comment les effets de la gestion de la DPE affectent la performance et la santé mentale des athlètes d'endurance. Cette étude fait partie de la recherche doctorale de Jonathan Lasnier.

En tant que participant, vous aurez à participer à une entrevue en personne ou en ligne via Zoom entre décembre 2019 et février 2020. L'entrevue durera environ 50 minutes et l'audio de celle-ci sera enregistré. L'entrevue examinera (a) votre expérience de la DPE en entraînement et en compétition, (b) les facteurs qui influencent votre expérience de la DPE en entraînement et en compétition, et (c) les stratégies que vous utilisez afin de gérer la DPE en entraînement et en compétition.

Pour être admissible, vous devez (a) être âgé de 18 à 35 ans, (b) être un membre de l'équipe nationale senior d'athlétisme (c.-à-d., compétitionner sur des distances variant de 600m au mile), de natation (c.-à-d., compétitionner sur des distances variant de 200m à 400m) ou de canoë kayak de vitesse (c.-à-d., compétitionner sur des distances variant de 500m à 1000m) et (c) avoir compétitionné dans l'une de ces épreuves durant la dernière année.

Votre participation au sein de ce projet de recherche est extrêmement importante. Vous contribuerez à l'élaboration de recommandations visant à aider les athlètes d'endurance à gérer la DPE dans leur sport. Si vous êtes intéressé, veuillez communiquer avec Jonathan Lasnier au [adresse courriel du chercheur]. Les participants seront recrutés selon le principe du premier arrivé, premier servi.

Merci beaucoup à l'avance pour votre temps et votre participation!

Cordialement,

Jonathan Lasnier, Candidat au doctorat
[adresse courriel du chercheur]
École des sciences de l'activité physique
Université d'Ottawa

Natalie Durand-Bush, PhD
[adresse courriel de la chercheuse]
École des sciences de l'activité physique
Université d'Ottawa

Appendix C: English Recruitment Text - Study 1

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Dear Athlete,

You are invited to participate in the first phase of our research project, in which we are aiming to understand how senior national team endurance athletes manage exercise-induced pain (EIP) in training and competition. There is limited research on this topic, thus this study is important to help uncover the effects of EIP management on the performance and mental health of endurance athletes. This study is part of the principal investigator's doctoral research.

As a participant, you will be asked to participate in one face-to-face interview conducted in person or online via Zoom between December 2019 and February 2020. The interview will last approximately 50 minutes. It will be audio-recorded and will examine (a) your experience of EIP in training and competition, (b) the factors influencing your experience of EIP in training and competition, and (c) the strategies you use to manage EIP in training and competition.

To be eligible, you must (a) be aged from 18 to 35 years old, (b) be a senior national team endurance athlete from the sports of track and field (i.e., competing in distances ranging from 600 meters to the mile), swimming (i.e., competing in distances ranging from 200m to 400m), or sprint canoe kayak (i.e., competing in distances ranging from 500m to 1000m), and (c) have competed in one of the aforementioned event in the past year.

Your participation is extremely valuable to this study. You will be contributing to recommendations to help endurance athletes manage EIP in their sport. If you are interested, please email Jonathan Lasnier at [researcher's email address]. Participants will be recruited on a first-come, first-served basis.

Thank you in advance for your time and participation!

Sincerely,

Jonathan Lasnier, PhD Candidate
[researcher's email address]
School of Human Kinetics
University of Ottawa

Natalie Durand-Bush, PhD
[researcher's email address]
School of Human Kinetics
University of Ottawa

Appendix D: French Consent Form - Study 1

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Formulaire de consentement - Phase 1

Titre du projet de recherche: L'interaction entre la gestion de la douleur provoquée par l'exercice, la performance et la santé mentale chez des athlètes d'endurance compétitifs et de haut niveau

Chercheur principal:
Jonathan Lasnier, Candidat au doctorat
École des sciences de l'activité physique, Université d'Ottawa
[adresse courriel du chercheur]

Superviseuse de recherche:
Dre. Natalie Durand-Bush, PhD
École des sciences de l'activité physique, Université d'Ottawa
[adresse courriel de la chercheuse]

Vous êtes invité à participer à la première phase de notre projet de recherche qui vise à comprendre comment les athlètes d'endurance des équipes nationales senior gèrent la douleur provoquée par l'exercice (DPE) en entraînement et en compétition. Cette étude est importante puisque peu de recherche existe à ce sujet. Celle-ci permettra de mieux comprendre comment les effets de la gestion de la DPE affectent la performance et la santé mentale des athlètes d'endurance. Cette étude fait partie de la recherche doctorale du chercheur principal.

Qu'attend-on de moi?

Si vous acceptez de participer, votre engagement consistera à prendre part à une entrevue en personne ou en ligne via Zoom entre décembre 2019 et février 2020. Celle-ci aura lieu à un moment jugé opportun tant pour vous que pour le chercheur principal. L'entrevue durera environ 50 minutes et l'audio de celle-ci sera enregistré. L'objectif de l'entrevue sera d'examiner (a) votre expérience de la DPE en entraînement et en compétition, (b) les facteurs qui influencent votre expérience de la DPE en entraînement et en compétition, et (c) les stratégies que vous utilisez afin de gérer la DPE en entraînement et en compétition.

Pour être admissible, vous devez (a) être âgé de 18 à 35 ans, (b) être un membre de l'équipe nationale senior d'athlétisme (c.-à-d., compétitionner sur des distances variant de 600m au mile), de natation (c.-à-d., compétitionner sur des distances variant de 200m à 400m) ou de canoë kayak de vitesse (c.-à-d., compétitionner sur des distances variant de 500m à 1000m) et (c) avoir compétitionné dans l'une de ces épreuves durant la dernière année.

Puis-je dire non?

Votre participation est complètement bénévole. Vous pouvez refuser de participer à l'étude ou vous en retirer à tout moment sans pénalité. Vous avez le droit de refuser de répondre à toute question et de refuser de commenter à tout moment. Si vous êtes mal à l'aise avec l'un des sujets abordés, vous avez le droit de mettre fin à l'entrevue. Si vous choisissez de vous retirer de l'étude, les données collectées seront conservées de manière sécurisée comme décrit ci-dessous ou détruites si telle est votre préférence. De plus, une fois que l'étude sera publiée, vous pourrez toujours demander la destruction de vos données afin d'empêcher leur utilisation dans des publications ultérieures.

125 Université / University
Ottawa ON K1N 6N5 Canada
www.uottawa.ca

Quels sont les risques potentiels?
Cette étude implique un risque minimal. Les réponses aux questions sont facultatives et volontaires. Vous vous réservez le droit de refuser de répondre, et ce, sans conséquence négative. Si une question génère un inconfort psychologique ou émotionnel, nous serons en mesure de vous diriger vers les ressources appropriées. Veuillez ne pas hésiter à nous contacter afin de discuter de vos préoccupations.

De quels avantages vais-je bénéficier en participant à cette étude?
En participant à cette étude, vous augmenterez votre conscience et votre connaissance de (a) votre expérience de la DPE en entraînement et en compétition, (b) des facteurs qui influencent votre expérience de la DPE en entraînement et en compétition, et (c) des stratégies que vous pouvez utiliser afin de gérer la DPE en entraînement et en compétition. Ceci pourrait avoir un impact positif sur votre performance et votre santé mentale. De plus, vous contribuerez à l'élaboration de recommandations pratiques visant à aider les athlètes d'endurance à gérer la DPE dans leur sport.

Est-ce que cette étude a reçu l'approbation éthique?
Ce projet de recherche a reçu l'approbation éthique du Bureau d'éthique et d'intégrité de la recherche de l'Université d'Ottawa. Votre participation est complètement bénévole. Vous pouvez vous retirer de l'étude à tout moment et/ou refuser de répondre aux questions sans conséquence négative. Si vous choisissez de vous retirer, vous aurez la possibilité de retirer également toutes les données collectées relatives à votre participation et celles-ci seront détruites. Si vous désirez retirer des données collectées pendant l'étude, vous pouvez le faire en communiquant à tout moment avec Jonathan Lasnier au [adresse courriel du chercheur] et vos données seront supprimées de la base de données.

Comment mes renseignements personnels sont-ils protégés et comment les données sont-elles conservées?
Vos réponses resteront anonymes et confidentielles. L'information que vous partagez pourra être utilisée par Jonathan Lasnier ou Dre. Natalie Durand-Bush dans des présentations de conférence et des publications au sein de journaux scientifiques. Cependant, soyez assuré que votre anonymat sera garanti en tout temps. Un identifiant de participant vous sera assigné. Votre nom ainsi que toute autre information susceptible de dévoiler votre identité dans la transcription de l'entrevue, dans des articles scientifiques et des présentations de conférence seront exclus. Toutes les données physiques telles que les transcriptions imprimées ou les rapports seront conservés de façon sécuritaire dans un classeur barré à clé au sein du laboratoire de Dre. Natalie Durand-Bush. Les données numériques et électroniques seront sauvegardées sur l'ordinateur protégé par un mot de passe de Jonathan Lasnier et de Dre. Natalie Durand-Bush. Toutes les données seront conservées pendant une période de cinq ans après que le projet soit terminé. Celles-ci seront par la suite détruites de façon permanente. Si vous choisissez d'effectuer l'entrevue en ligne via Zoom, vous acceptez que votre anonymat et votre confidentialité ne soient pas garantis à 100%.

Qui dois-je contacter si j'ai des questions?
Si vous avez des questions concernant la conduite éthique de cette étude, vous pouvez communiquer avec l'agent de protocole de l'éthique en recherche, Université d'Ottawa, Pavillon Tabaret, 550 Cumberland, Local 154, Ottawa, Ontario, K1N 6N5; Tel.: (613) 562-5387; Courriel: ethics@uottawa.ca. Pour toute autre question concernant cette étude, vous pouvez communiquer avec Jonathan Lasnier au [adresse courriel du chercheur] ou avec Natalie Durand-Bush au [adresse courriel de la chercheuse].

À qui dois-je donner mon consentement pour participer à l'étude?
Si vous souhaitez participer à la première phase de ce projet de recherche, veuillez lire les renseignements ci-dessous et signer manuellement ou électroniquement dans l'espace prévu à cet effet.

- Je comprends que l'on me demande de participer à la première phase de ce projet de recherche qui vise à comprendre comment les athlètes d'endurance des équipes nationales senior gèrent la douleur provoquée par l'exercice (DPE) en entraînement et en compétition.
- J'ai lu ou une autre personne m'a lu chaque page de ce formulaire de consentement.

- Mes questions ont été répondues avec entière satisfaction.
- Je comprends que j'ai le droit de me retirer de cette étude et de retirer les données collectées relatives à ma participation à tout moment, et ce, sans conséquence négative.
- J'accepte de participer bénévolement à cette étude.
- J'accepte d'être enregistré en format audio.
- J'accepte que les résultats de cette étude soient publiés dans des articles scientifiques ainsi que présentés lors de conférences et je comprends que mon anonymat sera protégé en tout temps.
- Je recevrai une des deux copies signées de ce formulaire de consentement.

_____	_____	_____
Nom imprimé du participant	Signature du participant	Date

Déclaration du chercheur principal

J'ai soigneusement expliqué cette étude au participant. Au meilleur de ma connaissance, le participant comprend la nature, les exigences, les risques et les avantages inhérents à sa participation à l'étude.

_____	_____	_____
Nom imprimé du chercheur principal	Signature du chercheur principal	Date

---

Ressources en santé mentale sur et hors campus dans la région d'Ottawa

Counselling et coaching - uOttawa SASS
100 Marie-Curie Private (4e étage, MCE)
Ottawa, ON, K1N 1A2
Tel.: (613) 562-5200
couns@uottawa.ca

Clinique des services de santé - uOttawa
300 – 100 Marie-Curie Private
Ottawa, ON, K1N 6N5
(613) 564-3950
https://www.uottawa.ca/sante/

Centre de détresse d'Ottawa
(613) 238-3311
https://www.uottawa.ca/health/

Good2Talk
1 (866) 925-5454
www.good2talk.ca

Ligne d'assistance - Drogue et alcool
1 (800) 230-3505

Programme de soins aux victimes d'agression sexuelle ou d'abus par un partenaire - Hôpital d'Ottawa
(613) 738-3762

Université Carleton : Étudiants hors campus
Local 2600, bâtiment CTTC
Ou appelez le 613-520-6674

Université Carleton : Étudiants en résidence
Counselling disponible de septembre à avril
Appelez le 613-520-2600 ext. 8061

Ressources nationales en santé mentale

Services de crises du Canada
Appel sans frais (24/7) : 1 (833) 456-4566
Soutien par texto (16h à minuit HE tous les jours) : 45645

Ligne canadienne de crise
1 (888) 353-2273

Better Help
www.betterhelp.com
Accès en ligne à des conseillers professionnels
En ligne et disponible pour les utilisateurs d'iPhone et d'Android
L'application LifeLine
www.thelifelinecanada.ca/fr/
Accès direct à du soutien de crise par téléphone, clavardage en ligne, texto et courriel
Counseling en ligne, outils d'autogestion, accès aux centres de crise partout au Canada
Disponible pour les utilisateurs d'iPhone et d'Android

Big White Wall Canada
www.bigwhitewall.ca
Communauté de soutien par les pairs anonyme et accessible en tout temps et n'importe où

Ressources provinciales en santé mentale

Colombie-Britannique
Canadian Mental Health Association Crisis Line – serves the entire east Kootenay region, from Golden to the Alberta and USA borders
24-hour crisis line: 1-800-667-8407

Fraser Valley Regional Crisis Line – serves Mission, Abbotsford, Chilliwack, Agassiz/Harrison, Hope, Yale and Boston Bar
24-hour crisis line: 1-877-820-7444

Crisis Centre for Northern BC – serves all of Northern BC north of Quesnel
Youth line (4-11pm): 250-564-8336
24-hour crisis line: 1-888-562-1214

Crisis Intervention & Suicide Prevention Centre of BC – serves Vancouver, North Vancouver city & district, Bowen Island, West Vancouver and Burnaby
24-hour crisis line: 604-872-3311

Province-Wide British Columbia
24-hour crisis line: 1-800-SUICIDE

Alberta
Distress Centre Calgary – serves Calgary and surrounding area
24-hour crisis line: (403) 266-4357

The Support Network Distress Line – serves Edmonton and surrounding areas
(780) 482-HELP

St. Paul & District Crisis Centre – serves all Alberta and Northeastern Saskatchewan
24-hour crisis line: 1-800-263-3045

Saskatchewan
Mobile Crisis Service – serves Saskatoon
24-hour crisis line: (306) 933-6200

Prince Albert Mobile Crisis Unit
24-hour crisis line: (306) 764-1011

Regina Mobile Crisis Services
24-hour crisis line: (306) 525-5333

Manitoba
Mobile Crisis Unit (MCU) – serves Brandon and Assiniboine regions
24-hour crisis line: 1-888-379-7699

Klinic Community Health Centre – serves Winnipeg
24-hour crisis line: 1-888-322-3019

Ontario
Hamilton
905-522-1477

Kingston
Distress line: 613-544-1771

London & District:
Mental health crisis line: 519-433-2023

Ottawa & Region
Distress line: 613-238-3311

Toronto
Distress line: 416-408-4357

Waterloo Region
Distress line: 519-745-1166

Windsor & Essex County
Distress line: 519-256-5000

Québec
Centre de prévention 24/7: 1-866-277-3553

Nouveau-Brunswick
Chimo Helpline – serves all of New Brunswick, bilingual, 24 hours
Provincial toll-free crisis line: 1-800-667-5005
Fredericton area: 450-HELP

Nouvelle-Écosse
Mental Health Mobile Crisis Team – serves the Capital District, Halifax, Dartmouth Bedford
24-hour crisis line: 902-4298167; toll free: 1-888-429-8167

Île-du-Prince-Édouard
24-hour province-wide bilingual service: 1-800-218-2885

Terre-Neuve-et-Labrador
Mental Health Crisis Centre – serves Newfoundland and Labrador
24-hour crisis line: 1-888-737-4668

Appendix E: English Consent Form - Study 1

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Participant Informed Consent Form - Phase 1

Title of Research Project: Investigating the interplay between exercise-induced pain management, performance, and mental health in competitive and high-performance endurance athletes

Principal Investigator:
Jonathan Lasnier, PhD Candidate
School of Human Kinetics, University of Ottawa
[researcher's email address]

Research Supervisor:
Dr. Natalie Durand-Bush, PhD
School of Human Kinetics, University of Ottawa
[researcher's email address]

You are invited to participate in the first phase of our research project, in which we are aiming to understand how senior national team endurance athletes manage exercise-induced pain (EIP) in training and competition. There is limited research on this topic, thus this study is important to help uncover the effects of EIP management on the performance and mental health of endurance athletes. This study is part of the principal investigator's doctoral research.

What is expected of me?

If you agree to participate, your involvement will consist of taking part in one face-to-face interview conducted in person or online via Zoom between December 2019 and February 2020. The interview, which will last approximately 50 minutes, will be audio-recorded and scheduled at a time that is convenient for both yourself and the principal investigator. The purpose of the interview will be to examine (a) your experience of EIP in training and competition, and (b) the factors influencing your experience of EIP in training and competition, and (c) the strategies you use to manage EIP in training and competition.

To be eligible, you must (a) be aged from 18 to 35 years old, (b) be a senior national team endurance athlete from the sports of track and field (i.e., competing in distances ranging from 600 meters to the mile), swimming (i.e., competing in distances ranging from 200m to 400m), or sprint canoe kayak (i.e., competing in distances ranging from 500m to 1000m), and (c) have competed in one of the aforementioned event in the past year.

Can I say no?

Your participation is completely voluntary. You may decline to participate in the study or withdraw from it at any time without penalty. You have the right to refuse to answer any question and deny comment at any time. Should you feel uncomfortable with any of the topics discussed, you have the right to end the interview. If you choose to withdraw from the study, the data collected will be securely stored as described below or destroyed if that is your preference. Additionally, once the study has been published, you may still request to have your data destroyed to prevent its use in any further publications.

125 Université / University
Ottawa ON K1N 6N5 Canada
www.uottawa.ca

What are some potential risks?
This study will involve minimal risk. Responses to questions are optional and voluntary; you reserve the right to withhold responses without any negative consequences. Should any of the questions cause psychological or emotional discomfort, we will be able to direct you towards appropriate resources. Please do not hesitate to contact the researchers to address any concerns.

What benefits will I receive from participating in this study?
By participating in this study, you will increase your self-awareness and knowledge of (a) how you experience EIP in training and competition, (b) the factors influencing your experience of EIP in training and competition, and (c) the strategies you can use to manage EIP in training and competition. This could have a positive impact on your performance and mental health. Further, you will be contributing to recommendations to help endurance athletes manage EIP in their sport.

Has this study received ethics approval?
This research project has received ethics approval from the Research Ethics Board of the University of Ottawa. Your participation is completely voluntary, and you may withdraw from the study at any time and/or refuse to answer questions without any negative consequences. If you choose to withdraw, you will have the opportunity to also withdraw all data collected related to your participation, in which case it will be destroyed. Should you wish to withdraw collected data, simply email Jonathan Lasnier at [researcher's email address] at any point during the study and your data will be deleted from the database.

How is my personal information being protected and how will the data be conserved?
Your responses will remain anonymous and confidential. The information that you share may be used by Jonathan Lasnier or Dr. Natalie Durand-Bush in conference presentations and publications in scientific journals; however, your anonymity is guaranteed at all times. You will be assigned a participant ID, and your name as well as any information that could reveal your identity in the interview transcript, scientific articles and conference presentations, will be excluded. All physical data such as printed transcripts or reports will be safely kept in Dr. Natalie Durand-Bush's laboratory in a locked cabinet. Digital and electronic data will be saved on Jonathan Lasnier's and Dr. Natalie Durand-Bush's password protected computer. All of the data will be conserved for five years after completion of the project, after which they will be permanently destroyed. If you choose to do the interview online via Zoom, you accept that anonymity and confidentiality will not be 100% guaranteed.

Who do I contact if I have further questions?
If you have any questions regarding the ethical conduct of this study, you may contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa, Ontario, K1N 6N5; Tel.: (613) 562-5387; Email: ethics@uottawa.ca. For any questions regarding this study, you can contact Jonathan Lasnier at [researcher's email address], or Dr. Natalie Durand-Bush at [researcher's email address].

Who do I provide my consent to participate in the study?
If you wish to participate in the first phase of this research project, please read the information below and sign manually or electronically in the designated space.

- I understand that I am being asked to participate in the first phase of this research project, which aims to uncover how senior national team endurance athletes manage EIP in training and competition.
- I have read each page of this Participant Informed Consent Form or have had it read to me.
- My questions have been answered to my complete satisfaction.
- I understand that I have the right to withdraw from this study or have collected data removed at any point in time without negative repercussions.
- I voluntarily agree to be a participant in this study.
- I agree to be audio-recorded.

- I accept that the results of this study will be published in scientific articles and presented at conferences and I understand that my anonymity will be protected.
- I will be given one of the two copies of this signed consent form.

_____	_____	_____
Participant's Printed Name	Participant's Signature	Date

Principal Investigator Statement

I have carefully explained this study to the participant. To the best of my knowledge, the participant understands the nature, demands, risks and benefits involved in taking part in the study.

_____	_____	_____
Principal Investigator's Name	Principal Investigator's Signature	Date

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Mental health resources on and off-campus in the Ottawa area

uOttawa SASS - Counselling and Coaching
100 Marie-Curie Private (4th floor, MCE)
Ottawa, ON, K1N 1A2
Tel.: (613) 562-5200
couns@uottawa.ca

uOttawa Health Services Clinic
300 – 100 Marie-Curie Private
Ottawa, ON, K1N 6N5
(613) 564-3950
https://www.uottawa.ca/health/

Ottawa Distress Centre
(613) 238-3311
www.dcottawa.on.ca

Good2Talk
1 (866) 925-5454
www.good2talk.ca

Drug & Alcohol Helpline
1 (800) 230-3505

Ottawa Hospital Assault Treatment Program
(613) 738-3762

Carleton University: Off-campus students
Room 2600 CTTC Building
Or call 613-520-6674

Carleton University: students in residence
Counselling is available Sept. to April
Call 613-520-2600 x 8061 for intake

National mental health resources

Crisis Services Canada
Toll Free (24/7): 1 (833) 456-4566
Text support (4pm-12am ET daily): 45645

Canadian Crisis Hotline
1 (888) 353-2273

Better Help
www.betterhelp.com
Online access to professional counsellors
On the web, and available for iPhone and Android users

The LifeLine App
www.thelifelinecanada.ca
Direct access to phone, online chat, text, and email crisis support
E-counselling, self-management tools, access to crisis centres across Canada
Available for iPhone and Android users

Big White Wall Canada
www.bigwhitewall.ca
Anonymous peer support community accessible anytime, anywhere

Provincial mental health resources

British Columbia
Canadian Mental Health Association Crisis Line – serves the entire east Kootenay region, from Golden to the Alberta and USA borders
24-hour crisis line: 1-800-667-8407

Fraser Valley Regional Crisis Line – serves Mission, Abbotsford, Chilliwack, Agassiz/Harrison, Hope, Yale and Boston Bar
24-hour crisis line: 1-877-820-7444

Crisis Centre for Northern BC – serves all of Northern BC north of Quesnel
Youth line (4-11pm): 250-564-8336
24-hour crisis line: 1-888-562-1214

Crisis Intervention & Suicide Prevention Centre of BC – serves Vancouver, North Vancouver city & district, Bowen Island, West Vancouver and Burnaby
24-hour crisis line: 604-872-3311

Province-Wide British Columbia
24-hour crisis line: 1-800-SUICIDE

Alberta
Distress Centre Calgary – serves Calgary and surrounding area
24-hour crisis line: (403) 266-4357

The Support Network Distress Line – serves Edmonton and surrounding areas
(780) 482-HELP

St. Paul & District Crisis Centre – serves all Alberta and Northeastern Saskatchewan
24-hour crisis line: 1-800-263-3045

Saskatchewan
Mobile Crisis Service – serves Saskatoon
24-hour crisis line: (306) 933-6200

Prince Albert Mobile Crisis Unit
24-hour crisis line: (306) 764-1011

Regina Mobile Crisis Services
24-hour crisis line: (306) 525-5333

Manitoba
Mobile Crisis Unit (MCU) – serves Brandon and Assiniboine regions
24-hour crisis line: 1-888-379-7699

Klinic Community Health Centre – serves Winnipeg
24-hour crisis line: 1-888-322-3019

Ontario
Hamilton
905-522-1477

Kingston
Distress line: 613-544-1771

London & District:
Mental health crisis line: 519-433-2023

Ottawa & Region
Distress line: 613-238-3311

Toronto
Distress line: 416-408-4357

Waterloo Region
Distress line: 519-745-1166

Windsor & Essex County
Distress line: 519-256-5000

Québec
Centre de prévention 24/7: 1-866-277-3553

New Brunswick
Chimo Helpline – serves all of New Brunswick, bilingual, 24 hours
Provincial toll-free crisis line: 1-800-667-5005
Fredericton area: 450-HELP

Nova Scotia
Mental Health Mobile Crisis Team – serves the Capital District, Halifax, Dartmouth Bedford
24-hour crisis line: 902-4298167; toll free: 1-888-429-8167

Prince Edward Island
24-hour province-wide bilingual service: 1-800-218-2885

Newfoundland & Labrador
Mental Health Crisis Centre – serves Newfoundland and Labrador
24-hour crisis line: 1-888-737-4668

Appendix F: French Interview Guide - Study 1

Questions générales d'ouverture

- Quelle est votre expérience sportive générale?
- Quelle est votre expérience sportive spécifique en [athlétisme ou natation ou canoë kayak de vitesse] ainsi que vos accomplissements à ce jour?

Question de transition

- Si vous étiez pour vous donner à fond pendant une durée de 4 minutes dans votre sport, que ressentiriez-vous?

DPE

- Que savez-vous à propos de la DPE? Comment définiriez-vous celle-ci?
    - Valider l'information ou ajouter l'information manquante à leur définition de la DPE afin que nous puissions être sur la même longueur d'onde pour le reste de l'entrevue
- Ressentez-vous de la DPE en entraînement? Si oui, quelle est votre expérience de celle-ci et quand la ressentez-vous?
    - Est-ce que les types d'entraînement, l'intensité et/ou le volume influencent votre expérience de la DPE? Veuillez expliquer.
- Qu'est-ce qui influence votre expérience de la DPE en entraînement? Veuillez expliquer et fournir des exemples spécifiques.
- Ressentez-vous de la DPE en compétition? Si oui, quelle est votre expérience de celle-ci et quand la ressentez-vous?
    - Est-ce que le type d'épreuve influence votre expérience de la DPE? Veuillez expliquer.
- Qu'est-ce qui influence votre expérience de la DPE en compétition? Veuillez expliquer et fournir des exemples spécifiques.
- Votre expérience de la DPE varie-t-elle en fonction de si vous vous entraînez ou si vous compétitionnez? Veuillez expliquer.
- Votre expérience de la DPE varie-t-elle au fil de votre saison? Veuillez expliquer.

Autorégulation de la DPE

- Comment vous préparez-vous à ressentir de la DPE en entraînement? Veuillez expliquer et fournir des exemples spécifiques.
- Lorsque vous ressentez de la DPE en entraînement, quelles sont les stratégies que vous utilisez afin de gérer celle-ci? Veuillez fournir des exemples spécifiques.
- Lorsque vous vous entraînez, comment faites-vous pour suivre l'efficacité des stratégies que vous utilisez afin de gérer la DPE? Veuillez expliquer.
- Après vous être entraîné, évaluez-vous les stratégies que vous avez utilisées afin de gérer la DPE? Veuillez expliquer.
- Utilisez-vous vos réflexions post-entraînement afin de modifier la façon dont vous vous préparez à ressentir et à gérer la DPE pour un entraînement à venir? Veuillez expliquer.
- Comment vous préparez-vous à ressentir de la DPE en compétition? Veuillez expliquer et fournir des exemples spécifiques.

- Lorsque vous ressentez de la DPE en compétition, quelles sont les stratégies que vous utilisez afin de gérer celle-ci? Veuillez fournir des exemples spécifiques.
- Lorsque vous compétitionnez, comment faites-vous pour suivre l'efficacité des stratégies que vous utilisez afin de gérer la DPE? Veuillez expliquer.
- Après avoir compétitionné, évaluez-vous les stratégies que vous avez utilisées afin de gérer la DPE? Veuillez expliquer.
- Utilisez-vous vos réflexions post-compétition afin de modifier la façon dont vous vous préparez à ressentir et à gérer la DPE pour une compétition à venir? Veuillez expliquer.

Conclusion

- Que retenez-vous de cette entrevue?
- Aimeriez-vous ajouter autre chose?
- Merci beaucoup d'avoir participé à cette étude!

Appendix G: English Interview Guide - Study 1

General opening questions

- What is your general sporting background?
- What is your [track and field or swimming or sprint canoe kayak] history and your achievements to date?

Transition question

- If you were to push yourself as hard as you can for a duration of 4 minutes in your sport, what would you experience?

EIP

- What do you know about EIP? How would you define it?
    - Validate or add to their definition of EIP so that we are on the same page for the rest of the interview
- Have you encountered EIP in training? If yes, how and when do you experience it?
    - Do the type of training, intensity and/or volume matter? Please explain.
- What influences your experience of EIP in training? Please explain and provide specific examples.
- Have you encountered EIP in competition? If yes, how and when do you experience it?
    - Does the type of event matter? Please explain.
- What influences your experience of EIP in competition? Please explain and provide specific examples.
- Does your experience of EIP vary depending on whether you are training or competing? Please explain.
- Does your experience of EIP vary over the course of a season? Please explain.

Self-regulation of EIP

- How do you prepare yourself to experience EIP in training? Please explain and provide specific examples.
- When you experience EIP in training, what strategies do you use to manage it? Please provide specific examples.
- When you are training, how do you monitor the effectiveness of the strategies you are using to manage EIP? Please explain.
- After training, do you evaluate the strategies you used to manage EIP? Please explain.
- Do you use your post-training reflections to change the way you prepare yourself to experience and manage EIP for an upcoming training session? Please explain.
- How do you prepare yourself to experience EIP in competition? Please explain and provide specific examples.
- When you experience EIP in competition, what strategies do you use to manage it? Please provide specific examples.
- When you are competing, how do you monitor the effectiveness of the strategies you are using to manage EIP? Please explain.
- After competing, do you evaluate the strategies you used to manage EIP? Please explain.
- Do you use your post-competition reflections to change the way you prepare yourself to experience and manage EIP for an upcoming competition? Please explain.

Summary

- What do you take away from this interview?
- Is there anything else you would like to add?
- Thank you so much for participating in this study!

Appendix H: Summary of the Self-Regulation Intervention Modules

Module	Title	Exercises
1	Introduction to Self-Regulation and Gold Standards	1.1. What are the important areas of your life and what are the main values guiding you in each of these areas? Use the pie chart below to identify your areas and key words to indicate your values in each area (e.g., Area = track and field; Values = hard work, safe and fair play, improvement). The extent of the importance of the different areas can be reflected in the size of the pie pieces. 1.2. Think back to your best performances in your sport or other context. Try to recapture the FAST (i.e., Feelings, Actions, Sensations, and Thoughts) that led to your performances and how you were influenced by your environment (e.g., coaches, teammates, competitors, equipment, weather, spectators, media, officials, parents). Now, shift your thoughts to your worst performances and do the same. Note below what appears to have facilitated and impeded your performances in these two types of situations. Compare your responses. 1.3. Based on your responses in Exercises 1.1 and 1.2, identify your gold standards. To do this, reflect on how you want to feel in each important area of your life that you identified in Exercise 1.1 (e.g., track and field). Factor in your values and your best and worst performances, and integrate as many dimensions (i.e., physical, cognitive, emotional, spiritual, social) as possible when describing how you want to feel in each area (see example below). Your gold standards are highly subjective – try to describe them to the best of your ability so that it is easy to refer to them. 1.4: What barriers can prevent you from achieving your gold standards? What strategies can you use to realign with them? Think of what has worked for you in the past. Alternatively, recall what some of your role models have done when facing challenging situations that impeded their desired experiences. 1.5. What is your biggest takeaway from Module 1? Write down your reflections below.

2	Preparation Phase 1: Goal-Setting	2.1. Part A. DREAM GOAL. Identify your dream goal, that is, your ultimate aim in track and field, taking into account your current capabilities and resources (e.g., talent, skills, work ethic, support). 2.1. Part B. LONG-TERM GOAL. Identify your long-term goal for this year, taking into consideration the outcome- and performance-related targets you want to achieve, particularly to fulfill your dream goal. 2.2. Part A. SHORT-TERM GOAL. Identify a short-term performance-related goal, taking into consideration the different skills and attributes you want to improve (e.g., physical, mental, technical, tactical, lifestyle) in order to achieve your long-term goal. Use the SMARTEST characteristics to effectively set your short-term goal. 2.2. Part B. DAILY GOALS. Identify a few daily goals, taking into consideration the process on which you must focus to achieve your short-term goal. Identify controllable, concrete actions or steps that allow you stay in the 'here-and-now' and execute tasks with the utmost quality. Choose actions leading you to learn and improve on a daily basis. Consider what you indicated under the "A" of the SMARTEST characteristics to set your daily goals. 2.2. Part C. SELF-ACCEPTANCE GOAL. Identify a self-acceptance goal to ensure that you remain compassionate and kind toward yourself as you experience both success and failure in your pursuits. 2.3. What is your biggest takeaway from Module 2? Write down your reflections below.
3	Preparation Phase 2: Strategic Planning	3.1. Devise a plan for the short-term performance-related goal you identified in Module 2 (Exercise 2.2. Part A.). Identity the actions in which you must engage to achieve this goal and the resources required to successfully perform these actions. Draw from the daily goals you set in Module 2 (Exercise 2.2. Part B.) and expand these to have a comprehensive plan that will provide essential steps and resources to achieve your goal. 3.2. Identify the barriers that can prevent you from achieving your short-term performance-related goal and the strategies to overcome them. 3.3. Part A. PRE-PERFORMANCE PLAN. Make a checklist of things you need to do BEFORE a race to perform at your best and increase your chances of achieving success. As you do so, refer to the guidelines provided above. Also, consider your best past performances, your desired FAST (i.e., feelings, actions, sensations, thoughts), and what you need from your environment (e.g., support from your coach).

		3.3. Part B. DURING-PERFORMANCE PLAN. Break down your race in specific segments (e.g., you could break down an 800m into four 200m segments) and make a checklist of things you want to do and experience DURING each of these segments to perform at your best and increase your chances of achieving success. Consider your best past performances, your desired FAST, and what you need from your environment (e.g., motivational feedback from your coach). Once you have generated a checklist for all the different segments of your race, summarize your ideas for each segment into 2-3 key words (e.g., 400m to 600m segment: "push and commit"). 3.3. Part C. POST-PERFORMANCE PLAN. Make a checklist of things you want or need to do AFTER a race to draw valuable lessons and get the most out of your performance and experience. Consider your best past performances, your desired FAST, and what you need from your environment (e.g., meeting with your coach to debrief). Put in place steps to identify what worked well, what didn't work so well, what needs adjustments, how you will make the adjustments, and the lessons you have learned. Remember all facets of your performance (i.e., physical, mental, technical, tactical). 3.4. What is your biggest takeaway from Module 3? Write down your reflections below.
4	Preparation Phase 3: Self-Motivational Beliefs Execution Phase 1: Self-Talk	4.1. Think of an upcoming performance (e.g., workout, time trial) and generate "I know" statements about this particular performance. Make a list of all the things you know about your knowledge and skills, social support, preparation, past cumulative experiences, past experiences of adversity, and past successes related to this performance. 4.2. REMEMBERING YOUR "WHY". Reflect on the reasons why you are engaging in middle-distance running and pushing yourself out of your comfort zone when training and competing. Every time you write something down, ask yourself why that specific statement is important to you. The goal of this activity is to discover your deepest motivations with regard to your middle-distance running journey. 4.3. Part A. Take a moment to reflect on the self-talk in which you typically engage in a given day – the thoughts and statements you say to yourself (about yourself and your performance) that make up your internal script or narrative. Write down the first couple of thoughts/statements that come to mind. Comment on the extent to which these are productive/helpful (e.g., help you focus on the right things at the right time, help you stay motivated) or unproductive/harmful (e.g., lead you to make mistakes, lead you to give up).

		4.3. Part B. Now, think of the recurring unproductive thoughts you may have about yourself and your performance. If it helps, think back to a recent training session or performance (e.g., race) and reflect on unproductive thoughts you might have had. Do you notice any patterns? Write these unproductive thoughts down and then list productive thoughts with which you will replace them if they arise again in the future. 4.4. Identify four motivational second-person self-talk statements you can use when training and/or competing. The first two motivational statements should be relevant to the early-mid stages of a workout and/or race (e.g., "You're doing well") and the last two statements should be more applicable to the late-end stages of a workout and/or race (e.g., "You can do this"). 4.5. What is your biggest takeaway from Module 4? Write down your reflections below.
5	Execution Phase 2: Focus	5.1. Part A. Think of a recent race and recall what you focused on during it. Be specific in terms of the external cues (e.g., opponents, teammates, coaches, friends, parents, environmental conditions) and internal cues (e.g., your thoughts, emotions, physical sensations) to which you were attending and how long you were attending to them. 5.1. Part B. Examine the types of cues to which you attended. Were they relevant or irrelevant to the task at hand? Were they more internal or external? How much time did you spend focusing on these different cues? Did you spend more time on some than on others? How did this affect your overall performance? Note your reflections below. 5.2. Part A. BROAD-EXTERNAL FOCUS. Choose and perform one of the two exercises below to improve your BROAD-EXTERNAL focus. Rate your ability to use your broad-external focus using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to), comment on your experience, and identify any distraction (if applicable). • Listen to sounds • Scan colours 5.2. Part B. BROAD-INTERNAL FOCUS. Choose and perform one of the two exercises below to improve your BROAD-INTERNAL focus. Rate your ability to use your broad-internal focus using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to), comment on your experience, and identify any distraction (if applicable). • Rearrange your training environment

		• The brain teaser 5.2. Part C. NARROW-EXTERNAL FOCUS. Choose and perform one of the two exercises below to improve your NARROW-EXTERNAL focus. Rate your ability to use your narrow-external focus using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to), comment on your experience, and identify any distraction (if applicable). • "Killer quads" • Maintain your balance 5.2. Part D. NARROW-INTERNAL FOCUS. Choose and perform one of the two exercises below to improve your NARROW-INTERNAL focus. Rate your ability to use your narrow-internal focus using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to), comment on your experience, and identify any distraction (if applicable). • Count breaths • Count heartbeats 5.3. What is your biggest takeaway from Module 5? Write down your reflections below.
6	Execution Phase 3: Imagery	6.1. Consult this immersive resource demonstrating how winter Olympic sledding (i.e., luge, bobsleigh, and skeleton) athletes use imagery to mentally practice their performance. Explain what you have learned and how you could implement these new insights into middle-distance running. 6.2. Part A. Respond to the following questions to determine the senses and actions that you are able to incorporate in your imagery. To eliminate distractions, close your eyes and imagine one of your track spikes. For each item, rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 6.2. Part B. How many senses and actions were you able to incorporate in your imagery? How clear were your images? Can you improve in certain areas? If so, which ones? Note your reflections below. If you had difficulty doing this exercise, don't worry, it takes considerable practice to develop and perfect this skill. 6.3. THE PRE-RACE ROUTINE. Imagine yourself at a race. Smell and feel the air. Use all your senses to capture every detail of this place. Imagine yourself successfully going through each step of your pre-race routine, feeling confident and ready to perform. Everyone who is important to you is there. See the spectators in the stands and channel their positive energy into your performance. Take

		a deep breath and feel the air fill your lungs and nourish your body and mind. Appreciate the present moment and the opportunity you have to perform. Feel the excitement as you walk up to the start line to begin the race. Rate your ability to complete this exercise using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). Reflect on your overall experience below. 6.4. Part A. MANAGING EIP. Close your eyes and imagine a recent situation in which you experienced EIP. Use all of your sense to relive the experience and capture how you reacted to the pain. Note your technique, body language, and pace during the workout or race. Recall the thoughts, feelings, and sensations you experienced. Open your eyes and reflect on the exercise. What does it reveal about your management of EIP? Rate your ability to complete the exercise using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to) and note your thoughts below. 6.4. Part B. MANAGING EIP. Now close your eyes and project yourself into the future to imagine a situation in which you will experience EIP. Using all of your senses, imagine yourself effectively and efficiently responding to EIP. See yourself using old or new strategies to successfully manage the pain throughout the workout or race. Accept and embrace the pain, and stay focused and confident through it. Open your eyes and reflect on the exercise. Rate your ability to complete the exercise using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to) and note your thoughts below. 6.5. What is your biggest takeaway from Module 6? Write down your reflections below.
7	Execution Phase 4: Self-Monitoring	7.1. DAILY CHECK POINTS. Please respond to the following prompts: a) Identify when it is realistic for you to “check in” throughout your day to self-examine. Check points can be specific times in your daily schedule (e.g., 9:00am, 12:00pm, 5:00pm) or they can be tied to when you change contexts or activities (e.g., when you step onto the track, when you get back home after a day at work and/or school, before going to bed). Consider when it would be most meaningful and efficient for you to check in so that you optimize your time management. b) For each check-in time point, indicate exactly what will you observe. In other words, specify the data you will note about yourself (e.g., motivation, fatigue) and your environment (e.g., heat, hills), so that you are in a position to make adjustments, as necessary, when you are off track with your performance goals and gold standards.

		7.2. PERFORMANCE CHECK POINTS. Have in mind your goals identified in Module 2 and your strategic plan identified in Module 3, and respond to the following prompts: a) Identify when will you check in while performing in a race. These check points can be at specific times or during strategic moments within your performance (e.g., at the 400m mark). b) Indicate what will you observe during these check points. In other words, specify the data you will note about yourself (e.g., level of exercise-induced pain, tension in upper body, technique, breathing) and your environment (e.g., opponent's speed and movement within the pack, change in wind direction) that will allow you to determine if you should make an adjustment to your performance. 7.3. STRATEGIES TO REALIGN WITH GOLD STANDARDS AND GOALS. List the strategies you can use to realign yourself with your gold standards and goals in your daily life and in competition situations. You can refer to Exercise 4 of Module 1 to help you. 7.4. SELF-RECORDING PLAN. Take a moment to reflect on how you can best record/track your personal data. Consider what you might already do, what you have done in the past, what other middle-distance runners you know do, and/or what resources are available to you (e.g., apps, tools provided by coaches and mental performance consultants). Be creative and ensure your selected methods of self-recording are suitable and feasible for you. Describe how you plan to self-record, including when (e.g., timing, how often) and where you plan to do so. 7.5. What is your biggest takeaway from Module 7? Write down your reflections below.
8	Evaluation Phase: Self-Reflection	8.1. POST-EVENT REFLECTION. Think about a workout you did in the last 24 to 48 hours. Complete this post-event reflection having this particular workout in mind. 8.2. MY SELF-EVALUATION. Identify how you will reflect on yourself and your environment over time to reap the most benefits from every performance. Indicate (a) the types of questions you will ask yourself, (b) how will you know if you are achieving your gold standards and goal (e.g., use indicators such as self-rating scale scores, how you feel, feedback from coach and teammates), and (c) how you will record your reflections over time. 8.3. What is your biggest takeaway from Module 8? Write down your reflections below.

Appendix I: Summary of the Mindfulness Intervention Modules

Module	Title	Exercises
1	Introduction to Mindfulness	1.1. Part A. Think of a performance situation in which you naturally implemented the MAC approach, and with regards to the MINDFUL component, your attention was on your internal experiences: • MINDFUL: focusing in the present moment with attention on internal experiences • ACCEPTANCE: not judging / accepting internal experiences • COMMITMENT: actively choosing behaviors in line with performance/life value Describe your performance and explain if you performed below or above your expectations? 1.1. Part B. Think of a performance situation in which you naturally implemented the MAC approach, however, with regards to the MINDFUL component, your attention was on performance/task-relevant cues, rather than your internal experiences: • MINDFUL: focusing on the present moment with attention on performance/task-relevant cues • ACCEPTANCE: not judging / accepting internal experiences (thoughts, emotions, and physiological sensations) • COMMITMENT: actively choosing behaviors in line with performance/life values Describe your performance and explain if you performed below or above your expectations? 1.1. Part C. Compare your responses in Part A and Part B. Are they similar or different? Reflect on the benefits and drawbacks of focusing on performance/task-relevant cues versus internal experiences (thoughts, emotions, and physiological sensations) when you are performing. 1.2. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 1.3. What is your biggest takeaway from Module 1? Write down your reflections below.

		Challenge of the week: Practice the “brief centering exercise” at least 3 times this week.
2	Defusion (Watch Your Thinking)	2.1. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 2.2. Part A. Think about the most unpleasant/unproductive/painful things your mind tells you about yourself, your life, and your future (e.g., about school, work, track and field, relationships). Write down your thoughts below. Then, copy what you have written down on a blank piece of paper. 2.2. Part B. Take the piece of paper with both of your hands and hold it tightly. Hold it up in front of your face so that all you can see are those thoughts on the piece of paper. Hold it up so close to your face that it’s almost touching your nose. If you were to have a conversation with someone else at that specific moment when you are all caught up in those thoughts, how would it be? Could you read the expression on the person’s face? Would you feel engaged and connected with the person? Would you be able to see what the person was doing? Please explain. 2.2. Part C. Keep holding the piece of paper tightly in front of your face with the piece of paper almost touching your nose. What’s your view of your environment like while you are all wrapped up in those thoughts? If you had to evaluate or respond to your environment at that moment, would you have access to important cues around you to effectively do this? Please explain. 2.2. Part D. Now place the piece of paper on your lap. Let it sit there for a moment. Compared to when you had it in front of your face, how do you see your environment? Do you feel more connected and engaged with the world around you? Please explain. 2.2. Part E. Notice the thoughts on the piece of paper haven’t gone anywhere. They’re still there if you want to get wrapped up in them. Let’s give it a try! Look down at your piece of paper and give it all your attention. Notice how you lose touch with the world around you when you get absorbed in those thoughts. Now look up and notice the environment around you. Do you prefer to get sucked into your thoughts down there or to be up here in the world interacting with people and your environment? Please explain.

2.3. Part A. “I’M NOTICING THAT I’M HAVING THE THOUGHT THAT…”. Write in the box below three unpleasant/unproductive/painful thoughts your mind throws at you from time to time (e.g., idiot).

2.3. Part B. “I’M NOTICING THAT I’M HAVING THE THOUGHT THAT…”. Put your unpleasant/unproductive/painful thoughts into short sentences in the form of “I am X” (e.g., “I’m an idiot”).

2.3. Part C. “I’M NOTICING THAT I’M HAVING THE THOUGHT THAT…”. Practice fusing and defusing with a thought, by adding words in front of it:

- First, fuse (i.e., get hooked) for 10 seconds with one of the three thoughts you identified in Part B above. In other words, replay the thought in your head (e.g., “I’m an idiot”) to get caught up in it and believe it as much as you possibly can.
- For the next 10 seconds, replay the thought in your head with this phrase in front of it: “I’m having the thought that…” (e.g., “I’m having the thought that I’m an idiot”).
- Now replay it for another 10 seconds, but this time add this phrase in front of it: “I notice that I’m having the thought that…” (e.g., “I notice that I’m having the thought that I’m an idiot”).
- Describe below your experience of these 3 types of replay. Is there a difference between them? For example, do you notice a sense of separation or distance from the unpleasant/unproductive/painful thought as you add words in front of it? If not, try running through the exercise again with a different thought from Part B.

2.4. Part A. SINGING YOUR THOUGHTS OR SAYING THEM WITH DIFFERENT VOICES. Practice fusing and defusing with a thought by turning it into a song:

- First, fuse for 10 seconds with one of the three thoughts you identified in Exercise 2.3. Part B.
- For the next 10 seconds, sing this thought (e.g., “I’m an idiot”) aloud or in your head to the tune “Happy Birthday”.
- Describe your experience below. What happens when you turn the thought into a song?
- Do you notice a sense of separation or distance from the thought? If not, try running through the exercise again with a different thought from Exercise 2.3. Part B.

2.4. Part B. SINGING YOUR THOUGHTS OR SAYING THEM WITH DIFFERENT VOICES . Practice fusing and defusing with a thought by repeating it using different voices:

		• First, fuse for 10 seconds with one of the three thoughts you identified in Exercise 2.3. Part B. • For the next 10 seconds, repeat the thought aloud or in your head using a silly voice or the voice of a cartoon character, movie character, or sports commentator. • Describe your experience below. What happens when you repeat the thought using a silly voice? • Do you notice a sense of separation or distance from the thought? If not, try running through the exercise again with a different thought from Exercise 2.3. Part B. 2.5. What is your biggest takeaway from Module 2? Write down your reflections below. Challenge of the week: Practice using defusion techniques. Whenever you are feeling stressed or anxious, identify the "hot" thought (i.e., the one that burns you the most), and try defusing it. Determine which technique works best for you.
3	Acceptance (Open Up)	3.1. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 3.2. Part A. OBSERVE. Scan your body from head to toe and zoom in on the part of your body where you are most intensely experiencing a sensation (e.g., tension) or a feeling (e.g., worry). Observe this sensation or feeling closely, as if you are a curious scientist who has never encountered it before (e.g., what it looks like, where it starts, where it stops). Learn as much about it as you can. Describe your experience; note what happens to your acceptance. 3.2. Part B. BREATHE. Go back to the feeling or sensation you were observing in Part A. For example, if it was tension in your neck, breathe into it as you observe the tension. For the next 30 seconds, imagine your breath flowing into and around the tension. Notice how fluid it is. Use all of your senses when breathing in and around the feeling or sensation (e.g., see the colour of your breath in and around the tension). Describe your experience; note what happens to your acceptance. 3.2. Part C. EXPAND. Imagine a difficult conversation you recently had and identify the main feeling you experienced during this conversation. As you imagine this feeling (e.g., frustration), see space open up around it (e.g., similar to a balloon inflating or bread rising in the oven). For the next

30 seconds, expand and make room for the feeling. Give it freedom to move around inside of you. Describe your experience; note what happens to your acceptance.

3.2. Part D. ALLOW. Recall a sensation you recently had in relation to your athletic performance (e.g., heaviness in your legs, tension in your upper body). Allow it to simply sit there for at least 30 seconds. You may feel a strong urge to fight with it or push it away. If so, just acknowledge that the urge is there without acting on it. Don't try to get rid of it or alter it. If it changes by itself, that's okay. If it doesn't change, that's okay too. Changing or getting rid of the feeling or sensation is not the goal. Your aim is simply to allow it and to let it be. Describe your experience; note what happens to your acceptance.

3.2. Part E. OBJECTIFY. For the next 30 seconds, observe your thoughts and see them naturally come and go. Then, choose one particular thought and objectify it. In other words, turn the thought into a concrete object (e.g., wrap the thought "My unclear future causes me anxiety" into a "soccer ball"). See the thought in the form of an object; observe it with curiosity and notice all of its features (e.g., colour, texture of the ball). Notice your relationship with the object (e.g., you are bigger than it). Describe your experience; note what happens to your acceptance.

3.3. Part A. QUICKSAND METAPHOR. Think of a situation in which you recently experienced EIP. What was your perception of and reaction to EIP? Did you struggle or accept it? What was the outcome of this? Reflect below on how the quicksand metaphor can help you to effectively respond to and manage EIP.

3.3. Part B. THE SAMURAI AND THE FLY METAPHOR. Think of a situation in which you were recently distracted. What was your perception of and reaction to the distraction? Did you fight or accept it? What was the outcome of this? Reflect below on how the samurai and the fly metaphor can help you to effectively respond to and manage distractions.

3.3. Part C. THE STRUGGLE SWITCH METAPHOR. Think of a situation in which you recently experienced anxiety. What was your perception of and reaction to this anxiety? Did you struggle with it or accept it? What was the outcome of this? Reflect below on how the struggle switch metaphor can help you to effectively respond to and manage anxiety.

3.4. What is your biggest takeaway from Module 3? Write down your reflections below.

Challenge of the week: Practice making room for your thoughts, feelings, and sensations. As soon as you realize that you are struggling with a thought, feeling, or sensation, use one (e.g., objectify) or a

		combination (e.g., observe, breathe, and expand) of the acceptance techniques presented in this module to stop struggling and start accepting it.
4	Contacting the Present Moment (Be Here Now)	4.1. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 4.2. Notice what is happening in your body right now. Note what you are feeling or sensing and where this is happening in your body (e.g., as you take a walk outside, you feel the cool air against your face, a surge of energy in your legs, a vibration in your lungs, and an overall sensation of optimism and hope in your heart). 4.3. Part A. PROBLEM-SOLVING MACHINE METAPHOR. Think of a situation in which your mind was a problem-solving machine. Where was your focus? How long did your mind remain in problem-solving mode? What was your experience of the present moment? What was the overall outcome of this? 4.3. Part B. TIME MACHINE METAPHOR. Think of a situation in which your mind was a time machine. Where was your focus? How long did your mind remain in time machine mode? What was your experience of the present moment? What was the overall outcome of this? 4.4. Part A. HAND MINDFULNESS. The aim of this exercise is to get absorbed in the present moment and pay attention to your hand. Complete the exercise by following the instructions provided in the audio component found here. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 4.4. Part B. HAND MINDFULNESS. Explain what you have discovered about your hand and what interested you the most about your experience. 4.4. Part C. HAND MINDFULNESS. Explain what could happen to your relationships if you paid attention to others the same way you paid attention to your hand. Note what you are willing to try to be present during interactions with significant others. 4.5. DROP AN ANCHOR. Plant your feet firmly on the ground. Push both feet down to make a solid connection with the ground. Notice the surface beneath you, supporting you. Notice the muscle

		tension in your legs as you push your feet down. Notice your entire body and the feeling of gravity flowing down from your head to your spine, legs, and feet. Now notice what you can see and hear around you. Notice where you are and what you're doing right here and now. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 4.6. 5-4-3-2-1. Look around you and name five things you can see. Name four things you can touch. Name three things you can hear. Name two things you can smell. Name one thing you can taste. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 4.7. What is your biggest takeaway from Module 4? Write down your reflections below. Challenge of the week: Practice being present. Each day, do at least one activity mindfully (e.g., brush your teeth, take a shower, eat a meal, wash the dishes, listen to music, talk to your partner, go for a run) by engaging in it fully and by using all of your senses. As soon as your mind wanders, re-engage with what you are doing in the here and now.
5	Self-as-Context (Cultivate Pure Awareness)	5.1. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 5.2. TALKING AND LISTENING. For the next few minutes, silently listen to what your mind is saying. If you don't have any particular thoughts, just keep listening until they appear. Write down what you noticed about your mind and what it was saying. Comment on whether or not you were able to adopt the viewpoint of the "sky" or the "chessboard" as you were noticing your thoughts. 5.3. THE CONTINUOUS YOU. The audio component of this exercise can be found here and will be necessary to complete this 7-min exercise. Follow the instructions provided in the audio component. Describe your experience below and explain if and how the concept of observing self is now clearer to you. 5.4. What is your biggest takeaway from Module 5? Write down your reflections below.

		Challenge of the week: Each day, take a moment to notice a thought (e.g., "it's time to workout"), sensation (e.g., exercise-induced pain in your legs as you step up the pace while running), or feeling (e.g., contentment after finishing your workout) emerging from your thinking self. Then take a step back to notice yourself noticing your thought, sensation, or feeling by using your observing self. Notice the difference between your thinking and observing self. Pay attention to how your thinking self changes continuously, but not your observing self.
6	Values (Know What Matters)	6.1. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 6.2. MY VALUES. Read through the list of values below and reflect on each word individually. Sit with each word for a moment and explore to what extent it resonates with you. Now, think about your life and your athletic performance. Ask yourself: How do I want to be in life and in sport? Highlight the values that best represent your response to this. Add any other value that is important to you. Make sure the values you chose are based on your personal beliefs and desires. Remember the difference between a value (i.e., principle guiding your way of being) and a goal (i.e., an aim or result you want to accomplish). 6.3. Part A. END OF CAREER CEREMONY. Complete the exercise by following the instructions provided in the audio component found here. When you hear the instruction "pause" after a question, you will need to pause the audio and answer that specific question below. Once you have answered the question, you can continue the audio until you reach the next "pause" instruction. Take your time when answering the questions. 6.3. Part B. END OF CAREER CEREMONY. Based on your answers from Part A, answer the following questions to further clarify your values. 6.4. What is your biggest takeaway from Module 6? Write down your reflections below. Challenge of the week: Notice when you are in touch with your values and what that's like. Reflect on the difference it makes in your life.

7	Committed Action (Do What it Takes) Part 1	7.1. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 7.2. Part A. Choose one area of your life (e.g., track and field, school, work, family, friends) that you want to enrich or improve. 7.2. Part B. Identify three values that are important to you in your chosen life area and that you would like to prioritize. These values will motivate and inspire the goal you will set and the committed actions you will take to accomplish it. 7.2. Part C. Based on the values identified in Part B, determine your long-term values-based goal in the chosen area of life (i.e., something you can achieve in the upcoming year). 7.2. Part D. Based on the values identified in Part B, determine your short-term values-based goal in the chosen area of life (i.e., something you can achieve in the upcoming month that will bring you a little closer to achieving your long-term values-based goal). 7.2. Part E. Based on the values identified in Part B, determine your immediate values-based goal in the chosen area of life (i.e., something that you can achieve in the upcoming 24-48 hours that will bring you a little closer to achieving your short-term values-based goal). For this goal, identify three small/simple committed actions that will allow you to stay true to your values while you enact this goal. 7.3. PSYCHOLOGICAL BARRIERS. Referring to the aforementioned FEAR and DARE characteristics, identify psychological barriers that can prevent you from taking committed actions and achieving your values-based goals. Next, reflect on the strategies you can use to overcome these barriers. Think of what has worked for you in the past, and imagine new strategies that would be worthwhile to try. 7.4. What is your biggest takeaway from Module 7? Write down your reflections below. Challenge of the week: Share your commitment to your values-based goals out loud with a trusted person for whom you care deeply.

8	Committed Action (Do What it Takes) Part 2	8.1. Complete the centering exercise by following the instructions provided in the audio component. Dedicate 6 minutes to complete it. Note how you feel before, during, and after the exercise. Describe the extent to which you were able to connect with and stay engaged in the present moment. Rate your ability using a 0 to 10 scale (0 = not able to at all, to 10 = completely able to). 8.2. Part A. THE VALUES-DRIVEN HIGHWAY. Go back to Exercise 7.2. of Module 7 and write in the box below the values and values-based goals you have identified. Your values and values-based goals represent the lighthouse at the end of the values-driven highway (see Figure 1). 8.2. Part B. THE VALUES-DRIVEN HIGHWAY. Describe a difficult situation in your identified life area of Exercise 7.2. Part A (e.g., experiencing exercise-induced pain when training and competing in track and field). 8.2. Part C. THE VALUES-DRIVEN HIGHWAY. List all the actions you can take when experiencing this difficult situation that are NOT aligned with your values and values-based goals (i.e., actions that make you take the avoidance-driven exit). E.g., slow down or stop training because the pain is too difficult to bear. 8.2. Part D. THE VALUES-DRIVEN HIGHWAY. Describe the short-term rewards of taking the avoidance-driven exit (see Figure 1). E.g., conserve energy; experience less discomfort. 8.2. Part E. THE VALUES-DRIVEN HIGHWAY. Describe the long-term consequences of taking the avoidance-driven exit (see Figure 1). E.g., underperform at the next race because did not push through the pain during training. 8.2. Part F. THE VALUES-DRIVEN HIGHWAY. List all the actions you can take when experiencing this difficult situation that are aligned with your values and values-based goals (i.e., actions that lead you to continue progressing toward the lighthouse). E.g., use self-talk to stay focused on technique when the pain kicks in; break down workout into manageable pieces. 8.2. Part G. THE VALUES-DRIVEN HIGHWAY. Describe the short-term consequences of taking the values-driven highway (see Figure 1). E.g., experience pain and fatigue as a result of difficult workout; feel proud, relieved, and accomplished from being able to push through it. 8.2. Part H. THE VALUES-DRIVEN HIGHWAY. Describe the long-term rewards of taking the values-driven highway (see Figure 1). E.g., be more fit; improve race time; get PB. 8.3. What is your biggest takeaway from Module 8? Write down your reflections below.

Appendix J: French Recruitment Text - Studies 2 and 3

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Cher athlète,

Vous êtes invité à participer à la deuxième phase de notre projet de recherche qui vise à évaluer et comparer les avantages, les désavantages ainsi que les effets de différentes interventions en ligne en préparation mentale sur la douleur provoquée par l'exercice (DPE), la performance et la santé mentale chez des athlètes d'endurance compétitifs et de haut niveau. Cette étude fait partie de la recherche doctorale de Jonathan Lasnier.

Les résultats de cette recherche mèneront à des recommandations pratiques que les athlètes d'endurance, les entraîneurs et les consultants en préparation mentale pourront utiliser afin d'améliorer la gestion de la DPE, la performance et la santé mentale. De plus, des cahiers d'exercices conçus spécifiquement pour les différentes interventions seront disponibles pour usage après cette recherche.

En tant que participant, vous aurez à participer à une intervention en ligne d'une durée de 8 semaines consécutives entre mars et mai 2020. L'intervention consistera à remplir un module d'un cahier d'exercices à chaque semaine et à l'envoyer à Jonathan Lasnier. Chaque module prendra environ 30 minutes à compléter. Vous aurez également à remplir un questionnaire avant et après l'intervention en ligne contenant des questions démographiques, psychologiques et liées à la santé mentale ainsi qu'à la gestion de DPE. Celui-ci vous prendra entre 20 à 30 minutes.

Après l'intervention en ligne, certains participants ayant indiqué dans leur formulaire de consentement qu'ils désiraient être contactés afin de participer à une étude qualitative de suivi seront invités à participer à une entrevue en personne ou en ligne via Zoom. L'entrevue, qui durera environ 45 minutes, aura lieu deux mois après la soumission du dernier module du cahier d'exercices et l'audio de celle-ci sera enregistré. Les participants auront à discuter de leur expérience globale et des changements perçus à la suite de leur participation au sein de l'intervention en ligne. Ils seront également amenés à discuter d'information contextuelle liée à leurs compétitions.

Pour être admissible, vous devez (a) être âgé de 16 à 35 ans, (b) être un athlète de club de niveau provincial, national ou international d'athlétisme spécialisé en demi-fond (c.-à-d., compétitionnant sur des distances variant du 600m au mile), (c) compétitionner avant et après l'intervention en ligne, et (d) être capable de lire en anglais.

Votre participation au sein de ce projet de recherche est extrêmement importante puisque les interventions en préparation mentale visant à améliorer la gestion de la DPE, la performance et la santé mentale sont limitées. Aidez-nous à aider les athlètes d'endurance à performer à leur plein potentiel tout en maintenant une bonne santé mentale. Si vous êtes intéressé, veuillez communiquer avec Jonathan Lasnier au [adresse courriel du chercheur]. Les participants seront recrutés selon le principe du premier arrivé, premier servi.

Merci beaucoup à l'avance pour votre temps et votre participation!

Cordialement,

Jonathan Lasnier, Candidat au doctorat
[adresse courriel du chercheur]
École des sciences de l'activité physique
Université d'Ottawa

Natalie Durand-Bush, PhD
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École des sciences de l'activité physique
Université d'Ottawa

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Appendix K: English Recruitment Text - Studies 2 and 3

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Dear Athlete,

You are invited to participate in the second phase of our research project, in which we are aiming to evaluate and compare the benefits, drawbacks, and effects of different online mental performance interventions on exercise-induced pain management (EIP), performance, and mental health in competitive and high-performance endurance athletes. This study is part of the principal investigator's doctoral research.

The findings of this research will lead to applicable recommendations that endurance athletes, coaches, and mental performance consultants can use to enhance EIP management, performance, and mental health. Further, workbooks specifically designed for the interventions will be available for use following this research.

As a participant, you will be asked to participate in an online intervention lasting 8 consecutive weeks between March and May 2020. The intervention will consist of completing a module of a workbook each week and submit it to the lead researcher, Jonathan Lasnier. Each module will take approximately 30 minutes to complete. You will also be asked to complete a survey containing demographic, EIP management, psychological skills, and mental health-related questions before and after the online intervention, which will take 20-30 minutes each time.

After the online intervention, some participants who have indicated in their consent form they wanted to be contacted for a follow-up qualitative study will be asked to participate in one face-to-face interview conducted in person or online via Zoom. The interview, which will last approximately 45 minutes, will take place two months after submitting the last module of the workbook and will be audio-recorded. Participants will be asked to discuss their overall experience and perceived changes as a result of participating in the online intervention. They will also be asked to discuss contextual competitions information.

To be eligible, you must (a) be aged from 16 to 35 years old, (b) be a provincial, national, or international level club middle-distance track and field athlete who is specialized in distances ranging from 600 meters to the mile, (c) be competing before and after the online intervention, and (d) be able to read in English.

Your participation in this research project is extremely important as mental performance interventions to improve EIP management, performance, and mental health in endurance athletes are limited. Help us help endurance athletes to perform up to their potential while maintaining their mental health. If you are interested, please email Jonathan Lasnier at [researcher's email address]. Participants will be recruited on a first-come, first-served basis.

Thank you for your time and participation!

Sincerely,

Jonathan Lasnier, PhD Candidate
[researcher's email address]
School of Human Kinetics
University of Ottawa

Natalie Durand-Bush, PhD
[researcher's email address]
School of Human Kinetics
University of Ottawa

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Appendix L: French Consent Form - Studies 2 and 3

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Formulaire de consentement - Phase 2

Titre du projet de recherche: L'interaction entre la gestion de la douleur provoquée par l'exercice, la performance et la santé mentale chez des athlètes d'endurance compétitifs et de haut niveau

Chercheur principal:
Jonathan Lasnier, Candidat au doctorat
École des sciences de l'activité physique, Université d'Ottawa
[adresse courriel du chercheur]

Superviseuse de recherche:
Dre. Natalie Durand-Bush, PhD
École des sciences de l'activité physique, Université d'Ottawa
[adresse courriel de la chercheuse]

Vous êtes invité à participer à la deuxième phase de notre projet de recherche qui vise à évaluer et comparer les avantages, les désavantages ainsi que les effets de différentes interventions en ligne en préparation mentale sur la douleur provoquée par l'exercice (DPE), la performance et la santé mentale chez des athlètes d'endurance compétitifs et de haut niveau. Cette étude fait partie de la recherche doctorale du chercheur principal.

Qu'attend-on de moi?
Si vous acceptez de participer, votre engagement consistera à prendre part à une intervention en ligne d'une durée de 8 semaines consécutives entre mars et mai 2020. L'intervention consistera à remplir un module d'un cahier d'exercices à chaque semaine et à l'envoyer à Jonathan Lasnier. Chaque module prendra environ 30 minutes à compléter. Vous aurez également à remplir un questionnaire avant et après l'intervention en ligne contenant des questions démographiques, psychologiques et liées à la santé mentale ainsi qu'à la gestion de la DPE. Celui-ci vous prendra entre 20 à 30 minutes chaque fois.

Après l'intervention en ligne, certains participants ayant indiqué dans ce formulaire de consentement qu'ils désiraient être contactés afin de participer à une étude qualitative de suivi seront invités à participer à une entrevue post-intervention en personne ou en ligne via Zoom. L'entrevue, qui durera environ 45 minutes, aura lieu deux mois après la soumission du dernier module du cahier d'exercices et l'audio de celle-ci sera enregistré. Les participants auront à discuter de leur expérience globale et des changements perçus à la suite de leur de leur participation au sein de l'intervention en ligne. Ils seront également amenés à discuter d'information contextuelle liée à leurs compétitions.

Pour être admissible, vous devez (a) être âgé de 16 à 35 ans, (b) être un athlète de club de niveau provincial, national ou international d'athlétisme spécialisé en demi-fond (c.-à-d., compétitionnant sur des distances variant du 600m au mile), (c) compétitionner avant et après l'intervention en ligne, et (d) être capable de lire en anglais.

Si vous dépassez un certain seuil au niveau des scores de dépression et/ou des troubles alimentaires, vous serez dirigé vers des ressources appropriées en santé

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mentale dans votre communauté. Les ressources en santé mentale sont fournies à la fin de ce formulaire de consentement.

Puis-je dire non?
Votre participation est complètement bénévole. Vous pouvez refuser de participer à l'étude ou vous en retirer à tout moment sans pénalité. Vous avez le droit de refuser de répondre à toute question et de refuser de commenter à tout moment. Si vous êtes mal à l'aise avec l'un des sujets abordés, vous avez le droit de mettre fin à l'entrevue. Si vous choisissez de vous retirer de l'étude, les données collectées seront conservées de manière sécurisée comme décrit ci-dessous ou détruites si telle est votre préférence. De plus, une fois que l'étude sera publiée, vous pourrez toujours demander la destruction de vos données afin d'empêcher leur utilisation dans des publications ultérieures.

Quels sont les risques potentiels?
Cette étude implique un risque minimal. Les réponses aux questions sont facultatives et volontaires. Vous vous réservez le droit de refuser de répondre, et ce, sans conséquence négative. Si une question génère un inconfort psychologique ou émotionnel, nous serons en mesure de vous diriger vers les ressources appropriées. Veuillez ne pas hésiter à nous contacter afin de discuter de vos préoccupations.

De quels avantages vais-je bénéficier en participant à cette étude?
En participant à cette étude, vous augmenterez votre conscience de soi et au cours de l'intervention, vous pourrez développer des habiletés mentales et des stratégies afin de gérer votre performance, votre santé mentale et votre DPE pendant les entraînement et les compétitions. De plus, vous vous nous aiderez à mieux comprendre les avantages et les désavantages des interventions en ligne puisque celles-ci ont été peu étudiées dans le contexte du sport. Les résultats de cette recherche mèneront à des recommandations pratiques pour les athlètes d'endurance, les entraîneurs et les consultants en préparation mentale. Par ailleurs, des cahiers d'exercices conçus spécifiquement pour les différentes interventions seront disponibles pour usage après cette recherche. En participant à cette recherche, vous nous aider à aider les athlètes d'endurance à performer à leur plein potentiel tout en maintenant une bonne santé mentale.

Est-ce que cette étude a reçu l'approbation éthique?
Ce projet de recherche a reçu l'approbation éthique du Bureau d'éthique et d'intégrité de la recherche de l'Université d'Ottawa. Votre participation est complètement bénévole. Vous pouvez vous retirer de l'étude à tout moment et/ou refuser de répondre aux questions sans conséquence négative. Si vous choisissez de vous retirer, vous aurez la possibilité de retirer également toutes les données collectées relatives à votre participation et celles-ci seront détruites. Si vous désirez retirer des données collectées pendant l'étude, vous pouvez le faire en communiquant à tout moment avec Jonathan Lasnier au [adresse courriel du chercheur] et vos données seront supprimées de la base de données.

Comment mes renseignements personnels sont-ils protégés et comment les données sont-elles conservées?
Vos réponses resteront anonymes et confidentielles. Afin de minimiser les risques d'atteinte à la sécurité et d'assurer votre confidentialité, nous vous recommandons d'utiliser des mesures standards de sécurité lorsque vous compléter et envoyer des documents et des questionnaires en ligne (p. ex., fermez votre navigateur et verrouillez votre écran ou votre appareil lorsque vous ne l'utilisez plus). Veuillez noter que même si les pièces jointes aux courriels (c.-à-d., les modules du cahier d'exercices) ne contiennent pas votre nom ni aucune information qui pourrait vous identifier, aucune mesure de sécurité supplémentaire ne sera prise lors de la communication avec vous par courriel. Ainsi, ces échanges seront soumis aux mêmes risques de sécurité associée avec toute autre communication par courriel. Les chercheurs ne peuvent pas garantir l'anonymat et la confidentialité en cas d'interception de courriels. Par ailleurs, si vous décidez d'effectuer l'entrevue post-intervention en ligne via Zoom, vous acceptez que votre anonymat et votre confidentialité ne soient pas garantis à 100%.

L'information que vous partagez pourra être utilisée par Jonathan Lasnier ou Dre. Natalie Durand-Bush dans des présentations de conférence et des publications au sein de journaux scientifiques. Cependant, soyez assuré que votre anonymat sera garanti en tout temps. Un identifiant de participant vous sera assigné. Votre nom ainsi que toute autre information susceptible de dévoiler votre identité dans la transcription de l'entrevue (si vous décidez de participer à l'entrevue post-intervention), dans des articles scientifiques et des présentations de conférence seront exclus. Toutes les données physiques telles que les transcriptions imprimées ou les rapports seront conservés de façon sécuritaire dans un classeur barré à clé au sein du laboratoire de Dre. Natalie Durand-Bush. Les données numériques et électroniques seront sauvegardées sur l'ordinateur protégé par un mot de passe de Jonathan Lasnier et de Dre. Natalie Durand-Bush. Toutes les données seront conservées pendant une période de cinq ans après que le projet soit terminé. Celles-ci seront par la suite détruites de façon permanente.

Qui dois-je contacter si j'ai des questions?

Si vous avez des questions concernant la conduite éthique de cette deuxième phase du projet de recherche, vous pouvez communiquer avec l'agent de protocole de l'éthique en recherche, Université d'Ottawa, Pavillon Tabaret, 550 Cumberland, Local 154, Ottawa, Ontario, K1N 6N5; Tel.: (613) 562-5387; Courriel: ethics@uottawa.ca. Pour toute autre question concernant cette deuxième phase du projet de recherche, vous pouvez communiquer avec Jonathan Lasnier au [adresse courriel du chercheur] ou avec Natalie Durand-Bush au [adresse courriel de la chercheuse].

Est-ce que je veux être contacté pour l'étude qualitative de suivi?

Désirez-vous être contacté pour une étude qualitative de suivi? Votre participation consistera à prendre part à une entrevue en personne ou en ligne via Zoom. L'entrevue, qui durera environ 45 minutes, aura lieu deux mois après la soumission du dernier module du cahier d'exercices et l'audio de celle-ci sera enregistré. Les participants auront à discuter de leur expérience globale et des changements perçus à la suite de leur participation au sein de l'intervention en ligne. Ils seront également amenés à discuter d'information contextuelle liée à leurs compétitions. Vous aurez la possibilité d'accepter ou de refuser de participer si vous êtes contacté.

☐ Oui, je souhaite être contacté pour l'étude qualitative de suivi.

☐ Non, je ne souhaite pas être contacté pour l'étude qualitative de suivi.

À qui dois-je donner mon consentement pour participer à la deuxième phase de ce projet de recherche?

Si vous souhaitez participer à la deuxième phase de ce projet de recherche, veuillez lire les renseignements ci-dessous et signer manuellement ou électroniquement dans l'espace prévu à cet effet.

- Je comprends que l'on me demande de participer à la deuxième phase de ce projet de recherche qui vise à évaluer et comparer les avantages, les désavantages ainsi que les effets de différentes interventions en ligne en préparation mentale sur la douleur provoquée par l'exercice (DPE), la performance et la santé mentale chez des athlètes d'endurance compétitifs et de haut niveau.
- J'ai lu ou une autre personne m'a lu chaque page de ce formulaire de consentement.
- Mes questions ont été répondues avec entière satisfaction.
- Je comprends que j'ai le droit de me retirer de l'étude d'intervention en ligne et/ou de l'étude qualitative de suivi (si vous décidez de participer à l'entrevue post-intervention) à tout moment et sans conséquence négative. Je peux également demander que mes données soient retirées à tout moment, et ce, sans pénalité.
- J'accepte de participer bénévolement à l'étude d'intervention en ligne et à l'étude qualitative de suivi (si vous décidez de participer à l'entrevue post-intervention)
- J'accepte d'être enregistré en format audio.
- J'accepte que les résultats de cette deuxième phase soient publiés dans des articles scientifiques ainsi que présentés lors de conférences et je comprends que mon anonymat sera protégé en tout temps.
- Je recevrai une des deux copies signées de ce formulaire de consentement.

_____	_____	_____
Nom imprimé du participant	Signature du participant	Date

Déclaration du chercheur principal
J'ai soigneusement expliqué la deuxième phase de ce projet de recherche au participant. Au meilleur de ma connaissance, le participant comprend la nature, les exigences, les risques et les avantages inhérents à sa participation aux deux études.

_____	_____	_____
Nom imprimé du chercheur principal	Signature du chercheur principal	Date

Ressources en santé mentale sur et hors campus dans la région d'Ottawa

Counselling et coaching - uOttawa SASS
100 Marie-Curie Private (4e étage, MCE)
Ottawa, ON, K1N 1A2
Tel.: (613) 562-5200
couns@uottawa.ca

Clinique des services de santé - uOttawa
300 – 100 Marie-Curie Private
Ottawa, ON, K1N 6N5
(613) 564-3950
https://www.uottawa.ca/sante/

Centre de détresse d'Ottawa
(613) 238-3311
www.dcottawa.on.ca

Good2Talk
1 (866) 925-5454
www.good2talk.ca

Ligne d'assistance - Drogue et alcool
1 (800) 230-3505

Programme de soins aux victimes d'agression sexuelle ou d'abus par un partenaire - Hôpital d'Ottawa
(613) 738-3762

Université Carleton : Étudiants hors campus
Local 2600, bâtiment CTTC
Ou appelez le 613-520-6674

Université Carleton : Étudiants en résidence
Counselling disponible de septembre à avril
Appelez le 613-520-2600 ext. 8061

Ressources nationales en santé mentale

Services de crises du Canada
Appel sans frais (24/7) : 1 (833) 456-4566
Soutien par texto (16h à minuit HE tous les jours) : 45645

Ligne canadienne de crise
1 (888) 353-2273

Better Help
www.betterhelp.com
Accès en ligne à des conseillers professionnels
En ligne et disponible pour les utilisateurs d'iPhone et d'Android

L'application LifeLine
www.thelifelinecanada.ca/fr/
Accès direct à du soutien de crise par téléphone, clavardage en ligne, texto et courriel
Counseling en ligne, outils d'autogestion, accès aux centres de crise partout au Canada
Disponible pour les utilisateurs d'iPhone et d'Android

Big White Wall Canada
www.bigwhitewall.ca
Communauté de soutien par les pairs anonyme et accessible en tout temps et n'importe où

Ressources provinciales en santé mentale

Colombie-Britannique
Canadian Mental Health Association Crisis Line – serves the entire east Kootenay region, from Golden to the Alberta and USA borders
24-hour crisis line: 1-800-667-8407

Fraser Valley Regional Crisis Line – serves Mission, Abbotsford, Chilliwack, Agassiz/Harrison, Hope, Yale and Boston Bar
24-hour crisis line: 1-877-820-7444

Crisis Centre for Northern BC – serves all of Northern BC north of Quesnel
Youth line (4-11pm): 250-564-8336
24-hour crisis line: 1-888-562-1214

Crisis Intervention & Suicide Prevention Centre of BC – serves Vancouver, North Vancouver city & district, Bowen Island, West Vancouver and Burnaby
24-hour crisis line: 604-872-3311

Province-Wide British Columbia
24-hour crisis line: 1-800-SUICIDE

Alberta
Distress Centre Calgary – serves Calgary and surrounding area
24-hour crisis line: (403) 266-4357

The Support Network Distress Line – serves Edmonton and surrounding areas
(780) 482-HELP

St. Paul & District Crisis Centre – serves all Alberta and Northeastern Saskatchewan
24-hour crisis line: 1-800-263-3045

Saskatchewan
Mobile Crisis Service – serves Saskatoon
24-hour crisis line: (306) 933-6200

Prince Albert Mobile Crisis Unit
24-hour crisis line: (306) 764-1011

Regina Mobile Crisis Services
24-hour crisis line: (306) 525-5333

Manitoba
Mobile Crisis Unit (MCU) – serves Brandon and Assiniboine regions
24-hour crisis line: 1-888-379-7699

Klinic Community Health Centre – serves Winnipeg
24-hour crisis line: 1-888-322-3019

Ontario
Hamilton
905-522-1477

Kingston
Distress line: 613-544-1771

London & District:
Mental health crisis line: 519-433-2023

Ottawa & Region
Distress line: 613-238-3311

Toronto
Distress line: 416-408-4357

Waterloo Region
Distress line: 519-745-1166

Windsor & Essex County
Distress line: 519-256-5000

Québec
Centre de prévention 24/7: 1-866-277-3553

Nouveau-Brunswick
Chimo Helpline – serves all of New Brunswick, bilingual, 24 hours
Provincial toll-free crisis line: 1-800-667-5005
Fredericton area: 450-HELP

Nouvelle-Écosse
Mental Health Mobile Crisis Team – serves the Capital District, Halifax, Dartmouth Bedford
24-hour crisis line: 902-4298167; toll free: 1-888-429-8167

Île-du-Prince-Édouard
24-hour province-wide bilingual service: 1-800-218-2885

Terre-Neuve-et-Labrador
Mental Health Crisis Centre – serves Newfoundland and Labrador
24-hour crisis line: 1-888-737-4668

Appendix M: English Consent Form - Studies 2 and 3

uOttawa

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de l'activité physique

University of Ottawa
Faculty of Health Sciences
School of Human Kinetics

Participant Informed Consent Form - Phase 2

Title of Research Project: Investigating the interplay between exercise-induced pain management, performance, and mental health in competitive and high-performance endurance athletes

Principal Investigator:
Jonathan Lasnier, PhD Candidate
School of Human Kinetics, University of Ottawa
[researcher's email address]

Research Supervisor:
Dr. Natalie Durand-Bush, PhD
School of Human Kinetics, University of Ottawa
[researcher's email address]

You are invited to participate in the second phase of our research project, in which we are aiming to evaluate and compare the benefits, drawbacks, and effects of different online mental performance interventions on exercise-induced pain management (EIP), performance, and mental health in competitive and high-performance endurance athletes. This study is part of the principal investigator's doctoral research.

What is expected of me?

If you agree to participate, you will be asked to take part in an online intervention lasting 8 consecutive weeks between March and May 2020. The intervention will consist of completing a module of a workbook each week and submit it to the lead researcher, Jonathan Lasnier. Each module will take approximately 30 minutes to complete. You will also be asked to complete a survey containing demographic, EIP management, psychological skills, and mental health-related questions before and after the online intervention, which will take 20-30 minutes each time. After the online intervention, some participants who have indicated in this consent form they wanted to be contacted for a follow-up qualitative study will be asked to participate in one face-to-face interview conducted in person or online via Zoom. The interview, which will last approximately 45 minutes, will take place two months after submitting the last module of the workbook and will be audio-recorded. Participants will be asked to discuss their overall experience and perceived changes as a result of participating in the online intervention. They will also be asked to discuss contextual competitions information.

To be eligible, you must (a) be aged from 16 to 35 years old, (b) be a provincial, national, or international level club middle-distance track and field athlete who is specialized in distances ranging from 600 meters to the mile, (c) be competing before and after the online intervention, and (d) be able to read in English.

If you score over a certain threshold for depression and/or eating disorders, you will be referred to appropriate mental health resources in your community. Mental health resources are provided at the end of this consent form.

Can I say no?

Your participation is completely voluntary. You may decline to participate in the study or withdraw from it at any time without penalty. You have the right to refuse to answer any question and deny comment at any time. Should you feel uncomfortable

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with any of the topics discussed, you have the right to end the interview. If you choose to withdraw from the study, the data collected will be securely stored as described below or destroyed if that is your preference. Additionally, once the study has been published, you may still request to have your data destroyed to prevent its use in any further publications.

What are some potential risks?

This study will involve minimal risk. Responses to questions are optional and voluntary; you reserve the right to withhold responses without any negative consequences. Should any of the questions cause psychological or emotional discomfort, we will be able to direct you towards appropriate resources. Please do not hesitate to contact the researchers to address any concerns.

What benefits will I receive from participating in this study?

By participating in this study, you will increase your self-awareness and through the intervention, you may develop mental skills and strategies to manage your performance, mental health, and EIP during training and competitions. Additionally, you will help increase our understanding of the benefits and drawbacks of online interventions, which have not been extensively studied in the context of sport. The findings of this research will also lead to applicable recommendations for endurance athletes, coaches, and mental performance consultants. Further, the workbooks specifically designed for the interventions will be available for use following this research. By participating in this research, you are helping us help endurance athletes to perform up to their potential while maintaining their mental health.

Has this study received ethics approval?

This research project has received ethics approval from the Research Ethics Board of the University of Ottawa. Your participation is completely voluntary, and you may withdraw from the study at any time and/or refuse to answer questions without any negative consequences. If you choose to withdraw, you will have the opportunity to also withdraw all data collected related to your participation, in which case it will be destroyed. Should you wish to withdraw collected data, simply email Jonathan Lasnier at [researcher's email address] at any point during the study and your data will be deleted from the database.

How is my personal information being protected and how will the data be conserved?

Your responses will remain anonymous and confidential. In order to minimize the risk of security breaches and to help ensure your confidentiality, we recommend that you use standard safety measures when completing and sending online documents and surveys (e.g., close your browser and lock your screen or device when you are no longer using it). Please note that while email attachments (i.e., the workbook modules) will not contain your name or other identifiable information, no additional security measures will be taken when communicating with you via email. As such, these exchanges will be subject to the same security risks that are associated with any communication via email, and the researchers cannot guarantee anonymity and confidentiality in the event that emails are intercepted. Additionally, if you choose to complete the post-interview online via Zoom, you accept that anonymity and confidentiality will not be 100% guaranteed.

The information that you share may be used by Jonathan Lasnier or Dr. Natalie Durand-Bush in conference presentations and publications in scientific journals; however, your anonymity is guaranteed at all times. You will be assigned a participant ID, and your name as well as any information that could reveal your identity in the interview transcript (should you complete the post-intervention interview), scientific articles and conference presentations, will be excluded. All physical data such as printed transcripts or reports will be safely kept in Dr. Natalie Durand-Bush's laboratory in a locked cabinet. Digital and electronic data will be saved on Jonathan Lasnier's and Dr. Natalie Durand-Bush's password protected computer. All of the data will be conserved for five years after completion of the project, after which they will be permanently destroyed.

Who do I contact if I have further questions?

If you have any questions regarding the ethical conduct of the second phase of this research project, you may contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street,

Room 154, Ottawa, Ontario, K1N 6N5; Tel.: (613) 562-5387; Email: ethics@uottawa.ca. For any questions regarding the second phase of this research project, you can contact Jonathan Lasnier at [researcher's email address] or Dr. Natalie Durand-Bush at [researcher's email address].

Do I want to be contacted for the follow-up qualitative study?

Do you want to be contacted for the follow-up qualitative study? The participation will consist of taking part in one face-to-face interview conducted in person or online via Zoom. The interview, which will last approximately 45 minutes, will take place two months after submitting the last module of the workbook and will be audio-recorded. Participants will be asked to discuss their overall experience and perceived changes as a result of participating in the online intervention. They will also be asked to discuss contextual competitions information. You will have the opportunity to accept or decline participation if you are contacted.

☐ Yes, I want to be contacted for the follow-up qualitative study.

☐ No, I do not want to be contacted for the follow-up qualitative study.

Who do I provide my consent to participate in the study?

If you wish to participate in the second phase of this research project, please read the information below and sign manually or electronically in the designated space.

- I understand that I am being asked to participate the second phase of this research project, which aims to evaluate and compare the benefits, drawbacks, and effects of different online mental performance interventions on EIP management, performance, and mental health in competitive and high-performance middle-distance track and field athletes.
- I have read each page of this Participant Informed Consent Form or have had it read to me.
- My questions have been answered to my complete satisfaction.
- I understand that I have the right to withdraw from the online intervention study and/or the follow-up qualitative study (should you complete the post-intervention interview) at any point without negative consequences. I can also request to have any of my data removed at any point in time without penalty.
- I voluntarily agree to be a participant in the online intervention study and the follow-up qualitative study (should you complete the post-intervention interview).
- I agree to be audio-recorded.
- I accept that the results of the second phase of this research project will be published in scientific articles and presented at conferences and I understand that my anonymity will be protected.
- I will be given one of the two copies of this signed consent form.

_____	_____	_____
Participant's Printed Name	Participant's Signature	Date

Principal Investigator Statement

I have carefully explained the second phase of this research project to the participant. To the best of my knowledge, the participant understands the nature, demands, risks and benefits involved in taking part in the two studies.

_____	_____	_____
Principal Investigator's Name	Principal Investigator's Signature	Date

Mental health resources on and off-campus in the Ottawa area

uOttawa SASS - Counselling and Coaching
100 Marie-Curie Private (4th floor, MCE)
Ottawa, ON, K1N 1A2
Tel.: (613) 562-5200
couns@uottawa.ca

uOttawa Health Services Clinic
300 – 100 Marie-Curie Private
Ottawa, ON, K1N 6N5
(613) 564-3950
https://www.uottawa.ca/health/

Ottawa Distress Centre
(613) 238-3311
www.dcottawa.on.ca

Good2Talk
1 (866) 925-5454
www.good2talk.ca

Drug & Alcohol Helpline
1 (800) 230-3505

Ottawa Hospital Assault Treatment Program
(613) 738-3762

Carleton University: Off-campus students
Room 2600 CTTC Building
Or call 613-520-6674

Carleton University: students in residence
Counselling is available Sept. to April
Call 613-520-2600 x 8061 for intake

National mental health resources

Crisis Services Canada
Toll Free (24/7): 1 (833) 456-4566
Text support (4pm-12am ET daily): 45645

Canadian Crisis Hotline
1 (888) 353-2273

Better Help
www.betterhelp.com
Online access to professional counsellors
On the web, and available for iPhone and Android users

The LifeLine App
www.thelifelinecanada.ca
Direct access to phone, online chat, text, and email crisis support
E-counselling, self-management tools, access to crisis centres across Canada
Available for iPhone and Android users

Big White Wall Canada
www.bigwhitewall.ca
Anonymous peer support community accessible anytime, anywhere

Provincial mental health resources

British Columbia
Canadian Mental Health Association Crisis Line – serves the entire east Kootenay region, from Golden to the Alberta and USA borders
24-hour crisis line: 1-800-667-8407

Fraser Valley Regional Crisis Line – serves Mission, Abbotsford, Chilliwack, Agassiz/Harrison, Hope, Yale and Boston Bar
24-hour crisis line: 1-877-820-7444

Crisis Centre for Northern BC – serves all of Northern BC north of Quesnel
Youth line (4-11pm): 250-564-8336
24-hour crisis line: 1-888-562-1214

Crisis Intervention & Suicide Prevention Centre of BC – serves Vancouver, North Vancouver city & district, Bowen Island, West Vancouver and Burnaby
24-hour crisis line: 604-872-3311

Province-Wide British Columbia
24-hour crisis line: 1-800-SUICIDE

Alberta
Distress Centre Calgary – serves Calgary and surrounding area
24-hour crisis line: (403) 266-4357

The Support Network Distress Line – serves Edmonton and surrounding areas
(780) 482-HELP

St. Paul & District Crisis Centre – serves all Alberta and Northeastern Saskatchewan
24-hour crisis line: 1-800-263-3045

Saskatchewan
Mobile Crisis Service – serves Saskatoon
24-hour crisis line: (306) 933-6200

Prince Albert Mobile Crisis Unit
24-hour crisis line: (306) 764-1011

Regina Mobile Crisis Services
24-hour crisis line: (306) 525-5333

Manitoba
Mobile Crisis Unit (MCU) – serves Brandon and Assiniboine regions
24-hour crisis line: 1-888-379-7699

Klinic Community Health Centre – serves Winnipeg
24-hour crisis line: 1-888-322-3019

Ontario
Hamilton
905-522-1477

Kingston
Distress line: 613-544-1771

London & District:
Mental health crisis line: 519-433-2023

Ottawa & Region
Distress line: 613-238-3311

Toronto
Distress line: 416-408-4357

Waterloo Region
Distress line: 519-745-1166

Windsor & Essex County
Distress line: 519-256-5000

Québec
Centre de prévention 24/7: 1-866-277-3553

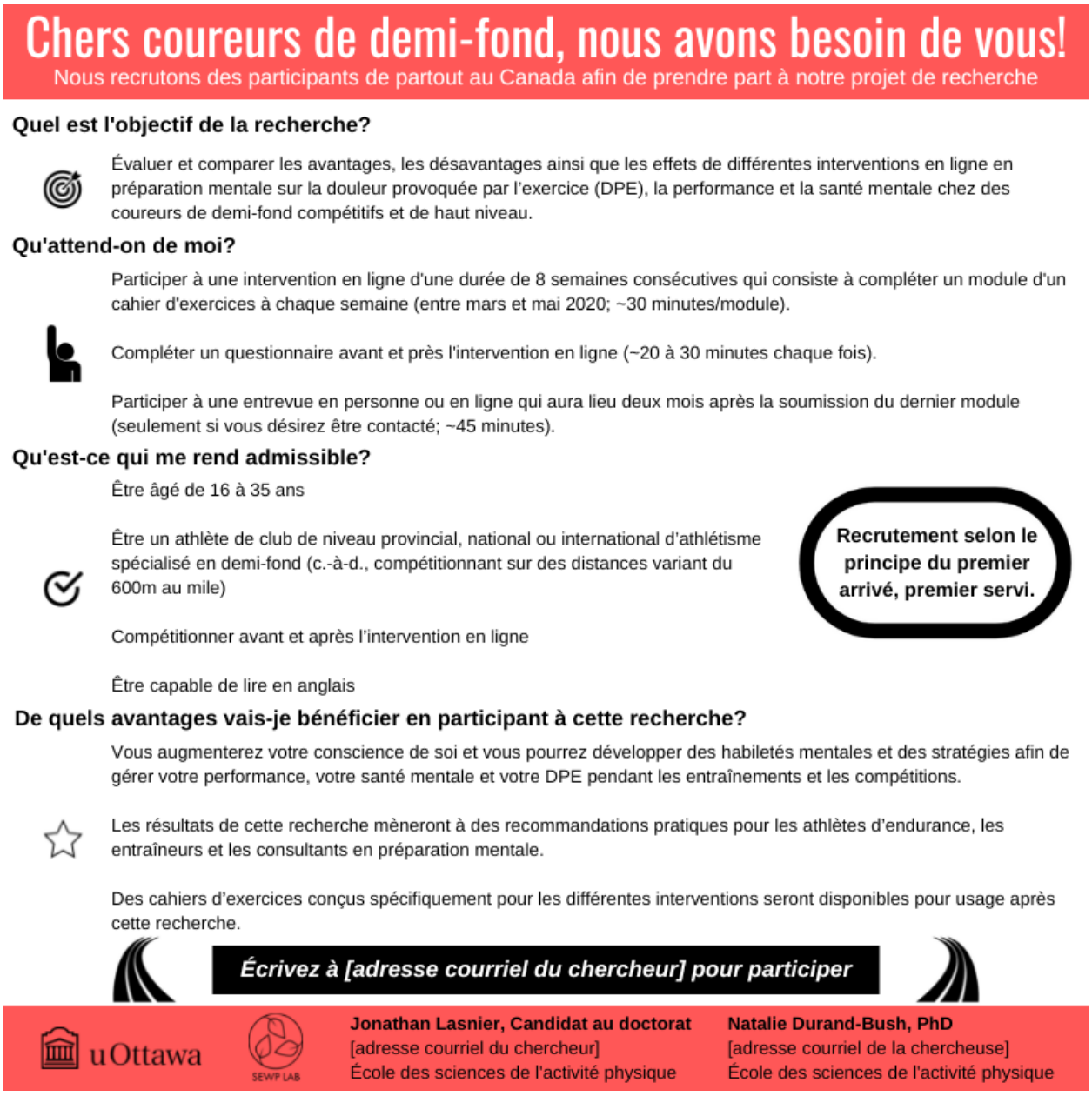
New Brunswick
Chimo Helpline – serves all of New Brunswick, bilingual, 24 hours
Provincial toll-free crisis line: 1-800-667-5005
Fredericton area: 450-HELP

Nova Scotia
Mental Health Mobile Crisis Team – serves the Capital District, Halifax, Dartmouth Bedford
24-hour crisis line: 902-4298167; toll free: 1-888-429-8167

Prince Edward Island
24-hour province-wide bilingual service: 1-800-218-2885

Newfoundland & Labrador
Mental Health Crisis Centre – serves Newfoundland and Labrador
24-hour crisis line: 1-888-737-4668

Appendix N: French Infographic - Studies 2 and 3



Appendix O: English Infographic - Studies 2 and 3

Dear middle-distance runners, we need you!

We are recruiting participants across Canada to take part in our research project

What is the purpose of this research?

Evaluate and compare the benefits, drawbacks, and effects of different online mental performance interventions on exercise-induced pain management (EIP), performance, and mental health in competitive and high-performance middle-distance runners.

What is expected of me?

Participate in an 8-week online intervention consisting of completing a workbook module each week (between March and May 2020; ~30 minutes/module).

Complete a survey before and after the online intervention (~20 to 30 minutes each time).

Participate in one interview conducted in person or online two months after submitting your last module (only if you wish to be contacted; ~45 minutes).

What makes me eligible to participate?

Be aged from 16 to 35 years old

Be a provincial, national or international level club middle-distance track and field athlete who is specialized in distances ranging from 600 meters to the mile

Be competing before and after the online intervention

Be able to read in English

Recruiting on a first-come, first-served basis.

What benefits will I receive from participating in this research?

You will increase your self-awareness and you may develop mental skills and strategies to manage your performance, mental health, and EIP during training and competitions.

Findings of this research will lead to applicable recommendations for endurance athletes, coaches, and mental performance consultants.

Workbooks specifically designed for the interventions will be available for use following this research.

Email [researcher's email address] to participate

uOttawa

SEWP LAB

Jonathan Lasnier, PhD Candidate
[researcher's email address]
School of Human Kinetics

Natalie Durand-Bush, PhD
[researcher's email address]
School of Human Kinetics

Appendix P: French Demographic Questionnaire

Questionnaire démographique

Veuillez noter que le genre masculin a été utilisé afin d'alléger le texte. Celui-ci est utilisé au sens neutre et désigne autant les femmes que les hommes.

Nom : _____ Adresse courriel : _____

Genre :

- ☐ Homme
- ☐ Femme
- ☐ Vous n'avez aucune option qui s'applique à moi. Je m'identifie comme étant (veuillez spécifier) : _____

Âge : _____

Date de naissance (mois/jour/année) : _____

Langue(s) parlée(s) : _____

Origine ethnique :

- ☐ Canadien anglais
- ☐ Canadien français
- ☐ Première nation, Inuit ou Métis
- ☐ Britannique
- ☐ Allemand
- ☐ Écossais
- ☐ Irlandais
- ☐ Néerlandais
- ☐ Scandinave
- ☐ Asiatique
- ☐ Russe
- ☐ Indien de l'Est
- ☐ Chinois
- ☐ Africain
- ☐ Arabe
- ☐ Sud-américain
- ☐ des Caraïbes
- ☐ Européen de l'Est
- ☐ Européen du Sud
- ☐ Autre (veuillez spécifier): _____

HISTORIQUE SCOLAIRE

Niveau scolaire | année d'étude en cours (si applicable) : _____

École | institution scolaire actuelle (si applicable) : _____

Plus haut niveau d'éducation obtenu :

- ☐ Diplôme de 8e année
- ☐ Diplôme d'école secondaire ou équivalent
- ☐ Diplôme du CÉGEP
- ☐ Formation technique ou professionnelle
- ☐ Diplôme professionnelle
- ☐ Baccalauréat
- ☐ Maîtrise
- ☐ Doctorat (PhD ou MD)

Nombre moyen d'heures par semaine consacrées aux études/devoirs (si applicable) : ___

HISTORIQUE DE TRAVAIL

Titre de votre poste de travail actuel (si applicable) : _____

Nombre moyen d'heures par semaine consacrées à travailler dans ce poste (si applicable) : _____

HISTORIQUE SPORTIF

Niveau actuel de compétition (c.-à-d., provincial, national, international) : _____

Nombre d'années d'expérience en course de demi-fond : _____

Nombre d'années d'expérience en course de demi-fond au niveau provincial : _____

Nombre d'années d'expérience en course de demi-fond au niveau national : _____

Nombre d'années d'expérience en course de demi-fond au niveau international : _____

Épreuve principale en course de demi-fond : _____

Équipe universitaire actuelle (si applicable): _____ Année d'éligibilité (si applicable) : _____

Club actuel (si applicable) : _____

Nombre moyen d'heures par semaine consacrées à l'entraînement durant la saison de compétition (inclure tous les types d'entraînement) : _____

Nom et date des compétitions ciblées durant la saison extérieure (p. ex., Sélection olympique, 25-28 juin) :

_____
_____
_____
_____

HISTORIQUE DE BLESSURE

Avez-vous actuellement une blessure qui affecte votre performance dans votre sport?

- ☐ Oui
- ☐ Non

Êtes-vous présentement en phase de réadaptation d'une blessure?

- ☐ Oui
- ☐ Non

Avez-vous eu des blessures dans les 5 dernières années?

- ☐ Oui
- ☐ Non

Si oui, type et date des blessures : _____

Avez-vous eu des chirurgies ou des séjours à l'hôpital dans les 5 dernières années?

- ☐ Oui
- ☐ Non

Si oui, date et raison des séjours à l'hôpital : _____

HISTORIQUE DE MALADIE MENTALE

Avez-vous déjà été diagnostiqué avec une maladie mentale?

- ☐ Oui
- ☐ Non

Si oui, type et date du diagnostic : _____

Est-ce qu'un membre de votre famille a déjà été diagnostiqué avec une maladie mentale?

- ☐ Oui
- ☐ Non

Si oui, type et date du diagnostic : _____

Avez-vous déjà travaillé avec un psychiatre, un psychologue, un psychothérapeute, un conseiller ou un consultant en performance mentale?

- ☐ Oui
- ☐ Non

Si oui, indiquez tout ce qui s'applique et décrivez votre expérience :

_____
_____
_____
_____

Appendix Q: English Demographic Questionnaire

Demographic Questionnaire

Name: _____ Email address: _____

Gender:

- ☐ Male
- ☐ Female
- ☐ You don't have an option that applies to me. I identify as (please specify): _____

Age: _____

Date of birth (month/day/year): _____

Language(s) spoken: _____

Ethnic origin:

- ☐ English Canadian
- ☐ French Canadian
- ☐ First Nation, Inuit, or Métis
- ☐ British
- ☐ German
- ☐ Scottish
- ☐ Irish
- ☐ Dutch
- ☐ Scandinavian
- ☐ Asian
- ☐ Russian
- ☐ East Indian
- ☐ Chinese
- ☐ African
- ☐ Arab
- ☐ South American
- ☐ Caribbean
- ☐ Eastern European
- ☐ Southern European
- ☐ Other (please specify): _____

SCHOOL HISTORY

Current grade | year of study (if applicable): _____

Current school | institution (if applicable): _____

Highest level of education completed:

- ☐ Grade 8 diploma
- ☐ High school diploma or equivalent
- ☐ CEGEP diploma
- ☐ Trade, technical, vocational training
- ☐ College or associate degree
- ☐ Bachelor's degree
- ☐ Master's degree
- ☐ Professional degree
- ☐ Doctorate degree (PhD or MD)

Average number of hours spent studying / doing homework per week (if applicable): ___

WORK HISTORY

Current job title (if applicable): _____

Average number of hours spent working in this position per week (if applicable): _____

SPORT HISTORY

Current level of competition (i.e., provincial, national, or international):

Years of experience in middle-distance running: _____

Years of experience in middle-distance running at the provincial level: _____

Years of experience in middle-distance running at the national level: _____

Years of experience in middle-distance running at the international level: _____

Main event in middle-distance running: _____

Current varsity team (if applicable): Year of eligibility (if applicable): _____
_____

Current club (if applicable): _____

Average number of hours you train per week during the competitive season (all types of activities included): _____

Name and date of competitions targeted during the outdoor season (e.g., Olympic Trials, June 25th-28th):

_____
_____
_____

INJURIES HISTORY

Do you currently have an injury that is affecting your performance in your sport?

- ☐ Yes
- ☐ No

Are you currently undergoing rehabilitation for your injury?

- ☐ Yes
- ☐ No

Have you had injuries in the past 5 years?

- ☐ Yes
- ☐ No

If yes, type and date of injuries: _____

Have you had any surgeries or hospital stays in the past 5 years?

- ☐ Yes
- ☐ No

If yes, date and reason for hospital stays: _____

MENTAL ILLNESS HISTORY

Have you ever been diagnosed with a mental illness?

- ☐ Yes
- ☐ No

If yes, type and date of diagnosis: _____

Have any of your family members been diagnosed with a mental illness?

- ☐ Yes
- ☐ No

If yes, type and date of diagnosis: _____

Have you ever worked with a psychiatrist, psychologist, psychotherapist, counsellor, or mental performance consultant?

- ☐ Yes
- ☐ No

If yes, list all that apply and describe your experience:

_____
_____
_____

Appendix R: French Pre- and Post-Intervention Survey

Échelle de catastrophisation de la douleur - Adaptée pour la douleur provoquée par l'exercice
(PCS; Sullivan et al., 1995; traduit en français)

Réfléchissez à des expériences antérieures de **douleur provoquée par l'exercice (DPE)** et indiquez à quelle fréquence vous avez eu certaines pensées ou émotions lorsque vous ressentiez celle-ci. La DPE est souvent associée à une sensation de brûlure dans les muscles et se produit lorsque les athlètes s'engagent dans un exercice intense et prolongé. La DPE, qui ne cause aucun dommage durable, diminue habituellement après que l'intensité de l'exercice soit réduite et disparaît une fois que l'exercice s'arrête.

Lorsque je ressens de la DPE…	Jamais	Rarement	Parfois	Souvent	Toujours
1. Je m'inquiète tout le temps à savoir si elle s'arrêtera	0	1	2	3	4
2. Je ressens que je ne peux plus continuer	0	1	2	3	4
3. C'est terrible et je pense que ça ne va jamais mieux aller	0	1	2	3	4
4. C'est affreux et j'ai l'impression que ça me submerge	0	1	2	3	4
5. Je ressens que je ne peux plus la supporter	0	1	2	3	4
6. J'ai peur qu'elle s'empire	0	1	2	3	4
7. Je n'arrête pas de penser à d'autres expériences douloureuses	0	1	2	3	4
8. Je désire anxieusement qu'elle disparaisse	0	1	2	3	4
9. Je n'arrête pas d'y penser	0	1	2	3	4
10. Je n'arrête pas de penser à quel point ça fait mal	0	1	2	3	4
11. Je n'arrête pas de penser à quel point je désire qu'elle cesse	0	1	2	3	4
12. Je ne peux rien faire pour réduire son intensité	0	1	2	3	4
13. Je me demande si quelque chose de grave va se produire	0	1	2	3	4

Questionnaire d'autorégulation - Version abrégée
(SSRQ; Carey et al., 2004; traduit en français)

	Fortement en désaccord	En désaccord	Incertain	D' accord	Fortement d' accord
1. J'effectue habituellement un suivi de mon progrès vers mes objectifs.	1	2	3	4	5
2. J'ai du mal à me décider.	1	2	3	4	5
3. Je suis facilement distrait de mes plans.	1	2	3	4	5
4. Je ne remarque pas les effets de mes actions avant qu'il ne soit trop tard.	1	2	3	4	5
5. Je suis capable d'atteindre les objectifs que je me suis fixés.	1	2	3	4	5
6. Je remets à plus tard les décisions que je dois prendre.	1	2	3	4	5
7. Il est difficile pour moi de remarquer lorsque j'en ai eu assez (p. ex., alcool, nourriture, bonbons).	1	2	3	4	5
8. Si je voulais changer, je suis confiant que je pourrais le faire.	1	2	3	4	5
9. Lorsqu'il s'agit de décider d'un changement, je me sens dépassé par tous les choix.	1	2	3	4	5
10. J'ai du mal à compléter les choses une fois que j'ai décidé de faire quelque chose.	1	2	3	4	5
11. Je ne semble pas apprendre de mes erreurs.	1	2	3	4	5
12. Je peux maintenir un plan qui fonctionne bien.	1	2	3	4	5
13. Je n'ai qu'à faire une erreur une fois pour en tirer des leçons.	1	2	3	4	5
14. J'ai des standards personnels et j'essaie de les respecter.	1	2	3	4	5
15. Dès que je vois un problème ou un défi, je commence à chercher toutes les solutions possibles.	1	2	3	4	5
16. J'ai de la difficulté à me fixer des objectifs.	1	2	3	4	5
17. J'ai beaucoup de volonté.	1	2	3	4	5
18. Quand j'essaie de changer quelque chose, je fais très attention à ce que je fais.	1	2	3	4	5
19. J'ai de la difficulté à faire des plans afin de m'aider à atteindre mes objectifs.	1	2	3	4	5
20. Je suis capable de résister à la tentation.	1	2	3	4	5
21. Je me fixe des objectifs et je fais un suivi de mon progrès.	1	2	3	4	5

22. La plupart du temps, je ne fais pas attention à ce que je fais.	1	2	3	4	5
23. J'ai tendance à continuer de faire la même chose, même quand ça ne fonctionne pas.	1	2	3	4	5
24. Je peux généralement trouver plusieurs possibilités lorsque je veux changer quelque chose.	1	2	3	4	5
25. Une fois que j'ai un objectif, je peux habituellement me faire un plan pour l'atteindre.	1	2	3	4	5
26. Si je prends la résolution de changer quelque chose, je fais très attention à ce que je fais.	1	2	3	4	5
27. Souvent, je ne remarque pas ce que je fais tant qu'une personne n'a pas attiré mon attention sur mon comportement/action.	1	2	3	4	5
28. Je réfléchis avant d'agir.	1	2	3	4	5
29. J'apprends de mes erreurs.	1	2	3	4	5
30. Je sais comment je veux être.	1	2	3	4	5
31. J'abandonne rapidement.	1	2	3	4	5

Échelle révisée de pleine conscience cognitive et affective
(CAMS-R; Feldman et al., 2007; traduit en français)

	Rarement/Pas du tout	Parfois	Souvent	Presque toujours
1. Il est facile pour moi de me concentrer sur ce que je fais.	1	2	3	4
2. Je suis préoccupé par le futur.	1	2	3	4
3. Je peux tolérer la douleur émotionnelle.	1	2	3	4
4. Je peux accepter les choses que je ne peux pas changer.	1	2	3	4
5. Je peux généralement décrire comment je me sens dans le moment avec des détails considérables.	1	2	3	4
6. Je suis facilement distrait.	1	2	3	4
7. Je suis préoccupé par le passé.	1	2	3	4
8. Il est facile pour moi de faire un suivi de mes pensées et de mes sentiments.	1	2	3	4
9. J'essaie de remarquer mes pensées sans les juger.	1	2	3	4
10. Je suis capable d'accepter les pensées et les sentiments que j'ai.	1	2	3	4
11. Je suis capable de me concentrer sur le moment présent.	1	2	3	4
12. Je suis capable de diriger mon attention sur une chose pendant une longue période de temps.	1	2	3	4

Continuum de santé mentale - Questionnaire abrégé
(MHC-SF; Keyes et al., 2008; traduit en français)

Au cours du dernier mois, à quelle fréquence vous êtes-vous senti…	Jamais	Une fois ou deux	Environ une fois par semaine	Environ deux ou trois fois par semaine	Presque tous les jours	Tous les jours
1. heureux	0	1	2	3	4	5
2. intéressé par la vie	0	1	2	3	4	5
3. satisfait à l'égard de votre vie	0	1	2	3	4	5
4. que vous aviez quelque chose d'important à apporter à la société	0	1	2	3	4	5
5. que vous aviez un sentiment d'appartenance à une collectivité (comme un groupe social, votre quartier, votre ville, votre école)	0	1	2	3	4	5
6. que notre société devient un meilleur endroit pour les gens comme vous	0	1	2	3	4	5
7. que les gens sont fondamentalement bons	0	1	2	3	4	5
8. que le fonctionnement de la société a du sens pour vous	0	1	2	3	4	5
9. que vous aimiez la plupart des facettes de votre personnalité	0	1	2	3	4	5
10. que vous étiez bon pour gérer les responsabilités de votre quotidien	0	1	2	3	4	5
11. que vous aviez des relations chaleureuses et fondées sur la confiance avec d'autres personnes	0	1	2	3	4	5
12. que vous vivez des expériences qui vous poussent à grandir et à devenir une meilleure personne	0	1	2	3	4	5
13. capable de penser ou d'exprimer vos propres idées et opinions	0	1	2	3	4	5
14. que votre vie a un but ou une signification	0	1	2	3	4	5

Trouble de l'anxiété généralisée
(GAD-7; Spitzer et al., 2006; traduit en français)

Au cours des deux dernières semaines, à quelle fréquence avez-vous été dérangé par les problèmes suivants?	Jamais	Plusieurs jours	Plus de la moitié des jours	Presque tous les jours
1. Sentiment de nervosité, d'anxiété ou de tension	0	1	2	3
2. Incapable d'arrêter de vous inquiéter ou de contrôler vos inquiétudes	0	1	2	3
3. Inquiétudes excessives à propos de tout et de rien	0	1	2	3
4. Difficulté à se détendre	0	1	2	3
5. Agitation qui fait en sorte qu'il est difficile de rester tranquille	0	1	2	3
6. Devenir facilement contrarié ou irritable	0	1	2	3
7. Avoir peur que quelque chose d'épouvantable puisse arriver	0	1	2	3
Si vous avez coché des problèmes, dans quelle mesure ceux-ci vous ont-ils empêché de faire votre travail, de vous occuper de choses à la maison ou de vous entendre avec d'autres personnes? ☐ Pas du tout difficile ☐ Un peu difficile ☐ Très difficile ☐ Extrêmement difficile				

Échelle de dépression
(CES-D; Radloff, 1977; traduit en français)

Durant la dernière semaine…	Rarement ou jamais (moins d' un jour)	Parfois ou peu souvent (1-2 jours)	À l' occasion ou modérément (3-4 jours)	La plupart du temps ou tout le temps (5-7 jours)
1. J'ai été dérangé par des choses qui d'habitude ne me dérangent pas	0	1	2	3
2. Je n'ai pas eu envie de manger, j'ai manqué d'appétit	0	1	2	3
3. Je sentais que je ne pouvais pas me défaire de mes idées noires, même avec l'aide de ma famille et de mes amis	0	1	2	3
4. J'ai eu le sentiment d'être aussi bon que les autres	0	1	2	3
5. J'ai eu du mal à me concentrer sur ce que je faisais	0	1	2	3
6. Je me suis senti déprimé	0	1	2	3
7. J'ai senti que tout ce que je faisais demandait un effort	0	1	2	3
8. J'ai été confiant face au futur	0	1	2	3
9. J'ai pensé que ma vie était un échec	0	1	2	3
10. Je me suis senti craintif	0	1	2	3
11. Mon sommeil était agité	0	1	2	3
12. J'étais heureux	0	1	2	3
13. J'ai parlé moins qu'à l'habitude	0	1	2	3
14. Je me suis senti seule	0	1	2	3
15. Les autres ont été hostiles envers moi	0	1	2	3
16. J'ai profité de la vie	0	1	2	3
17. J'ai eu des crises de larmes	0	1	2	3
18. Je me suis senti triste	0	1	2	3
19. J'ai eu l'impression que les gens ne m'aimaient pas	0	1	2	3
20. J'ai manqué d'entrain	0	1	2	3

Test d'attitudes alimentaires

(EAT-26; Garner et al., 1982; traduit en français)

Veuillez choisir une réponse pour chacun des énoncés suivants :	Toujours	Très souvent	Souvent	Parfois	Rarement	Jamais
1. Je suis terrifié à l'idée d'être trop gros.	3	2	1	0	0	0
2. J'évite de manger quand j'ai faim.	3	2	1	0	0	0
3. Je suis trop soucieux de la nourriture.	3	2	1	0	0	0
4. J'ai eu des épisodes de gloutonnerie durant lesquels je me sentais incapable d'arrêter de manger.	3	2	1	0	0	0
5. Je découpe mes aliments en petits morceaux.	3	2	1	0	0	0
6. J'ai conscience de la valeur calorique des aliments que je mange.	3	2	1	0	0	0
7. J'évite particulièrement les aliments riches en glucides (p. ex., pain, pomme de terre, riz).	3	2	1	0	0	0
8. Je sens que les autres aimeraient mieux que je mange davantage.	3	2	1	0	0	0
9. Je vomis après avoir mangé.	3	2	1	0	0	0
10. Je me sens très coupable après avoir mangé.	3	2	1	0	0	0
11. Le désir d'être plus mince me préoccupe.	3	2	1	0	0	0
12. Lorsque je fais de l'exercice, je pense à brûler des calories.	3	2	1	0	0	0
13. Les autres pensent que je suis trop mince.	3	2	1	0	0	0
14. Je suis préoccupé par le fait d'avoir trop de gras sur mon corps.	3	2	1	0	0	0
15. Je prends plus de temps que les autres pour manger mes repas.	3	2	1	0	0	0
16. J'évite de manger des aliments sucrés.	3	2	1	0	0	0
17. Je mange des aliments diététiques.	3	2	1	0	0	0
18. J'ai l'impression que la nourriture contrôle ma vie.	3	2	1	0	0	0
19. Je suis discipliné devant la nourriture.	3	2	1	0	0	0
20. J'ai l'impression que les autres me poussent à manger.	3	2	1	0	0	0
21. Je consacre trop de temps et je pense trop à la nourriture.	3	2	1	0	0	0
22. Je me sens inconfortable après avoir mangé des sucreries.	3	2	1	0	0	0
23. Je m'oblige à me mettre à la diète.	3	2	1	0	0	0
24. J'aime avoir l'estomac vide.	3	2	1	0	0	0
25. Je ressens le besoin de vomir après les repas.	3	2	1	0	0	0
26. J'aime essayer des aliments riches.	0	0	0	1	2	3

Appendix S: English Pre- and Post-Intervention Survey

Pain Catastrophizing Scale (PCS) - Adapted for Exercise-Induced Pain
Sullivan et al. (1995)

Reflect on past painful exercise experiences and indicate how often you have experienced particular thoughts or feelings when experiencing **exercise-induced pain (EIP)**. EIP is often associated with a burning sensation in the muscles and occurs when athletes engage in intense and prolonged exercise. EIP does not cause lasting damage and usually diminishes after intensity is reduced and disappears after exercise ceases.

When I'm experiencing EIP…	Not at all	To a slight degree	To a moderate degree	To a great degree	All the time
1. I worry all the time about whether EIP will end	0	1	2	3	4
2. I feel I can't go on	0	1	2	3	4
3. It's terrible and I think it's never going to get any better	0	1	2	3	4
4. It's awful and I feel that it overwhelms me	0	1	2	3	4
5. I feel I can't stand it anymore	0	1	2	3	4
6. I become afraid that EIP may get worse	0	1	2	3	4
7. I keep thinking of other painful experiences	0	1	2	3	4
8. I anxiously want EIP to go away	0	1	2	3	4
9. I can't seem to keep it out of my mind	0	1	2	3	4
10. I keep thinking about how much it hurts	0	1	2	3	4
11. I keep thinking about how badly I want EIP to stop	0	1	2	3	4
12. There's nothing I can do to reduce the intensity of EIP	0	1	2	3	4
13. I wonder whether something serious may happen	0	1	2	3	4

Short Version of the Self-Regulation Questionnaire (SSRQ)
Carey, Neal, & Collins (2004)

	Strongly disagree	Disagree	Uncertain or unsure	Agree	Strongly agree
1. I usually keep track of my progress towards my goals.	1	2	3	4	5
2. I have trouble making up my mind about things.	1	2	3	4	5
3. I get easily distracted from my plans.	1	2	3	4	5
4. I don't notice the effects of my actions until it is too late.	1	2	3	4	5
5. I am able to accomplish goals I set for myself.	1	2	3	4	5
6. I put off making decisions.	1	2	3	4	5
7. It's hard for me to notice when I've "had enough" (alcohol, food, sweets).	1	2	3	4	5
8. If I wanted to change, I am confident that I could do it.	1	2	3	4	5
9. When it comes to deciding about a change, I feel overwhelmed by the choices.	1	2	3	4	5
10. I have trouble following through with things once I've made up my mind to do something.	1	2	3	4	5
11. I don't seem to learn from my mistakes.	1	2	3	4	5
12. I can stick to a plan that's working well.	1	2	3	4	5
13. I usually only have to make a mistake one time in order to learn from it.	1	2	3	4	5
14. I have personal standards, and try to live up to them.	1	2	3	4	5
15. As soon as I see a problem or challenge, I start looking for all possible solutions.	1	2	3	4	5
16. I have a hard time setting goals for myself.	1	2	3	4	5
17. I have a lot of willpower.	1	2	3	4	5
18. When I'm trying to change something, I pay a lot of attention to how I'm doing.	1	2	3	4	5
19. I have trouble making plans to help me reach my goals.	1	2	3	4	5
20. I am able to resist temptation.	1	2	3	4	5
21. I set goals for myself and keep track of my progress.	1	2	3	4	5
22. Most of the time I don't pay attention to what I'm doing.	1	2	3	4	5
23. I tend to keep doing the same thing, even when it doesn't work.	1	2	3	4	5

24. I can usually find several different possibilities when I want to change something.	1	2	3	4	5
25. Once I have a goal, I can usually plan how to reach it.	1	2	3	4	5
26. If I make a resolution to change something, I pay a lot of attention to how I'm doing.	1	2	3	4	5
27. Often I don't notice what I'm doing until someone calls it to my attention.	1	2	3	4	5
28. I usually think before I act.	1	2	3	4	5
29. I learn from my mistakes.	1	2	3	4	5
30. I know how I want to be.	1	2	3	4	5
31. I give up quickly.	1	2	3	4	5

Cognitive and Affective Mindfulness Scale-Revised (CAMS-R)
Feldman et al. (2007)

	Rarely/Not at all	Sometimes	Often	Almost always
1. It is easy for me to concentrate on what I am doing.	1	2	3	4
2. I am preoccupied by the future.	1	2	3	4
3. I can tolerate emotional pain.	1	2	3	4
4. I can accept things I cannot change.	1	2	3	4
5. I can usually describe how I feel at the moment in considerable detail.	1	2	3	4
6. I am easily distracted.	1	2	3	4
7. I am preoccupied by the past.	1	2	3	4
8. It's easy for me to keep track of my thoughts and feelings.	1	2	3	4
9. I try to notice my thoughts without judging them.	1	2	3	4
10. I am able to accept the thoughts and feelings I have.	1	2	3	4
11. I am able to focus on the present moment.	1	2	3	4
12. I am able to pay close attention to one thing for a long period of time.	1	2	3	4

Mental Health Continuum Short Form (MHC-SF)
Keyes et al. (2008)

During the past month, how often did you feel…	Never	Rarely (once or twice)	Sometimes (about once a week)	Often (about 2 or 3 times a week)	Very often (almost every day)	Always (every day)
1. happy	0	1	2	3	4	5
2. interested in life	0	1	2	3	4	5
3. satisfied with life	0	1	2	3	4	5
4. that you had something important to contribute to society	0	1	2	3	4	5
5. that you belonged to a community (like a social group, or your neighborhood)	0	1	2	3	4	5
6. that society is a good place, or is becoming a better place, for all people	0	1	2	3	4	5
7. that people are basically good	0	1	2	3	4	5
8. that the way society works makes sense to you	0	1	2	3	4	5
9. that you liked most parts of your personality	0	1	2	3	4	5
10. good at managing the responsibilities of your daily life	0	1	2	3	4	5
11. that you had warm and trusting relationships with others	0	1	2	3	4	5
12. that you had experiences that challenged you to grow and become a better person	0	1	2	3	4	5
13. confident to think or express your own ideas and opinions	0	1	2	3	4	5
14. that your life has a sense of direction and meaning to it	0	1	2	3	4	5

Generalized Anxiety Disorder (GAD-7)
Spitzer et al. (2006)

Over the past two weeks, how often have you been bothered by the following problems?	Not at all sure	Several days	Over half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it's hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritated	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

If you checked off any problems, how difficult have these made it for you to do your work, take care of things at home or get along with other people?

- ☐ Not difficult at all
- ☐ Somewhat difficult
- ☐ Very difficult
- ☐ Extremely difficult

Center for Epidemiological Studies Depression Scale (CES-D)
Radloff (1977)

During the past week…	Rarely or none of the time (less than1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me	0	1	2	3
2. I did not feel like eating; my appetite was poor	0	1	2	3
3. I felt that I could not shake off the blues even with help from my family or friends	0	1	2	3
4. I felt I was just as good as other people	0	1	2	3
5. I had trouble keeping my mind on what I was doing	0	1	2	3
6. I felt depressed	0	1	2	3
7. I felt that everything I did was an effort	0	1	2	3
8. I felt hopeful about the future	0	1	2	3
9. I thought my life had been a failure	0	1	2	3
10. I felt fearful	0	1	2	3
11. My sleep was restless	0	1	2	3
12. I was happy	0	1	2	3
13. I talked less than usual	0	1	2	3
14. I felt lonely	0	1	2	3
15. People were unfriendly	0	1	2	3
16. I enjoyed life	0	1	2	3
17. I had crying spells	0	1	2	3
18. I felt sad	0	1	2	3
19. I felt that people disliked me	0	1	2	3
20. I could not get "going"	0	1	2	3

Eating Attitudes Test (EAT-26)
Garner et al. (1982)

Please choose a response for each of the following statements:	Always	Usually	Often	Sometimes	Rarely	Never
1. I am terrified about being overweight.	3	2	1	0	0	0
2. I avoid eating when I am hungry.	3	2	1	0	0	0
3. I find myself preoccupied with food.	3	2	1	0	0	0
4. I have gone on eating binges where I feel that I may not be able to stop.	3	2	1	0	0	0
5. I cut my food into small pieces.	3	2	1	0	0	0
6. I am aware of the calorie content of foods that I eat.	3	2	1	0	0	0
7. I particularly avoid food with a high carbohydrate content (ex. bread, potatoes).	3	2	1	0	0	0
8. I feel that others would prefer if I ate more.	3	2	1	0	0	0
9. I vomit after I have eaten.	3	2	1	0	0	0
10. I feel extremely guilty after eating.	3	2	1	0	0	0
11. I am preoccupied with a desire to be thinner.	3	2	1	0	0	0
12. I think about burning up calories when I exercise.	3	2	1	0	0	0
13. Other people think that I am too thin.	3	2	1	0	0	0
14. I am preoccupied with the thought of having fat on my body.	3	2	1	0	0	0
15. I take longer than others to eat my meals.	3	2	1	0	0	0
16. I avoid foods with sugar in them.	3	2	1	0	0	0
17. I eat diet foods.	3	2	1	0	0	0
18. I feel that food controls my life.	3	2	1	0	0	0
19. I display self-control around food.	3	2	1	0	0	0
20. I feel that others pressure me to eat.	3	2	1	0	0	0
21. I give too much time and thought to food.	3	2	1	0	0	0
22. I feel uncomfortable after eating sweets.	3	2	1	0	0	0
23. I engage in dieting behavior.	3	2	1	0	0	0
24. I like my stomach to be empty.	3	2	1	0	0	0
25. I have the impulse to vomit after meals.	3	2	1	0	0	0
26. I enjoy trying rich foods.	0	0	0	1	2	3

Appendix T: French Interview Guide - Study 3

Questions générales d'ouverture

- Comment as-tu commencé à faire de l'athlétisme?

Expérience globale avec l'intervention en ligne

- Parlez-moi de votre expérience globale avec l'intervention en ligne.
    - Quel a été l'impact de la pandémie de la COVID-19 sur ton expérience?
- Quels ont été les avantages de participer à l'intervention en ligne?
- Quels ont été les désavantages de participer à l'intervention en ligne?
- Quelles stratégies avez-vous mises en place depuis votre participation à l'intervention en ligne?

Changements perçus

- L'intervention en ligne a-t-elle amélioré votre niveau [d'autorégulation ou de pleine conscience]? Veuillez expliquer et fournir des exemples spécifiques.
- L'intervention en ligne a-t-elle eu un impact sur la façon dont vous ressentez et gérez la douleur provoquée par l'exercice (DPE)? Veuillez expliquer et fournir des exemples spécifiques.
    - Ressentez-vous et gérez-vous la DPE de façon différente lorsque vous courez à l'intérieur comparativement à l'extérieur? Veuillez expliquer.
- L'intervention en ligne a-t-elle eu un impact sur votre santé mentale? Veuillez expliquer et fournir des exemples spécifiques.
- L'intervention en ligne a-t-elle eu un impact sur votre performance? Veuillez expliquer et fournir des exemples spécifiques.

Conclusion

- Quelles sont vos impressions générales de l'intervention en ligne?
- Quelles sont les plus grandes leçons que vous retirez de ce processus?
    - Pensez-vous que ces leçons vous aideront dans le futur? Veuillez expliquer.
- Auriez-vous changé quelque chose dans l'intervention en ligne? Veuillez expliquer.
- Aimeriez-vous ajouter autre chose?
- Merci beaucoup d'avoir participé à cette étude!

Appendix U: English Interview Guide - Study 3

General opening question

- How did your journey in track and field start?

Overall experience with the online intervention

- Tell me about your overall experience with the online intervention.
    - What was the impact of the COVID-19 pandemic on your experience?
- What were the benefits of participating in the online intervention?
- What were the drawbacks of participating in the online intervention?
- What strategies have you put in place since you took part in the online intervention?

Perceived changes

- Did the online intervention improve your level of [self-regulation or mindfulness]? Please explain and provide specific examples.
- Did the online intervention have an impact on your experience of exercise-induced pain (EIP) and your management of it? Please explain and provide specific examples.
    - Do you experience and manage EIP differently when you are running indoor versus outdoor? Please explain.
- Did the online intervention have an impact on your mental health? Please explain and provide specific examples.
- Did the online intervention have an impact on your performance? Please explain and provide specific examples.

Summary

- What are your overall impressions of the online intervention?
- What are the biggest lessons you take from this process?
    - Do you feel these lessons will help you in the future? Please explain.
- Would you have changed anything in the online intervention? Please explain.
- Is there anything else you would like to add?
- Thank you so much for participating in this study!