

Navigating the Mental Triad During the Olympic and Paralympic Quadrennium: A Longitudinal Analysis of Canadian Athletes' Experiences

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Mental health is an important component of high-performance athletes' overall functioning, and mental performance may help protect athletes' mental health. While research on mental health in sport is growing, the inter-relationships between mental health, mental performance, mental illness, and sport performance require further investigation, as evidence remains limited. The purpose of this study was to better understand the interplay between these variables in a sample of Canadian athletes. A longitudinal design was used to track a group of 12 athletes (nine women) in team and individual sports during the 2020 Tokyo and 2022 Beijing Olympic/Paralympic Games quadrennium. Participants selected ($n = 7$) and not selected ($n = 5$) to compete at the Games completed an online survey at three timepoints assessing mental health, mental performance, symptoms of common mental illnesses, and perceptions of sport performance. Visual analyses using a heat map and descriptive statistical analyses were conducted. Findings suggest meaningful variability in athletes' psychological profiles and perceptions of sport performance over time, and a consistent association between frequency of mental performance skill use and better mental health. Key implications of the study findings include the importance of individual assessment and tailored support to address athletes' varied mental health needs, and the potential value of mental performance training for both overall performance and well-being.

Keywords: mental health, mental performance, mental illness, high performance, sport performance

According to several researchers, practitioners, and the broader sport community, mental health (MH) is an important component of athletes' overall functioning and sport performance (SP; Schinke et al., 2018; Vella et al., 2021). This realization has led several Canadian national and multi-sport organizations to promote MH in sport, including the Coaching Association of Canada, the Canadian Centre for Mental Health and Sport (CCMHS), and Game Plan (CCMHS, 2023; Coaching Association of Canada, 2024; Game Plan, 2022). While athletes can experience positive MH, they can also be affected by a range of MH challenges during their career, which have been linked to various sport-related risk factors

and cultural characteristics (Goutteborge et al., 2017; Jewett et al., 2024; Poucher et al., 2021; Poucher et al., 2023). For example, disturbed sleep is an important risk factor that can potentially lead to more serious MH challenges or mental illness (MI), or detriments to SP if not addressed (Drew et al., 2017). Conversely, protective factors can help prevent and buffer the negative effects of MH challenges, including mental performance (MP) competencies such as motivation, confidence, and emotion regulation (Dithurbide et al., 2022). Yet, studies specifically addressing the relationship between these variables in sport remain limited. An aim of the current study was to address this gap by investigating the interplay between MP, MH, MI symptoms, and SP in a sample of Canadian high-performance athletes.

The Mental Triad Model, derived from Keyes' (2002) dual continua model, conceptualizes MP, MH, and MI as distinct yet interconnected constructs influencing athletes' functioning and performance

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(CCMHS, 2023; Van Slingerland, 2021). MH is a state of psychological, emotional, and social well-being enabling athletes to enjoy life, realize their full potential, cope with stressors, and contribute to their communities (Westerhof & Keyes, 2010; WHO, 2025b). MI is a condition characterized by alterations in athletes' thoughts, emotions, and behaviours, leading them to experience significant distress and impaired functioning in important areas of life (WHO, 2025a). MP captures athletes' capability to use cognitive processes and mental or self-regulation competencies to perform in their sport (Durand-Bush & Van Slingerland, 2021). The model emphasizes that these constructs can vary independently. For example, an athlete may have a MI diagnosis (e.g., anxiety, depression) and/or transdiagnostic clinical symptoms (e.g., sleep disturbances) while still demonstrating good MH and high MP (e.g., if they have adequate support and coping skills). Conversely, an athlete without a MI may experience poor MH and/or low MP due to high stress and limited coping skills. Finally, the model visually depicts an athlete's mental triad profile across three states informed by Keyes' (2002) MH continuum adapted to the sport context: languishing (e.g., poor MH, low MP, and/or presence of MI), vulnerable (e.g., moderate MH and MP, subthreshold MI), or flourishing (e.g., good MH, high MP, low MI symptoms) (Durand-Bush, Misurelli, et al., 2022; Keyes, 2002).

Another model showcasing the link between elements of the Mental Triad Model and SP (i.e., athlete's ability to execute the physical skills and demands required for performance in their sport environment) is the evidence-informed Gold Medal Profile for Sport Psychology (GMP-SP; Durand-Bush, Baker, et al., 2022). The GMP-SP reviews key MP competencies (e.g., motivation, resilience, attentional control, communication) crucial for overall performance success and highlights MH as an overarching construct influencing these competencies and vice versa. Overall, the Mental Triad Model and GMP-SP outline the logical connections between MP, MH, MI, and SP and emphasize the individual and nuanced nature of athletes' MH states and experiences.

While attention to the importance of examining MH in athlete-focused research has burgeoned in recent decades (Poucher et al., 2021), studies specifically investigating links between MH-related variables (MH and MI) and performance variables (MP and SP) have been limited. This may be partially due to traditional,

albeit currently refuted, beliefs that athletes were immune to mental health challenges given their physical prowess. Notwithstanding this gap, qualitative researchers have provided a compelling understanding of how dynamically connected well-being and SP can be, and the role that MP can play in supporting both areas (Dithurbide et al., 2022; Jewett et al., 2024; Lebrun et al., 2018). For example, Jewett and colleagues (2024) interviewed high-performance athletes who reported detailed examples of intricate, bidirectional links among MH, MI, and MP. Namely, the athletes discussed how poor MH could interfere with their ability to use MP skills. They also described how the use of MP skills protected them against poor MH. In terms of SP, the athletes described many situations when symptoms of MI or poor MH interfered with their ability to meet the physical and psychological demands of training and competing in their sport. Other studies have highlighted the negative impact that perceived performance failure can have on athlete MH and MI symptoms (e.g., Hammond et al., 2013). Furthermore, a small number of intervention-based studies have examined the impact of MP training on athlete well-being, with Dubuc-Charbonneau and Durand-Bush (2015) reporting that student-athletes' well-being increased following participation in a MP intervention.

While this research points to a meaningful relationship between MH, MI, and SP, and suggests that MP skills may be helpful in different ways, to strengthen this growing body of research, the incorporation of varied and novel research methods can be beneficial. Indeed, Perry and colleagues (2021) highlighted the need to employ a variety of research methods when conducting athlete MH research to contribute to a more holistic understanding of their states and experiences. Quantitative accounts of relationships between MP, MH, symptoms of MI, and SP are also lacking in the current literature. Furthermore, there has been a heavy reliance on cross-sectional data in athlete MH research, prompting calls within the field for longitudinal study designs to explore MH over time (Poucher et al., 2021; Tahtinen et al., 2021).

It is important to assess MH over time, given that athletes experience a range of stressors throughout a competitive season that can interact with MH and SP (Fletcher et al., 2012). In particular, they can experience intense performance pressure and related 'highs and lows' during an Olympic/Paralympic quadrennium, which are the four years of

a Games cycle during which athletes are embedded in qualification, selection, preparation, competition, and recovery phases, each associated with a range of psychological and physical demands (Henriksen et al., 2020). In line with this recommendation, Poucher and colleagues (2022) investigated MI symptoms in a Canadian high-performance athlete sample at four timepoints between December 2019 and September 2020 and surprisingly reported that levels of depression, anxiety, and disordered eating remained consistent and high. These researchers highlighted the need for additional longitudinal research beyond the most acute phase of the COVID-19 pandemic and a focus on individual-level changes in athletes' MH to continue shedding light on potential patterns and individual differences in athletes' MH experiences surrounding the Olympic/Paralympic Games. These are important areas we aimed to build on in this study.

Challenges such as symptoms of depression and anxiety continue to be meaningful to study, given their high incidence in athletes, and thus were included as key variables in the current study (Gulliver et al., 2015; Poucher et al., 2021). There have also been calls in the literature for increased attention to sleep disturbances, which are understudied but important manifestations of MI in athletes (Dunican et al., 2019; Rabin et al., 2020; Tuomilehto et al., 2017). Poor sleep is an important indicator of MH and contributes to SP challenges in athletes (Reardon et al., 2019; Tuomilehto et al., 2017). Due to the high prevalence of sleep issues in athlete samples and their relevance to sport performance, sleep was included as a variable of interest in the current study.

Purpose and Rationale

As highlighted, there is minimal empirical research examining the relationships between MP, MH, MI symptoms, and SP. While existing knowledge has led to more research and support for athletes (Durand-Bush & Van Slingerland, 2021; Henriksen et al., 2020; Poucher et al., 2023), sport organizations continually face financial constraints, limiting their ability to fully address athletes' well-being needs. Therefore, more specific knowledge of athletes' experiences is warranted, which can then inform adequate policies and funding. To address the aforementioned gaps, the purpose of the current study was to examine relationships among MP, MH, symptoms of common MIs, and SP in a sample of Canadian high-performance athletes, using methods that prioritize individual variability and a longitudinal design with

three timepoints during the Olympic/Paralympic quadrennium. The following research questions and hypotheses guided the study:

1. What are athletes' levels of MP, MH, MI symptoms, and perceived SP? It is hypothesized that athletes will report the presence of MI symptoms, and the majority will report moderate to poor MH based on previous research with a similar sample (Poucher et al., 2021). MP levels are expected to be high given that high-performance athletes are likely to have access to this element of training within national-level sport environments.
2. Are there fluctuations in Canadian high-performance athletes' levels of MP, MH, MI symptoms (i.e., mental triad profiles), and perceived SP across timepoints? It is hypothesized that athletes' MH will decrease, and MI symptoms will increase closer to the Games due to elevated stress and pressure. Perceived SP is expected to fluctuate over time with qualification periods and performance at the Games, while MP is anticipated to remain relatively stable and high, as high-performance athletes are anticipated to implement MP skills consistently.
3. Is there evidence of relationships between athletes' levels of MP, MH, MI symptoms, and perceived SP? It is hypothesized that athletes' MH and MI symptoms will be correlated, with higher MH associated with lower MI symptoms. Higher MH and lower MI are expected to correlate with higher MP. Given the overlap between psychological and emotional processes involved in MH and MP, athletes are expected to use MP skills more effectively when in a positive MH state, while MH challenges may hinder their use of these skills. Finally, more negative perceptions of SP are hypothesized to correlate with lower MH and MP, and higher MI symptoms based on previous research findings suggesting a link between SP outcomes and MH challenges (Hammond et al., 2013).

Method

Participants

Participants were Canadian high-performance athletes training to qualify for and compete at the Tokyo 2020 or Beijing 2022 Olympic and Paralympic Games. Inclusion criteria involved athletes of all genders and aged 18 years and older. Forty-nine

athletes completed the survey at the first time point; however, due to participant attrition, only 12 completed the survey at all three timepoints. Given the aim of this study to examine athletes' in-depth, nuanced experiences over time, the current sample was limited to these 12 athletes. Nine (75%) of the athletes self-identified as female and three (25%) as male, and the mean age of the sample was 29 years ($SD = 3.85$). The majority of the sample identified as White English Canadian ($n = 9$; 75%), while two athletes identified as White French Canadian (17%) and one identified as East Indian (8%). Athletes competed in both winter ($n = 5$; 42%) and summer ($n = 7$; 58%) sports, and individual ($n = 4$; 33%) and team ($n = 8$; 67%) sports. Seven (58%) of the 12 athletes competed at the Tokyo 2020 ($n = 6$) or Beijing 2022 ($n = 1$) Games, including one Paralympian, while five of the athletes did not qualify for the Games. Two athletes reported being previously diagnosed with MIs, specifically depression, attention-deficit hyperactivity disorder, and anxiety.

Procedure

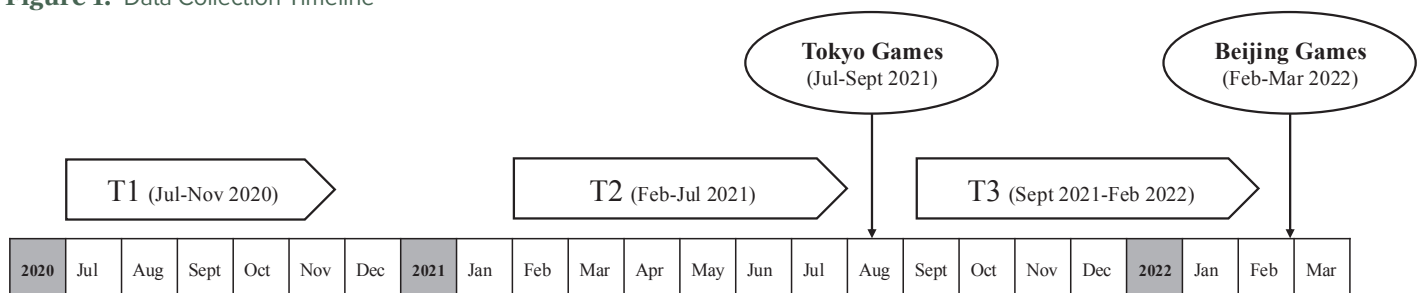
Upon receiving ethical approval from the Research Ethics Boards at the University of Ottawa and Toronto Metropolitan University, the survey was pilot-tested for comprehension and length using a convenience sample of former competitive athletes who were graduate students. Participant recruitment began by contacting, via social media and personal contacts, Canadian national team athletes who were identified as such using publicly available information on National Sport Organization (NSO) websites. Advertisements for the study were also distributed through athlete groups and NSOs' newsletters

and blog posts. Once an initial sample of athletes participated in the first online 30-minute survey timepoint, this group was contacted a maximum of three times via personalized emails and asked to complete the survey at subsequent timepoints. Athletes provided informed consent to participate at each timepoint via an electronically signed consent form prior to accessing the survey. Athletes were given a \$10 Amazon e-gift card for completing each of the first two survey timepoints and a \$20 Amazon e-gift card for completing the third survey timepoint. The study involved three timepoints to assess athletes' MP, MH, MI symptoms, and perceptions of SP during the Olympic/Paralympic quadrennium. Each survey timepoint window was extended from one month to five to six months to allow athletes flexibility in their participation given the high physical and psychological demands of their training and competition schedules and given the constraints surrounding the COVID-19 pandemic. Figure 1 depicts the data collection timeline.

Survey Measures

The survey was designed to measure the key constructs included in the Mental Triad Model (i.e., MP, MH, and symptoms of MI) and SP. Athletes' perceptions of their SP were assessed using a self-report measure, and whether athletes were selected to compete at their respective Games (i.e., Tokyo or Beijing) was used as an objective indicator of SP. Demographic questions were included to describe key characteristics and sport participation. All measures were psychometrically sound for use with competitive athlete populations, and the survey was available in English and French.

Figure 1. Data Collection Timeline



Note. Each timepoint is represented by bars labeled T1, T2, and T3. The date range included on each bar is the timeframe during which the survey was open. Within each timepoint, three attempts were made to ask athletes to participate in the study.

Mental Performance

The Mental Performance Checklist (MPC; Durand-Bush, 2020) assesses athletes' perceptions of their ability to use a range of MP competencies (e.g., self-confidence, self-talk, attention regulation). The 23 items are measured using a 5-point Likert scale ranging from 1 (*almost never*) to 5 (*almost always*). Examples include "I believe in myself even in difficult situations" and "I refocus when I get distracted." Higher scores indicate greater skill utilization, with a total possible score of 115. Scores of 0-45 indicate low MP, 46-89 moderate MP, and 90-115 high MP.

Mental Health

The Mental Health Continuum – Short Form (MHC-SF; Keyes, 2002) is a 14-item questionnaire that assesses overall MH across three dimensions: emotional well-being (EWB; three items); social well-being (SWB; five items); and psychological well-being (PWB; six items). Each item asks respondents to rate how often they have felt various phenomena in the past month (e.g., "interested in life", "that your life has a sense of direction and meaning"), based on a 6-point Likert scale from 0 (*never*) to 5 (*every day*). Higher scores indicate better MH, with scores ranging from 0 to 70. In addition to a continuous score, responses can also be used to categorize respondents' MH as flourishing, moderate/vulnerable, or languishing (Keyes, 2002). The MHC-SF demonstrated good internal consistency in the current sample at T3 (Cronbach's alpha = .92) and in previous research (Cronbach's alpha > .80; Keyes, 2005), and its three-factor structure was confirmed in young adults (Robitschek & Keyes, 2009).

Anxiety

Symptoms of anxiety were measured using the Generalized Anxiety Disorder scale (GAD-7; Spitzer et al., 2006). The scale includes seven items assessing how often respondents are affected by various issues (e.g., "feeling nervous, anxious, or on edge", "not being able to stop or control worrying") over the past two weeks on a 3-point scale (0 = *not at all*, 1 = *several days*, 2 = *more than half of the days*, and 3 = *nearly every day*). An additional item asks how much dysfunction these issues cause. Total scores range from 0 to 21. Respondents can be categorized as having no (0-4), mild (5-9), moderate (10-14), or severe (15+) generalized anxiety symptoms. A Cronbach's alpha of .92 has been reported for the GAD-7 (Spitzer et al., 2006).

Depression

The Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) is a 9-item inventory that assesses symptoms associated with depression (e.g., "little interest or pleasure in doing things", "feeling down, depressed, or hopeless"), and how difficult these symptoms render daily life. A 4-point Likert scale measures the frequency with which each symptom occurred in the past two weeks, ranging from 0 (*not at all*) to 3 (*nearly every day*). With a range of 0-27, scores reveal no symptoms (0-4), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20 and above) depression symptoms. Kroenke and colleagues (2001) reported a Cronbach's alpha of .89, indicating good internal consistency.

Sleep Difficulties

Sleep quality was assessed using the Athlete Sleep Screening Questionnaire (ASSQ; Samuels et al., 2016), which contains 16 items targeting sleep experiences during the past month (e.g., "how many times per week do you have trouble staying asleep", "how long does it take you to fall asleep at night"). Five of the items produce a sleep difficulty score (SDS) ranging from 0 to 17, categorizing respondents as having no (0-4), mild (5-7), moderate (8-10), or severe (11+) sleep difficulties, while the remaining items provide information for intervention planning. Only items that contributed to the SDS were included in this study. The ASSQ was validated with a sample of Canadian national team athletes, yielding acceptable internal consistency (Bender et al., 2018).

Sport Performance

The Sport – State Self-Esteem Scale (S-SSES; Gotwals et al., 2003) is a 10-item measure of sport performance, assessing respondents' perceptions of their sport performance during the past month (e.g., "I feel confident about my athletic abilities", "I feel like I am not doing well athletically"). Items are rated using a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A high total score indicates a more positive perception of athletic performance, with scores ranging from 10 to 50. Acceptable internal consistency has been reported in previous research; Gotwals et al. (2003) reported a Cronbach's alpha of .70.

Data Analysis

Descriptive statistics and a heat map (Wilkinson & Friendly, 2009) were selected to highlight relationships and changes in the variables of interest across the three study timepoints and to depict the variety of mental triad profiles within the sample.

Profiles and Relationships

A heat map (see Figure 2) was created to depict the variables of interest for each participant at each study timepoint, relative to one another. We anticipated that the sample across the three data collection timepoints would be small because of the relatively small athlete population from which we were drawing and early challenges encountered with participant recruitment (e.g., national sport organizations' hesitation to disseminate the research information, restrictions due to the COVID-19 pandemic, limited availability of athletes close to Olympic and Paralympic Games). We therefore opted for a data analysis method appropriate for a small sample size (i.e., approximately 8-15 participants) that could convey detailed inter- and intra-individual views of the data, aligning with the study aim. A heat map, a visual representation of data that uses a color-coding system, satisfied these conditions (Wilkinson & Friendly, 2009). The approach is adapted from DesClouds and colleagues' (2022) work analyzing athletes' smartphone use and its impact on MH, using a similar sample size of 10 athletes.

The heat map was created by first calculating the athletes' scores on each measure at each timepoint. Then the mean score on each measure was calculated to determine the threshold for favourable scores (above the sample mean) and unfavourable scores (below the sample mean). Next, colours were used to show how individual scores compared to the rest of the sample. A green-to-red scale represents favourable to unfavourable scores, with the sample mean score demarcating the threshold between green and red. The intensity of the colour is based on the degree to which each athlete's score deviates from the sample's minimum (worst) and maximum (best) scores.

The heat map colour gradient highlights subtle trends over time and potential relationships between the variables. The most intense green in the map represents the most favorable score on the specific measure within the sample, while the deepest red signifies the most unfavorable score on that measure.

All colour gradients between red and green signify variability between these extremes. Progression from green to red suggests an unfavorable change, while a shift from red to green indicates a favorable change over time. Favorable or unfavorable trends align with standard interpretations of the measures (e.g., an increase in MH is favourable; an increase in MI symptoms is not).

Athletes in the heat map are ordered by sport type (winter/summer), and to provide context for each athlete, Games selection status, disclosure of MI diagnosis, and gender are included. The heat map also displays each athlete's individual measure scores, enabling assessment of the absolute values of MP, MH, MI symptoms, and perceptions of SP for each athlete relative to the score range for each measure, which is depicted in parentheses under the heading of each variable.

Additional Analyses

Means, ranges, standard deviations, and percentages were used to provide an overview of the athletes' reported data. To supplement the heat map visual analyses, statistical associations between the variables of interest across time and across the entire sample were investigated. Although the sample size was insufficient to draw widely generalizable conclusions, these analyses were undertaken to contribute to initial foundations and insights upon which future research may build. Spearman's rho correlation coefficients (r_s) were calculated between all variables of interest at each timepoint and interpreted as weak ($\pm .10$), medium ($\pm .30$), or strong ($\pm .50$; Field, 2013). Finally, a repeated-measures ANOVA was performed to determine within-subject differences in MP, MH, symptoms of MI, and perceived SP across the three timepoints (Field, 2013). Statistical analyses were performed using SPSS Statistics 29 (IBM Corp., Armonk, NY, USA) with a significance level set at $p < .05$.

Results

Profiles and Relationships

Figure 2 is a heat map representation of the athletes' scores on the variables of interest across the three study timepoints. The heat map showcases distinct variations among individual athletes, highlighting notable fluctuations in MP, MH, MI symptoms, and SP over time. When analyzed vertically, intra- and inter-individual differences and changes can be discerned

for each variable. Horizontally, intra-individual relationships between variables and inter-individual profile distinctions between the athletes can be observed. For example, from a SP perspective, participant 4F appeared to have a relatively negative experience compared to the rest of the sample - she did not qualify for the Winter Games. She reported some of the most negative perceptions of her SP across time compared. Interestingly, despite the challenges with SP she experienced, she reported

consistently high MP and MH, and very low MI symptoms during her Olympic quadrennium. Almost the opposite profile is seen with participant 3F, who is another winter sport athlete. She reported unfavourable MP, MH, elevated MI symptom scores, and a self-reported MI diagnosis, while experiencing moderately positive perceptions of SP, even though she did not qualify for the Winter Games. Participant 7F's and 11F's profiles illustrate a key proposition of the Mental Triad Model – that an athlete's MH state

Figure 2. Heat Map of Variables of Interest

Participant	Games	Selected	Self-Reported Diagnosis	Timepoints	MP (0-115)	MH (0-70)	Anxiety (0-21)	Depression (0-27)	Sleep Difficulties (0-17)	Sport Self-Esteem (10-50)
1F	Winter	yes	no	1	84	40	14	11	6	30
				2	87	40	15	17	6	38
				3	75	42	12	14	8	36
2F	Winter	no	no	1	74	26	14	17	12	36
				2	75	29	9	13	11	37
				3	78	53	5	2	6	35
3F	Winter	no	yes	1	81	27	11	17	9	38
				2	77	41	17	12	10	35
				3	77	36	8	16	10	36
4F	Winter	no	no	1	94	61	2	1	3	26
				2	87	57	4	3	1	33
				3	93	61	4	3	1	27
5M	Winter	no	no	1	95	51	4	5	12	27
				2	101	49	3	7	13	36
				3	97	54	3	4	12	30
6F	Summer	yes	yes	1	94	45	19	14	5	36
				2	98	49	2	8	4	26
				3	89	51	11	8	2	31
7F	Summer	yes	no	1	108	62	8	9	9	40
				2	98	60	7	5	9	39
				3	104	68	2	0	6	38
8M	Summer	yes	no	1	76	23	12	5	2	39
				2	81	22	9	7	7	26
				3	96	36	6	3	3	40
9M	Summer	yes	no	1	81	46	5	6	6	26
				2	75	34	6	4	7	32
				3	61	35	7	9	7	31
10F	Summer	yes	no	1	77	48	6	9	8	36
				2	64	34	8	10	9	36
				3	63	21	8	14	10	36
11F	Summer	yes	no	1	71	42	2	4	3	32
				2	73	27	12	4	4	32
				3	79	23	3	5	6	34
12F	Summer	no	no	1	74	46	11	10	4	38
				2	78	59	4	2	3	36
				3	74	46	5	3	5	34

Note. Heat map displaying individual scores for each variable measure across the three study timepoints. Colours depicted with each score represent how an individual's score compares to the rest of the sample. The most favourable score is depicted by the brightest green and is the best score on the measure within the sample. The least favourable score is depicted by the darkest red and is the worst score on the measure within the sample. All colour gradients between red and green signify variability between these extremes. The "M" or "F" beside each participant number signifies male or female gender. Numbers found under each variable heading are the score ranges for each survey measure.

can be distinct from MI symptoms. Participant 7F qualified for the Summer Games and reported the most positive perceptions of SP and the highest MP and MH amongst the sample – scores indicating a flourishing state – while concurrently reporting some symptoms of anxiety, depression, and sleep difficulties. Notably, participant 11F is a summer sport athlete who also qualified for and competed at the Games. However, her profile illustrates a pattern of low MP and deteriorating MH scores that suggest she shifted from a vulnerable to a languishing state across the study timepoints, without consistently elevated MI symptoms. Overall, the heat map reveals substantial variability in athletes' MP, MH, MI symptoms, and SP profiles.

Across the sample, a visual analysis reveals potential relationships between the variables of interest. For example, higher MP appears to be associated with better MH, as evidenced by the colour consistencies across these two columns (e.g., if an athlete reported favourable MP scores, they also tended to report favourable MH scores, and vice versa). This pattern is distinctly seen in participant 4F's, 5F's, 7F's, 9M's, 10F's, and 11F's profiles. Interestingly, there does not appear to be a consistent relationship between MP and perceptions of SP within this group, with some athletes reporting high MP and low sport self-esteem, and others reporting low or moderate MP and high or moderate sport self-esteem (e.g., participant 4F's, 5M's, and 6F's profiles). Finally, in general, it appears that athletes who reported poor MH also reported the presence of symptoms of anxiety, depression, and/or sleep difficulties (e.g., participant 2F's, 3F's, and 10F's profiles).

Additional Analyses

The athletes scored an average of 83.03 on the MPC, indicating a moderately high frequency of mental skills use within this group, considering that the measure's maximum score is 115. Regarding MH, no athletes fell into the languishing category based on Keyes' (2002) criteria. The majority ($n = 9$; 75%) were vulnerable/moderately mentally healthy, whereas a minority ($n = 3$; 25%) were flourishing according to this measure. In terms of MI symptoms, 17% ($n = 2$) of athletes reported no anxiety, while 58% ($n = 7$) and 25% ($n = 3$) revealed mild and moderate symptoms, respectively. For depression, 8% ($n = 1$) reported no symptoms, whereas 50% ($n = 6$) and 42% ($n = 5$) reported mild and moderately severe symptoms, respectively. No sleep difficulties were reported by

33% ($n = 4$) of the athletes, mild symptoms by 25% ($n = 3$), moderate symptoms by 33% ($n = 4$), and several symptoms by 8% ($n = 1$). The athletes' mean S-SSES score was 33.83, indicating that the group held moderately positive perceptions of their SP.

Spearman's rho correlations were performed to assess relationships at each timepoint. At T1, there was a negative correlation between MH and anxiety symptoms ($r_s = -.586$, $p = .045$), a positive correlation between anxiety symptoms and depression symptoms ($r_s = .795$, $p = .002$), and a positive correlation between MP and MH ($r_s = .609$, $p = .036$). At T2, the positive correlation between MP and MH was the only statistically significant relationship observed ($r_s = .628$, $p = .029$). At T3, MP was negatively correlated with anxiety symptoms ($r_s = -.591$, $p = .043$) and depression symptoms ($r_s = -.593$, $p = .042$), MH was negatively correlated with depression symptoms ($r_s = -.668$, $p = .018$), and anxiety symptoms and depression symptoms were correlated ($r_s = .732$, $p = .007$). Again, at T3, a positive correlation was observed between MH and MP ($r_s = .669$, $p = .017$). The significant correlations between MP and MH at T1, T2, and T3 suggest that more frequent use of MP skills was associated with better MH. Notably, no significant relationships were observed between perceptions of SP and the remaining variables, or between sleep difficulties and the remaining variables. Finally, the ANOVA analysis revealed no significant differences in survey scores between T1, T2, and T3, indicating that reports of MP, MH, symptoms of anxiety, depression, and sleep difficulties, and perceptions of SP remained relatively stable for the sample as a whole across the study timepoints.

Discussion

The current study's findings shed light on the complex, individual nature of the relationships among MP, MH, MI symptoms, and SP in this sample of Canadian high-performance athletes. Unique methodological approaches were employed, including a heat map and a longitudinal design spanning important periods of the Tokyo and Beijing Olympic/Paralympic Games' quadrennia. This study addressed calls for longitudinal research, methodological variety, and attention to individual MH states and to the relationships between psychological constructs important to athlete well-being and performance domains (Poucher et al., 2021; Tahtinen et al., 2021). Results indicated that MP, MH, MI symptoms, and perceptions of

SP remained relatively stable across the study timepoints; however, intra-individual fluctuations in the variables of interest over time revealed a more nuanced account of individual differences in mental triad profiles.

Addressing the first research question regarding prevalence rates, descriptive statistics generated findings that are largely consistent with previous studies. Consistent with our hypothesis about MI symptoms, most of the athletes reported the presence of mild to moderate anxiety symptoms, mild to moderate depression symptoms, and mild to severe sleep difficulties. Poucher and colleagues (2021) found similar prevalence rates in their sample of Canadian high-performance athletes with regard to anxiety and depression. Rabin and colleagues (2020) also reported a high frequency of sleep problems in a sample of NCAA athletes. Taken together, these findings suggest that amongst competitive athletes at both the university and elite levels, sleep disturbances are a notable challenge.

Also consistent with our hypothesis, 75% of the sample reported levels of psychological, emotional, and social well-being that reflected a vulnerable state of MH. Vulnerable MH equates to Keyes' (2002) description of moderate MH, which indicates a lack of flourishing and puts individuals more at risk of experiencing MI symptoms. Importantly, some athletes fluctuated between flourishing and vulnerable states over time, suggesting that interventions at key points may prevent MH deterioration or contribute to MH improvements. These findings support recommendations outlined in the Mental Health Strategy for High Performance Sport in Canada (Durand-Bush & Van Slingerland, 2021) and in international consensus statements (Henriksen et al., 2020). Such authors stated that MH and MI assessment throughout an Olympic/Paralympic quadrennium is paramount for identifying athletes in vulnerable states and connecting them with appropriate resources.

In terms of performance-based variables, the current study is among the very few to explore rates of MP skill use and perceptions of SP in a high-performance athlete sample. Interestingly and consistent with our hypothesis, the group as a whole reported relatively frequent use of MP skills. This finding aligns with previous research showing that elite athletes have higher MP than less elite counterparts (Mitić et al., 2021). This suggests that efforts to increase access

to MP resources in recent years (e.g., through widespread hiring of Mental Performance Consultants to work with national team athletes) may have been beneficial (e.g., Canadian Sport Institute, 2022).

The athletes also reported moderately positive perceptions of SP as a group. Also, for most of the athletes, perceptions of SP did not fluctuate significantly over time, indicating relative stability in sport self-esteem, even in response to an important event such as the Olympic/Paralympic Games. A possible explanation for these findings is that sport self-esteem may be more reflective of a stable trait, rather than a construct like self-confidence, which may be highly sensitive to context and objective indicators of sport performance (such as being selected to compete at the Games or not). Minimal research has examined the nature of sport self-esteem over time; however, evidence suggests that self-esteem in general tends to be stable across adulthood (Trzesniewski et al., 2003). A more in-depth understanding of this construct would continue to inform its utility in research and practice wherein MPCs and coaches may be working with athletes to improve their sport self-esteem.

The second research question was addressed through a longitudinal analysis of notable changes in athletes' levels of MP, MH, MI symptoms, and perceptions of SP across the quadrennia of the Tokyo and Beijing Games. Contrary to parts of our hypotheses, at the group level, these variables did not change significantly over time. As Poucher and colleagues (2022) suggested, when interpreting their findings, elevated stress related to the COVID-19 pandemic could have contributed to the maintenance of elevated MI symptoms and poor general MH over time. Although the current study captured athletes' experiences during the two years after Poucher and colleagues' (2022) study, COVID-19 related restrictions were still profoundly impacting Canadian high performance athletes' training and competition opportunities and environments (Katz, 2021) and were likely still playing a role in their overall well-being (Dithurbide et al., 2022; Jia et al., 2023).

In light of this potentially confounding context, our ability to examine individual variability in these constructs over time using the heat map method led to more nuanced results. While not captured at the group level, it is noteworthy that participants 2F, 6F, 8M, 11F, and 12F reported enough variability in their MH and MI symptoms to fluctuate between

desirable (green) and undesirable (red) scores over time. For example, participant 6F, a summer sport athlete who competed at the Tokyo Games, reported severe anxiety a year before the Games, no anxiety a few months pre-Games, and moderate anxiety post-Games. Participant 11F's scores paint a notably different picture, with the highest anxiety symptoms reported in the few months preceding the Games. The individual variability in their MH highlights that while investigating trends in large samples of athletes can provide valuable insights, assessing individual profiles and tailoring support resources is critical to meeting the varied needs of athletes at different points in their embedded contexts. This implication provides strong support for recommendations within the field to attend to the individualization and periodization of MH care throughout the Olympic/Paralympic quadrennium (Durand-Bush & Van Slingerland, 2021; Henriksen et al., 2020).

Delving into the third and final research question regarding relationships between MP, MH, MI symptoms, and perceptions of SP, findings point to a meaningful connection between MH and MP. Supporting our hypothesis, favorable MH scores aligned with favourable MP scores based on the colours in the heat map, and significant and strong correlations between MH and MP scores across all three study timepoints corroborate these visual analyses. Interestingly, and contrary to our hypotheses regarding relationships between MP, MH, MI, and perceptions of SP, a similarly consistent and strong relationship over time was not observed between these variables. There are a range of possible explanations for this surprising finding, one of which may be related to the already discussed nature of sport self-esteem as a potentially stable, trait-like perception of performance. As such, it may not fluctuate in ways that align with changes in MH, MP, or MI over time. It is also possible that more objective indicators of performance (e.g., competition outcomes, statistics, personal best times) would have shown different or clearer associations with the other variables (Lochbaum et al., 2022), as they may or may not align with athletes' perceptions of their SP. Participant 6F's profile illustrates this point: this athlete achieved an Olympic gold medal, a pinnacle of SP, yet reported relatively low subjective sport self-esteem compared to the sample as a whole. Patterns such as these indicate that research investigating the potentially variable relationship between objective or subjective measures of SP and athlete well-being is an interesting direction for

future research. It is also worth considering that the lack of significant relationships between SP and MH, MP, and MI observed in the current study may be due in part to limited statistical power, as the relatively small sample size may have constrained our ability to detect effects that might emerge in larger samples.

These findings provide rare quantitative support for the notion that the use of MP skills may have positive and protective effects on MH, which is consistent with qualitative reports provided by both national team athletes and MH and MP practitioners supporting them (Dithurbide et al., 2022; Jewett et al., 2024). These findings support relevant existing theoretical models of MP, such as the GMP-SP, which frames MH as an overarching construct influencing athletes' MP and SP, and vice versa (Durand-Bush, Baker, et al., 2022). It also helps justify the MP dimension in the Mental Triad Model, an expansion of Keyes' dual continuum model of interrelatedness between MH and MI (Keyes, 2002). The inter-relationships observed in this study provide additional compelling empirical support for the relevance of attending to the interactions between MP, MH, and MI proposed in these models.

An interesting explanation for this relationship lies in the similarities in the foundational elements of these constructs (e.g., MP and MH integrate and depend on the management of thoughts, emotions, and behaviours to typically improve athletes' SP and their psychological, emotional, and social well-being, respectively). Furthermore, techniques that enhance resilience, emotion regulation, and cognitive flexibility, which are common in MP training, align with well-established therapeutic approaches for promoting and strengthening MH (Beck, 2020; Hayes et al., 2016). This finding highlights the importance of exposing athletes to interdisciplinary care that includes both clinical MH resources and MP resources to support both SP and MH overall. Importantly, clinical mental healthcare is needed for MI treatment, and our findings underscore the value of sport organizations concurrently prioritizing MP training. Critically, for athletes who continue to experience stigma and hesitate to seek support for their MH, the ability to develop MP skills within their sport environment may feel more acceptable and concurrently benefit their MH. Moreover, MP practitioners are important allies for athletes, as they can refer them to MH specialists when necessary (McHenry et al., 2022).

Strengths, Limitations, and Future Directions

Notable strengths of the current study include its longitudinal design and the use of a variety of methods to analyze and present the data, which highlight both group patterns and individual variability. These methods enabled deeper exploration of the MH and performance experiences of Olympic and Paralympic athletes, capturing nuanced fluctuations that can be obscured by reliance on cross-sectional and exclusively group-based analyses. A limitation that is worth highlighting is the potential for selection bias. Athletes with lived experience of MI or a specific interest in MH or MP in general may have been more likely to participate in the study. Results must, therefore, be interpreted with caution.

Another limitation is the predominance of White athletes and exclusively cisgender-identifying athletes in the sample. Research has shown that differences in race and ethnicity and other important individual differences, such as gender identity and sexual orientation, often interact with MH and MI experiences (Budge et al., 2016; Fumarco et al., 2020). Thus, given the lack of diversity in the current sample, generalizability of the research findings to different groups is not advised. While the study had broad inclusion criteria and attempted to recruit a diverse sample, the self-selection of primarily White and cisgender athletes underscores the need for more deliberate sampling strategies to achieve a level of diversity consistent with that seen among national teams. Future research should make this a priority, and specific investigations exploring equity-deserving groups' perspectives on and engagement with MH in sport research are warranted.

Worth discussing is the significant participant dropout across the survey timepoints. Multiple factors may account for the dropout pattern we observed, such as athletes understandably prioritizing training and competition demands during one of the most critical periods of their sport career (Olympic and Paralympic Games), and potentially ongoing psychological burnout from coping with COVID-19-related stressors during this period (Jia et al., 2023). Taken together, our experience highlights the ongoing difficulty of accessing high-performance athlete populations for research (Rice et al., 2016). To address these barriers, researchers should emphasize knowledge translation activities and showcase the tangible benefits of research outcomes for improving athletes' experiences.

Finally, as mentioned, data collection windows were much longer than anticipated in attempts to optimize response rates. It is possible that the variability in survey completion times affected the study findings. For example, the time of survey completion could be a relevant covariate influencing athletes' survey responses, given the variety of experiences (e.g., competitions, Games selection decisions) they could have had over the course of each data collection window. The research findings should be interpreted in light of this context. Furthermore, psychometric indices (e.g., internal consistency estimates) were not reported for the current sample, as such statistics are known to be unstable and potentially misleading when calculated from small samples (Charter, 1999). Nonetheless, the measures employed have demonstrated robust psychometric properties in larger, well-validated samples, supporting their appropriateness for use in the present study.

To build on our findings, future research should continue to investigate the nature and direction of the relationships among the variables of interest to continue developing a comprehensive database that could eventually lead to specific norms for this population. It would also be important to continue employing longitudinal designs and to integrate methods that can address questions of directionality that are not confirmed in the current study. Finally, our findings highlight the need to continue investigating the effects of MP-based interventions on athletes' MH and MI symptoms (e.g., Fogaca, 2021).

Conclusion

In conclusion, the results of the current study offer novel insights into the intricate links between MP, MH, MI symptoms, and SP among Canadian high-performance athletes. Employing the unique methodological approach of a heat map alongside a longitudinal design spanning a notable period surrounding the Tokyo and Beijing Olympic/Paralympic Games, the findings advance our understanding of athlete well-being and performance in this context. More specifically, there was relative stability in MP, MH, MI symptoms, and perceived SP at the group level, but significant intra-individual fluctuations were evident over time. There was a meaningful connection between MH and MP, with alignment between favorable MH and MP scores. Though correlational in nature, this finding underscores the potential benefits of MP training for both SP and MH, highlighting the importance of

prioritizing MP resources within sport organizations. This finding can also inform practical implications for MP and MH practitioners working with athletes. For example, MP practitioners could emphasize the potential generalizability of MP competencies to positively impact MH and encourage athletes to implement such competencies across a range of important life domains. Alternatively, MH practitioners working with athletes could explore athletes' existing MP competencies and how they could apply them to help manage MH challenges and symptoms. To strengthen the conclusions that may be drawn from the findings and implications outlined in this study, future research should continue to investigate relationships between the mental triad constructs, including the impact of MP interventions on MH outcomes. In addition, future research should investigate the experiences of athletes from equity-deserving groups and with diverse personal identities.

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