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Research Article

Acceptability, Feasibility, and Effects of a Mindfulness-Based Intervention on the Quality of Life and Performance of the Brazilian Paralympic Boccia Team: Mixed Methods Case Study

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This study evaluated the acceptability, feasibility, and effects on the quality of life and performance of a mindfulness-based intervention (MBI) for the Brazilian Paralympic Boccia Team. A longitudinal quasi-experimental intervention case study design was used with evaluations before and after applications. A mixed design with quantitative and qualitative instruments was applied for 29 participants categorized as ATHLETE and NON-ATHLETE. Mindfulness training consisted of eight one-hour sessions with a four-hour 1st CYCLE, a four-hour 2nd CYCLE, and three follow-up evaluations (one, six, and 12 months after the baseline) with 10 maintenance sessions. Participants underwent an improvement of quality of life and performance associated with a significant increase in attention levels. Regarding acceptability and feasibility, the MBI showed high levels of participant compliance, satisfaction, and recommendation for use in Paralympic contexts. These findings suggest that mindfulness interventions can be a viable strategy for promoting psychological resilience and enhancing competitive performance in Paralympic athletes.

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Introduction

The impact of sports on improving the quality of life is well documented in Paralympic sports[1][2][3], reporting the benefits of physical activity in reducing chronic diseases and mortality in addition to the rehabilitation and social inclusion of people with disabilities[1][2][4]. However, a debated topic refers to the relevance of quality of life per sports[5][6][7][8] due to the demand for studies on the strategies that can identify and respond to athletes' mental health needs[6] since high-performance sport (HPS[1]) athletes are vulnerable to a series of health problems, especially depression and anxiety—previous research has shown that this population suffers twice as much from these outcomes as controls[6]—possibly due to the long-term risks of the competitive nature of the sport[7], the conflict with the desirable self-regulatory ability[9] in an athlete, and the strategies to cope with stress in competitive settings[10], as per '*Whenever you get into a high-stress situation, you kind of go crazy*'[11].

When entering the universe of Paralympic sports, persons with disabilities (PWD) are described as individuals with long-term physical, intellectual, or sensory impairment, which, together with one or more barriers, could obstruct their full, effective, and equal participation in society[4].

Although the concept of the Paralympic movement was based on a model of rehabilitation and leisure for wounded English soldiers from World War II[1], it currently focuses on HPS, striving for results up to the top of periodization, i.e., the Paralympic Games (Boccia International Sports Federation, 2018). PWD first participated in the Olympic Games in 1904. Since then, a long path has been undertaken until Paralympic sports were seen as HPS. Regarding Brazil, the nation took seventh place in the 2020 Tokyo Paralympics[12] and earned its four-time-champion title (2007-2019) in the Parapanamerican Games (Parapan).

Boccia began to be played competitively in Brazil in 1995, but the nation competed for the first time in the 2008 Beijing Paralympic Games. Boccia requires strategy and precision; both female and male athletes compete against each other in up to four sets per game[13]. Boccia can be played in teams, pairs, or individually[12]. Its technical and tactical context uses leather balls with a 275±12-g mass and a 270±8-mm perimeter. Players must throw 12 blue and red balls as close as possible to the white ball (called Jack) in a flat covered court spanning 6 by 12.5m with floor markings[14].

Boccia is a highly representative Paralympic sport that includes people with severe leg and arm motor impairment. Elite athletes compete in wheelchairs using their hands, feet, or assistive devices and are divided into four classes according to their degree of disability and need for assistance on the court. As a precision sport requiring acute focus, strategic thinking, and emotional control under high-pressure conditions, Boccia presents a strong rationale for integrating mindfulness training to support cognitive and emotional demands of elite competition.

Studies have shown how effectively mindfulness can improve athletic performance and daily life in wheelchair basketball players[15], decrease perceived stress and rumination, increase psychological flexibility[16], and mitigate the increase in salivary cortisol associated with the competition period[15]. Moreover, an eight-session mindfulness training could significantly improve quality of life[17], but no studies were found on mindfulness in Boccia players. Thus, raising the question of whether the findings on mindfulness as a supplementary training approach can improve performance in precision sports[18] such as Boccia.

This study evaluated the implementation of a mindfulness-based intervention (Mindfulness Based Health Promotion – MBHP) and its effects on quality of life and sports performance in the Brazilian Paralympic Boccia Team. MBHP stems from Mindfulness-Based Stress Reduction (MBSR) and has been applied to promote quality of life in different scenarios[19][20][21], proving to be potentially feasible for adaptation to the Paralympic sport. We hypothesized that participation in the MBI would lead to increased mindfulness, decreased stress, anxiety, and depression, and improvements in quality of life and perceived performance. Specifically, the main hypothesis of this study postulates that MBI with eight one-hour MT and 10 MT maintenance sessions could be adapted to the Paralympic sport with significant acceptability and feasibility, with results associated with changes in participants' levels of mindfulness, stress, anxiety, and depression; whereas the other hypotheses referred to quality of life outcomes (which this study evaluated by quantitative and qualitative measures) and performance (which were assessed by successfully acquired titles). Thus, the general objective of this study is to evaluate the acceptability, feasibility, and effects of an MBI in a Boccia Team regarding their quality of life and sports performance.

Method

Participants

A convenience sample was used in this case study: the Brazilian Paralympic Boccia Team, which consists of 12 elite athletes, and 17 coach and technical staff, totaling 29 participants summoned by the National Association of Sports for the Disabled (ANDE) during the preparation for Road to Tokyo 2020. Athletes are classified into four categories (BC1 to BC4) according to the severity and nature of their motor impairment. BC1 and BC2 include athletes with cerebral palsy; BC3 athletes use assistive devices and ramps; and BC4 includes athletes with severe locomotor impairments not caused by cerebral palsy.

Participants were categorized into two groups: ATHLETES (elite-level Boccia players) and NON-ATHLETES (coaches, technical staff, and assistants involved in athlete support, especially in BC1

and BC3/4 categories where court assistance is allowed). This distinction reflects the functional roles during training and competition.

Inclusion and Exclusion Criteria

Only athletes officially classified in the BC1 to BC3 categories were eligible to participate, as determined by the official criteria of the Boccia International Sports Federation. The inclusion of NON-ATHLETE in MBI was justified by their presence on court during the game, their action as assistants in BC1 and BC3/4 classes, and evidence that "*mental health intervention-based research should ensure the involvement and support of key coaching staff.*" [6]. All participants (ATHLETES and NON-ATHLETES) undergoing initial treatment for severe mental disorders (SMD), including schizophrenia or bipolar disorder, were excluded regardless of their classification status, to ensure safety and protocol adherence. Exclusion criteria also included previous experience with MBI; aged below 18 years, no access to the internet, and no electronic access to practices by audio.

Final Sample

A large part of the sample consisted of men averaging 37 years of age, who were single, from the Brazilian Southeast and with complete higher education. However, one ATHLETE lacked formal education and needed assistance to complete the questionnaire, which was expected. Regarding clinical aspect, few participants reported chronic diseases, of which hypertension was the most frequent. In total, 75% of ATHLETES used physiotherapeutic resources and 33.3% had a therapeutic follow-up with a psychologist at T0, a rate that increased to 66.7% at T4. Moreover, 58.3% continuously used some medication. Our last data collection showed COVID-19 in 41.7% of ATHLETES and 58.8% of NON-ATHLETES.

Ethics

This research was conducted in São Paulo, Brazil, with the approval of the Research Ethics Committee (CEP) under opinion no. 19577519.2.0000.5505 and under the rules established by the Helsinki Convention. All methodological procedures were prepared according to Resolution no. 466 of the Brazilian National Health Council of the Ministry of Health and were registered on ClinicalTrials.gov under no. NCT04334642.

Written informed consent was obtained from participants to include them in this study by free informed consent forms, which were signed by participants and approved by ANDE.

Experimental design

This case study employed a longitudinal quasi-experimental intervention design with mixed methods and repeated pre- and post-intervention assessments[22]. We used a concurrent triangulation strategy[23][24], combining quantitative and qualitative techniques in the same research design[24] (Figure 1).

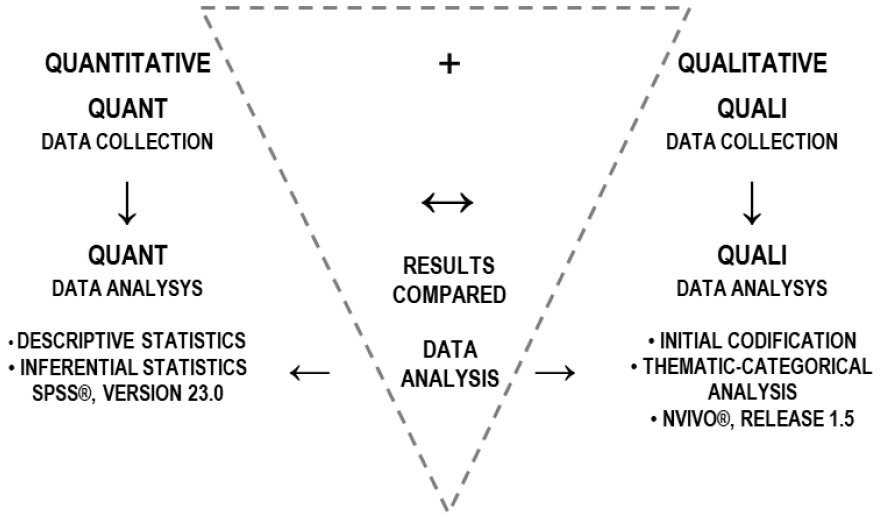

Figure 1. Mixed-Methods Concurrent Triangulation Strategy (adapted from[24]).

According to this concurrent triangulation strategy[23][25][24], after the quantitative and qualitative data were simultaneously collected, both databases were compared to evaluate the occurrence of convergences, differences, or some combination thereof[25]. Quantitative and qualitative results are narratively described in a joint display[26] in Appendix A (Supplementary Material).

Procedure

The Brazilian Paralympic Boccia team was initially approached through official communication with the Brazilian Association of Athletes with Cerebral Palsy (ANDE), which provided institutional support and facilitated contact with team staff and athletes. The objectives and procedures of the study were presented to the athletes and team members during a scheduled training meeting. Participation was voluntary, and all individuals received detailed information about the research and signed informed consent forms.

Data collection was carried out at four time points (T0 to T3), with on-site administration of questionnaires and neuropsychological instruments by trained researchers. During the COVID-19 pandemic restrictions, follow-up data were collected remotely using digital platforms and secure links, ensuring continuity and participant safety. The mindfulness intervention was integrated into the team's training calendar to minimize disruption and maximize feasibility.

Mindfulness-based intervention – MBHP

The Mindfulness-Based Health Promotion (MBHP) protocol was originally developed by Demarzo and colleagues as a culturally adapted version of MBSR for the Brazilian population. While it retains core MBSR components such as attention regulation, breath awareness, and body scanning, MBHP emphasizes health promotion, is more flexible in format, and often integrates shorter sessions and pragmatic delivery modes suited to community settings[27][28].

The Paralympic MBHP (Mindfulness-Based Health Promotion) protocol was implemented as a structured program constituted by a progressive didactic logic intrinsic to the MBI fundamentals[29], observing the periodization of the sport on which MBI was designed based on MBHP elements[27][28], and adapted to the Team's training[30], and conducted in line with the Road to Tokyo 2020 preparation. The sessions included core mindfulness practices such as body scan, sitting meditation, mindful breathing, and gentle mindful movements, tailored to participants' physical capacities. Maintenance sessions reinforced these practices and encouraged daily informal mindfulness in sport-related contexts.

The intervention protocol was aligned with the sport periodization of the Paralympic calendar and included the following components:

- One introductory lecture;
- A core intervention consisting of eight structured 1-hour sessions, delivered in two 4-hour in-person cycles (i.e., 4 sessions per cycle);
- Ten monthly maintenance sessions delivered over a 12-month period;
- Supplementary materials, including audio guides, WhatsApp support, and weekly mindfulness content.

In total, eighteen 1-hour sessions were implemented over a 15-month period, beginning in June 2019 following the introductory lecture. The program followed these phases:

1. **Mindfulness Training:** Eight 1-hour sessions delivered in two cycles—1st Cycle (T0, four sessions) and 2nd Cycle (T1, four additional sessions);
2. **Maintenance Training:** Ten 1-hour monthly sessions during the follow-up period (T2, T3, and T4) (see Figure 2).

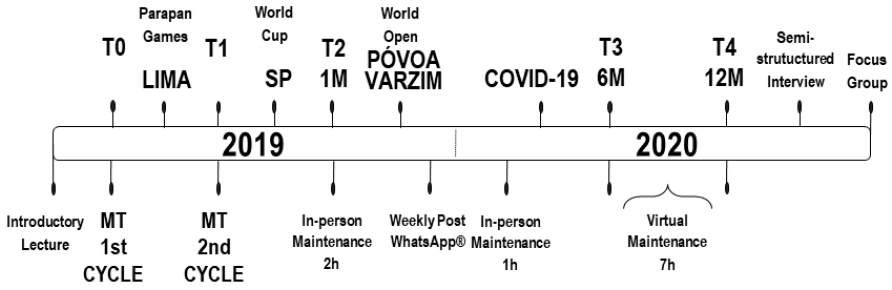

Figure 2. Study Timeline.

The taught mindfulness practices have been addressed in depth during the training of instructors[27][28], limiting MT to a certified instructor. However, MBI promotes participants' autonomy by multiplying their acquired knowledge. Each session in this study included a specific topic, dynamic, and formal practice audios[28] made available on Soundcloud® and Spotify®, and a practice script focused on attention to breathing, body, and movements. A WhatsApp® channel made the intervention content available. The instructor recommended that the participants listen to guided practices daily to complement the MT they underwent.

Regarding how adequately these practices fit the Team, the main elements of each practice remained intact, as applying these procedures for participants with low mobility is provided for in the training of mindfulness instructors[28].

MT was maintained in-person in October 2019 and January 2020 and virtually via the Zoom® platform from March to September 2020 due to the mobility restrictions imposed by the COVID-19 pandemic. Finally, the WhatsApp® channel created by the Team for MBI enabled 45 weekly posts on mindfulness prepared by the researcher from November 2019 to December 2020.

Instruments

A survey was applied from July 16, 2019, to September 27, 2020, during which the 29 participants were evaluated using eight self-report scales that were developed in SurveyMonkey® to be filled out individually. Our quantitative assessment was conducted using the WHOQOL-BREF, DASS21, and MAAS instruments, the sociodemographic inventory, performance assessments, intervention acceptability questionnaire, and an analysis of the perception of the effect of MT on the earning of titles (Table 1). Specifically, performance outcomes were assessed by athletes' competition results, the number of titles won in international events (Parapan, World Cup, and World Open), and the self-reported perception of mindfulness impact on competitive outcomes.

A sociodemographic inventory to collect participants' perception of the effect of MT on winning titles published in the Results Archive[31], non-participant observations, semi-structured individual interviews, and focus groups were also applied (Table 1).

Acceptability and feasibility were assessed through the following indicators: adherence rates, drop-outs, acceptability ratings (Table 4). The MBI Acceptability Questionnaire included 11 Likert-scale items covering satisfaction, enjoyment, perceived usefulness, and recommendation. Also, the post-intervention questionnaire contained eight open-ended items capturing the perceived impact of the MBI on everyday life, training, and emotional regulation.

Instrument	description	t0	t1	t2	t3	t4
1. WHOQOL-bref[32]	An instrument that assesses self-perceived quality of life.	26	26	26	26	26
2. DASS21: Anxiety and Depression Stress Scale - Short Form[33]	A scale that measures symptoms of anxiety, depression, and stress.	21	21	21	21	21
3. Scale Mindful Attention Awareness Scale MAAS[34]	A scale that evaluates a central characteristic of the state of mindfulness: present-focused consciousness.	15	15	15	15	15
4. Sociodemographic inventory	A collection of personal, clinical, professional, and sportive data.	37	5	4	5	15
5. MBI Acceptability Assessment Questionnaire	A peer-validated questionnaire based on qualitative research demands with 11 questions about MBI acceptability.	†	†	†	†	11
6. Semi-structured Pre-intervention Questionnaire	A peer-to-peer questionnaire based on qualitative research demands with two questions about expectations regarding MBI.	2	†	†	†	†
7. Questionnaire of unexpected effects of mindfulness[35]	A questionnaire with two questions and five developments that investigates the unexpected effects of mindfulness practice.	†	2	2	2	2
8. POST Mindfulness Questionnaire	The peer-validated questionnaire based on qualitative research demands with eight questions about MBI resulting content.	†	8	8	8	8
9. Non-participant observation	Field notes about MT and MT maintenance sessions.	**	**	**	**	**
10. Semi-structured individual interview	A semi-structured interview script validated between peers.	†	†	†	†	**
11. Focus group	A script of north end questions validated between peers.	†	†	†	†	**
Total		91	77	76	77	98

Table 1. Overview of quantitative and qualitative instruments used at each time point (T0–T4).
The values shown under T0–T4 correspond to the total number of items included in each instrument.

*Note: * External instrument ** Qualitative instrument † Not applied.*

Qualitative and quantitative instruments

Data analysis

Data were analyzed according to our concurrent triangulation strategy. The main objective of the quantitative part of this study is to identify the effects of MBI on quality of life and performance, and the main objective of the qualitative part of this was to understand MBI implementation and to expand and complement[22] the quantitative results. For this, qualitative research markers, such

as reflexivity, rigor, transparency, credibility, reliability, and audit[36] were addressed by discussions with an expert in qualitative methodology.

Quantitative method

Statistical procedures were performed on an intention-to-treat[37] and/or per-protocol basis. Excel 2010 and SPSS, version 30, for Windows were used to tabulate and analyze data. All variables were subjected to distribution normality verification. The means and standard deviations of the continuous variables and the absolute and relative frequencies of the categorical variables were calculated. For the initial comparison of data between groups, the unpaired t-test or the Mann-Whitney test and Fisher's exact or the chi-squared test were used for continuous and categorical variables, respectively.

Descriptive statistics were calculated for all variables. To compare variables across time (T0 to T4), analyses were performed using the MANOVA repeated measures test; and to identify the correlation between study variables and the MAAS, WHOQOL-BREF, and DASS21 scales, the Pearson's and Spearman's correlation coefficients were used. Moreover, the Pillai trace, the Tukey's test, and the Mahalanobis distance were also used.

Qualitative method

To produce qualitative data, three pre- and post-intervention questionnaires were used, applying three data collection techniques that enabled the triangulation of results: semi-structured interviews, focus groups, and non-participant observations. NVivo 12 was used for qualitative data coding and thematic analysis.

MT reports and MT maintenance were recorded by the researcher's field notes during sessions (in which he abstained from direct participation). For the interviews, participants were invited during the 12-month follow-up measure (T4). The criterion for focus groups was to invite those who participated in an interview. After consenting and being guided through the interview and focus group process via Google Meet®, participants were digitally recorded, transcribed, and verified for accuracy.

Results

Results corresponding to the suggested hypotheses are shown by the data obtained in the quantitative study, followed by the qualitative study. These are integrated in the Discussion section.

Quantitative data

By the intention-to-treat approach, 27 individuals participated in this study. Although, by protocol, 25 participated at the beginning of this study, 23 completed all questionnaires. Thus, of the 29 participants, this research lost two NON-ATHLETE follow-ups in T2, of which one only participated in the 1st CYCLE and the other requested exoneration from the Team.

Quality of life

Our Quality-of-Life analysis using WHOQOL-BREF showed an improvement in the physical, psychological, and environmental domain scores with no significant effect for social relationships. Moreover, our assessment of symptoms of anxiety, stress, and depression by the DASS21 showed a decline throughout the study (Table 2). Specifically, in the physical domain of WHOQOL-BREF, a statistically significant increase of 4.07% was observed ($p = 0.005$), with similar trends for psychological well-being (4.08%, $p = 0.013$), and depression symptoms decreased by 59.72% ($p = 0.008$).

Mindfulness

Based on the general MAAS score, levels of mindful attention significantly augmented throughout the study, increasing by 7.44% ($p < 0.001$) (Table 2).

INSTRUMENT	T0	T1	T2	T3	T4	Δ	%Δ	P-value (time effect)
WHOQOL-BREF (n = 23)								
Physical domain	16.47±1.48	16.00±1.96	16.60±1.56	16.42±1.90	17.14±1.35	0.67±1.16	4.07	**0.005**
Psychological domain	16.41±2.15	16.35±2.29	16.55±1.62	16.35±2.16	17.07±1.54	0.67±1.29	4.08	0.013
Social relations	16.81±1.96	16.99±1.81	16.52±2.23	16.00±2.41	16.64±1.88	-0.17±1.86	-1.01	0.068
Environment	15.37±2.28	14.74±2.24	15.26±2.07	15.20±2.02	15.39±2.23	0.02±1.48	0.13	**0.037**
DASS21 (n = 23)								
Anxiety								
Anxiety	3.30±5.47	1.57±2.59	1.04±2.01	2.22±3.78	1.91±3.42	-1.39±5.11	-42.12	**0.026**
Stress	4.74±3.57	4.87±3.84	3.87±3.72	4.43±3.88	3.65±4.23	-1.09±2.48	-23.00	**0.030**
Depression	4.22±5.99	2.00±2.83	2.09±2.59	2.78±2.91	1.70±2.96	-2.52±5.04	-59.72	**0.008**
MAAS (n = 23)	4.30±0.94	4.10±1.00	4.47±0.88	4.34±0.96	4.62±0.88	0.32±0.65	7.44	**<0.001**

Table 2. Statistical description of variables at the different times of the study (T0, T1, T2, T3, T4) by repeated measurement MANOVA analysis

Sportive performance

Regarding performance, in the correlation between winning titles and the perception of the MT effect, this study found a perfectly linear and statistically significant ($p<0.001$) relation for the MT effect in Parapan and the World Cup ($\varphi = 1.000$) (Table 3).

Title	n	F	*P*	Classification
PARAPAN	10	1.000	0.001	Very Strong
WORLD CUP	11	1.000	0.001	Very Strong
WORLD OPEN	6	-0.250	0.460	Weak

Table 3. Correlation analysis between the effect of mindfulness training (T1, T2, and T3) and perceived effects on winning titles at the Parapan, World Cup, and World Open.

Note: Calculated using the phi coefficient (φ).

Acceptability

The MBI's high levels of acceptability stem from its utility and recommendation to Paralympic sport (Table 4).

Variable	Acceptability			
	Non-athlete (n=15)		Athlete (n=12)	
	Median	Amplitude interquartil	Median	Amplitude interquartil
Enjoyed participating in the MT (a)	4	2	5	1
MBI satisfaction level (b)	4	2	5	1
Recommended for paralympic athletes (c)	5	1	5	1
Utility for the Team (d)	5	1	5	1

Table 4. Descriptive analysis of MBI acceptability (n=27)

(a) *Did not like =1, liked a little = 2, Indifferent = 3, Liked it = 4, Liked it very much = 5;*
(b) *Very bad = 1, Bad = 2, Indifferent = 3, Good = 4, Very good = 5;*
(c) *Would not recommend it = 1, Would recommend it a little = 2, Might recommend it = 3, Would recommend it = 4, Would recommend it a lot = 5;*
(d) *Nothing useful = 1, Little useful = 2, Indifferent = 3, Useful = 4, Very useful = 5.*

Qualitative data

The results of the qualitative study encompassed the categorical thematic analysis of the data produced in the survey (T0 to T4) that were further developed by the interviews, focus group reports, and the field notes of non-participants' observation. Thus, data analysis highlighted three dimensions of analysis—Outcome, Mediators, and Moderators—based on the production of 29 categories grouped into 11 thematic fields in Appendix B (Supplementary Material). Across dimensions, three main themes emerged: (1) perceived improvements in focus, emotional regulation, and daily coping; (2) challenges related to practice adherence and cognitive distraction; and (3) broader psychosocial benefits, such as team cohesion and resilience during the pandemic (Table 5).

Dimension	Thematic Field	Subtheme Example	Illustrative Quote
Outcomes	Emotional Regulation	Reduced reactivity	"I noticed I don't explode like before..."
Outcomes	Performance	Focus during competition	"It helped me calm down during the matches."
Moderators	Adherence	Accessibility of online format	"Doing it online was easier for me to attend."
Mediators	Attention and Awareness	Body awareness	"I became more aware of my posture and breathing."
Mediators	Self-perception	Increased self-acceptance	"Now I treat myself with more kindness."

Table 5. Summary of qualitative findings: dimensions, thematic fields, and illustrative meaning units.

Note: Quotes translated from Portuguese and edited for clarity.

Outcome

The Outcome dimension resulted from the four thematic fields of Acceptability, Adherence, Performance, and Quality of life. In "Acceptability," reports approached quantitative data that

indicated significant levels of approval and a high level of acceptability, whereas "Adherence" stemmed from ATHLETES continuing their practice in Appendix C (Supplementary Material).

The thematic field of "Performance" consisted of participants' perception of the effect of MT on winning titles and showed a consensus regarding Parapan (T1) in which the Team composed of 10 of the 11 athletes received MT, whereas the World Cup (T2) had a Team composed of 11 of the 12 athletes who received MT and 10 reported its effects. Finally, the World Open (T3) had a Team composed of eight athletes, six of whom received MT and four reported an effect (Figure 3).

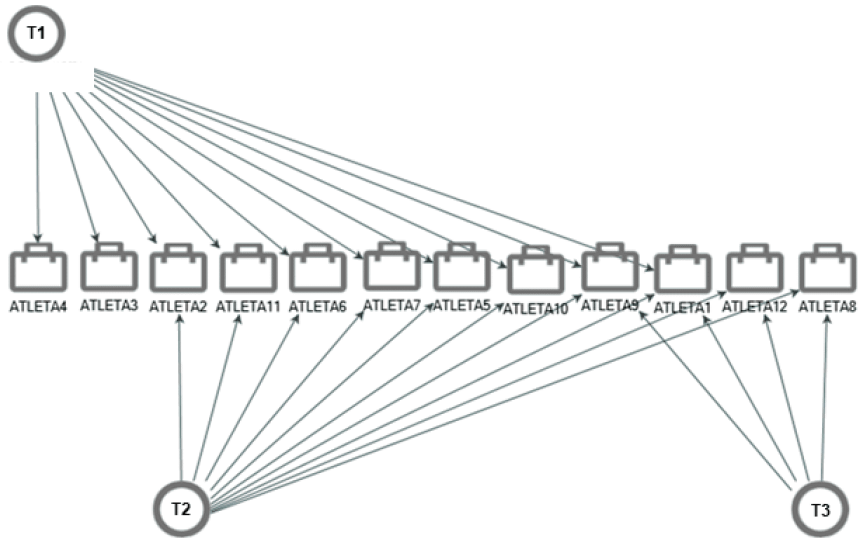

Figure 3. Effect of mindfulness on winning titles (T1 T2 T3).

Regarding Quality of life, T1 highlighted significant reports: "*The program brought me a different vision of some things and this practice will be incorporated into my daily life because it was very important for me and reflected positively on my life."* T2 described the same: *"A great experience that opened my eyes to the need for mental preparation in all activities of our life,"* T4: "*[...] the social isolation of certain activities caused great discomfort for all of us and the skills learned were of vital importance to me."*

Moderators

The Moderators dimension came from the four thematic fields that made up the factors that moderated MBI: Difficulty, Expectation, Ease, and Profile. The thematic field "Difficulty" reported *body scanning* as the most difficult practice to be maintained in participants' daily lives in the face of the difficulty represented by mental dispersion, whereas *attention to breathing* was mentioned as the easiest practice, showing how easily volunteers understood the information in the MT.

In the thematic field of "Profile," a factor that seems to have moderated MBI referred to the non-compulsory participation in the program, the few unexpected effects of mindfulness practice related to the continuity of practice, and the importance of the MBI skills, resulting in a consensus in ATHLETE about the importance of mindfulness during the COVID-19 pandemic in Appendix C (Supplementary Material).

Finally, the thematic field Expectation pointed to a convergence between what was expected pre-intervention and the ability to apply mindfulness in sports or daily life in T4: "*I had never imagined that I could meditate. This mindfulness, this experience could offer me great benefits as I have been feeling it throughout my competitions, on a daily basis, in the way I deal with people."*

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Mediators

The Mediators dimension resulted in three thematic fields that constitute some of the underlying mechanisms of mindfulness. Thus, the thematic field of Social competence derived the category Social Integration: *"I could feel that there was a considerable improvement in the group as a whole and especially in the athletes since boccia is a sport that requires concentration and precision as well as game tactics study."* (T1). Meanwhile, Mindfulness Ability derived *attentive attention* and *mental and body awareness*: *"I was able to pay more attention at the game time and not get dispersed [...]"* (T1); *"I was able to have more clarity in my actions during training and games."* (T1)

Finally, Cognitive and Emotional Processes derived *self-regulation* and *emotional framework*: "*I was able to pay more attention to what happens both internally and externally. I learned not to judge my emotions or thoughts, just to notice them."* (T1); *"Decreased stress and consequently lower blood pressure... (sic). I feel fewer headaches and less body aches."* (T2); *"The program helped me control anxiety during competitions."* (T4).

Discussion

To the best of our knowledge, this is the first study to address a mixed methods longitudinal case study evaluating the acceptability, feasibility, and effects of implementing an MBI in Boccia elite para-athletes and their staff. We sought to answer whether MBI could be adapted to the Paralympic sport with significant levels of acceptability and whether MBI would effectively reproduce the expected effects. Participants underwent an improvement of quality of life and performance associated with a significant increase in attention levels.

Interestingly, the most pronounced improvements in psychological and physical dimensions were observed at 6 and 12 months (T3 and T4), rather than immediately post-intervention (T2). This suggests that ongoing mindfulness practice and maintenance sessions may have contributed to sustained or delayed effects, a pattern worth exploring in future longitudinal designs. On the other hand, the COVID-19 pandemic, which coincided with the follow-up period, may have affected psychological outcomes independently of the MBI. However, participants reported that mindfulness helped them manage isolation and uncertainty, suggesting a buffering effect.

Regarding acceptability and feasibility, the MBI showed high levels of participant compliance, satisfaction, and recommendation for use in Paralympic contexts. Moreover, the MBI high levels of utility for the Team confirmed the hypothesis of its viability and effectiveness. While both ATHLETE and NON-ATHLETE groups reported high acceptability and perceived benefits, the nature of the outcomes may differ. Athletes frequently referenced improvements in competitive focus and stress regulation, whereas NON-ATHLETES emphasized emotional balance and interpersonal dynamics on and off the court.

Based on the integration of mixed methods in '*apprehending the totality of a situation and describing the complexity of a concrete case*'[38], results show practitioners' acquisition of the skill to apply mindfulness in sports and everyday life situations. These outcomes were correlated with the significant increase in quality of life by a decline in levels of depression, anxiety, and stress during this study in ATHLETES and NON-ATHLETES and the positive perception of the effect of MT on winning titles reported by ATHLETES, whose correlation in Parapan and in the World Cup was classified with a perfectly linear, statistically significant relationship. While strong correlations were found between titles won and perceived MBI effects, these findings are not causal and rely on self-report perceptions, which may be subject to bias.

Our findings are in line with MBSR-based studies showing the relevant effect of mindfulness on the well-being and performance of Paralympic athletes[39][40], the MBI positively impacted participants' personal lives, training, and competitions as mindfulness scores are indirectly correlated with performance as they regulate cognitive anxiety[41]. Moreover, our results also align with prior findings on MBSR-based interventions in athletes, including retired football players[42], which showed reductions in stress, anxiety, and depression, and improvements in psychological well-being.

In this study, three dimensions of analysis, namely outcomes, moderators, and mediators, emerged according to the coping skills related to sports[30] and the criteria for feasibility studies[43], resulting in thematic fields related to quality of life, performance, acceptability, and adherence that could support other research that seeks to investigate the effects of an MBI in sports.

The notable outcome of quality of life was associated with the content of non-participant observation notes, interviews, and focus groups, which reported a positive effect on sleep and pain, thus improving quality of life[44][45][46][47][48]. Previous studies[41][49][50] suggest that elite athletes experience a broadly comparable risk of mental disorders in relation to the general population[7][8] and are vulnerable to a series of mental health problems, with a prevalence of depression and anxiety twice as high as in controls[6]. Moreover, athletes' anxiety can impair their performance[50] which leads to the importance of discussing well-being as a multidimensional concept, starting by listening to athletes' voices, exposing the relationship between quality of life and performance, such as when a gymnast gave up the competition over what would have been her 22nd gold medal at the Tokyo 2020 Olympics: "*We have to protect our minds and bodies, it's not just going out there [competing] and doing what the world wants us to do*" [11]. This configures a serious mental health warning, in which sports medicine would be an accessible resource for athletes who are unaware of their risk condition in a context in which stress has been more correlated with susceptibility to injuries[51][52], as opposed to the need for strategies to cope with stress in the competitive stage[10]. In fact, the significant increase in attention levels throughout the MBI possibly contributed to the reported changes in quality of life[46][53], suggesting the MBI's potential as a psychological intervention to treat and prevent mental health symptoms and support performance[39].

Considering that interventions that seek to improve the well-being of Paralympic athletes can also favorably impact their performance[41], the MBI, in turn, can promote psychological and physiological health, alleviating problems such as anxiety, depression, and chronic pain[47][48][54]. Thus, the impact of mindfulness in achieving titles, thereby ensuring the spots for the Tokyo 2020 Paralympics, was suggested as an effect of the MT before the World Cup, according to reports that associated the obtention of gold medals with improved levels of attention in ATHLETES. Likewise, the MT before Parapan was related to the results of the Team in the competition, in which Brazil became a consecutive four-time champion since 2007. Thus, it is possible to relate these findings to the evidence on the relevant effect of mindfulness on throwing performance and precision modalities[55], such as Boccia. On the other hand, the few MT effects reported to the World Open could be related to athletes repositioning themselves, which could have affected group cohesion[9]. In fact, two ATHLETES won medals and four perceived MT effects, perhaps because '*mindfulness practitioners are better at dismissing irrelevant external stimuli that contribute to stress, resulting in individuals evaluating situations as less stressful than before mindfulness training*'[56]. Therefore, these outcomes are intertwined with other variables that concern a broader spectrum. This study supports the need for more rigorous investigations[9] since the application of mindfulness in the performance of Paralympic athletes is considered limited and poorly understood[40]. Although our study explored subjective perceptions of performance outcomes, no objective sport-specific performance metrics (such as throwing accuracy or match statistics) were collected. Future studies should consider incorporating such measures to better evaluate the impact of MBIs on athletic performance.

Finally, the moderators[41] pointed out that adherence potentially moderated the effectiveness of MBI due to the presence of an instructor[28] as '*Teacher skill is needed to facilitate the learning of new skills and group discussions, ensure that skills are practiced and applied in everyday life, and reduce the potential for harm*'[39]. From the perspective of the mediators[41], participants collectively showed mindfulness strategies due to their mindfulness skills[18][54], cognitive and emotional processes[30][54][55], and social competence[9], which makes us believe that '*A careful monitoring of activity, a level of self-efficacy appropriate for personal skills and abilities, as well as a mindful attitude allow the setting of a sportsman towards success and performance*'[9]. Moreover, the acceptability of MBI was related to the alliance between participants and the intervention team[57], which probably contributed to the 100% survey response rate and no volunteer withdrawal[39]. Besides, MT maintenance—conducted to motivate adherence[58]—led to a negative oscillation of symptoms of anxiety, depression, and stress during the COVID-19 outbreak, from March to September 2020. Notably, in the year in which the Tokyo 2020 Paralympics were to be held, the COVID-19 pandemic broke out, postponing this event to 2021. As a result of social distancing, as of March 2020, MT maintenance started to be carried out in a virtual environment and resulted in a consensus among the ATHLETES on the importance of mindfulness during the pandemic, which was also noted by NON-ATHLETES.

It should be noted that this MBI, based on MBHP elements[27][28], was adapted to the context of the selected Team and applied as a structured program[53][54][55][59] that showed the effects of mindfulness in sport[15][16][60] since the first MBI carried out by Kabat-Zinn[47][48] in Olympic rowing in 1980. Although the MBSR has been offered in eight two-hour sessions for eight consecutive weeks, the expansion of this format to the population caused an evasion rate justified by the lack of time of most professionals[29]. Especially for HPS, a crucial topic is the periodization of the Team. For this reason, the MT was conducted in eight one-hour sessions and performed in two cycles in the pre-competitive period[15][16][60] in line with '*shorter models of mindfulness training, without giving up acceptable levels of effectiveness*' [29] and with the need for strategies to cope with stress in the competitive stage[10]. Interestingly, a high level of acceptance of the program practices was reported, as well as compliance within sessions and informal practices '*applying mindfulness state into daily activities and competitions*' but a low level of adherence to regular daily formal practice between sessions at home.

The data discussed in this study are expected to contribute to other scientific evidence related to HPS since the combined analysis of results enabled us to infer that the reports of interviews and focus groups, plus non-participant observations, supported and expanded the survey results that were quantitatively and qualitatively analyzed, validating our study hypotheses with a view to the feasibility, acceptability, and effectiveness of MBI.

Limitations

This study is limited by its case study design, lack of a control group, reliance on self-report measures, and small sample size, which restrict generalizability. Additionally, the absence of an active control group limits the interpretation of findings, as improvements may be influenced by nonspecific factors. Future studies may benefit from comparing mindfulness interventions with other psychological or educational programs. Also, convenience sampling may introduce selection bias, although is justified as Paralympic medalists encompasses a series of unique characteristics[61][62].

Moreover, although winning titles and subjective perceptions of performance outcomes reflects high performance, it is a distal measure influenced by various contextual and team-based factors. In the same direction, the perfect correlation ($\varphi = 1.000$) observed between 'winning titles' and the 'perception of the MT effect' may be explained by the complete alignment of binary responses within a small sample. This suggests a possible design artifact or tautology rather than a true empirical effect. Although descriptively accurate, this finding should be interpreted with caution and investigated further in studies with larger and more diverse samples, ideally incorporating objective Boccia-specific performance indicators (such as throwing accuracy) to enhance measurement and analyses precision.

Conclusion

This research described a case study that tested the feasibility and effectiveness of an MBI in Para-athletes and the technical staff of the Brazilian Paralympic Boccia Team, significantly improving participants' quality of life and sports performance, especially in the competitive period in which the MT was held and indicating significant levels of approval and a high level of acceptability of that intervention.

Qualitative measures helped to compose a mixed methods case study design with quantitative measures, which generated a considerable number of variables, whose analysis was further developed in three publications to provide better analytical possibilities in the face of a single sample: the case of the Brazilian Paralympic Boccia Team. Furthermore, the notorious adherence to MBI was shown by the continuity of practices and the acquisition of the ability to apply mindfulness in sports or everyday life, indicating that the Team collectively showed mindfulness strategies.

Although the results on the viability of this mindfulness program may be applicable to the improved performance of Paralympic athletes and the social interaction between athletes and non-athletes, it is extremely important to point out that, in addition to performance, volunteers showed a significant acquisition of new skills for coping in sports, such as self-perception and self-regulation in the face of high emotional demands, as seen by the improved adherence,

acceptability, and quality of life. Future studies applying randomized and controlled designs are needed to confirm our results in larger samples and other Paralympic modalities.

Thus, this study is of interest since our results confirm the hypothesis of the acceptability and feasibility of adapting an MBI to a Paralympic sport and applying it to the promotion of quality of life and performance, which has been the subject of debate in the scientific community beyond sports. These aspects align with the evidence that relates performance to the ability for self-regulation, which characterizes the strong psychological profile of HPS athletes, including in Paralympic sport.

Finally, the first MBI with Paralympic athletes in Brazil showed a functional (with the creation of a mindfulness training protocol for Paralympic HPS) and a social component by expanding the understanding of human nature, explained in a scientific study that addresses the different nuances of a single sport with exceptional characteristics, i.e., Boccia.

Abbreviations

- ANDE – National Association of Sports for the Disabled
- Boccia – Paralympic boccia
- CEP – Unifesp Research Ethics Committee
- HPS – High performance sport
- MBHP – Mindfulness Based Health Promotion
- MBI – Mindfulness based intervention
- MBSR – Mindfulness-Based Stress Reduction
- MT – Mindfulness Training
- Parapan – Parapanamerican Games
- PWD – Person with disability
- Team – Brazilian Paralympic Boccia Team

Statements and Declarations

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Conflicts of interest

No potential competing interests to declare.

Author Contributions

Conceptualization: MD, CW, MSJ; Methodology: MD, LG, MSJ; Formal analysis: MSJ, SSC, SBCBS; Investigation: MSJ, CW, LG, VSJ, MOS; Data Curation: MSJ, SBCBS, SSC, VSJ; Writing – Original Draft: MSJ; Writing – Review & Editing: MD, CW, SSC, SBCBS, VSJ; Supervision: MD, CW; Project Administration: MSJ, LG; Funding Acquisition: MD. All authors contributed to the intellectual development of this work and the preparation of the manuscript.

Data Availability

The raw data supporting the conclusions of this article may be made available by the authors upon reasonable request, subject to ethical and privacy considerations related to the participant data. Inquiries can be directed to the corresponding author.

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References

1. ^a ^b ^cFerez S, Ruffié S, Joncheray H, Marcellini A, Pappous S, Richard R (2020). "Inclusion through sport: a critical view on paralympic legacy from a historical perspective." Social Inclusion. **8**(3):224–235. doi:10.17645/si.v8i3.2735.
2. ^a ^bCampeão MS (2011). "Paralympic sport as an instrument for the morality of public health practices involving people with disabilities: an approach from the bioethics of protection." Escola Nacional de Saúde Pública Sergio Arouca, Fundação Oswaldo Cruz. https://www.arca.fiocruz.br/handle/icict/17958.
3. ^Comitê Paralímpico Brasileiro (2019). "Technical report 2019." Comitê Paralímpico Brasileiro. https://www.cpb.org.br/conteudo/detalhe/31/relatorio-tecnico.
4. ^a ^bIBGE Educa (2023). "Disabled people." IBGE Educa. https://educa.ibge.gov.br/jovens/conheca-o-brasil/populacao/20551-pessoas-com-deficiencia.html.
5. ^Barak S, Mendoza-Laiz N, Fuentes MT, Rubiera M, Huyzler Y (2016). "Psychosocial effects of competitive Boccia program in persons with severe chronic disability." J Rehabil Res Dev. **53**(6):973–988. doi:10.1682/jrrd.2015.08.0156.
6. ^a ^b ^c ^d ^eRice SM, Purcell R, De Silva S, Mawren D, McGorry PD, Parker AG (2016). "The mental health of elite athletes: A narrative systematic review." Sports Medicine. **46**(9):1333–1353. doi:10.1007/s40279-016-0492-2.
7. ^a ^b ^cGulliver A, Griffiths KM, Mackinnon A, Batterham PJ, Stanimirovic R (2015). "The mental health of Australian elite athletes." Journal of Science and Medicine in Sport. **18**(3):255–261. doi:10.1016/j.jsams.2014.04.006.
8. ^a ^bGouttebarge V, Jonkers R, Moen M, Verhagen E, Wylleman P, Kerkhoffs G (2017). "The prevalence and risk indicators of symptoms of common mental disorders among current and former Dutch elite athletes." Journal of Sports Sciences. **35**(21):2148–2156. doi:10.1080/02640414.2016.1258485.
9. ^a ^b ^c ^d ^ePopa D, Mîndrescu V, Iconomescu TM, Talaghir L (2020). "Mindfulness and self-regulation strategies predict performance of Romanian handball players." Sustainability. **12**(9):3667. doi:10.3390/su12093667.
10. ^a ^b ^cHolguín-Ramirez J, Gastélum-Cuadras G, Cervantes-Borunda M, Reyes-Acosta Y, Ramos-Jiménez A, Hernández-Torres RP (2020). "Use of mindfulness on stress indicators in athletes during the competitive stage: Systematic review." Revista Ciencias de la Actividad Física. **21**(2):1–13. doi:10.29035/rcaf.21.2.2.
11. ^a ^bGranato L, Sena V (2021). "Simone Biles shows that mental health is a challenge even for superhumans." Exame. https://exame.com/carreira/simone-biles-saude-mental/.
12. ^a ^bWinckler C, Oliveira MC (2018). "Paralympic sport and the paths to social inclusion." Revista Científica Virtual da ESA. **27**:176–186. https://issuu.com/esa_oabsp/docs/revista_27_-_direito_desportivo.
13. ^Boccia International Sports Federation (2018). "BISfed International Boccia Rules – 2018 (3)." Boccia International Sports Federation. http://www.bisfed.com/wp-content/uploads/2018/05/V.3_editable_boccia_rules-portuguese-BRA.pdf.
14. ^Conde AJM (2018). Paralympic memory v. I. São Paulo: Comitê Paralímpico Brasileiro. https://indd.adobe.com/view/0e47dd19-9663-4cd6-870e-072617bec30b?fbclid=IwAR3NY5enAgsrsEQcV93CZRAzsPCYF-UJaCvYTWbqMDjFZo3PUpwrohORtgU.
15. ^a ^b ^c ^dMacDonald LA, Oprescu F, Kean BM (2017). "An evaluation of the effects of mindfulness training from the perspectives of wheelchair basketball players." Psychology of Sport and Exercise. **37**:188–195. doi:10.1016/j.psychsport.2017.11.013.
16. ^a ^b ^cLundqvist C, Ståhl L, Kenttä G, Thulin U (2018). "Evaluation of a mindfulness intervention for Paralympic leaders prior to the Paralympic Games." International Journal of Sports Science & Coaching. **13**(1):62–71. doi:10.1177/1747954117746495.
17. ^Macdougall H, O'Halloran P, Sherry E, Shields N (2019). "A pilot randomised controlled trial to enhance well-being and performance of athletes in para sports." European Journal of Adapted Physical Activity. **12**(2):7. doi:10.5507/euj.2019.006.
18. ^a ^bBirrer D, Röthlin P, Morgan G (2012). "Mindfulness to enhance athletic performance: theoretical considerations and possible impact mechanisms." Mindfulness. **3**(3):235–246. doi:10.1007/s12671-012-0109-2.
19. ^Trombka M, Demarzo M, Campos D, Antonio SB, Cicuto K, Walcher AL, García-Campayo J, Schuman-Olivier Z, Rocha NS (2021). "Mindfulness training improves quality of life and reduces depression

and anxiety symptoms among police officers: Results from the POLICE study – A multicenter rando mized controlled trial." Frontiers in Psychiatry. ***12****. doi:10.3389/fpsyt.2021.624876.*

20. ^*Sopezki D, Andreoni S, Montero-Marin J, Castro Filho ED (2020). "Feasibility and effectiveness of a mindfulness-based program vs. relaxation in the treatment of burnout in Brazilian primary care pro viders: a mixed-methods pragmatic controlled study." Mindfulness.* ***11****:2573–2588. doi:10.1007/s12671 -020-01472-w.*
21. ^*Mapurunga M, Andreoni S, Oliveira D, Sarubbi V Jr, Bonilha AC, D'Almeida V, Tomita L, Ramos LR, D emarzo M (2020). "Protocol for a nested randomized controlled trial to evaluate the feasibility and preliminary efficacy of the mindfulness based health promotion program on the quality of life of ol der adults assisted in primary care - "The MBHP-Elderly Study"." Frontiers in Medicine.* ***7****. doi:10.338 9/fmed.2020.563099.*
22. a, b*Yin RK (2010). Case study: planning and methods. 4th ed. Porto Alegre: Bookman.*
23. a, b*Creswell JW, Plano Clark VL (2011). Designing and conducting mixed methods research. 2nd ed. L os Angeles: SAGE Publications.*
24. a, b, c, d*Creswell JW, Plano Clark VL, Gutmann M, Hanson W (2003). "Advanced mixed methods resea rch designs." In: Tashakkori A, Teddlie C (Eds.), Handbook of mixed methods in social and behaviora l research. pp 209–240. Thousand Oaks, CA: Sage.*
25. a, b*Creswell JW (2010). Research project: qualitative, quantitative and mixed methods. 3rd ed. Porto Alegre: Artmed.*
26. ^*Guetterman TC, Fetters MD, Creswell JW (2015). "Integrating quantitative and qualitative results in health science mixed methods research through joint displays." The Annals of Family Medicine.* ***13*** *(6):554–561. doi:10.1370/afm.1865.*
27. a, b, c, d*Demarzo M, Garcia-Campayo J (2015). Mindfulness handbook: curiosity and acceptance. 3rd ed. São Paulo: Palas Athena.*
28. a, b, c, d, e, f, g*Demarzo M, Garcia-Campayo J, Vargas V (2019). Mindfulness based health promotion – instructor's manual. 2nd ed. São Paulo: Mente Aberta – Centro Brasileiro de Mindfulness e Promo ção da Saúde.*
29. a, b, c*Cebolla I, Martí A, Garcia-Campayo J, Demarzo M (2016). Mindfulness and science: from traditi on to modernity. São Paulo: Palas Athena.*
30. a, b, c*Josefsson T, Ivarsson A, Lindwall M, Gustafsson H, Stenling A, Böröy J, Mattsson E, Carnebratt J, Sevholt S, Falkevik E (2017). "Mindfulness mechanisms in sports: Mediating effects of rumination an d emotion regulation on sport-specific coping." Mindfulness.* ***8****(5):1354–1363. doi:10.1007/s12671-017- 0711-4.*
31. ^*Boccia International Sports Federation (2019). "Results Archive." Boccia International Sports Feder ation. https://www.worldboccia.com/competitions/archive.*
32. ^*Fleck MPA, Louzada S, Xavier M, Chachamovich E, Vieira G, Santos L, et al. (2000). "Application of t he Portuguese version of the abbreviated quality of life assessment instrument "WHOQOL-bref"." Re vista de Saúde Pública.* ***34****(2):178–183. doi:10.1590/s0034-89102000000200012.*
33. ^*Vignola RCB, Tucci AM (2014). "Adaptation and validation of the depression, anxiety and stress sca le (DASS) to Brazilian Portuguese." Journal of Affective Disorders.* ***155****:104–109. doi:10.1016/j.jad.2013. 10.031.*
34. ^*Barros VV, Kozasa EH, Souza CW, Ronzani TM (2015). "Validity evidence of the brazilian version of the Mindful Attention Awareness Scale (MAAS)." Psicologia: Reflexão e Crítica.* ***28****(1):87–95. doi:10.1 590/1678-7153.201528110.*
35. ^*Cebolla A, Demarzo M, Martins P, Soler J, Garcia-Campayo J (2017). "Unwanted effects: is there a n egative side of meditation? a multicentre survey." PLOS ONE.* ***12****(9):e0183137. doi:10.1371/journal.pon e.0183137.*
36. ^*Small ML (2011). "How to conduct a mixed methods study: Recent trends in rapidly growing literat ure." Annual Review of Sociology.* ***37****:57–86. doi:10.1146/annurev.soc.012809.102657.*
37. ^*Gupta SK (2011). "Intention-to-treat concept: a review." Perspectives in Clinical Research.* ***2****(3):109– 112. doi:10.4103/2229-3485.83221.*
38. ^*Goldenberg M (2004). The art of research: how to do qualitative research in the social sciences. 8th ed. Rio de Janeiro: Editora Record.*
39. a, b, c, d*Myall K, Montero-Marin J, Gorczynski P, Kajee N, Sheriff RS, Bernard R, et al. (2023). "Effect of mindfulness-based programmes on elite athlete mental health: a systematic review and meta-anal ysis." British Journal of Sports Medicine.* ***57****(2):99–108. doi:10.1136/bjsports-2022-105596.*

40. ^a, ^bCampbell ML (2021). "Mindfulness-Based Practices for the Impaired Performance Athlete." All Graduate Plan B and other Reports. Utah: Utah State University. https://digitalcommons.usu.edu/gradreports/1582.
41. ^a, ^b, ^c, ^d, ^eRöthlin P, Birrer D, Horvath S, Holtforth MG (2016). "Psychological skills training and a mindfulness-based intervention to enhance functional athletic performance: design of a randomized controlled trial using ambulatory assessment." BMC Psychology. **4**(1):39. doi:10.1186/s40359-016-0147-y.
42. ^Norouzi E, Gerber M, Masrour FF, Vaezmosavi M, Pühse U, Brand S (2020). "Implementation of a mindfulness-based stress reduction (MBSR) program to reduce stress, anxiety, and depression and to improve psychological well-being among retired Iranian football players." Psychol Sport Exerc. **47**:101636. doi:10.1016/j.psychsport.2019.101636.
43. ^Bowen DJ, Kreuter M, Spring B, Cofta-Woerpel L, Linnan L, Weiner D, et al. (2009). "How we design feasibility studies." American Journal of Preventive Medicine. **36**(5):452–457. doi:10.1016/j.amepre.2009.02.002.
44. ^Grossman P, Kappos L, Gensicke H, D'Souza M, Mohr DC, Penner IK, et al. (2010). "MS quality of life, depression, and fatigue improve after mindfulness training: a randomized trial." Neurology. **75**(13):1141–1149. doi:10.1212/WNL.0b013e3181f4d80d.
45. ^Chiesa A, Serrati A (2009). "Mindfulness-based stress reduction for stress management in healthy people: a review and meta-analysis." The Journal of Alternative and Complementary Medicine. **15**(5):593–600. doi:10.1089/acm.2008.0495.
46. ^a, ^bHofmann SG, Sawyer AT, Witt AA, Oh D (2010). "The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review." Journal of Consulting and Clinical Psychology. **78**(2):169–183. doi:10.1037/a0018555.
47. ^a, ^b, ^cKabat-Zinn J, Beall B, Rippe J (1985). "A systematic mental training program based on mindfulness meditation to optimize performance in collegiate and Olympic rowers." Poster presented at the World Congress in Sport Psychology, Copenhagen, Denmark.
48. ^a, ^b, ^cKabat-Zinn J, Lipworth L, Burney R (1985). "The clinical use of mindfulness meditation for the self-regulation of chronic pain." J Behav Med. **8**(2):163–190. doi:10.1007/BF00845519.
49. ^Grade I, Andrade H, Guerreiro R, Stieler E, Silva FR, Silva H, et al. (2022). "The sleep parameters of paralympic athletes: characteristics and assessment instruments." Journal of Sport Rehabilitation. **32**(2):203–214. doi:10.1123/jsr.2021-0407.
50. ^a, ^bMesagno C, Harvey JT, Janelle CM (2012). "Choking under pressure: The role of fear of negative evaluation." Psychology of Sport and Exercise. **13**:60–68. doi:10.1016/j.psychsport.2011.07.007.
51. ^Naderi A, Shaabani F, Zandi HG, Calmeiro L, Brewer BW (2020). "The effects of a mindfulness-based program on the incidence of injuries in young male soccer players." Journal of Sport and Exercise Psychology. **42**:161–171. doi:10.1123/jsep.2019-0003.
52. ^Williams JM, Andersen MB (1998). "Psychosocial antecedents of sport injury: Review and critique of the stress and injury model." Journal of Applied Sport Psychology. **10**:5–25. doi:10.1080/10413209808406375.
53. ^a, ^bNoetel M, Ciarrochi J, Van Zanden B, Lonsdale C (2019). "Mindfulness and acceptance approaches to sporting performance enhancement: A systematic review." International Review of Sport and Exercise Psychology. **12**(1):139–175. doi:10.1080/1750984x.2017.1387803.
54. ^a, ^b, ^c, ^dSugiura Y (2008). "New directions for research of emotion regulation and psychological treatments: Potential benefits of mindfulness construct." THE JAPANESE JOURNAL OF RESEARCH ON EMOTIONS. **16**(2):167–177. doi:10.4092/jsre.16.167.
55. ^a, ^b, ^cBühlmayer L, Birrer D, Röthlin P, Faude O, Donath L (2017). "Effects of mindfulness practice on performance-relevant parameters and performance outcomes in sports: a meta-analytical review." Sports Medicine. **47**(11):2309–2321. doi:10.1007/s40279-017-0752-9.
56. ^Ivarsson A, Johnson U, Andersen MB, Fallby J, Altemyr M (2015). "It pays to pay attention: A mindfulness-based program for injury prevention with soccer players." Journal of Applied Sport Psychology. **27**(3):319–334. doi:10.1080/10413200.2015.1008072.
57. ^Tebourski K, Bernier M, Ben Salha M, Souissi N, Fournier JF (2022). "Effects of mindfulness for performance programme on actual performance in ecological sport context: Two studies in basketball and table tennis." International Journal of Environmental Research and Public Health. **10**(19):12950.
58. ^Campayo JG, Íñigo-Gías P, Demarzo M, Navarro-Gil M (2015). "Mindfulness maintenance groups: the University of Zaragoza model." Actas Espanolas de Psiquiatria. **43**(Supl. 1):1–90. https://www.res

earchgate.net/publication/280977960_Mindfulness_maintenance_groups_the_University_of_Zaragoza_model.

59. ^*Sappington R, Longshore K (2015). "Systematically reviewing the efficacy of mindfulness-based interventions for enhanced athletic performance." Journal of Clinical Sport Psychology. **9**(3):232–262. doi:10.1123/jcsp.2014-0017.*
60. a, b*MacDonald LA, Minahan CL (2018). "Mindfulness training attenuates the increase in salivary cortisol concentration associated with competition in highly trained wheelchair-basketball players." Journal of Sports Sciences. 1–6. doi:10.1080/02640414.2017.1308001.*
61. ^*Loturco I, Pereira L, Winckler C, Santos WL, Kobal K, McGuigan M (2019). "Load-velocity relationship in national paralympic powerlifters: A case study." International Journal of Sports Physiology and Performance. **14**(4):531–535.*
62. ^*Macdougall H, O'Halloran P, Sherry E, Shields N (2016). "Needs and strengths of Australian para-athletes: Identifying their subjective psychological, social, and physical health and well-being." The Sport Psychologist. **30**(1):1–12. doi:10.1123/tsp.2015-0006.*

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