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 case study was used with evaluations before and after applications. A mixed design with quantitative and qualitative instruments was applied to 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 in quality of life and performance mediated by a significant increase in attention levels. Regarding feasibility, the MBI received significant levels of approval and recommendation for Paralympic sports due to participants' acquired ability to apply mindfulness in sports or quotidian life. Mindfulness programs may be acceptable, feasible, and effective for Paralympic teams, potentially improving quality of life and performance.

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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.

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, begging 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. 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 mediated by 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, categorized as ATHLETE, and 17 coach and technical staff, categorized as NON-ATHLETE; totaling 29 participants summoned by the National Association of Sports for the Disabled (ANDE) during the preparation for Road to Tokyo 2020.

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.

The inclusion of NON-ATHLETE in MBI was justified by their presence on the court during the game, their action as assistants in BC1 and BC3 classes, and evidence that "*mental health intervention-based research should ensure the involvement and support of key coaching staff.*"[6]. Exclusion criteria were set according to probable active mental disorder (such as depression and anxiety during initial treatment or severe symptoms of such diagnoses), significant previous experience with MBI; aged below 18 years, no access to the internet, and no electronic access to practices by audio.

Experimental design

This case study with longitudinal follow-ups and mixed methods[22] used a concurrent triangulation strategy[23][24], combining quantitative and qualitative techniques in the same research design[24] (Figure 1).

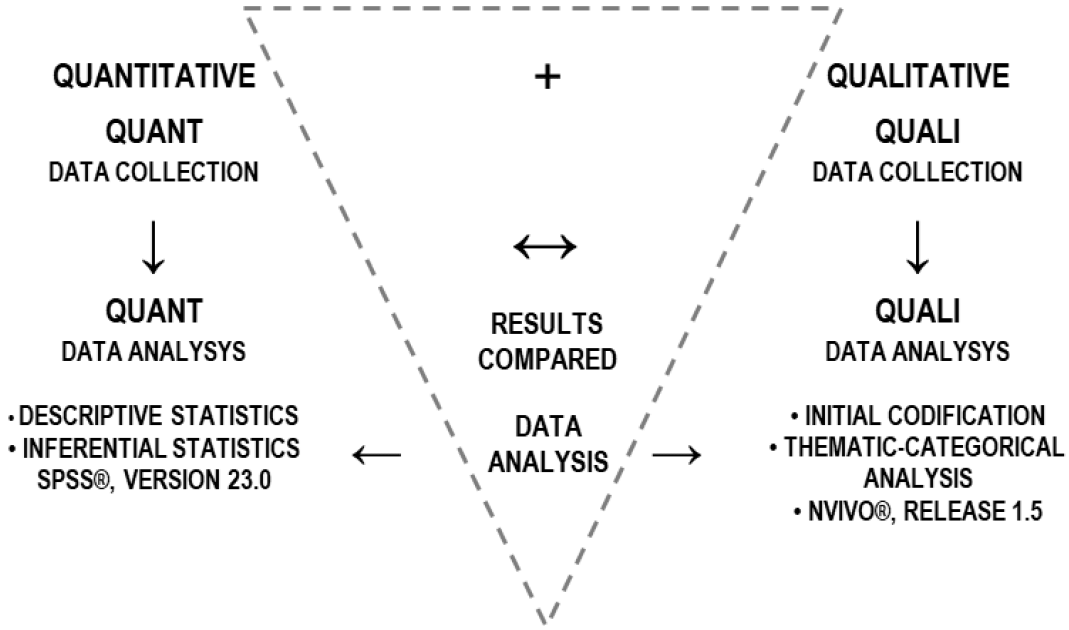

Figure 1. Mixed-Methods Concurrent Triangulation Strategy (adapted from[24]).

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).

Mindfulness-based intervention – MBI

The Paralympic MBHP-HPS protocol was implemented as a structured program constituted by a progressive didactic logic intrinsic to the MBI fundamentals[27], observing the periodization of the sport on which MBI was designed based on MBHP elements[28][29], and adapted to the Team's training[30], and conducted in line with the Road to Tokyo 2020 preparation.

A total of 18 sessions were administered over 15 months, beginning in June 2019 after an introductory lecture: 1) Mindfulness Training – eight one-hour sessions with a four-hour 1st CYCLE (T0) and a four-hour 2nd CYCLE (T1); 2) In total, three follow-ups, one (T2), six (T3), and 12 months (T4) after baseline, were performed, intermediated by 10 MT maintenance sessions (Figure 2).

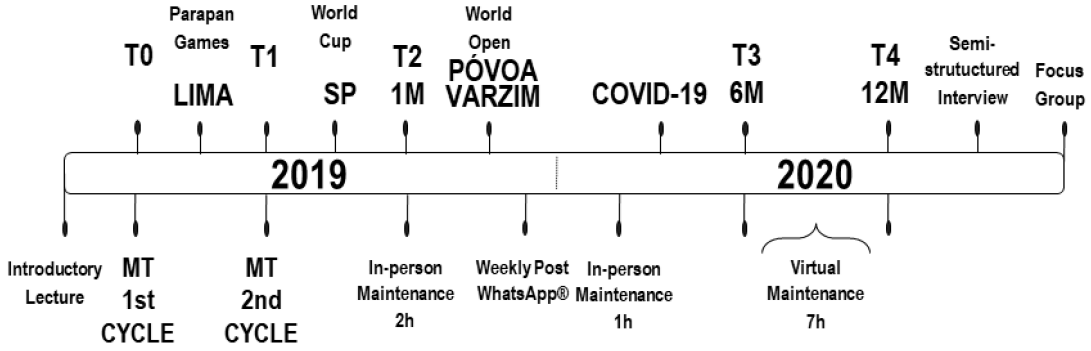

Figure 2. Study Timeline.

The taught mindfulness practices have been addressed in depth during the training of instructors[28][29], 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[29] 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[29].

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

The 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. 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 included in this research (Table 1).

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. Qualitative and quantitative instruments

*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 23.0, 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.

Thus, our quantitative assessment was conducted using the WHOQOL-BREF, DASS21, and MAAS instruments, the sociodemographic inventory, performance assessments, intervention acceptability questionnaire, and our analysis of the perception of the effect of MT on the earning of titles.

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.

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.

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 the 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.

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).

Mindfulness

Based on the general MAAS score, levels of attention significantly increased throughout the study, with a significant effect for time 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 winning titles and the perception of the effect of MT (T1, T2, and T3)

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).

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).

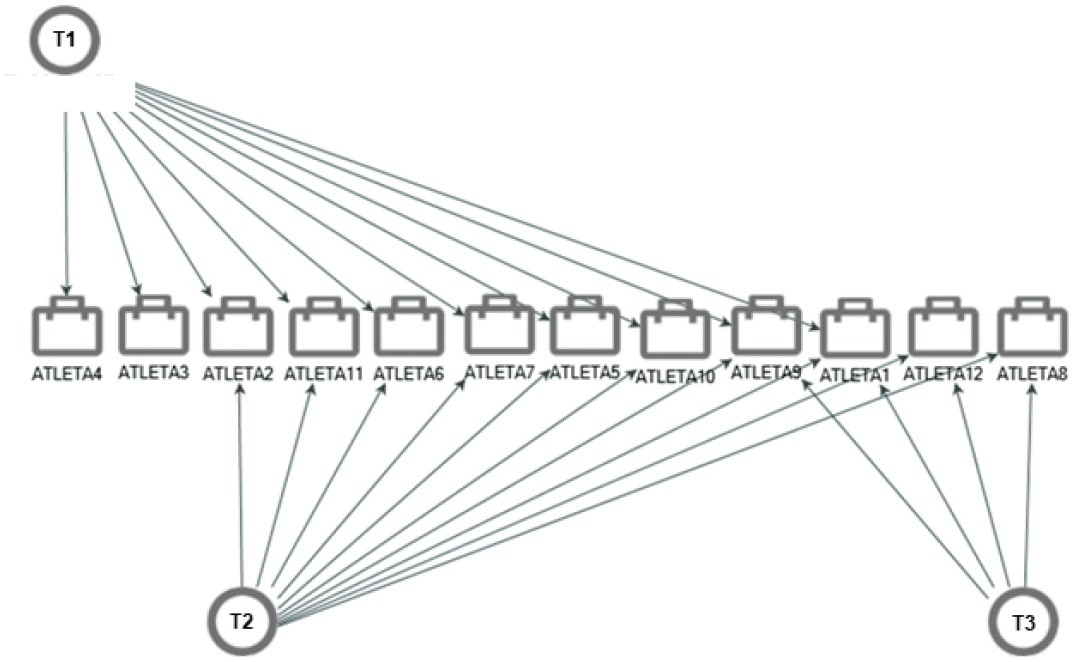

Figure 3. Effect of mindfulness on winning titles (T1 T2 T3).

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.*"

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. Regarding feasibility, this study evaluated MBI according to adherence to practices and acceptability, which showed significant levels of approval and recommendation among the Paralympic athletes. Moreover, the MBI's high levels of utility for the Team confirmed the hypothesis of its viability and effectiveness.

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. In line with MBSR-based studies showing the relevant effect of mindfulness on the well-being and performance of Paralympic athletes[39][40], this MBI positively impacted participants' personal lives, training, and competitions as mindfulness scores are indirectly correlated with performance as they regulate cognitive anxiety[41].

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[42], 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[43][44][45][46][47]. Previous studies[41][48][49] 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[49] 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[50][51], 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[45][52], 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[46][47][53]. 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[54], 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*'[55]. 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].

It is essential to highlight a probable limitation of this research due to the lack of additional comparison groups and its small sample size, which is justified as they are Paralympic medalists with a series of unique characteristics[56][57].

Finally, the moderators[41] pointed out that adherence potentially moderated the effectiveness of MBI due to the presence of an instructor[29] 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][53], cognitive and emotional processes[30][53][54], 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[58], which probably contributed to the 100% survey response rate and no volunteer withdrawal[39]. Besides, MT maintenance—conducted to motivate adherence[59]—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[28][29], was adapted to the context of the selected Team and applied as a structured program[52][53][54][60] that showed the effects of mindfulness in sport[15][16][61] since the first MBI carried out by Kabat-Zinn[46][47] 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[27]. 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][61] in line with '*shorter models of mindfulness training, without giving up acceptable levels of effectiveness*' [27] 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.

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

Conflicts of interest

The authors declare they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this study.

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