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Mindfulness applied to high performance athletes: a case report

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The present case study reports the experience of offering a mindfulness-based program to a high performance male Brazilian athlete, 26 years old, with a history of diminished performance following repeated injuries, and severe sleep disturbance. The intervention consisted in an adaptation of the *Mindfulness Based Stress Reduction* (MBSR) program, created by Jon Kabat-Zinn. The athlete was followed during 23 weeks, with collection of physiological (heart rate variability - HRV) and psychological data (perceived stress, trace and state anxiety, and mindfulness), added to quality of life and sleep assessments. At the end of the program, an in-depth interview was conducted to identify qualitative aspects of his experience with the program (expectations, perceived results and difficulties). The analysis of quantitative and qualitative data suggests that the athlete has shown improvements in physiological and psychological parameters,

even while facing several setbacks during the development of the mindfulness program. We can conclude that the implementation of a mindfulness programs addressing high performance athletes may be feasible, with great potential benefits for this type of public, especially for managing physical and psychological demands related to the particularities of the life of a professional athlete. To increase the feasibility of using this type of intervention in high-performance athletes, adapting programs to specific routines and demands (daily agenda and seasonal training and competitions; and potential missed sessions due to injury, commitments with sponsors, etc.) is recommended. It also seems important to maintain the monitoring of athletes for longer periods, to ensure learning and incorporating techniques into the routine of life and training as well as providing integration of other team members when necessary, for instance, in case of the diagnosis of sleep disorders, common in this type of audience.

Keywords: High performance athletes, Mindfulness, Quality of life, Perceived stress, Quality of sleep, Heart rate variability

Mindfulness en deportistas de alto rendimiento: estudio de caso

Este caso clínico describe la experiencia de administrar un programa de mindfulness a un atleta de alto rendimiento, brasileño, de 26 años, con una historia de disminución del rendimiento deportivo y trastorno del sueño grave. La intervención consistió en una adaptación del programa *Mindfulness Based Stress Reduction* (MBSR), creado por Jon Kabat-Zinn. El atleta fue seguido durante 23 semanas, recolectando datos fisiológicos (variabilidad de la frecuencia cardíaca) y psicológicos (estrés percibido, ansiedad rasgo y estado, y mindfulness), además de sueño y calidad de vida. Al final del programa, fue realizada una entrevista en profundidad para identificar aspectos cualitativos de su experiencia con el programa (expectativas, resultados percibidos y dificultades). El análisis de los datos cuantitativos y cualitativos sugiere que el atleta mejoró en los parámetros fisiológicos y psicológicos, incluso pese a haber tenido que afrontar dificultades importantes durante el programa de mindfulness.

Podemos concluir que la implementación de un programa de mindfulness dirigido a atletas de alto rendimiento es factible, con gran potencial para beneficiar a este tipo de atletas, especialmente para trabajar con las demandas físicas y psicológicas específicos de este grupo de población. Para aumentar la factibilidad se recomienda adaptar el programa a sus demandas específicas (agenda diaria con entrenamiento periódico y competiciones, sesiones perdidas por lesiones, compromisos con los esponsores, etc.). También es impor-

tante mantener la monitorización de los atletas durante largos periodos, para asegurar el aprendizaje y la incorporación de las técnicas en la vida diaria y en los entrenamientos así como integrar a los otros miembros del equipo si es necesario, por ejemplo, en el caso de alteraciones del sueño, frecuentes en este tipo de población.

Palabras clave: Atletas de alto rendimiento, Mindfulness, Calidad de vida, Estrés percibido, Calidad del sueño, Variabilidad de la frecuencia cardíaca

Introduction

The word "mindfulness" can be used to describe a mental state or trait characterized by a particular quality of attention, focused on the present moment, with an open and non-judgmental attitude. In addition, mindfulness can refer to practices and exercises to train that special mental state, many of such meditative techniques deriving from Eastern traditions such as Buddhism¹. Mindfulness-Based Interventions (MBI) appear in the late 1970s in the US, and are highly structured programs where mindfulness practices for cultivating that particular type of attention are applied, and they have been extensively researched and progressively integrated into contemporary clinical practice in psychology and medicine²⁻⁴.

More recently, different MBI programs have been adapted for specific target audiences, including athletes, in this case in order to improve psychological well-being, attention, concentration, and sports performance^{5,6}. Some studies also begin to discuss the relationship and the application of mindfulness programs to certain sports practices, such as Aikido⁷, as well as the development of social skills in team sports⁸.

On the other hand, there are still few studies and experiences on the use of mindfulness in professional sports; thus, this case study⁹ aims to report an experience of application of MBI tailored to a high performance Latin American athlete, in order to observe in depth its feasibility and transcultural and cultural adaptability, as well as its psycho-physiological effects and impact on the quality of life and sleep.

Athlete's Profile

In the time of this study (second half of 2011), he was an expert in one of the modalities of athletics, an internationally recognized and rewarded Brazilian Olympian. Born in the 1980s, he was 26, 104 kg and 2.02 meters tall, and since his teens, he has excelled in his modality. In the 2000s, he reached the peak of his career, beating international records and winning awards in several competitions. At the end of the same decade, he presented a

decrease in performance and happened to have recurring physical problems, added to psychological complaints related to stress and sleep disorders, and anxiety.

Entering the Program, Monitoring and Evaluation

The athlete was contacted through their head coach, which previously approved their participation in the program of mindfulness. After the athlete's consent, he was followed and evaluated for 23 weeks (Table 1), being collected quantitative and qualitative data. The mindfulness program sessions were conducted from 8.30 to 10.00 am, and the data always collected before the scheduled start of the session (at 8:00), or in the same time when there were no meetings. Psychological and quality of life assessments were made only before and after the application of the full program of mindfulness, and the following instruments were applied: 14-item Perceived Stress Scale - *PSS*¹⁰; short-form of the WHO Quality of Life (*WHOQOL-BREF*)¹¹; the Brazilian version (IDATE) of the State-Trait Anxiety Inventory (STAI)¹²; and the Mindful Attention Awareness Scale (MAAS)¹³. For serial assessment of the sleep quality, the Pittsburgh Sleep Quality Index¹⁴ (Table 1) was applied. The physiological assessment was carried out in 14 steps, from the analysis of physiographic data on heart rate variability (HRV), collected through a Polar RS800CX watch¹⁵, both at rest and during the mindfulness of breathing practice (Table 1). At the end of the program, the athlete was in-depth interviewed for the qualitative evaluation of the program and to identify and deepen meanings related to expectations, perceived outcomes, fears and difficulties experienced in the program.

Mindfulness-based Program

The applied intervention consisted of an adaptation of the Mindfulness-based Stress Reduction (MBSR) program, originally proposed by Jon Kabat-Zinn¹⁶, of which the following practices were used: "raisin" exercise, mindfulness of breathing, body scan, mindful movements and mindful walking (see details in Table 1), plus a psycho-education about stress in high performance sports and competition and its management. The main adaptations were: 1) instead of a retreat, a session was made entirely in silence (silent practices sequence - Session 6); and 2) a technique of compassion or kindly awareness, originally from the Breathworks Foundation (UK) program, was introduced. The program has been applied face-to-face by a certified instructor in MBI (one of the authors of this report - MMPD). Eight weekly sessions were initially planned (1 and a half hour each session, each including mindfulness practices, "inquiry" about the experiences, and psycho-education), but

Table 1	Details of the mindfulness program, evaluations and interurrences during the follow-up of the athlete (per week)	
Week (W)	Activity and General Content	
W0	-	Initial data collection (baseline - pre-intervention)
W1	-	HRV data collection (rest) and sleep quality Presentation and general information about the mindfulness program for the athlete and his head coach Stressing the commitment necessary and checking the motivation to the proposed program
W2	-	HRV data collection (rest) and sleep quality Session 1: <ul style="list-style-type: none"> • Raisin exercise • Discussion about "what is mindfulness" and its application in everyday life and sports • General orientation for mindfulness practices (posture, aspects to be careful about, etc.)
W3	-	HRV data collection (rest) and sleep quality Session 2: <ul style="list-style-type: none"> • Introduction to mindfulness of breathing (MoB) • Managing distractions and other challenges in mindfulness practice
W4	-	No activities due to sports competition
W5	-	HRV data collection (rest) and sleep quality Session 3: <ul style="list-style-type: none"> • Introduction to body scan • Awareness, suffering, discomfort, curiosity and acceptance (how mindfulness works)
W6	-	HRV data collection (rest) and sleep quality Session 4: <ul style="list-style-type: none"> • Introduction to mindful walking
W7-8	-	No activities due to sports competition
W9	-	HRV data collection (rest) and sleep quality Session 5: <ul style="list-style-type: none"> • Introduction to mindful movements
W10-18	-	No activities due to surgery and recovery period.
W19(M)	-	HRV data collection (rest plus one measure during mindfulness of breathing, lying down - W19M) and sleep quality Reactivation of the mindfulness program
W20	-	HRV data collection (rest) and sleep quality Session 6: <ul style="list-style-type: none"> • Sequence of mindfulness practices in silence (MoB - body scan - MoB. No walking or mindful movements were performed due to the surgery)
W21	-	No activities due to unjustified absence.
W22	-	HRV data collection (rest) and sleep quality Session 7: <ul style="list-style-type: none"> • Introduction to the kindly awareness practice • Mindfulness in daily life
W23 (M/P)	-	Final data collection (post-intervention), including HRV (rest plus one measure during mindfulness of breathing, lying down - W23M, plus one post-practice rest measure - W23P) Session 8: <ul style="list-style-type: none"> • How to incorporate mindfulness in daily life (formal and informal practices) • Evidence-based benefits of mindfulness • Doubt about the practices In-depth Interview

the program had to be adapted due to interferences experienced by the athlete during the intervention period (see Table 1).

Results and Discussion

As mentioned before, the program proposed initially had to be adapted to the schedule of the athlete (see Table 1) due to two sporting competitions (weeks 4, 7 and 8) and, particularly, to an unexpected interruption between weeks 10 and 18, when the athlete was submitted to a lower limb surgery, followed by a recovery period.

Besides the surgery being an important factor contributing to physical and emotional stress, this interval of several weeks should be regarded as potentially significant, possibly representing a partial loss of program benefits obtained so far, since the athlete reported not maintaining a regular practice of mindfulness during the period.

Pre and post Measures

Figures 1 and 2 show a trend of increases in psychological, social and environmental quality of life dimensions, and improvement in the perception of stress after 23 weeks of follow-up, which may be related to the practice of mindfulness⁴.

On the other hand, there was a loss in the "physical" dimension of quality of life (down 12 points to 6.85), and an increased state of anxiety, possibly attributed to the surgery the athlete suffered when he was halfway into the program, with consequent perceived loss of physical capacity and performance¹⁷. Interestingly, mindfulness levels fall slightly after 23 weeks of follow-up, probably related to increased state of anxiety, as well as the improvement in self-perception of the psychological state, as reported in previous studies¹⁸.

Follow-up Measures

In the pre-intervention assessment of sleep quality a pattern of 3-5 hours of sleep per night was observed, coupled with a poor perception of sleep quality, corresponding to severe sleep disorder, a condition usually found in high performance athletes, with harmful physical, psychological and performance consequences^{19,20}. However, during the study, the athlete showed a trend of improvement in the perception of the quality of sleep, especially after the first two weeks of the program, and after his return from the rest period due to surgery (Figure 3), which may be related to the practice of mindfulness²¹.

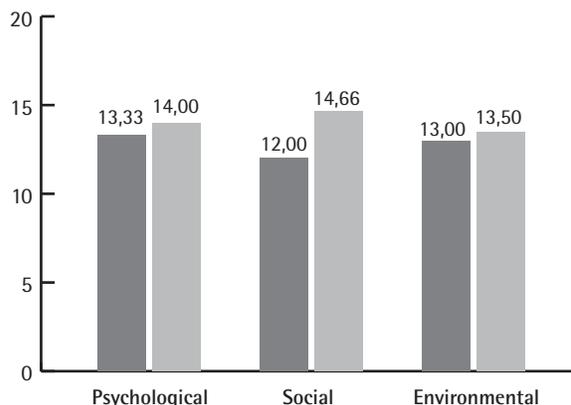


Figure 1

Effects of the mindfulness program in psychological, social and environmental domains of the quality of life after 23 weeks of follow-up (blue = pre / red = post)

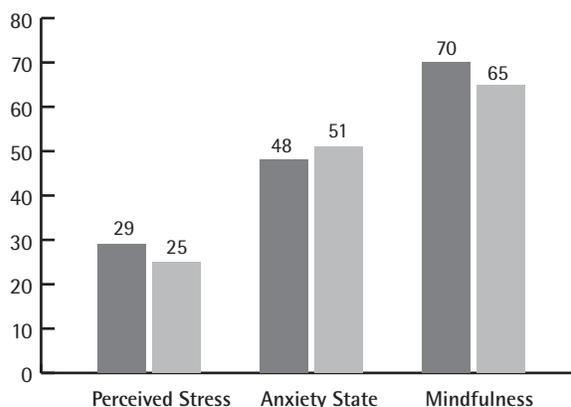


Figure 2

Effects of the mindfulness program in Perceived stress, state of anxiety and mindfulness levels, after 23 weeks of follow-up (blue = pre / red = post) .

For the evaluation of HRV, the frequency domain (linear method) was used, breaking HRV in two frequency components: High Frequency (HF), an indicator of the prevalence of vagal activation (parasympathetic), and Low Frequency (LF), associated with increased activation of the sympathetic system, related to chronic stress situations¹⁵. Thus, it was possible to verify a progressive increase in the HF component from the start of the regular practice of

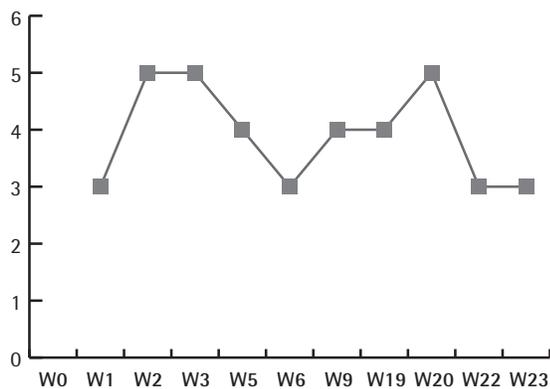


Figure 3

Evolution of the perception of the sleep quality during follow-up, being "1" the worst perception and "7" the best.

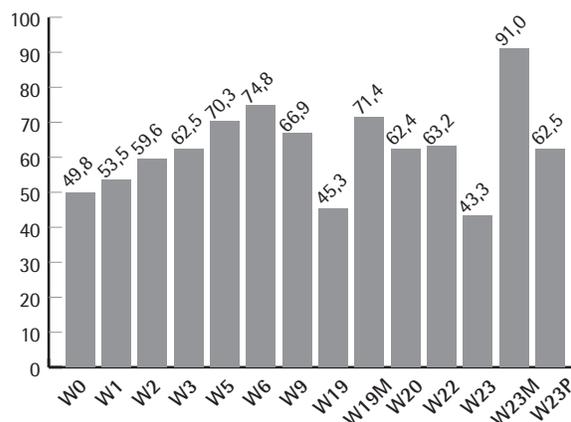


Figure 4

Evolution of the High Frequency domain (HF) of the HRV during follow-up.

mindfulness (W2), prone to loss of this pattern after the main program interruptions due to sports competitions (weeks 7 and 8) and surgery (weeks 10 to 18) (Figure 4). Moreover, a sharp increase in HF component records was observed where the athlete was asked to engage in the practice of mindfulness of breathing (W23M and W19M). However, these data may be biased due to changes in respiratory rate¹⁵, which usually falls during practice mindfulness, and this finding should be seen with caution. LF components had an inversely proportional pattern to the HF, reinforcing the results observed for the high frequency component of the HRV.

Qualitative data

Qualitative data suggested the importance of relativizing mindfulness program results from a biographical perspective of the athlete. By the time of this study, his promising career had apparently entered its decline after a series of injuries, with consequent diminishment of performance and success in competitions. In addition, the fact of still being young enough to compete at a high level put over him an enormous pressure (personal and external) to achieve good results, and possibly, this fact has created a situation of chronic stress, which may partially explain his poor sleep quality¹⁹. Moreover, the very poor quality of sleep can be a cause of his poorer performance^{19,20}, creating a vicious circle. Everything together makes the athlete's case handling complex, probably requiring a more comprehensive intervention, also engaging with other team members (doctors, psychologists, coaches, sponsors, etc.)²⁰.

On the other hand, he revealed that the mindfulness program was helpful and brought benefits in all aspects of

his life, becoming calmer and increasing his capacity for reflection. In addition, he expressed the desire to continue practicing mindfulness and doing it more consistently and in a more disciplined way, feeling sorry for the interruptions that generated discontinuity in the program sessions. Moreover, he recognized the difficulty of establishing a regular mindfulness practice at home, and identified his personal life problems as a main barrier for adherence and compliance to the mindfulness program; especially after surgery (he repeatedly used the word "chaos" to describe his current personal life situation at that time). He also noted that the improvements have not been as potent as they could in his sleep patterns, and attributed this fact to the lack of a regular practice of mindfulness. As for the athletic performance, the athlete referred an overall improvement in the quality of life and ability to concentrate, and, above all, greater ability to regulate his emotional state during training periods to avoid being negatively affected by the worries and ruminations of daily life. These results are aligned with previous studies involving athletes^{5,6}.

Study Limitations

The main limitation of this case report is related to the own type of the study, limiting the analysis to one athlete only, limiting the possibility of generalizing of its findings. The fact that the physiological data (HRV) were collected with a Polar type apparatus also configures a limitation, since it only allows the analysis of a single electrocardiographic derivation. In addition, the standard mindfulness program was hampered by disruptions caused by the participation of the athlete in competitions and by the surgical event.

Furthermore, the fact that the initial contact has not been directly with the athlete, but with his head coach, may have affected the athlete's commitment and motivation to the mindfulness program, and consequently, its full benefits.

Conclusion and Future Implications

The analysis of quantitative and qualitative data suggested that the athlete showed positive changes in several physiological and psychological parameters, as well as in some aspects of his personal and professional life. Those improvements were obtained even in the face of several professional interferences during the development of the mindfulness program, and into the complex reality of his personal life at that moment. Thus, it may be concluded that the implementation of a mindfulness-based program for high performance athletes may be feasible, with great potential for personal and professional benefits, especially for managing the physical and psychological demands related to long-term training routine and competitions stressors, as well as regarding the difficulties and typical characteristics of the personal life of a high performance athlete.

To increase the feasibility of the application of this type of intervention for high-performance athletes, a more flexible mindfulness program content, adapted to specific training routines and professional demands (daily and seasonal agenda of trainings and competitions, with potential missed sessions due to injury, commitments with sponsors, etc.), is recommended. It also seems important to maintain the monitoring of athlete for longer periods, to ensure the learning and incorporation of mindfulness techniques into training and life routines, as well as enabling the inclusion of other team members in the process when necessary, for example, when physical and psychological disorders are detected, including sleep disorders.

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