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Effect of 8-week Mindfulness-Based Stress Reduction (MBSR) on sleep quality, depression and perceived stress in adolescent athletes during transition

Ebrahim Norouzi, Nadia Milani***

**Department of Physical Education, Farhangian University, Tehran, Iran.*
***Department of Physical Education and Sport Sciences, University of Eyvanakey, Semnan, Iran.*

BACKGROUND: *Adolescence is a period marked by significant psycho-social challenges, often leading to sleep disorders and depression. Mindfulness-based stress reduction (MBSR) has emerged as a promising non-pharmacological intervention for these issues.*

METHODS: *Forty adolescent basketball players were randomly assigned to an MBSR group or a control group. Participants completed questionnaires assessing sleep quality, perceived stress, and depression symptoms at baseline, post-intervention, and four weeks later.*

RESULTS: *Results indicated that MBSR significantly improved sleep quality, reduced perceived stress, and alleviated depression symptoms in adolescent athletes compared to a control group.*

CONCLUSION: *MBSR is an effective intervention for supporting adolescents during the transition to adulthood, offering a non-pharmacological approac*h to address common challenges.

KEY WORDS: Adolescent athletes, Transition, Mindfulness, Depression, Sleep

Introduction

Adolescence is a period marked by significant physical, cognitive, and emotional changes. Adolescents experience disruptions to their circadian rhythms, leading to delayed sleep onset and wake times (Suppiah, Low, Choong, et al.,

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The protocol for this study was registered in the University of Eyvanakey (Semnan, Iran) in Iran and was approved by the ethics committee of the university with the code IR.UOE.1402223, which was performed under the ethical principles laid down in the seventh and current edition (2013) of the Declaration of Helsinki. Written informed consent was obtained from all subjects and/or their legal guardian(s).

Correspondence to: Ebrahim Norouzi Department of Physical Education, Farhangian University, Tehran, Iran (E-mail: e.norouzi@cfu.ac.ir)

2016). Epidemiological studies have shown that approximately 37.6% of adolescents aged 12-17 years suffer from sleep disorders. According to the epidemical statistics, 72.7% of high school students sleep less than 8 hours per night (Dubey et al., 2019). For young athletes, this transition can be particularly challenging as they navigate the demands of training, competition, and the broader social and academic world (Stambulova, 2003; Zick et al., 2007). This is especially true during the transition from youth to senior-level competition, a period often characterized by increased expectations, heightened competition, and more demanding training regimens (Park et al., 2013; Stambulova et al., 2017). Research has consistently highlighted the unique psychological challenges faced by athletes during this transition. The shift from youth to senior-level competition can lead to increased stress, anxiety, and depression, as athletes grapple with the pressure to perform at a higher level while balancing other life demands (Kristiansen & Roberts, 2010; Stambulova et al., 2021). Furthermore, the physical and mental demands of elite athletics can contribute to sleep disturbances, rumination, and ineffective thought patterns (Charest & Grandner, 2020; Cummins & O'Boyle, 2015). While these challenges are common among athletes, the transition from youth to senior-level competition presents unique stressors that can exacerbate these issues.

Various career transition frameworks, such as those proposed by Schlossberg (1981) and Stambulova (2003) offer valuable insights into understanding the processes involved in transitions and how factors like demands, resources, barriers, and coping strategies influence different outcomes. Recent frameworks, including the Scheme of Change for Sport Psychology Practice (SCSPP) by Samuel and Tenenbaum (2011), the Integrated Career Change and Transition Framework (ICCT) by Samuel et al. (2019), and the Cultural Transition Model by Ryba et al. (2016) have further enriched our understanding of these processes. The SCSPP framework, in particular, provides a cognitive-behavioral lens for examining transitional career events, such as team selection or de-selection, emphasizing appraisals, decisions, and coping behaviors (Stambulova et al., 2021).

Given the growing recognition of the challenges faced by athletes during the transition from youth to senior sport (Bennie & O'Connor, 2006; Chamorro et al., 2019; Stambulova, 2003), there has been a significant increase in research activity in this area. Psychological and support interventions can be used to support those who are going through this process (Drew et al., 2019; Stambulova, 2012). Based on the literature, sport-specific studies on the transition from adolescence to adulthood have included studies in football (Chamorro et al., 2019), ice hockey (Stambulova et al., 2017), track and field (Bennie & O'Connor, 2006), and basketball (Cummins & O'Boyle, 2015). Studies have

been conducted in a number of countries around the world, including the United Kingdom, New Zealand, Canada, and Australia. However, in countries such as Iran, there has been very little research (Norouzi et al., 2020).

The COVID-19 pandemic led to unprecedented disruptions in daily life, including widespread lockdowns and restrictions. These lockdowns had a significant impact on the mental health of young athletes, who experienced disruptions to their training routines, social interactions, and academic activities (Kass & Morrison, 2023). Research has documented a rise in depression and anxiety symptoms among adolescent athletes during these lockdowns (Batalla-Gavalda et al., 2021). The lack of structured activity, combined with increased stress and uncertainty, can contribute to sleep disturbances, including difficulty falling asleep, staying asleep, and experiencing poor sleep quality overall. These sleep problems can, in turn, exacerbate feelings of depression and fatigue, creating a negative cycle for adolescent athletes' mental well-being (Kass & Morrison, 2023). Sleep deprivation can lead to a range of problems (Charest & Grandner, 2020), including reduced academic performance, increased risk of accidents, mood swings and irritability, difficulty concentrating and increased risk of depression and anxiety. Therefore, adolescent athletes may experience stress and anxiety about performing well or meeting expectations in these two critical period included transition from junior to senior and COVID-19 pandemic (Chamorro et al., 2019; Kristiansen & Roberts, 2010).

Depression and sleep disturbances are common among adolescents, often leading to significant impairment in daily functioning (Suppiah, Low, Choong, et al., 2016). While pharmacological interventions are often used as a first-line treatment, their effectiveness can be limited, prompting a search for alternative approaches (Thase, 2006). Mindfulness-based stress reduction (MBSR) has emerged as a promising non-pharmacological intervention for managing these conditions (Winbush et al., 2007). Mindfulness, rooted in ancient Buddhist practices, has been adapted into the modern-day MBSR program, which was developed by Jon Kabat-Zinn in the 1970s. Previous research has demonstrated the efficacy of MBSR in improving sleep quality, reducing depressive symptoms, and enhancing psychological well-being in various athletes populations (Kabat-Zinn, 2003; Moore & Gardner, 2014). Mindfulness-based therapy is one of the recommended treatments for improving sleep and mood (Carlson & Garland, 2005), mental fatigue (Johansson et al., 2012), behavioral activation (Salmoirago-Blotcher et al., 2013), reduction of depression symptoms (Greeson et al., 2015) and anxiety (Song & Lindquist, 2015), enhancement of psychological well-being (Nyklíček & Kuijpers, 2008), improvement of emotional distress (Young & Baime, 2010) and emotional regulation (Goldin & Gross, 2010). However, studies examining the specific impact of MBSR on adolescent

athletes during transition are relatively limited. Given the unique challenges faced by athletes, including performance pressure, injury risk, transition to higher elite level and social demands, MBSR may offer a particularly valuable approach to supporting their mental health.

While other interventions like Cognitive-Behavioral Therapy for Insomnia (CBT-I) and Acceptance and Commitment Therapy for Insomnia (ACT-I) share some similarities with MBSR in their focus on mindfulness and acceptance, MBSR offers a broader approach that may be particularly beneficial for adolescent athletes (El Rafihi-Ferreira et al., 2023; Hut, 2020). Unlike CBT-I, which primarily focuses on cognitive restructuring and behavioral techniques (Dewald-Kaufmann et al., 2019), MBSR incorporates a wider range of mindfulness practices, such as body scan, yoga, and meditation (Norouzi et al., 2020). This comprehensive approach can address the multifaceted challenges faced by athletes, including stress, anxiety, and emotional regulation. Additionally, while Mindful Sport Performance Enhancement (MSPE) is more sport-specific, MBSR provides a broader foundation of mindfulness skills that can be applied to various aspects of athletic performance, including pre-competition anxiety, injury recovery, and overall well-being (Norouzi et al., 2020).

Depression and sleep disturbances in transitioning adolescents can be caused by inefficient emotional-cognitive processes (Suppiah, Low, & Chia, 2016; Tarokh et al., 2019). These inefficient processes can interfere with self-regulation behaviors. MBSR are used with a focus on acceptance and non-attachment to failure in changing the emotional and cognitive process. Therefore, in this study, MBSR will be used for the first time with a focus on improving emotional-cognitive dysfunction among athletic adolescent during transition. It was hypothesized that: 1) the MBSR intervention group would show a significant improvement in sleep quality compared to a control group, 2) the MBSR intervention group would exhibit a significant improvement in depression compared to a control group, and 3) the MBSR intervention group would demonstrate a significant improvement in perceived stress compared to a control group.

Methods

The present quasi-experimental study consisted of pre-test, intervention (MBSR), and post-test stages. The intervention was an 8-week MBSR program that was delivered in two 60-minute session per week. Participants were randomly assigned to either the MBSR (n = 20) or control (n = 20) group. Inclusion Criteria were 1) Adolescent athletes in the national basketball league in the season 2021-2022. 2) All participants were between the ages of 13 and 18. Exclusion Criteria were 1) withdrawal from the study, 2) absence on the day of the study, 3) injury at any stage of the study.

Participants

Participants were 40 female adolescent athletes aged 15.925 ± 1.84 years (range: 13 - 18). The participants were active members of competitive basketball teams, training regularly and participating in matches. Prior to the intervention, all participants reported having no previous experience with mindfulness practices. Participants with the inclusion criteria were randomly assigned to the MBSR and control groups. Adolescent athletes were screened for depression using the Farsi version of the Beck Depression Inventory (Ghassemzadeh et al., 2005) and for sleep disturbances using the Farsi version of the Pittsburgh Sleep Quality Index (Farrahi Moghaddam et al., 2012). A clinical psychologist conducted diagnostic interviews to identify participants with major depression disorder or sever sleep problems. Individuals meeting these criteria were excluded from the study to ensure that the intervention would not be confounded by pre-existing mental health conditions. Baseline measures of depression, sleep quality, and perceived stress were collected prior to the intervention. Moreover, to assess participants' physical and psychological well-being, we conducted semi-structured interviews to gather more in-depth information about participants' subjective experiences. In the face-to-face format, interviews were conducted with physical distancing due to the COVID 19.

The selection of this sample size was based on the calculations of sample size adequacy using G-power software, which were randomly assigned to two equal groups of 20 MBSR and control. The approximate number of subjects was measured based on the calculation of power, significance level, and effect size using G*power statistical software. At least 32 people were needed to obtain a significant effect, which was considered as a sample of 40 people. First, written informed consent was obtained from the participants. Then, the participants were familiarized with the aims of the study and the procedure of the task and the implementation of the desired tests.

Intervention

Mindfulness-Based Stress Reduction Program (MBSR)

The intervention was grounded in the theoretical frameworks of mindfulness-based stress reduction and positive psychology. These approaches provided a comprehensive framework for addressing the multifaceted challenges faced by adolescent athletes. By targeting cognitive processes, emotional regulation, and the cultivation of positive mindsets, the intervention aimed to equip participants with the tools to manage stress, enhance performance, and improve overall well-being. The MBSR intervention program is detailed in Table I for each of the eight weeks.

Control Group

The control group continued their normal life and sports as before. In the control group, participants were asked about their physical and psychological condition twice a week. Sports training and general life status were discussed. They also had group discussions on topics from recent newspapers and magazines.

Procedure

At first, the participants were familiarized with the aims of the study. In the pre-test stage, the participants completed the Beck Depression Inventory, Pittsburgh Sleep Quality Index and the Perceived Stress Scale. The MBSR intervention was delivered by a qualified clinical psychologist with 5 years of experience in mindfulness-based interventions. The intervention consisted of eight weeks of training, with two sessions per week. Each session lasted

Table I.
MBSR Intervention For Adolescent Athletes: Weekly Schedule

Week 1 (Session 1 and 2)	Introduction to Mindfulness	Mindful breathing exercise: Introduce basic breathing techniques, such as diaphragmatic breathing, to help participants cultivate present-moment awareness. Body scan meditation: Guide participants through a full-body scan to increase body awareness and reduce tension. Mindful walking: Practice mindful walking to enhance focus and reduce stress. Homework MBSR: Spend 10-15 minutes focusing on different parts of your body, noticing sensations without judgment.
Week 2 (Session 3 and 4)	Cultivating Mindfulness in Daily Life	Mindful eating: Practice mindful eating, paying attention to the tastes, textures, and aromas of food. Mindful sports practice: Incorporate mindfulness techniques into sports training, such as focusing on the present moment during drills and games. Mindful journaling: Use journaling to explore thoughts and emotions without judgment. Homework MBSR: Practice deep, slow breathing for 5-10 minutes. Pay attention to the rise and fall of your chest and abdomen.
Week 3 (Session 5 and 6)	Dealing with Obstacles and Challenges	Mindful self-compassion: A guided meditation to cultivate kindness and understanding towards oneself. Mindful problem-solving: Discuss strategies for approaching challenges with a mindful perspective, focusing on finding solutions rather than dwelling on negative emotions. Stress management techniques: Teach relaxation techniques such as progressive muscle relaxation and deep breathing. Homework MBSR: Choose a meal and eat it slowly, paying attention to the taste, texture, and smell.
Week 4 (Session 7 and 8)	identifying Values and Distinguishing Between Values and Goals	Mindfulness meditation: Guided meditation to enhance focus and present-moment awareness. Guided visualization: Visualize personal goals and values in a positive and supportive way. Values clarification exercises: Explore personal values and how they align with goals. Homework MBSR: Take a walk and focus on your senses: the feel of the ground, the sounds around you, and the sights you see.
Week 5 (Session 9 and 10)	Mindfulness Practice and Staying in the Present Moment	Mindful breathing: Guided breathing exercises to reduce stress and anxiety. Body scan meditation: A guided meditation to increase body awareness and reduce tension. Mindful movement: Practice mindful yoga or tai chi for relaxation and focus. Mindfulness of senses: Practice mindfulness of sounds, sights, smells, tastes, and touch. Homework MBSR: Imagine yourself performing well in a basketball game, feeling calm and focused.

Continue

Continue TABLE I.

Week 6 (Session 11 and 12)	Cognitive, Emotional, and Behavioral Flexibility	Psychological flexibility involves acknowledging and embracing thoughts, feelings, and sensations as they are, without attempting to change or avoid them. By cultivating behavioral flexibility through mindfulness practices, adolescent basketball athletes can better manage the challenges of the transition to adulthood, including balancing academic and athletic commitments, coping with increased pressure to succeed, and navigating changes in social relationships Mindfulness meditation: Guided meditation to enhance emotional regulation and cognitive flexibility. Cognitive reframing exercises: Learn to challenge negative thoughts and replace them with more positive and helpful ones. acceptance, and commitment to personal values. Homework MBSR: Before shooting a free throw or taking a shot, focus on your breath and visualize the ball going through the hoop. Practice dribbling while focusing on your body movements and the rhythm of the ball. During a defensive drill, focus on your opponent's movements and stay present in the moment.
Week 7 (Session 13 and 14)	Acceptance	Mindfulness meditation: Guided meditation to cultivate acceptance of thoughts and emotions. Journaling: Explore personal reactions and connections between thoughts, emotions, and behaviors. Challenging negative thoughts: Learn to identify and challenge negative thoughts about oneself and the situation. Acceptance of negative emotions: Practice accepting negative emotions without judgment.
Week 8 (Session 15 and 16)	Integration and Coherence	Review and integration of learned skills: Discuss the importance of practicing mindfulness in daily life. Mindfulness practice in daily life: Encourage participants to incorporate mindfulness techniques into their daily routines. Goal setting: Help participants set realistic and achievable goals aligned with their values. Self-care strategies: Discuss strategies for self-care, such as healthy eating, sufficient sleep, and regular exercise

1 hours. The homework activities were a mix of homework activities, included mindfulness meditations, body scans, mindful eating, journaling, mindful basketball training. The intervention protocol was adapted from the mindfulness intervention protocol (Norouzi et al., 2020). The post-test was performed exactly after the last intervention session. At this stage, the participants completed the whole questionnaire once again. Four weeks after the completion of the study, the follow-up test was performed similar to the post-test.

MEASURES

Pittsburgh Sleep Quality Index (PSQI)

To assess sleep quality, participants completed the Farsi version (Farrahi Moghaddam et al., 2012) of the Pittsburgh Sleep Quality Index (PSQI) (Buysse et al., 1991). The PSQI is a 19-item self-report inventory that measures the quality and pattern of sleep. Each item is rated on a 4-point scale, with a total score of 0-21. A score of 0-5 indicates good sleep quality, 6-10 indicates moderate sleep quality, and 11-21 indicates poor sleep quality.

Beck Depression Inventory (BDI)

To assess symptoms of depression, participants completed the Farsi version (Ghassemzadeh et al., 2005) of the Beck Depression Inventory (Beck et al., 1961). The Beck Depression Inventory is a 21-item self-report inventory that measures the severity of depression. Each item is rated on a 4-point scale, with a total score of 0-63. A score of 0-9 indicates no depression, 10-16 indicates mild depression, 17-29 indicates moderate depression, and 30-63 indicates severe depression. In a previous study, the translated Persian version of the BDI had acceptable reliability with a Cronbach alpha of 0.82. In the present study, reliability was also acceptable ($\alpha = .80$).

Perceived Stress

To assess level of perceived stress the Farsi version (Maroufizadeh et al., 2014) of Perceived Stress Scale (PSS), which consists of 14 items (Cohen et al., 1994). The questionnaire asked questions like "How often in the past month did you feel that you were unable to manage all of the things you had to do?" Participants answered on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*), with higher scores indicating more perceived stress. The Cronbach's alpha of the Persian version of the PSS was 0.90, indicating its validity, which was previously confirmed in a study conducted by Maroufizadeh et al. in 2014. The score ranged from 0 to 56.

Data Analyses

We used independent t-tests and Chi-square tests to compare age, highest educational level, and demographic information among the two groups. Then, we conducted a series of Mixed ANOVA (3 Time x2 Group) to analyze the effect of time (baseline, post-test, follow-up), Group (MBSR, vs. control), and the time by group interaction on sleep quality, depression, and perceived stress as dependent variables. Post-hoc analyses were performed using Bonferroni-Holm corrections to adjust for multiple comparisons. To indicate effect sizes, partial eta-squared coefficients were reported, while for pairwise comparisons, mean differences and standard deviation (SD) were displayed, and we set the level of significance at $p \leq 0.05$. We processed all statistics using SPSS® 25.0 (IBM Corporation, Armonk, N.Y., USA) for Apple McIntosh®.

Results

Sample Characteristics

Table II presents data on the participants' sociodemographic characteristics, grouped by MBSR, and the control group. 40 adolescent athletes participated in the present study. The mean of age of the participants in the control group was 15.77, in the MBSR was 16.08. The results of independent

TABLE II.
Sample Characteristics And Tests For Differences In Sociodemographic Background Between Groups

Group	*Control*	*MBSR*	*Statistics*
N	**20**	**20**	
	M±SD	M±SD	
Age (years)	15.77±1.36	16.08±2.02	t (1,59)=0.97, P=0.44
Age range (years)	13-18	13-18	
	F(N)	*F(N)*	
Education			
High School	22	24	P=0.06
middle school	18	16	
Income			
has it	36	38	0.26
does not have	4	2	
Smoking			
Yes	3	5	0.56
no	17	15	
Underlying disease			
does not have	1	2	0.48
has it	19	18	
Physical activity			
Yes	19	18	0.26
No	1	2	
Marital status			
Single	19	20	0.35
Married	1	0	

MBSR: Mindfulness Based Stress Reduction, M: mean, SD: Standard deviation

t tests showed that there was no significant difference regards age ($p<0.05$). All of the samples in the studied groups were female. The majority of the sample members in the groups were unemployed, had no specific income, were non-smokers, had regular physical activity, and were single. Chi-square test showed non-significant difference between the groups in terms of education (p=0.061), occupation (p=0.41), income (p=0.26), smoking. (p=0.56), physical activity bassline levels (p=0.26), underlying disease (p=0.52) and marital status (p=0.35).

Table III presents the mean and standard deviation values for all the measured outcomes at the baseline, post-test, and follow-up periods, respectively for both the intervention and control groups.

The results of 2 x 3 mixed-ANOVA models showed that the mean score of sleep quality did change significantly over time and significant difference was observed between the groups (p=0.05). Moreover, the results of this test showed that the trend of intra-group changes in the mean score of depression

TABLE III.
Comparison Of The Mean Score Of Sleep Quality, Depression, And Perceived Stress Before, Immediately And One Month After The Intervention In The MBSR And Control Groups.

Group	Control	MBSR	Group	Time	Time x Group interaction	Eta Squared
N	17	16				
	M±SD	M±SD				
PSQI			0.04*	0.02*	0.007*	0.26
Baseline	9.56±3.5	9.05±2.68				
Post-test	8.44±2.43	4.34±1.4				
Follow-up	12.8±8.7	5±1.5				
Depression Symptoms			0.001*	0.02*	0.001*	0.32
Baseline	16.5±3.5	17.2±3.6				
Post-test	15±4.4	6.4±3.2				
Follow-up	15.9±2.6	7.8±4.2				
Perceived stress			0.001*	0.04*	0.001*	0.21
Baseline	34.7±4.29	36.4±3.4				
Post-test	27.7±3.1	17±5.2				
Follow-up	33±4.9	7.3±2.7				

MBSRPA: Mindfulness Based Stress Reduction, PSQI: Pittsburgh Sleep Quality Index, *p < 0.05.; **p < 0.01

and perceived stress over time is significant (p=0.05). However, there was a statistically significant difference between the groups in terms of the mean score of depression and perceived stress (p=0.001). The interaction between Group and perceived stress has P-value =0.001. Moreover, the interaction between Group and sleep quality is significant (p=0.007). The significance of the interaction effect shows that perceived stress and sleep quality are clearly different between groups.

Since the interaction effect was significant for the variables of sleep quality and perceived stress, contrasts (group comparison) analyze were performed for these two variables. The mixed-ANOVA model and Bonferroni correction was conducted. In regards sleep quality ($F_{(1)} = 3.76$, $p = 0.01$) and perceived stress ($F_{(1)} = 4.73$, $p = 0.01$), the contrasts calculations showed that scores did differ significantly between groups. Post-hoc comparison calculations showed that there were significant differences between MBSR and the control groups (p = 0.03) with lower sleep problems, depression and perceived stress in the MBSR group.

Discussion

The results of the present study showed that MBSR can reduce self-reported sleep problems, depression and perceived stress among adolescent

female athletes during transition from junior to senior. The present findings add to the current literature in an important way in that MBSR interventions should be considered as complementary therapies and used in conjunction with standard treatment protocols.

In our first hypothesis, we expected that, participation in MBSR training would have a more positive impact on sleep quality compared to a control group. Based on our result, the analysis revealed a significant trend, suggesting that there was statistically significant difference between MBSR and control group in improving sleep quality. These findings align with previous research that has explored the benefits of MBSR for sleep. For example, Yook et al. (2008) found that MBSR interventions can significantly improve sleep quality in individuals. Similarly, Kim et al. (2009) examined the effectiveness of an MBSR program in patients with anxiety disorders. They found that sleep quality scores (based on the PSQI) were significantly improved in a sample of 19 patients with anxiety disorders and insomnia after receiving an 8-week MBSR. In addition, Gong et al. (2016) conducted a meta-analysis to investigate the effect of mindfulness meditation (one of the techniques of MBSR) on insomnia. They analyzed 6 intervention studies with a total population of 330 people. Overall, the data analysis showed that mindfulness meditation can have a significant effect on total wake time and sleep quality, but it has no significant effect on sleep latency, total sleep time, post-sleep wakefulness, sleep efficiency, and insomnia severity. Consistent with our findings, previous research has demonstrated the positive effects of MBSR on sleep quality. In a community sample, Jermann et al. (2024) found that MBSR significantly improved sleep disturbance and sleep problem. These findings in line with our finding, suggest that MBSR can be an effective intervention for addressing sleep-related issues in a variety of populations, including adolescent athletes.

One of the common sleep challenges faced by adolescent athletes during the transition period is delayed sleep onset, as noted in previous research (Suppiah, Low, & Chia, 2016; Suppiah, Low, Choong, et al., 2016). MBSR addresses this issue by focusing on the thoughts and emotions that can contribute to sleep difficulties. As discussed in previous research (Chan et al., 2022; Kim et al., 2016; Peters et al., 2022), this process of mindful awareness can help reduce arousal levels, leading to faster sleep onset and decreased sleep latency. The ability to accept and observe thoughts and emotions without judgment, as taught in MBSR, can be particularly beneficial for athletes who may struggle with avoiding or suppressing negative thoughts, a common obstacle to sleep (Emami et al., 2023; Riemann et al., 2020). This issue has also been confirmed in previous studies. For example, the results of the study

by Ong et al. (2014) showed that mindfulness can improve the sleep patterns in people with chronic insomnia and reduce arousal at sleep onset.

As a result, with MBSR, adolescent athletes learn to view parts of their mental productions as a background, like a disturbing noise or even a rumination. The adolescent athletes try to organize and accept their feelings and thought content. In other words, the adolescent athletes try to make peace with the components of their mind and also learns to accept their mental productions, including thoughts and feelings. This is helpful for adolescent athletes who have symptoms of depression and anxiety because the main obstacle to their sleep is their attempt to avoid thoughts and emotions (Riemann et al., 2020). Therefore, by changing the mental pattern towards attention and focus instead of control, the sleep pattern improved (Lau et al., 2018). MBSR shares some similarities with CBT, a well-established approach for treating insomnia (Khoo et al., 2019). Both approaches focus on changing negative thought patterns and behaviors that can interfere with sleep. While previous studies have primarily focused on the effectiveness of MBSR for treating anxiety disorders and insomnia, our findings suggest that MBSR can also have a significant impact on sleep quality in a population of adolescent athletes. This highlights the versatility of MBSR as an intervention for improving sleep in various populations.

On the other hand, after MBSR, the individual changes their position from an involved person to an observer (metacognitive state). For example, the thought "If I don't sleep, I won't have a good day tomorrow" comes to the patient's mind because previously they were in the position of an involved person, they were affected and preoccupied with the content of the thought, and they became insomniac (Kim et al., 2016). However, after MBSR and doing the exercises related to the process of self-contextualization (Norouzi et al., 2020), their position has changed to that of an observer, and they say that rumination or worry entered their mind and they just observed it (Ong et al., 2012).

In our second hypothesis we expected that, participation in MBSR would have a more positive impact on depression compared to control. Present finding confirms this hypothesis and depression did decrease after MBSR intervention. Brand et al. (2020) showed that 8-week MBSR can reduce cortisol levels (a stress hormone) in healthy people. One of the main factors in depression is stress, so by reducing stress and cortisol levels, depression symptoms can be reduced (Brand et al., 2012). Cortisol is considered the stress hormone. MBSR plays a decisive role in reducing this hormone. According to previous research (Brand et al., 2012), reducing cortisol can lead to improvement in depression symptoms. Gong et al. (2016) showed that mind-

fulness exercises do not have a significant effect on dysfunctional beliefs and attitudes. These results are inconsistent with the results of the present study. However, it is worth noting that the aforementioned study only examined one process of this intervention, while the present study focused on MBSR.

In our third hypothesis we expected that, participation in MBSR would have a more positive impact on perceived stress compared to the control group. For the assessment of perceived stress, a significant trend was observed. This implies that the MBSR intervention may lead to a significant decrease in perceived stress. This study aligns with Baer et al. (2012) by demonstrating the positive impact of MBSR on self-reported perceived stress. Notably, Baer et al. (2012) suggest a temporal order in these changes. Participants experienced significant increases in mindfulness skills as early as the second week of the program, while significant reductions in perceived stress emerged by the fourth week. Furthermore, the extent of improvement in mindfulness during the initial three weeks predicted the overall change in perceived stress throughout the intervention. This suggests that the development of mindfulness skills may be a key mechanism through which MBSR exerts its beneficial effects on stress reduction. Future research could explore the specific mindfulness practices within MBSR that contribute most significantly to these changes.

In line with the existing literature on transitions and sport performance, our findings suggest that 8 weeks of MBSR can reduce self-reported sleep problems, depression and perceived stress among adolescent athletes during transition. This is consistent with studies by Franck and Stambulova (2020) and Brustio et al. (2024). Additionally, the incorporation of cognitive-behavioral therapy for insomnia (CBT-I), acceptance and commitment therapy for insomnia (ACT-I), and mindfulness-based stress reduction for athletes (MSPE) may be beneficial in addressing the psychological challenges associated with transitions in sport. Our study suggests that MBSR can be a valuable tool in facilitating a smooth transition. This aligns with the workshop model proposed by Hansen et al. (2018), which highlights the importance of education and coping strategies. By incorporating mindfulness techniques into existing transition preparation programs, we may further enhance athlete well-being. Our research on the effectiveness of MBSR for adolescent basketball players transitioning to senior adds to the growing body of knowledge on athlete transition support. Similar to the work by Poczwardowski et al. (2024), which explores practitioner experiences in diverse athletic transitions, our study focuses on providing a practical intervention strategy for this population. Our findings are consistent with Hut (2020), which demonstrated that mindfulness training can be a valuable tool for improving the mental

health and performance of student-athletes. Our study further supports the notion that MBSR can be particularly beneficial for athletes transitioning in sport career, as it can help them manage stress, enhance sleep quality, and maintain a positive mindset. Future research could explore the long-term effects of MBSR on athletes transitioning in different transition model like out of sport. Additionally, investigating the potential benefits of combining MBSR with other interventions, such as sports psychology counseling, could provide a more comprehensive approach to supporting athletes during this challenging period.

Limitations

The findings of this study provide encouraging evidence for the effectiveness of MBSR in addressing transition challenges faced by adolescent athletes. By targeting cognitive processes, emotional regulation, and the cultivation of positive mindsets, MBSR can help participants develop the skills necessary to manage stress, enhance performance, and improve overall well-being. While this study has certain limitations, such as the relatively small sample size and the impact of the COVID-19 pandemic, the findings suggest that MBSR has the potential to transform the landscape of transition difficulty management within sport psychology. By offering a patient-centric, cost-effective, and sustainable approach, MBSR can contribute to improving the overall quality of life for adolescent athletes. Future research with larger sample sizes and longer follow-up periods is needed to further explore the long-term effects of MBSR on these outcomes. Nevertheless, the results of this study provide a promising foundation for future investigations and highlight the potential benefits of incorporating mindfulness-based interventions into sport psychology practice.

Conclusion

The present study offers significant insights into the potential effectiveness of non-pharmacological interventions, such as MBSR, for alleviating sleep disturbances, depressive symptoms, and stress symptoms among female adolescent athletes transitioning from junior to senior levels. Our findings demonstrate that MBSR can be a valuable tool in managing the unique challenges faced by this population. By cultivating present-moment awareness, reducing rumination, and promoting emotional regulation, MBSR can help athletes navigate the psychological and physiological demands of the

transition process. These results contribute to a growing body of evidence supporting the benefits of mindfulness-based interventions for athletic populations. Therefore, MBSR can offer a promising alternative or complement to traditional pharmacological interventions.

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