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A NARRATIVE REVIEW ON MINDFULNESS PRACTICES IN OPTIMIZING PERFORMANCE AMONG SPORTS INDIVIDUALS

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KEYWORDS

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ABSTRACT

Mindfulness practice has become an increasingly popular intervention in optimizing athletic performance in sports. Numerous studies have reported on applying mindfulness for improving the performance of various sports such as tennis, table tennis, shooting, cricket, archery, golf, running, hockey, swimming, and cycling. This narrative review addresses different existing mindfulness programs that enhance sports performance, the outcome measures of mindfulness therapy, and identifies the anxiety and depression that affect the performance of sports individuals. To cope with the issues, the efficacy of mindfulness in performance enhancement and future research directions on mindfulness needs attention.

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1 Introduction

The term mindfulness refers to the way that individuals pay attention to their own experiences from moment to moment with non-judgmental attitudes (Kabat-Zinn, 2009; Kabat-Zinn, 2012). Quite recently, considerable attention has been paid to mindfulness practice, it originated from Buddhist tradition where it developed through meditation and involves cultivating an ability to be non-reactive to thoughts, feelings, and body sensations (Mize, 2015). The mindfulness practice is an act of focusing or attention on being in the present moment, for instance by focusing completely on taking in its scent, warmth, taste, drinking a hot cup of tea, and removing overpowering emotions from the mind. The mindfulness model by Hölzel et al. (2011) specifies this underlying mechanism act as an active component in mindfulness practice where emotion regulation, perspective on the self, and attention regulation creates body awareness. According to Ludwig & Kabat-Zinn (2008), the mindfulness concept comprises five major characteristics which include the experience of being present, awareness, acceptance,

attention, and the transformative process of being mindful and moving towards a more integrated way of living. By considering these characteristics, towards individual sports achievements attention is one of the important factors, that stimulate the inner thoughts and emotions of an athlete through mindfulness (Lutkenhouse, 2007).

Therefore, the purpose of this review is to identify the different types of anxiety and depression, which affects individual sports performance and the effect of various mindfulness approaches that enhancing sports performance. And to find the outcomes measurement tools applied in mindfulness therapy. The sports enhancement mindfulness programs were originated from various mindfulness methods like Mindfulness-based stress reduction (MBSR), Mindfulness-based Cognitive therapy (MBCT), Mindfulness – acceptance commitment (MAC), Mindful sports performance enhancement (MSPE), and Mindfulness Meditation Training for sports (MMTS) as shown in Table 1.

Table 1 Diverse approaches in Mindfulness

Source	Mindfulness techniques	Duration of the intervention
Kabat-Zinn, 1990	Mindfulness-based stress reduction (MBSR)	Breathing and mindfulness techniques for 90 minutes in a week for 8 weeks
Segal et al., 2002	Mindfulness-based Cognitive therapy (MBCT)	Mindful attention, nonjudgmental acceptance of internal states, and commitment to achieving valued goals for 2 hours per week for 8 weeks
Gardner & Moore, 2004	Mindfulness – acceptance commitment (MAC)	Seven weekly meeting or modules includes in-session exercises and discussion on the skills being learned
Kaufman et al., 2009	Mindful sports performance enhancement (MSPE)	Mindfulness exercises, including walking meditation, adapted to participants' sport of focus weekly 90-minute for 4 weeks
Baltzell & Akhtar, 2014	Mindfulness Meditation Training for sports (MMTS)	6 weeks program consisting of two sessions (30 minutes) per week, and integrating mindfulness training and traditional psychology skills training (e.g., imagery and self-talk)
Pineau et al., 2014	Expand version of MSPE	Raisin exercise, the body scan, mindful breathing, the sitting meditation, mindful yoga, and the walking meditation 6 weeks program consisting of weekly 90-minutes group sessions and daily home practice

Mindfulness practice prepares an individual's brain prefrontal cortex to be calm and prepare the mind to stay focused by avoiding distractive thoughts and perform at the best to reduce the stress response in the brain (Kabat-Zinn, 1990). On the other hand, a higher level of mindfulness practice activates the insular cortex of the brain and brings an individual's attention inward (Huang, 2016), which calms the participant's mind by lowering the stress hormone (resting cortisol levels) (Rosenkranz et al., 2013). Further, Dr. Kristen Race, founder of "Mindful Life" reported that the awareness and recognizing of the body movements enhanced the association between the body and mind (Yeh, 2016). This would in turn help in sensing the physiological responses, like muscle tension or short breathing patterns that make an individual respond immediately with a conscious mind by aware of what is going on both physically and mentally (Race, 2014). From Denny & Steiner, (2009) findings among Stanford student-athletes (N=140) toward coping with performance hardship showed that internal factors like mindfulness, self-restraint, locus of control, and self-esteem were more potent, better account for happiness, and maintained throughout than the external factors (playing time, scholarship) that referring to the mindfulness model (Hölzel et al., 2011). These reports have shown that the mindfulness practice had brought more inner peace to calm the sports individuals.

2 Psychological status of an athlete

2.1 Common psychological challenges and Mindfulness effects

In sports, athletes generally engage with positive emotions like joy and happiness that brings in by their satisfying performance, whereas concurrently, they do experience negative emotions such as anger, distress, anxiety, over-arousal that may hurdle their way in performance. The right amount of good stress helps sports individuals to be prepare, focus, and perform their sports at an optimal level. Equally bad stress, distress may hinder athletes to accomplish a task. Besides, anxiety among sports individuals can be recognized in three levels, cognitive as a thought process, somatic as a physical response, and behavioral as patterns of behavior (Karageorghis & Terry, 2010; Weinberg & Gould, 2011). Additionally, a study by Elmagd (2016) indicates that the optimal positive emotions capable to initiate and maintain the required amount of effort to perform a task towards their success. As evidenced, Pre-competition stress (PCS) was considered common stress among athletes which usually distracts athletes from their specific sports task, fails to cope with the performance during the competition (Miles et al., 2016).

A study by Freeman & Rees (2009) suggested that among 118 high-performance male golfers proved that positive emotions such as excitement and happiness were associated with better sport performances, while negative emotions such as anger, anxiety, or

shame were associated with poor sports performance. Another study by Lane et al. (2010) studied the association of emotions with optimal and dysfunctional performance among 284 volunteer students participants from various sports which includes track and field, soccer, rugby union, hockey, basketball, volleyball, cricket, netball, lacrosse, tennis, badminton, martial arts, golf, water polo, boxing, and distance running. Similar to the previous study, Lane et al. (2010) reported that positive emotions like happiness, calmness, and vigor were associated with optimal sports performance whereas negative emotions such as anger and confusion were associated with poor performance. Though these studies applied different emotional tools such as Stress Appraisal Measure (SAM), a 20-item self-reported questionnaire to report perception of support availability, emotional intelligence scale, and the 24-item Brunel Mood Scale (BRUMS) to test the participants' emotional state. However, both these studies reported positive emotions are the key factor that optimizes sports performance (Denny & Steiner, 2009; Lane et al., 2010).

The response of 4-weeks Mindfulness Meditation Therapy (MMT) on elite shooters showed an effect on HPA-Axis by decreasing the level of salivary cortisol among experimental participants (n=48) as a reliable physiological marker in PCS compared with the control group (n=48) (John et al., 2011). Another study on junior elite soccer players (n=41) showed that 67% of the players in the mindfulness-based intervention remained injury-free and their attention level possibly decrease their injury risks (Ivarsson et al., 2015). The effectiveness of mindfulness was measured with the psychological instrument by using the Mindful Attention Awareness Scale (MAAS) on anxiety and sports performance training techniques among badminton players (n= 40). The results showed a reduction in post-test anxiety as compared to the pre-test results. Besides, the mindfulness scores among players showed improvement in their awareness and enhanced athletic performance (Moghadam et al., 2013). The authors found the impact of mindfulness influence burnout of stress level among 382 athletes towards perceived performance in their academic and sports activities in 79% of respondents. However, the participants perceived performances in sports were negatively related to their burnout level. The study suggested that mindfulness can be an important stress buffer and may help elite youth athletes to avoid burnout and perform better (Moen et al., 2015). The studies applied MAAS as the measuring tool following their mindfulness intervention (Moghadam et al., 2013; Jekauc et al., 2016).

2.2 Sports Individuals anxiety and depression

Mental illness greatly affects the day-to-day healthy living, which might cause serious functional impairments such as anxiety and depression that are found to be predictors of poor athletic performance. According to the American College Health

Association (ACHA) survey, 30 % of the 195,000 student-athletes have been identified as having depression over the past 12 months, and 50 % reported having anxiety over the same period which might be due to pre-competition anxiety (PCA) (Davoren & Hwang, 2014). Ferreira et al. (2007) reported that the incidence of PCA among (n= 42) Paralympic athletes. They studied the temporal patterning components analysis for 20 minutes, 2 hours, and 1-week among these athletes found that anxiety is a common problem, and suggested the importance of clinical intervention to deal the emotional distress, to benefit the individual against the emotional problem, and support them to cope with their stress.

Sports injuries are defined as tissue damage or physical trauma along with functional impairment (Scott-Hamilton et al., 2016). The athlete who has suffered injury is potentially at the risk of developing posttraumatic stress disorders and depression 6- times more in chances as compared to the non-injured athletes. Besides, the injured athletes also exhibit greater anxiety and lower self-esteem (O'Connell & Manschreck, 2012). In chronic sports injuries, athletes are more likely to become depressed than their teammates. Practicing in elite-level sports offers a completely different set of circumstances for athletes that place them in a high-pressure career with stressors and limitations that tend to cause injury (Schaal et al., 2011). A study among rugby players (n=470), examined the role of psychological factors, their prediction, and sport-related injury prevention to assess somatic anxiety, worry, and concentration disruption. Their results showed that social support, coping skills, and previous injury closely interacted with life stress and injury (Maddison & Prapavessis, 2005). Another study by Li et al. (2017) measured preseason anxiety and depression and reported a total of 597 injuries with 40.6% preseason injuries, 28.8%, and 21.7% of athletes suffered from anxiety and depressive symptoms. Furthermore, athletes with pre-season anxiety symptoms showed a higher injury incidence rate compared to athletes without anxiety symptoms. In general, anxiety increases fear (Scott-Hamilton et al., 2016), when this persists over a period that affects the personality of athletes as trait anxiety, whereas that affects temporary as state anxiety (Ensari et al., 2015). On the other hand, the state anxiety classified depends on the mental state and physical state as cognitive anxiety and somatic anxiety respectively (Waechter & Stolz, 2015).

2.3 Mindfulness in optimizing sports performance

Elite athletes face a variety of challenges in their careers, leading to important steps to ensure that sports psychologists have an appropriate response to athletes' challenges in the field of sport (Birrer et al., 2012). Over the last 30 years, the techniques used were primarily from psychological skills training (PST) with a set of systems for self-talk, imagery, goal setting, and arousal

regulation based on cognitive-behavioral theories. Recently, the rise of interest in mindfulness-based interventions has increased in sport psychology which ultimately creates an impact on optimizing sports performance (Elmagd, 2016). The 8-week mindfulness intervention among the competitive cyclist (n=27) showed increased attention of the athletes, decreased sport-specific anxiety, and sport-specific pessimism compared to the control group (n=20) cyclist (Scott-Hamilton et al., 2016).

Mindfulness mediation practice can reduce anxiety (Keng et al., 2011) and this practice has been reported to have associated with the ability to let go of and decreased the occurrence of negative thoughts (Evans et al., 2008). The trait mindfulness among 133 elite athletes and their levels of engagement from various sports showed that trait mindfulness encouraged a positive functioning in high demand situations, which improves athletes' performance. Besides, mindfulness was found to be able to reduce the state anxiety before a competition of the athlete (Röthlin et al., 2016). A study by Walker (2016) explored the relationship between mental toughness and mindfulness among provincial adolescent female hockey players (N=484), found that mindfulness exhibited positive correlations with positive emotions (Walker, 2016).

The mindfulness acceptance commitment (MAC) approach among 118 collegiate sports participants from various sports like soccer, field hockey, crew, and wrestling, exhibited a significantly greater increase in coach ratings and increase in flow experience comparing with PST participants (Gardner & Moore, 2004; Lutkenhouse, 2007). Another study by Vøllestad et al. (2011) investigated the effect of MBSR on self-referred participants (n=76) under heterogeneous anxiety disorders reported to have higher relief from depression, anxiety, and trait anxiety. Further, the study evidence that mindfulness has fully mediated a change in acute anxiety level and partial changes in trait anxiety level.

Kaufman et al. (2009) developed MSPE to track the sports performance, affected flow states, and psychological characteristics of the archers (n=11) and the golfers (n=21). Their results indicate that MSPE has been a positive intervention to improve sport-confidence flow, knowledge, and aspects. A further study on the long-term effects of MSPE psychological aspects of the individual athlete and their athletic performance was conducted among golfers, archers, and long-distance runners (N = 25) in the set duration of one-year. Their results showed the athletes manage to cope up with the depression level. Specifically, the long-distance runners showed improvement in their time duration, performance, and trait variables. The authors recommended MSPE as a promising approach for sports individuals that enhance long-term changes in trait variables towards athletic performance (Thompson et al., 2011; Kaufman et al., 2018). Another study

among (n=45) collegiate athletes who attend 75-min, 6-week MSPE reported positive psychological assistance such as mental strength and relaxation (Mistretta et al., 2017).

Mindfulness Meditation Training for Sport (MMTS) is a mindful based intervention that was introduced by Baltzell & Akhtar (2014) with traditional psychological skills training among female collegiate athletes (n=42), showed that athletes who received MMTS had increased in mindfulness score. Another study explored mindfulness intervention on women soccer players,

coaching staff, and their entire team. Their result showed in the beginning participants mostly had difficulty in understanding the process of meditation, however after undergoing MMTS, they reported an increased ability to accept and experience positive emotions, both on and off their field. At the session end, the participants felt sport-focused mindfulness programs help in enhancing sports performance (Baltzell et al., 2014). Similarly, a study by Cote et al. (2019) on MMTS 2.0 among collegiate tennis players (n=9) improved their sports concentration, adaptability, and tolerance level.

Table 2 Mindfulness study design, population, interventions, tools, and results

Author reference	Study design	Study population	Intervention	Tools used	Results
Röthlin et al., 2016	Cross-sectional study	(N=133) Elite athletes	Perception of Trait mindfulness to promote positive sports performance in high demanding situations in sports	37-item Comprehensive Inventory of Mindfulness Experiences	Trait mindfulness reduced performance worries and influencing athletes' performance in their specific sports
Walker, 2016	Experimental study	(N=484) adolescent female hockey players	Relationship between mental toughness and mindfulness	14-item Sports Mental Toughness Questionnaire 10-item Child and Adolescent Mindfulness Measure	Athletes in the high mindfulness group reported significantly higher levels of control and general mental toughness Mindfulness exhibited significant positive correlations with confidence, constancy, and control, as well as with total mental toughness
De Petrillo et al., 2009	Experimental study	N=25 Runners	Determined the effects of 4-weeks Mindful Sport Performance Enhancement (MSPE)	39-item Kentucky Inventory of Mindfulness Skills (KIMS) 13-item Toronto Mindfulness Scale (TMS). Mindfulness Practice Log	MSPE group showed significantly more improvement in perfectionism compared with controls groups
Kaufman et al., 2009	Experimental study	N=11 archers and N= 21 golfers	4-weeks MSPE to check the performance and psychological characteristics of participants	39-item Kentucky Inventory of Mindfulness Skills (KIMS) 13-item Toronto Mindfulness Scale (TMS). Daily Mindfulness Practice Log	MSPE is a promising intervention to enhance flow, mindfulness, and aspects of sport-confidence

Thompson et al., 2011	Longitudinal study	archers, golfers, and long-distance runners ($N = 25$)	One-year follow-up (MSPE), a program designed to improve athletic performance and psychological aspects of the sport.	39-item Kentucky Inventory of Mindfulness Skills (KIMS)	MSPE techniques as a promising intervention for long-term changes in trait variables that may contribute to optimal athletic performance
Baltzell & Akhtar, 2014	Experimental study	Female athletes ($N = 42$) soccer players ($N=19$), rowers ($N=23$)	Examined the impact of a twelve-session, 30-minute mindfulness meditation training session for sport (MMTS) intervention	Mindfulness Attention Awareness Scale (MAAS), the Positive Affect Negative Affect Scale (PANAS), the Psychological Well-Being Scale and the Life Satisfaction Scale	Paired sample t-tests highlight significant increases in mindfulness scores for the intervention group ($p < .01$)
Baltzell et al., 2014	Longitudinal study	$N=7$ soccer players	6-week, 12 session mindfulness meditation training for sport (MMTS) program	Interview	Participants reported an enhanced ability to accept and experience a different relationship with their emotions, both on and off their field, during post-intervention
Cote et al., 2019	Longitudinal study	$N=9$ Division I varsity tennis collegiate athletes	one-hour program or in two 30-minute segments for 6 days, 6 weeks MMTS 2.0 program addressing the psycho-education, guided practice, and group discussion	Participants completed pre-post interview on the MBI	Interviews highlights MMTS 2.0 is a practical and valuable intervention for collegiate athletes
Scott-Hamilton et al., 2016	Experimental study	$N=27$ cyclists in the mindfulness intervention condition, $N=20$ cyclists in the control condition	8-weeks mindfulness training increases athletes' mindfulness and flow experience and decreases sport-specific anxiety and sport-specific pessimism	Participants completed baseline and post-test measures of mindfulness, flow, sport-anxiety, and sport-related pessimistic attributions	Results suggest that mindfulness-based interventions tailored to specific athletic pursuits can be effective in facilitating flow experiences
John et al., 2011	Experimental study	96 male elite Shooters, experimental and control (48 in each)	4- weeks of MMT and one week study to determine the follow-up effect	Salivary Cortisol (SC), a reliable physiological marker of HPA- axis response in reducing Pre-competitive stress (PCS)	Reduction of PCS level and increase in shooting performance

Conclusion

This review on various mindfulness approaches has been proven to be effective in managing the sports individuals' state anxiety and depression, hence be able to enhance performance in individual sports.

Further, it conveys for the sports rehabilitation specialists that mindfulness practice has diverse approaches that are transfigured from cognitive-based therapy to a mindful approach, namely from MBSR to MMTS.

However, the majority of the study reported the effectiveness of mindfulness practice was assessed by using the very subjective questionnaire MAAS for testing the participants' mindfulness attention expect one study applied salivary cortisol testing. Hence, this review suggests the need for an objective assessment method to assess the impact of mindfulness intervention in sports rehabilitation.

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The authors declare that they have no competing interests.

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