

Mindfulness to Enhance Athletic Performance: Theoretical Considerations and Possible Impact Mechanisms

Daniel Birrer · Philipp Röthlin · Gareth Morgan

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Abstract Top athletes face various challenges in their career on and off the sports field. Sport psychologists teach techniques to help athletes to cope with these challenges. Over the last 30 years, the techniques used stem mainly from psychological skills training (PST), which is influenced mainly from cognitive-behavioral theories. Recently, interest in mindfulness-based interventions has increased in sport psychology. This article identifies the limits of PST and presents theoretical considerations how mindfulness-based interventions can amend PST. Further, it addresses in what form and by what mechanisms athletes could benefit. In reviewing current mindfulness literature, we conclude that it is important to distinguish between mindfulness practice and dispositional mindfulness. Mindfulness practice means the methods through which mindfulness is fostered, whereas dispositional mindfulness describes the tendency to be mindful in everyday life. In our conceptualization, we differ between three interwoven facets of mindfulness practice (intention, attention, and attitude), which are associated with six components of dispositional mindfulness. We consider that athletes with a higher degree in mindfulness practice and dispositional mindfulness will enhance the level of several required psychological skills through various impact mechanisms. Based on theoretical considerations, we suggest bare attention, experiential acceptance, values clarifications, self-regulation/negative emotion regulation, clarity about one's internal life, exposure, flexibility, non-attachment, and rumination as possible impact mechanisms. A greater knowledge of the

conceptualization of mindfulness and its impact on psychological skills could develop and improve the effectiveness of mindfulness based interventions in sports.

Keywords Mindfulness · Sport · Performance enhancement · Psychological skills training

Introduction

Roger Federer, one of the most successful tennis players ever, lost the 2011 US Open Semi-Final in five sets, 6–7, 4–6, 6–3, 6–2, 7–5. When the score was 5–3, 40–15 in the last set, he gave away two match points on his serve. After the match, he described this situation in the following way: “At first I thought, okay, now I have done it. Before the match ball, I was very nervous because of joy that everything went so well. Fifteen minutes later, you leave the court and did not win the match. To lose in such a way is very disappointing because I had the feeling that he [Novak Djokovic] was already beaten in the head and no longer believed in his victory.” This example shows that even at the highest performance level in sports, dysfunctional thinking, which can become ruminative, can occur. Although dysfunctional thinking does not reach a clinical level and might not be problematic in another context, in the unforgiving environment of elite sports, dysfunctional thinking can be performance relevant.

By teaching psychological strategies, sport psychologists try to assist athletes in coping with this and other challenges. The use of psychological strategies enhance athletes' chances of performing at their highest level under very demanding, stressful, and sometimes even hostile conditions. In this context, mindfulness-based interventions have drawn attention from a handful of sport psychologists. Kabat-Zinn and colleagues

D. Birrer (✉) · P. Röthlin · G. Morgan
Elite Sport Department, Federal Institute of Sports,
Alpenstrasse 16,
2532 Magglingen, Switzerland
e-mail: daniel.birrer@baspo.admin.ch

were perhaps the first to report the application of this approach in sport (Kabat-Zinn et al. 1985). He provided training in mindfulness meditation to rowers. This article outlines theoretical considerations for how mindfulness-based interventions can fruitfully amend psychological skills training (PST) in sports.

Psychology of High Performance—Nonpathologic Inhibitors and Facilitating Processes

Mindfulness is increasingly being used in clinical psychology, and the salutary effects have been impressively documented under a range of conditions (Hofmann et al. 2010; Chiesa and Serretti 2010). The scientific evidence of the efficacy of mindfulness-based interventions is so broad that it has been proposed as a common factor across several schools of psychotherapy (Martin 1997). However, athletes are commonly psychologically and physiologically healthy; thus, the possible benefits of mindfulness-based interventions need justification. Therefore, as the first step in demonstrating the efficacy of mindfulness-based interventions for athletes, understanding the psychology of high performance is important.

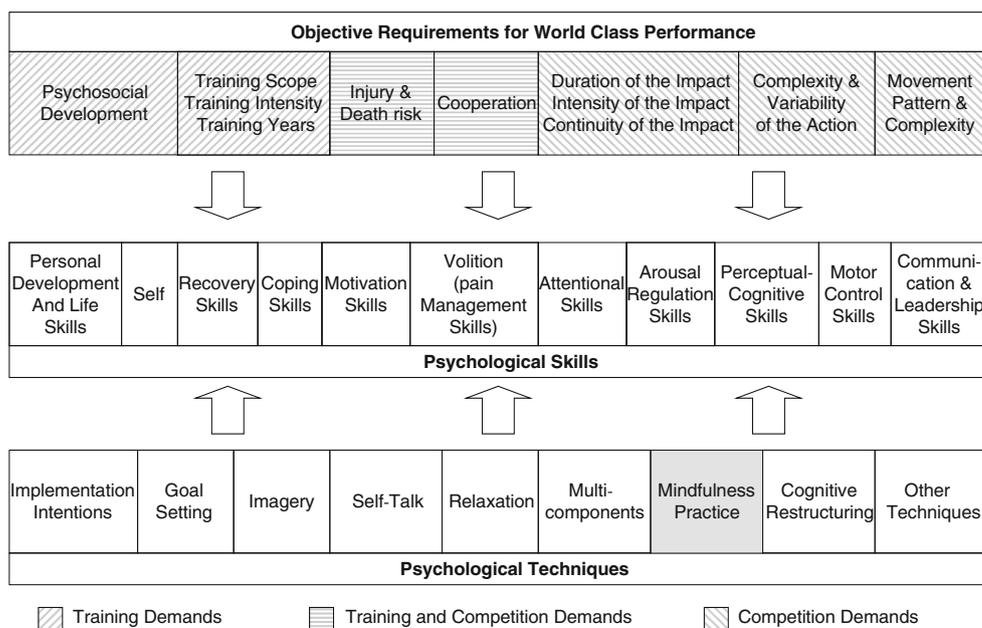
High performance can be undermined by non-pathologic psychological inhibitors, yet be promoted by an optimal psycho-physiological state. Among others, performance inhibitors include unrealistic expectations because of a perfectionistic personality (Hill et al. 2011) or an injury (Gardner and Moore 2007), competition anxiety (Hardy et al. 1996), anger and other negative emotions (Hanin 2000), fear of failure (Elbe et al. 2003), perceived pressure (Beilock and Gray 2007), and avoidance behavior (Jordet and Hartman

2008). These inhibitors predominately influence performance in competition. However, other factors can influence performance negatively. These include personal factors as an avoidance coping style (Hanson et al. 1992) or internal failure attribution (Biddle et al. 2001) as well as environmental factors such as overtraining (Meeusen et al. 2006; Jones and Tenenbaum 2009), interpersonal problems, or life-balance difficulties (Hardy et al. 1996). In contrast, Hardy and colleagues (1996) proposed an excellent performance is facilitated by a psycho-physiological state characterized by automatic goal-focused processes. During performance, athletes ideally adapt the relevant aspects of their behavior automatically to the specific situational demands (Gardner and Moore 2007). This process is called discrepancy adjustment and is comparable to airplane autopilot (Wells 2000). This mostly automatic process (Carver and Scheier 1988; Sbrocco and Barlow 1996), consisting of self-monitoring, self-evaluating, and adjusting behavior, is essential for regulating behavior effectively (Gardner and Moore 2007). However, because sports are multifaceted, there is a huge difference in the physical and psychological demands of different sports. Therefore, identifying the specific demands of each sport is essential in deciding which processes or psychological skills facilitate performance-relevant automatic goal-focused processes.

Promoting High Performance—Requirements, Skills, and Techniques

Recently, Birrer and Morgan (2010) introduced a model for deducing the specific psychological demands of a specific

Fig. 1 Potential psychological skills to cope with the psychological requirements for world-class performance



sport (Fig. 1). They provided reasoning for high performance requiring not only specific skills for elite competitive performance but also specific skills for the often strenuous and long-term training process. The proposed model consists of three conceptual layers: requirements, skills, and techniques.

Requirements

The first layer describes the possible categories of objective (psychological) requirements an athlete has to meet in different sports. Demands from competition itself incorporate the *duration, intensity, and continuity of the impact*, the *complexity and variability of the action*, and the *movement pattern and movement complexity*. Demands stemming from the lengthy training process and lifestyle to reach an elite performance level incorporate *training scope, training intensity*, and *years of training* to become an expert in the corresponding discipline and the *psychosocial development* that each sporting and non-sporting individual needs to fulfill. Finally, demands stemming from both competition and training processes are incorporated in *injury and death risk* in the relevant sport and the *cooperation between the athlete and all members of the party* needed to fulfill the task. The requirements dictate the psychological skills crucial for successfully coping with the specific demands of the relevant sport.

Skills

Consequently, the second layer provides psychological skills, which are hypothesized as helping to regulate an athlete's behavior to meet the requirements of a specific sport. In this context, a skill is the learned capacity or ability to carry out a specific task. These skills are *attention, motivation, volition, arousal regulation, perceptual cognitive functions, motor control*, and the various “self” constructs (e.g., self-awareness, self-efficacy, self-worth, self-confidence) known as *self skills*, as well as *personal development and life skills, coping skills, communication and leadership skills*, and finally *recovery skills*. Birrer and Morgan (2010) followed the differentiation, suggested by Vealey (2007) and Seiler and Stock (1994), between psychological skills as desired outcome (e.g., increased self-confidence and enhanced attentional focus) and psychological techniques (e.g., imagery and self-talk) as the means to promote the desired outcomes through the systematic application of these techniques. In this context, a technique is the procedure used to enhance a skill needed to manage the requirements.

Techniques

The third layer of the model comprises the techniques suitable for fostering the required psychological skills. Vealey

(2007) named *imagery, goal-setting, self-talk*, and *physical relaxation techniques* as the four basic mental techniques predominantly used in sports psychology interventions, supplemented with *multimodal psychological skills training*, which incorporates a combination of these basic techniques. However, numerous additional techniques are used to enhance an athlete's psychological skills, e.g., cognitive restructuring. Birrer and Morgan (2010) adopted these basic techniques in their model and added mindfulness-based interventions as a further important technique promoting psychological skills so that athletes can meet the requirements for a successful career. Mindfulness is a multifaceted concept. Therefore, it is expected that mindfulness-based interventions will influence the psychological functioning of elite athletes via numerous impact mechanisms. More comprehensive than Birrer and Morgan (2010), we believe these interventions have to be seen more as a meta-technique than a “simple” psychological technique.

Traditional Psychological Skills Training in Sports and Possible Limitations

During the last 30 years, the psychological techniques predominantly used to enhance athletic performance have stemmed mainly from psychological skills training (PST), which is influenced mostly by cognitive-behavioral theories (Meichenbaum 1977). This approach involves developing self-control of internal states such as thoughts, emotions, and physical experience to enhance performance. Scientific evidence has shown the efficacy of PST. Many studies demonstrate that PST decreases negative internal states, such as performance anxiety, and increases positive internal states (such as self-confidence, e.g., Daw and Burton 1994). However, only a few studies have revealed a clear performance-relevant impact of these internal state changes (see Gardner and Moore 2006; Moore 2009, for a review). Evaluating the efficacy of an intervention with a target group of elite athletes is difficult. Samples of elite athletes are small, and it is very difficult and ethically questionable to persuade athletes and their coaches to be part of a control group. Nevertheless, many athletes seem to experience difficulty in controlling their cognitive processes by employing traditional PST methods. The usefulness of these methods seems limited.

Two theories may explain why athletes cannot successfully control their cognitive processes despite investing in the mental effort: the theory of ironic mental processes of mental control (Wegner 1994; Janelle 1999) and the theory of reinvestment (Masters 1992).

The theory of ironic mental processes explains the “tendency to feel, act, and think in ways that are opposite to the intended direction of emotion, behavior, and cognition”

(Janelle 1999, p. 202). Two processes are important in the attempt to control one's own mental processes (Wegner 1994): (a) an intentional operating process, which facilitates the desired outcome by the conscious and effortful search for mental content, which is consistent with the desired outcome, and (b) a monitoring process that checks if the operating process is still needed by automatically and unconsciously searching for signs of failures to produce the desired outcome. It is hypothesized that the operating process needs more cognitive capacity and has more influence than the monitoring process. Additionally, the monitoring process usually functions to activate the operating process. In circumstances of reduced cognitive capacity, such as stress, time urgency, mental overload, or distraction, the monitoring process may supersede the operating process because it is easier to access. Therefore, the sensitivity to signs of mental states that are least desired or the opposite of the desired outcome is enhanced. Ironically, these individual attempts to gain mental control may cause the undesired outcome the athlete was trying to avoid. Golfers often experience this phenomenon when trying to avoid driving the ball into a water hazard. Because the golfer tries so hard to avoid the hazard, the ball often splashes into the water.

Ironic mental processes are predominately associated with the deliberate self-control of psychological states or processes (thoughts, emotions, bodily sensations, and behaviors), mostly to attain personal goals. The performance-decreasing effect of this phenomenon is hypothesized as caused by the focus on non-task-relevant cues (thoughts and feelings; external targets to be avoided). Athletes who experience task irrelevant feelings or thoughts might try to deliberately invest mental effort in focusing on task-relevant information or the processes most relevant for executing the task. Psychologists usually refer to these attempts as concentration. Sport psychologists try to enhance athletes' concentration by teaching them psychological techniques such as specifying action goals, pre-performance routines, self-talk (trigger words), and imagery (Moran 2010). Consciously putting more effort in task execution might be performance relevant. However, scientific evidence supports the performance-decreasing effects of such attempts (e.g., Masters and Maxwell 2008). Further, some findings suggest that ironic mental processes are associated with performance-decreasing attention processes, more precisely athletes' gaze behavior (Binsch et al. 2009, 2010).

Ironic mental processes can be regarded as detrimental self-regulatory behaviors associated with conscious control of thoughts, emotions, or bodily sensations. Self-regulatory detrimental behaviors associated with conscious control of movement have been united under the umbrella term reinvestment (Masters 1992). Reinvestment processes are activated whenever an athlete's self-evaluated performance does not match his or her expected performance. This discrepancy can be in either an unexpected poor performance or an unexpected good

performance. In this case, self-regulation is enhanced and tends to initiate discrepancy reduction efforts (Carver and Scheier 1988; Sbrocco and Barlow 1996). Reinvestment theory states that automatic movement will be disrupted if the athlete tries to control it consciously with declarative knowledge (Masters and Maxwell 2008). Masters and Maxwell (2008) specified numerous contingencies that can result in reinvestment, for example, psychological pressure, adaptation of process goals, or availability of too much time.

In summary, many contingencies can trigger the reinvestment of task-relevant declarative knowledge. This has a negative impact on performance. It is suggested that reinvestment is prevented through emotion control training (Abrams 2010), an external focus of attention (Wulf et al. 2007), or the use of implicit motor learning (Masters 1992). However, reinvestment would not appear if athletes were not involved in self-evaluation processes because they are attempting to attain personal goals. Mindfulness-based interventions could help prevent the detrimental effects of ironic mental processes or reinvestment. However, these reflections imply a possible paradox of mindfulness-based interventions in top sports, namely, the disaccord (or inconsistency) of the no goal and acceptance attitude of mindfulness and the extreme win and goal orientation of high performance sport. We will address this paradox later, after briefly clarifying our understanding of mindfulness.

Facets and Components of Mindfulness Practice and Dispositional Mindfulness

Despite widespread interest across different areas of psychology in the application and effects of mindfulness, there is no common understanding of the psychological construct of mindfulness, or what facets and components the construct involves (Coffey et al. 2010). Further, what impact mechanisms are associated with it, and how these mechanisms relate to different facets and components of mindfulness and formal or informal mindfulness training, is not clear (Dorjee 2010). However, for elite athletes to benefit from using mindfulness, careful investigation of the facets and components of mindfulness and their possible mechanisms of effect is important. Therefore, a working model incorporating the basic facets and components of mindfulness will be discussed, and possible mechanisms of effect of mindfulness in the attempt to enhance athletic performance will be presented.

“Clinically oriented conceptualizations of mindfulness can confound the description of the phenomenon with the methods (practice) through which it is fostered” (Brown et al. 2007, p. 215). The commonly used definition of mindfulness as intentional, non-judgmental awareness (Kabat-Zinn

1990) was introduced to describe *mindfulness practice*. Research has shown that mindfulness practice is associated with greater *dispositional mindfulness* (a temporary more-or-less stable state or trait, the tendency to act mindful in everyday life; Brown and Ryan 2003; Baer et al. 2008). Consciously carrying over mindfulness principles or elements into everyday life can be seen as informal mindfulness practice. In this context, we believe, similar to other researchers (e.g., Bishop et al. 2004; Brown and Ryan 2003), that mindfulness may be cultivated through everyday experience or processes other than formal meditation.

To better understand the processes and principles that underlie mindfulness, several researchers have sought to clarify the concept by clearly establishing its facets. Bishop et al. (2004) pointed to two dimensions of mindfulness: *self-regulation of attention* and the *attitude of openness to experience*. Bohus and Huppertz (2006) differentiated “What” and “How” modalities. Their conceptualization comprised *observing, describing, and acting* (“what modality”) in a *non-judgmental, concentrated, and effective* way (“how modality”). Shapiro and colleagues (2006) tried to break mindfulness down into a simple, comprehensible construct. This construct reflected the core components of formal mindfulness practice: *intention, attention, and attitude*. These components “are not understood as separate processes or stages—they are interwoven aspects of a single cyclic process and occur simultaneously. Mindfulness (practice) is this moment-to-moment process” (Shapiro et al. 2006, p. 375). Based on the description of mindfulness in Mindfulness-Based Stress Reduction (MBSR) and in a Buddhist context, Dorjee (2010) provided a working model with five mindfulness facets relevant to psychological and neuroscientific research: (1) *intention and context of mindfulness practice*, (2) *bare attention*, (3) *attentional control*, (4) *wholesome emotions*, and (5) *ethical discernment*.

Baer and colleagues (2006, 2008) investigated the factor structure of mindfulness by combining all items from five recently developed mindfulness questionnaires into a single questionnaire. Since most mindfulness measures quantify dispositional mindfulness, we believe that Baer and colleagues (2006, 2008) conceptualized dispositional mindfulness. Exploratory factor analysis led them to five factors for mindfulness with the following components: (1) *observe*—observing, noticing, and attending to thoughts, feelings, perceptions, and sensations; (2) *describe*—describing or labeling with words; (3) *act aware*—acting with awareness; (4) *nonreact*—not reacting to inner experience; and (5) *nonjudge*—not judging experience.

By exploring which of Baer and colleagues’ (2006, 2008) mindfulness components predict psychological well-being, symptoms of anxiety, depression, and stress, Cash and Whittingham (2010) showed that the mindfulness components *nonjudge* and *act aware* were significant predictors of

depression. Additionally, *nonjudge* was a significant predictor of anxiety and stress. Thus, different components of dispositional mindfulness make different contributions to psychological functioning. Coffey and colleagues (2010) complained about the lack of a clear mindfulness definition, especially about the lack of clear boundaries between different mindfulness conceptualizations and emotion regulation, in mechanisms of impact by which mindfulness components might influence mental benefits. To differentiate between mindfulness components and emotion regulation, Coffey et al. ran different exploratory, confirmatory factor analysis and structural equation models to better understand the factor structure of mindfulness and emotion regulation measures and possible impact mechanisms on psychological functioning. The researchers concluded mindfulness consists of two facets: (1) *present-centered attention* and (2) *acceptance of experience*. They suggested that other components captured in current trait measures of mindfulness are the consequence of mindfulness rather than components. A reason for this might be that the boundaries between mindfulness practice and dispositional mindfulness are not very clear. Formal mindfulness practice with bare attention, the intention to self-regulate, and a nonjudgmental and accepting attitude will enhance the disposition to act with more attention and a nonjudgmental attitude in everyday life, which, we argue, is nothing more than the trait components of dispositional mindfulness. Finally, recently Bergomi and colleagues (in press) developed a new instrument, the Comprehensive Inventory of Mindfulness Experiences (CHIME). It consists of six components: (1) *non-reactivity/decentering*, (2) *observe/perceive*, (3) *relativization*, (4) *openness/non-avoidance*, (5) *act aware*, and (6) *acceptance/self-compassion*.

These differing conceptualizations of mindfulness highlight the problematic confusion of mindfulness practice (as a method to become mindful) and dispositional or trait mindfulness (the phenomenon, Brown et al. 2007). For our own mindfulness interventions and in contrast to other conceptualizations, we differentiate mindfulness practice from dispositional mindfulness. For the concept of mindfulness practice, we mostly follow the proposal by Shapiro and colleagues (2006) because it seems to be a parsimonious model. Almost all of the other models’ facets can be integrated into Shapiro and colleagues’ conceptualization. Further, *bare attention* and *nonjudgmental attitude* have shown a reasonable impact on psychological functioning in empirical studies (Coffey et al. 2010; Carmody et al. 2009). Thus, our mindfulness practice concept consists of the following interwoven facets: (1) an *intention* to practice, which could include self-regulation, self-exploration, self-liberation, insight, and wisdom (see also Dorjee 2010), (2) *bare attention* to internal or external stimuli with the possibility of sustained attention, shift, and inhibition, and (3) an *attitude* of

nonjudgmental, acceptance, openness, self-respect, and non-reactivity. Although there are signs that *intention* to practice is not a relevant impact factor (Coffey et al. 2010; Carmody et al. 2009), we decided to keep it in our conceptualization because intention to practice can constitute an important motivational variable in the context of elite sports. Regarding dispositional mindfulness, we suggest using Bergomi and colleagues' (in press) concept because it is based on eight validated mindfulness questionnaires and shows good reliability and validity. Further, the authors emphasized while constructing the instrument that the measure is equally applicable to experienced meditation practitioners and meditation novices. Therefore, it should be applicable to athletes. To differentiate between mindfulness practice and dispositional mindfulness, we refer to facets of mindfulness when we talk about mindfulness practice and to components of mindfulness when we talk about trait mindfulness.

Mechanisms of Mindfulness

Mindfulness is often described as a key aspect of the so-called third wave of behavior therapy (Hayes 2004). These interventions emphasize changing the function, not the form of behavior, emotion, cognition, bodily sensations, and external stimuli. They aim to change the relationship to thoughts and emotions, not the content of thoughts and emotions. This differentiation is important to bear in mind because it has an essential influence on possible impact mechanisms. Additionally, for examining the effectiveness of mindfulness-based interventions as well as their impact mechanism, considering the techniques used to foster dispositional mindfulness is important. MBSR (Kabat-Zinn 1982) and Mindfulness-Based Cognitive Therapy (MBCT; Segal et al. 2002), for example, emphasize regular mindfulness meditation practice whereas acceptance and commitment therapy (ACT; Hayes et al. 1999) and dialectical behavior therapy (DBT; Linehan 1993) do not.

There is evidence that formal mindfulness practice leads to more dispositional mindfulness (Carmody et al. 2009). The degree of dispositional mindfulness is also influenced by informal practice (doing routine activities mindfully, Kabat-Zinn 1990) and psychotherapy (Martin 1997) as well as individual genetic (Way et al. 2006) and developmental (Greenough and Black 1992) differences. In addition, knowledge about mindfulness (through education in psychology) could influence the degree of dispositional mindfulness. However, which of these factors and which combination of these factors contribute to what extent to changes in psychological functioning and with athletes to changes in performance is unclear.

There is evidence that increased dispositional mindfulness mediates improvement in psychological functioning

(see Baer 2009 for a review) and that different facets of dispositional mindfulness make different contributions to psychological functioning (Cash and Whittingham 2010; Baer et al. 2008; Baer et al. 2006). It is hypothesized that improved attention facilitates the recognition of internal associative processes (Carmody 2009). This recognition leads to the development of re-perceiving (Shapiro et al. 2006). Re-perceiving is closely related to the concepts of decentering (Safran and Segal 1990), deautomatization (Deikman 1982), detachment (Bohart 1983), and metacognitive awareness (Teasdale et al. 2002).

These terms describe a change in perception. It is no longer the content (of, e.g., a thought) that is perceived, but the content (of this thought) as an event in/of the mind (Shapiro et al. 2006). This perception is accompanied by the insight that experience consists of components of thoughts, emotions, and bodily sensations associated with each other. This change in perception and the resulting insight lead in turn to various psychological outcomes. According to Shapiro and colleagues (2006), re-perceiving is a meta-mechanism for the mechanisms of action flexibility, values clarification, self-regulation, and exposure. Carmody et al. (2009) showed that change in flexibility and change in values were significant predictors (mediators) of changes in perceived stress and psychological symptoms. However, the significant influence of re-perceiving as a meta-mechanism has been only partially confirmed.

Coffey et al. (2010) tested the mediating roles of clarity about one's internal life, the ability to manage negative emotions, non-attachment, and rumination in the relationship between mindfulness and psychological distress and flourishing mental health. Ruminating is a form of self-focus in which thoughts cycle around a common topic. Results confirmed the importance of these mediators in the relationship between the mindfulness facets of present-centered attention and the acceptance of experience and mental health. Interestingly, the attitudinal, acceptance-based facet of mindfulness (practice) mattered more for the measured psychological functioning than the attention facet. Acceptance is another considered mechanism of action for mindfulness (Hayes et al. 1999). Acceptance stands in contrast to avoidance and control and can lead to a calmness independent of external circumstances.

These findings suggest that mechanisms by which mindfulness might beneficially impact psychological adjustment are (1) *bare attention*, (2) *experiential acceptance*, (3) *values clarification*, (4) *self-regulation/negative emotion regulation*, (5) *clarity* about one's internal life, (6) *exposure*, (7) *flexibility*, (8) *non-attachment*, and (9) *less rumination*. Considering these possible mechanisms of action for mindfulness practice and taking into account Birrer and Morgan's (2010) model, we assumed the following mechanisms of action of mindfulness practice for athletes (Fig. 2):

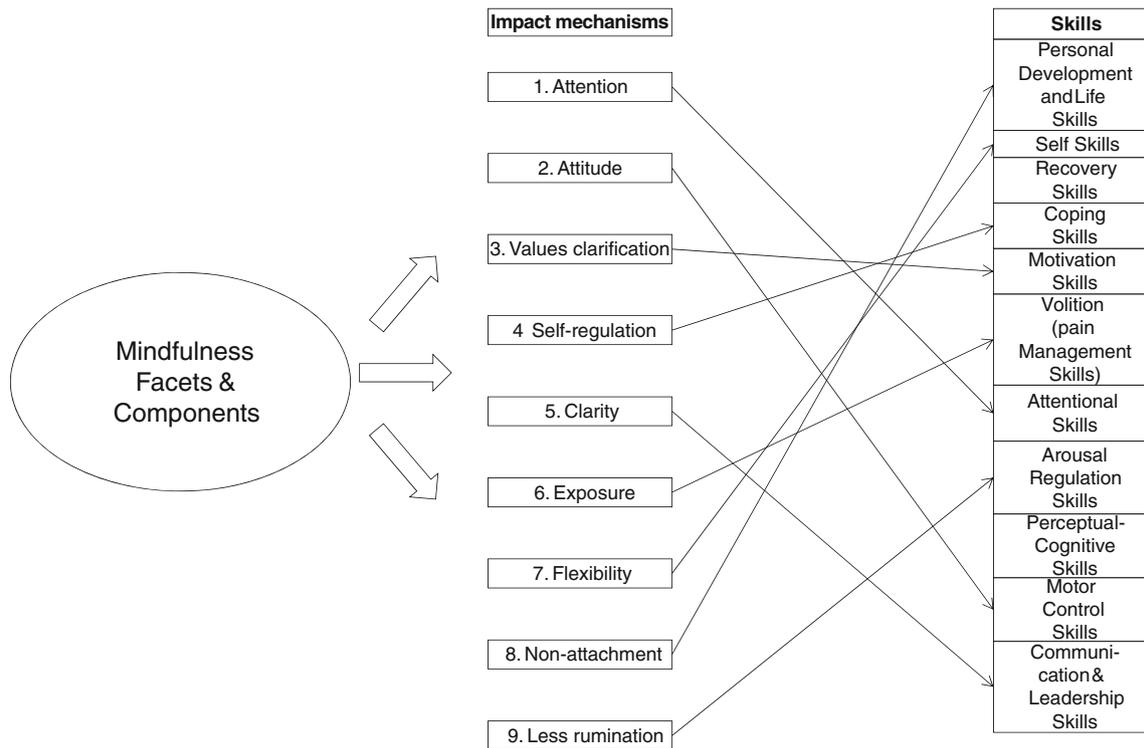


Fig. 2 Potential impact mechanisms of mindfulness facets and components on psychological skills. *Arrows* imply the influence of mechanisms on skills. Only one possible relationship between a mechanism and a skill is shown because of clarity reasons

- *Bare attention* facet of mindfulness practice: Mindfulness practice (the bare attention facet) improves *attentional* and *perceptual-cognitive skills* directly (Chambers et al. 2008; Chiesa et al. 2011; Ortner et al. 2007). Therefore, athletes are possibly less distracted, better able to control their attention and place it on goal-relevant aspects, and improve their action orientation. When attention is no longer employed with irrelevant content, it is free for other aspects of the situation, which might lead to a solution of a problem and a better outcome (Carmody 2009).
- *Attitude* facet of mindfulness practice (acceptance, non-judgmental, openness, self-respect, and non-reactivity): Mindfulness practice increases experiential acceptance (Hayes et al. 1999). As a result, athletes accept a performance discrepancy (unexpected poor performance and unexpected good performance), and reinvestment processes are not be triggered. The tendency to control automatized movements with declarative knowledge is reduced, and athletes could therefore enhance their performance of well-learned *motor skills* because automatic processes are not interrupted. Additionally, the occurrence of ironic mental processes would decrease, which again should favor athletic performance.
- *Values clarification*: Mindfulness practice leads to a clarification of values (Shapiro et al. 2006). Athletes could identify conflicts between their personal values

- and goals and thus increase their self-concordance (Koestner et al. 2002) and the degree of their self-determined behavior, which would have a positive effect on their need-satisfaction (Deci and Ryan 1985). Consequently, *motivational skills*, *personal*, and *developmental* as well as *self skills* would profit from a clarification of values.
- *Self-regulation/negative emotion regulation*: Dispositional mindfulness as a result of formal and informal mindfulness practice enhances self-regulation (Carmody et al. 2009; Coffey et al. 2010; Shapiro et al. 2006). Therefore, athletes would be better able to deal with anger, fear, and other negative emotions. *Arousal regulation*, *coping*, *communication*, and *leadership*, as well as *self skills*, should profit from an enhanced self-regulation.
- *Clarity* about one’s internal life: Mindfulness leads to better clarity about one’s internal feelings and one’s ability to control behavior in the presence of negative affect (Coffey et al. 2010). Better clarity would have a positive effect on *personal development* and *life*, *self*, *recovery*, and *coping* as well as *communication* and *leadership skills*. Thus, there would be fewer over-trained athletes and drop-outs.
- *Exposure*: Mindfulness practice leads to more exposure (Shapiro et al. 2006), in particular the willingness to remain in contact with an unpleasant experience. Therefore, athletes could be more willing to endure negative

emotions and aversive states instead of avoiding them. Thus, the athletes could confront more difficult situations in competition, tend to extend their threshold of pain, and be willing to face aversive training situations. Enhanced *volitional*, *pain management*, and *coping skills* are the likely consequence.

- Cognitive, emotional, and behavioral *flexibility*: Adaptation and flexibility in responding to the environment as a result of dispositional mindfulness (Carmody et al. 2009) promote the consolidation of *personal development* and *self* as well as *communication* and *leadership skills*.
- *Non-attachment*: The belief that one's own happiness is independent of obtaining positive outcomes (non-attachment) is a consequence of mindfulness (practice) (Coffey et al. 2010). Presumably, non-attachment reduces ironic mental processes and reinvestment. Thus, non-attachment has a positive effect on *personal development*, *self*, *recovery*, *coping*, and *motor control* as well as *communication* and *leadership skills*.
- *Less rumination*: Mindfulness reduces rumination (Coffey et al. 2010) or at least the uncontrollability of rumination (Raes and Williams 2010). Less ruminating thinking influences several psychological skills, most likely *personal development* and *life*, *self*, *recovery*, *coping*, *arousal regulation*, *attentional*, and *motor control skills*.

The Goal Paradox: Can Mindfulness Be Applied in an Elite Sports Environment?

At this point, it seems appropriate to address the issue of the apparent inconsistency of the fundamental no goal and acceptance attitude of traditional mindfulness practice and the radical goal orientation of elite sports. This issue stems from the difficulty of Western society adopting a concept developed over centuries within an Eastern cultural background. Elite sports signify the pinnacle of meritocracy of modern Western society. In an environment where coming fourth is often regarded as a failure, athletes are extremely outcome oriented. This radical goal orientation stands in contrast to the acceptance and no goal attitude of mindfulness. Stemming from Buddhist tradition, the practice of mindfulness is based on an Eastern philosophical belief that the source of suffering is an uncontrolled mind guided by anger, attachment, and ignorance (Dorjee 2010). The goal of mindfulness meditation is therefore often the liberation of one's desire and will. This (ostensibly) contradicts an athlete's goal to win a competition. Obviously, there is a paradox we cannot easily solve. Otherwise, inherent aspects of sports are consistent with mindfulness (philosophy).

For instance, successful athletes have realized that the temptation of focusing on winning can inhibit their current performance. Four-time Olympic, six-time World, and 21-time European Champion Alexander Popov (freestyle swimming) is a very good example of keeping one's attention on the moment at hand. Before winning his sixth World title in 2003, he stated seemingly succinct: "Who thinks of winning loses." He realized that thoughts on winning would distract him from the task at hand and inhibit the delivery of automated processes. Hence, successful athletes already seem to use attitudes conjoint with mindfulness philosophy, namely, focusing on the present moment, accepting an unpleasant experience such as physical pain, and practicing consistently. However, integrating mindfulness-based interventions in an elite sports setting remains challenging.

To tackle the general problem of integrating mindfulness in therapeutic concepts of Western society, Berking and Znoj (2006) suggested distinguishing different facets of mindfulness and training them separately. We addressed this aspect earlier by making a thorough distinction between the facets of mindfulness practice and the components of dispositional mindfulness and their possible impact mechanisms on the specific demands of psychological functioning of elite athletes. Regarding the intention to train facet of mindfulness, most athletes certainly aim to enhance their self-regulation. The key challenge is to unite the attitude facet with the attitudes shaped by Western sociocultural-related forces and the forces stemming from every different sports culture (for example, the sports culture of professional soccer differs in many aspects from the culture of rhythmic gymnastics). With this in mind, mindfulness is far from being seen as a psychological skill or a quick fix. On the contrary, the training and practice aspect inherent in mindfulness meditation is very similar to the understanding of training in sports. Performance is mostly seen as an outcome of a years-long training process. Similarly, enhancing self-regulation can be easily seen as the cause of a process demanding hundreds of hours of continual practice with the right attitude (non-judgmental, acceptance, openness, self-respect, and non-reactivity). These similarities can be used in applying mindfulness-based interventions to a sports setting.

This leads to another point Berking and Znoj (2006) suggested: how to beneficially integrate mindfulness in the Western context. The introduction together with the reasoning for mindfulness interventions must be separated from the traditional Buddhist culture and adapted to the predominant values and belief system of Western culture, and even more specifically to the different sports cultures. The acceptance attitude of mindfulness practice, for example, might be easily misinterpreted in a sports setting and can lead to unintended outcomes. For instance, a player might be tempted to accept the result at the half-time of a game as an

unmistakable fact and therefore accept the thought that his or her opponent is stronger than his or her own team, and thus give up before the end of the game. Hence, an introduction to the mindfulness attitude might require a thorough understanding of mindfulness aspects as well as the sports culture. The athlete has to understand that acceptance does not mean the approval of the present moment condition but the non-judging awareness of the present circumstances or the reaction to it in the form of thoughts and emotions. Consistent with the third wave of behavior therapy (Hayes 2004), thoughts are seen as what they are, namely, thoughts and not facts. Similarly, emotions are emotions and nothing else. Modification of dysfunctional thoughts is not targeted, but the insight that thoughts are just processes of our brain and the refocus on other psychological functions, for instance, the perception of task relevant aspects are normal. Similarly, emotions, bodily sensations, and external stimuli are not the aim of change, but the relationship to them. Therefore, using mindfulness techniques will help athletes regain a state of mind where goal-oriented behavior and automatic goal-focused processes are facilitated.

Thus, the sole use of either mindfulness training or psychological skills training will likely be ineffective in tackling athletes' issues as long as the training is not integrated into one compatible concept. Therefore, we agree with Berking and Znoj (2006) that mindfulness-based techniques might have to be taught with other techniques, which enables a person to proactively solve a problem.

Current State of Knowledge about the Effectiveness of Mindfulness-Based Interventions in Sports

Kabat-Zinn et al. (1985) provided training in mindfulness meditation to collegiate and Olympic rowers with specific applications of mindfulness to rowing. The researchers reported that collegiate rowers exceeded the coach's expectations based on the athletes' level of experience and physical abilities. Furthermore, several rowers who medaled at the Olympics reported that mindfulness training helped them perform at their full potential. After this promising start, mindfulness-based interventions in sports more or less disappeared from the sport psychology landscape for almost two decades. Recently, two sport-specific mindfulness-based intervention programs have been developed: Mindfulness–Acceptance–Commitment Approach (MAC; Gardner and Moore 2007) and Mindful Sports Performance Enhancement (MSPE; Kaufman et al. 2009). To our knowledge, eight empirical studies have been conducted in English that investigate mindfulness in sports or mindfulness-based interventions with athletes. There are two correlational studies (Gooding and Gardner 2009; Kee and Wang 2008) and a single case study (Schwanhausser 2009). The remaining five

are intervention studies. Three examine the MSPE program (De Petrillo et al. 2009; Kaufman et al. 2009; Thompson et al. 2011). The other two explore other mindfulness-based interventions (Aherne et al. 2011; Bernier et al. 2009). The number of subjects in the intervention studies is at most 32. If there is a control group, it is a passive waiting list control group. In sum, there is empirical evidence that dispositional mindfulness is a performance-relevant trait in sports and that mindfulness-based interventions may be helpful for athletes. The results so far suggest that dispositional mindfulness is related to more flow, less fear, and fewer task-irrelevant thoughts. Mindfulness-based interventions seem to increase dispositional mindfulness. For a thorough assessment, however, more high-quality studies are needed. They should use randomized control group designs with active control groups or multiple baseline designs and measure performance as the dependent variable. A systematic study of the mechanisms of action of mindfulness-based interventions in sports has yet to be conducted. The effects found so far are relatively small and/or not significant. In competitive sports, however, even small effects can be important. Detecting small effects takes a lot of statistical power and therefore a large number of subjects. This is likely to prove to be difficult in the context of competitive sports. Ways to deal with this problem are meta-analyses or correlational studies with large numbers of subjects.

Conclusions

The aim of the present paper was to present theoretical considerations on how mindfulness-based interventions can be used to help elite athletes successfully meet the demands of their sport. The focus was on the distinction between mindfulness practice and dispositional mindfulness as well as possible mechanisms of impact. Overall, the use of mindfulness-based interventions in sports seems to be a promising approach. By explaining what and how performance-related skills can be improved with mindfulness practice, the theoretical considerations show that it makes sense to scientifically study this approach let alone its value as a practical intervention concept. Mindfulness seems to be a holistic intervention fostering the development of several personal, sport, and performance-relevant psychological skills.

However, to effectively apply mindfulness-based interventions in sports, we suggest thoroughly differentiating the mindfulness practice facets from the mindfulness components of dispositional mindfulness and training and measuring them separately (although we see them as more or less interwoven but distinguishable constructs). As a first step, examining the relationship of dispositional mindfulness and performance-relevant variables and preliminarily studying the hypothesized impact mechanism in cross-sectional studies

with many elite athletes seems worthwhile. As a second step, the influence of mindfulness practice on dispositional mindfulness and performance-relevant variables might be investigated in intervention studies.

Because of the limited empirical data and despite the statistical challenges, many questions need to be addressed in both steps: (1) Do mindfulness-based interventions have a performance-relevant effect on athletes? This question should be investigated with randomized control group studies, active control groups, or multiple baseline designs and standardized intervention manuals. The intervention is effective if mindfulness practice is associated with an improvement in performance-related skills and a reduction of inhibitors of high performance or at its best improving performance. These relationships should be mediated by changes in dispositional mindfulness. In additional steps, the following questions should be examined: (2) Can the postulated mechanisms of action of mindfulness-based interventions for athletes be confirmed? (3) How much (dose) and what kind of mindfulness practice (formal, informal, psycho-education) is necessary to achieve the expected changes in performance-related skills (response)? (4) Do different components of dispositional mindfulness have different influences on performance-related skills? (5) What kind of mindfulness practice influences which components of dispositional mindfulness? (6) What facets of mindfulness practice have what influence on performance-related skills and dispositional mindfulness? (7) How can mindfulness-based interventions and traditional PST be combined? Further, whether mindfulness-based interventions in some cases could result in performance decline, because athletes might remain self-focused too long, is not clear.

Finally, a briefly outline of how mindfulness techniques might be translated into the sports setting seems appropriate. Mindfulness practice can be taught in many ways. Formal mindfulness breathing exercises might be introduced in a non-sports setting. To explain the mindfulness philosophy, using the athlete's own examples and demonstrating a non-judging and accepting attitude in his or her specific situations is important. Additionally, mindfulness exercises can be easily transferred into a training program or training session as Kabat-Zinn and colleagues (1985) demonstrated when they delivered sport-specific mindfulness techniques to rowers. Rowers can train mindfulness exercises directly in their boat when they focus on the breath or letting go of thoughts of pain and discomfort. As another example, a body scan exercise can easily be administered during the cool-down phase at the end of a training session. At first glance, mindfulness seems incompatible with an elite sports setting. However, with the appropriate openness as well as sport-specific expertise, mindfulness techniques can be integrated in a sports setting in many ways.

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