

Attention, Concentration, Flow and the current research evidence regarding Mindfulness training in Sport, 2011. W Mark Singleton.

Attention and concentration are key aspect of performance at all skill levels within sport. Despite conscious cognitive efforts to the contrary amateur tennis players in common with other athlete report losing concentration, losing focus or being distracted during matches. Mindfulness training can be understood as a meta-cognitive skill whereby an individual becomes more aware of the nature of attention and their own processing of internal and external stimuli. Mindfulness has been defined as "paying attention in a particular way: on purpose, in the present moment" (Kabat-Zinn, 1994, p.4).

This paper reviews information processing models of attention and questions the utility and efficacy of these models in the field of Sports Psychology. Flow is reviewed as another approach to concentration and attention in sport. Links between Flow and Mindfulness are explained. Evidence for the efficacy of Mindfulness applications with athletes is reviewed and contrasted with traditional Psychological Skills Training. Performance enhancement is a key endeavour within Sports Psychology. However, outcome following interventions is also influenced by an athlete's attitude to various extraneous psychological factors and their impact on general well-being. This paper also addresses this issue.

Available research is informed by Kahneman's (1973) model of attention, which is cited in many introductory texts on Sports Psychology (Moran, 2004; Lavallee, Kremer, Moran & Williams, 2004; Shaw, Gorely & Corban, 2005). The most comprehensive review is in Williams, Davids and Williams

(1999, 2005.) The key element in Kahneman's model is that attentional capacity is not fixed but flexible and the 'policy' or decisions about attention are based on 'enduring dispositions' and 'momentary intentions'. Enduring dispositions are rules of attention over which we have no control. This is the inherent ability of the mind to notice stimuli, such as fast moving objects or sudden loud noises. The sudden quality, novelty and intensity of stimuli are key to how our attention is occupied. Momentary intentions can be self-directed and under the individuals control or they can be a response to a coach's instructions. Sportspeople have to overcome the nature of enduring dispositions with the application of effective momentary intentions within a rich world of stimuli. Potential stimuli can be external, such as the crowd, the scoreboard, the referee and the opposition; or they can be internal, such as attention to thoughts, body state and breathing. The human mind wanders between multiple potential stimuli clambering for attention.

Sports Psychologists have traditionally used information processing models and inherent issues of capacity to explain attention processes. For example, Lavallee et al (2004) suggest that 'dimensions' of attention can be distinguished in three ways. First, 'selectivity of perception' which is selective attention that involves the sportsperson 'zooming in' on task relevant information. So a rugby fly half must see the space behind the on rushing opponents in order to place his kick. Second, 'mental time sharing' also known as divided attention. A tennis doubles player, receiving serve, must be aware of the pace and direction of the ball while simultaneously being aware of the position and movement of the volleyer at the net. Third, 'deliberate mental effort' which means concentrated, focused mental effort at a given moment.

The focusing quality inherent in attention has led to use of various descriptors within attention models. These are primarily known as 'filter' and 'spotlight'. However the complex nature of attentional processing has been described as a 'pool of mental energy' in Lavallee, Williams and Jones (2008), referring primarily to Kahneman's (1973) model. The emphasis here is on mental energy or internal processing. These information processing, capacity or resource theories have been criticised (Lavallee et al, 2004) because they focus on the internal processing and do not take account of the nature of the external stimuli.

Williams et al (1999, 2005) outlined the evolution of theory in this field and the relationship between (external) stimuli and (internal) sensory capacity. 'Multiple resource theories' conceptualise several 'pools' and address how our different senses may have different mechanisms each with its own capacity and designed to handle certain kinds of information. The concern within these models is the dynamics between pools or resources. It is thought that there are negative performance effects when attention resources are derived from the same pool. Perhaps inevitably, information processing models are conceptually complex. For example, Wickens (1984) developed a three dimensional model. These dimensions are: 1) Modalities and Codes - visual, auditory/spatial, and verbal; 2) Stages - encoding, central processing, and responding; 3) Responses - manual and vocal. The complexity of these models informs our understanding of attentional processes but has not facilitated application in the applied sports field.

These information-processing models grapple with the capacity of the human mind to attend effectively to key information. Nideffer's (1976) model looks at individual difference in attentional processes. The 'Test of Attentional and Interpersonal Style' (TAIS, Nideffer, 1976) conceptualises attention along two independent dimensions, width and direction. Width refers to both, broad many stimuli focus, and narrow focus where irrelevant information is successfully excluded. Direction refers to whether the target of attention is internal or external. Lavallee et al (2004, p.100) highlight a number of issues with the TAIS. Relevant to this study is whether athletes can accurately evaluate their own attentional processes. It is difficult to imagine how attention can be assessed directly in the field while athletes are engaged in dynamic sports. Self-report requiring reflection on attentional processes appears to be a necessary component of enquiry in this field.

In another vein of attention research, Neumann (1990) highlights the role of action. For Neumann it is the capacity or limitations of the body for action that makes for selective attention. Neumann's theory involves the selection of effectors within the human system and the selection of parameters in a given situation. Selection of information combines with the principle that some information is ignored because we don't want it to interfere with control of the action we are about to perform. Neumann's theory is salient when we consider the dynamic nature of tennis and the interactions between attention and action. There are also links between this conceptualisation and one of the key fundamentals of Flow, namely 'action-awareness merging' (Jackson & Csikszentmihalyi, 1999).

The study of Flow is quite different from the information-processing approaches outlined above and represents another approach to the elusive and complex nature of attention and concentration in the sports arena. Flow is typically characterised as the ideal performance state. Flow has been described as "a state of consciousness where one becomes totally absorbed in what one is doing, to the exclusion of all other thoughts and emotions. So flow is about focus" (Jackson & Csikszentmihalyi, 1999, p. 5).

Jackson & Csikszentmihalyi propose nine criteria before flow is experienced. These are: (1) a Challenge-Skills balance is necessary so that the athlete is stretched and mental capacity is occupied with clear demands. Concentration is therefore fully occupied only with the activity; no attention is left over. The other dimensions of their model are, (2) Action- awareness merging; when the mind and body fuse into one, with echoes of Neumann, (1990). (3) Clear goals; so there is clarity of intention and the mind focuses attention and avoids distraction. (4) Unambiguous feedback; this links to goals and is the sense/information that the athlete is on target. (5) Concentration on the task in hand; "focus in the flow state is complete and purposeful, with no extraneous thoughts distracting from the task at hand" (p 25). (6) Sense of control; this is the sense of can-do-no-wrong, a sense of confidence in one's abilities and skills. (7) Loss of self-consciousness; no attention capacity is left over for self-concern or self-doubt, flow frees the individual from self-consciousness. (8) Transformation of time; athletes report alterations in the perception of time in the flow state; a long marathon run may seem to pass in minutes, the execution of a winning shot may be experienced as 'all the time in the world'. (9) Autotelic experience; that

is, flow is intrinsically rewarding, experienced as pleasurable. These elements of flow, albeit descriptive, are informative in the study of attention and concentration in sport. There appears some significant overlap between (1), (3), (5) and (7), as regards occupying and focusing attention and not allowing the mind to wander. There are clear links, outlined below between Flow and Mindfulness.

Kee and Wang's (2008) study, based on a cluster analytic approach considers the relationship between Flow, as described by Jackson and Csikszentmihalyi (1999) and Mindfulness. Many of the dimensions of Flow are also features of Mindfulness. The authors suggested that athletes who tend to be more mindful are also more likely to experience the flow state. The four key dimensions of Flow associated with Mindfulness are: challenge-skill balance, merging of action and awareness, clear goals, and loss of self-consciousness. Bernier, Thiernot, Codron and Fornier, (2009) made a two-part study in this field. In their first study exploratory interviews with elite swimmers showed that optimal performance or state of flow reveal similar characteristics to mindfulness and acceptance states. In flow experiences, the elite swimmers described that they had been particularly mindful of their bodily sensations and accepted them. Interpreting these key elements of the flow state from a Mindfulness perspective suggest athletes will not be distracted with unhelpful thoughts. They will experience a challenge and skill balance, thus avoiding trigger thoughts such as, 'its too easy' or 'its too difficult'. Athletes will not be distracted with thoughts about technique during play, the dreaded 'paralysis by analysis' (Kremer & Moran, 2008; p. 93). Athletes will have clear focused goals, this facilitates a 'here and now' state of mind and they will not be distracted with unhelpful thoughts about self.

Athletes in most sports including tennis will have had the experience of trying to not think unhelpful thoughts. Ironically this process may actually encourage unwanted thoughts. This process is the subject of Wegner's (1994) 'ironic processing model' which proposes a 'conscious intentional system' and an 'unconscious monitoring system'. Under conditions of cognitive load or fatigue the 'ironic system' may prevail. Minds wander and we end up thinking about the thing we intended not to. Janelle (1999) considers the implications for Sports Psychologists of these ironic processes. Janelle refers to four principles that may assist in overcoming detrimental ironic effects. These are; 1) Cognitive load; 2) Paradoxical interventions; 3) Expertise and automaticity; and, significantly for the current study, 4) Metacognitive skills. This is "the ability to think about what one is thinking about and make appropriate adjustments" (Janelle 1999, p216.). Mindfulness has also been described as "metacognitive monitoring" (Segal, Williams & Teasdale, 2002: p.163). This ability to be aware and reflect on mental processes is at the heart of Mindfulness. Indeed the roots of Mindfulness are Buddhist meditation and the active cultivation of attention and awareness (Brown & Ryan, 2003).

This review will now consider the efficacy of Mindfulness interventions. In contrast with traditional cognitive-behavioural interventions the application of Mindfulness training as a change technique is well established in the field of mental health. This approach has been broadly referred to as acceptance-based behaviour therapy, ABBT, (Roemer & Orsillo, 2009). One of the most comprehensively researched and applied areas is relapse prevention in depression (Segal, Williams & Teasdale,

2002). Mindfulness training has also been applied in the field of Borderline Personality Disorder, (Linehan, Comtois, Murray, Brown, Gallop & Heard, et al 2007) and Linehan's development of DBT, Dialectical Behaviour Therapy. Other evidence for ABBT is available within the field of substance abuse (Hayes, Bisset, Roget, Padilla, Kohlenberg & Fisher, 2004), eating disorders (Safer, Telch & Agras, 2001; Telch, Agras & Linehan, 2001) and anxiety (Forman, Herbert, Moitra, Yeomans & Geller, 2007).

Evidence is emerging within Sport Psychology of the efficacy of Mindfulness as a process for enhancing awareness and attention, and as a medium for improving competitive performance (Moore, 2009). The ability to manage the wandering mind and focus on what is important in the 'here and now' was instrumental in the remarkable performance by Louis Oosterhuizen in winning The Open Championship at St Andrews, on Sunday 18 July 2010. On his own web site he uses the word 'chaotic' to describe his typical competitive mindset prior to working with Manchester sports psychologist Karl Morris. However, since Morris's intervention a small red dot on Oosterhuizen's glove "is a classic example of what is known as 'process goals' in sports psychology, when the athlete is asked to focus on something, however minor, to stop them thinking of what happens if the shot goes wrong - it brings them to the here and now before the shot is actually played " (Connor: The Independent 20.07.2010). This example of an effective intervention from golf highlights that the human mind is always attending to something. Athletes across different sports have to be aware of attentional processes and attend to the right thing at the right time.

While the above evidence may be anecdotal, empirical evidence for the benefit of Mindfulness applications in sport is available. Working with collegiate athletes Wolanin (2005) conducted an open trial of the Mindfulness-Acceptance-Commitment Approach (MAC). The study demonstrated an increase in self and coach ratings of performance, as well as self and coach ratings of attention and practice intensity, as compared to treatment controls. The MAC is a protocol approach that embraces the earlier work of Hayes, Strosahl, and Wilson (1999). MAC "emphasizes mindful, non-judging awareness and acceptance of moment-to-moment cognitive, affective and sensory experiences" and "Commitment can thus be defined as the process of actively choosing behaviours that are directly in pursuit of activities" (Gardner & Moore, 2007: p.33 & p.34). There are echoes of Jackson and Csikszentmihalyi (1999) and their flow concepts of 'merging action with awareness', 'concentration on the task at hand' and 'the loss of self-consciousness'. The MAC protocol combines elements of awareness, being in the moment and acceptance of experiences.

Bernier, Thiernot, Codron, and Fornier, (2009) investigated the efficacy of Mindfulness and Commitment approaches in performance enhancement. In the second part of their study mindfulness and acceptance were integrated into a psychological skills training program for seven young elite golfers. This program contributed to performance enhancement in competition. Participants improved the efficacy of their routines by seeking more relevant internal and external information. That is they attended to the most salient aspects for the situation. In Gooding and Gardner's (2009) study seventeen members of men's basketball teams completed measures of mindfulness and sport-related anxiety to examine

the relationship between mindfulness, pre-shot routine, trait arousal, and basketball free throw shooting percentage. Results indicate that levels of mindfulness significantly predict game free throw percentage. This is the outcome sports people desire - enhanced performance.

Mindfulness approaches are compatible with the recommendations of Moran (2004, 2008) for concentration techniques. Specifying performance goals, pre-performance routines, utilizing trigger words can all serve to keep the athlete in the 'here and now'. Sports people are likely to engage with and, as above evidence shows, benefit from, understanding concepts from Mindfulness. This includes the idea that thoughts are just thoughts and not the same as reality. Mindfulness embraces the idea that attention does wander and elevates the benefit of non-judgemental awareness. A further key element of Mindfulness is the concept of the 'here and now'. There are applications and training approaches to develop mindfulness skills (Gardner & Moore 2007). These findings for the efficacy of Mindfulness are in contrast to findings from more traditional approaches to performance enhancement. Lutkenhouse, Gardner and Moore (2007) conducted a randomised controlled trial in which MAC participants experienced significantly greater increases in measures of attention and flow, as well as coach ratings of performance, than participants receiving traditional Psychological Skills Training (PST) procedures.

Psychological skills training (PST) approaches place the emphasis on training sports people to develop the capacity to control internal states, such as cognitions, emotions and sensations. The focus with PST is on control and change, in contrast with MAC approaches where the focus is

with awareness and acceptance. Hardy, Jones and Gould (1996) have written an overview of this PST work. Drawing on traditional cognitive-behavioural techniques, PST trains individuals in arousal control interventions, goal setting, imagery training, self-talk modifications and pre-competitive routines.

Significantly for the current review, Moore (2003), Gardner and Moore (2006 & 2007), have analysed the empirical support for PST. They used criteria established by the American Psychological Association's Division 12 (Society for Clinical Psychology) Task Force for the Promotion and Dissemination of Psychological Procedures (Chambless & Hollon, 1998). This large-scale review of the literature regarding goal setting, imagery, self-talk, arousal regulation and multicomponent interventions indicated insufficient empirical support for the efficacy of these interventions with competitive athletes. Moore (2009) asserts that the acceptance-based foundation of Mindfulness within their MAC (Mindfulness-Acceptance-Commitment) program is an essentially opposite perspective to these control based interventions. "That is, optimal performance does not require the reduction or control of internal states but rather, requires a nonjudging (i.e. not good, not bad) moment-to-moment awareness and acceptance of one's internal state, whatever that may be, and an attentional focus on task relevant external stimuli and behavioural choices that support one's athletic endeavour" (p. 292). Interestingly for the current enquiry, Moore's (2003) review does not challenge the efficacy of pre-shot routines studied and advocated for performance enhancement by Orlick (1986, 1990) and endorsed by expert athletes (see Kremer & Moran, 2008). It seems possible that the mental processes inherent in pre-shot routines, such as transferring from

thinking to doing, the proximal nature of awareness and action and staying in the present moment could be conceptualised as focusing mediums for Mindfulness.

Moran (2004), discussing flow, refers to the 'mercurial quality' of these mental processes inherent in optimal performance. The same might be said of Mindfulness. Scientific enquiry in this field necessitates appropriate measures of these mental states. Brown and Ryan (2003) have developed the Mindfulness Attention Awareness Scale (MAAS). Gardner and Moore (2007) endorse the MAAS as "a convenient and effective measure of mindful attention and mindful awareness" (p. 90). This is important because unless we can agree what we mean by 'mercurial states' they remain elusive and the research process may meander. In their studies, Brown and Ryan (2003) developed the MAAS by reducing the number of items from 184 items to 15. Item content is distributed across cognitive, emotional, physical, interpersonal and general domains. However, the items reflect the common capacity of the mind to wander and the item wording captures degrees of mindlessness. For example, doing things without paying attention rather than mindfully concentrating (see appendix 1). During the development of the MAAS items describing high levels of attention and awareness (Mindfulness) were eliminated by both item raters (content validity checks) and by low loadings within a factor analysis. 'Mindlessness' is thought to be the more common state and more accessible as a questionnaire item. Therefore high scores on the scale indicating, 'almost never' mindless are equivalent to a high degree of mindfulness. As a further check the final version of the MAAS was compared with a scale of similar items re-worded to reflect a 'direct' measure of mindfulness and the correlation was .70. This indicates that

the two scales appeared to be measuring the same construct. Brown and Ryan (2003) also subjected the MAAS to examination by studies of correlation with other measures, essentially convergent and discriminant scales and well-being scales. Their results indicate the scale is measuring a distinct construct and they conclude, "overall, the pattern of associations indicates that higher scorers on the MAAS tend to be more aware of and receptive to inner experiences and are more mindful of their overt behavior. They are more 'in tune' with their emotional states and able to alter them, and they are more likely to fulfill basic psychological needs" (p. 832).

Brown and Ryan (2003) have undertaken a thorough statistical analysis of the scale. The MAAS is the Mindfulness measure of choice by Gardner and Moore (2007) for MAC, the Mindfulness-Acceptance-Commitment approach to enhancing human performance. Gooding and Gardner (2009) adopted the MAAS as the measure of mindfulness in the study enhancing basketball free throw percentage. It is also used as the Mindfulness measure in an efficacy study by Schwanhausser (2009) with an adolescent spring-board diver.

Mindlessness may be considered to be a type of cognitive interference not conducive to performance in sport. The idea of internal distractions and 'minds-wandering' has been studied extensively in educational contexts. Measures of cognitive interference have been linked with poor academic performance (Sarason, Sarason & Pierce, 1990). Out of this work Hatzigeorgiadis and Biddle (2000) developed the Thought Occurrence Questionnaire for Sports (TOQS). Item content was reviewed by interview and face validity was checked via content analysis. Items were subjected to factor analysis and the psychometric properties

of validity and reliability examined. This assessment tool is an attempt to capture and measure cognitive interference, or mental distraction in the sports field. The questionnaire has three sub-scales reflecting task-related worries, usually about performance; task-irrelevant thoughts i.e. distractions; and thoughts of escape, that is not wanting to be there. In a follow-up study with volleyball players (Hatzigeorgiadis & Biddle, 2001) interfering thoughts were shown to be associated with disrupted concentration and decreased effort. Lane, Harwood and Nevill (2005) conducted a confirmatory factor analysis of the TOQS amongst adolescent athletes. Interestingly the 17 final TOQS items each describe thoughts which are about an individual not being in the 'here and now', that is not being focused and not being Mindfull.

Future research could be directed at outcome measurement focusing on more specific skill enhancement across a range of sports. The potential broader impact of Mindfulness training in the sports psychology field could be examined by investigating the effect on other variables such as self-efficacy and emotional regulation.

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