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The Effects from Mindfulness Training on Norwegian Junior elite Athletes in Sport

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Abstract

This study investigates the effects from a 12-weeks mindfulness intervention on perceived stress, perceived performance in school and sports, and athlete burnout among junior elite athletes in sports. In the present investigation 50 Norwegian junior athletes from two different schools for elite sports participated in an experiment with a pre-test, post-test control group design. Twenty three of them were in the experiment group whereas 27 were in the control group. The athletes were from different sports such as cross country skiing, biathlon, shooting and track and field. As hypothesized, we found significant effects from the mindfulness intervention on athlete burnout. There were no significant effects found on perceived stress, perceived performance in school and sports. These findings are discussed in regard of applied implications and possible future research.

Key words: Mindfulness, sport, stress, athlete burnout

Introduction

A future in elite senior sports is a natural aim for most junior elite athletes. Though, the path towards elite sports has a wide range of challenges and stressors that can contribute to negative overload and eventually to athlete burnout (Black & Smith, 2007; Gustafsson & Skoog, 2012). Junior elite athletes who are attending high schools specialized for sports are in a profound and important age for both their academic- and athletic development (Gustafsson, Kenttä, Hassmén & Lundqvist, 2007; Goodger et al., 2007; Gould & Dieffenbach, 2002; Moen, 2013; Viru & Viru, 2001). Possible unfulfilled expectations within their sports and academic work, or social hassles in their social environment are possible stressors that occur naturally. Relevant research claims that high degrees of stress may impact athletes' abilities for training adaptation and performance, as negative stress may lower junior elite athletes' ability to reach the elite level in their sports (Goodger, Gorely, Lavalle & Hardwood, 2007). Athletic stress is as such an especially important research topic in junior elite sports, as more knowledge could help prevent junior athletes from being burned out (Moen, 2013).

Due to the multidimensional nature of athlete burnout and the contributing influence of stress on burnout syndromes (Black & Smith, 2007; Gustafsson & Skoog, 2012; Raedeke & Smith, 2001; 2004), different stress management interventions should be examined as athletic burnout prevention techniques. One of the acknowledged stress management tools is mindfulness training (Baer, 2003). In addition to a possible stress reducing effect from mindfulness training (Baer, 2003; Grossman,

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Niemann, Schmidt & Wallach, 2004), mindfulness is also found to be negatively associated to burnout (Mc Cracken & Yang, 2008). Research has also documented that mindfulness training can be useful in a wide range of performance enhancement cases (Marks, 2008). Thus, it should be interesting to investigate if mindfulness training also has an implication on performance. This study therefore seeks to investigate the effect from mindfulness training on junior elite athletes' perceived stress, performances in sports and school, and athlete burnout.

THEORETICAL FRAMEWORK

Competitiveness in elite sports requires high quality training spans of 10 years or more (Smith, 2003; Viru &Viru, 2001). Effective training loads enhance athletes' performance levels by the adaption of the physiology and psychology to the specific requirements of the sport (O`Toole, 1998). The degree of adaptation of the training process influences the outcome of the performance development (Bompa &Haff, 2009). However, adaptation to training loads depends on the relationship between total generated stress load (physiological, psychological and social stress) and adequate regeneration (McEwen, 1998; Miller, Vaughn & Miller, 1990; Semmer, McGrath, & Beehr, 2005). A high load of generated stress over time might become chronic and maladaptation to stress can lead towards the impairment of training adaptation, potential risk for underperformance and ultimately to athlete burnout (Cresswell, 2009; Gustafsson, Hassmén, Kenttä & Lundqvist, 2007; Rowbottom, 2000). Thus, it is of high importance that athletes and coaches consider both training and non-training stressors to develop young athletes effectively on their path towards elite sports (Gustafsson, Kenttä & Hassmén, 2011).

Stress

One contemporary stress theory that integrates both physical and psychological stress as a theoretical proponent for both training and straining of the athletes is the Cognitive Activation Theory of Stress (CATS; (Ursin & Eriksen, 2004). CATS defines the stress load neutrally, in that the stress load (or stressor) in itself is neither good or bad. The way the stress load might become harmful is when it is prolonged and excessive (Ursin, 2009). Research shows that animals that are kept in stressful situations without a possibility to control the situation develop illnesses (Ursin, 2009; Ursin & Eriksen, 2004). Ursin (2009, page 642) wrote that when animals "are left in situations beyond their control [they] may develop gastric ulcerations, hypertension, cardiac failure, immunological deficits, or changes in the brain biochemistry similar to those occurring during depression and psychoses".

Thus, if the total load of being a student, an elite athlete, and taking care of other important facets of ones' life adds up to be too much, an athlete might feel the situation is beyond his or her control. The consequence might be overreaching or burnout if the physical and psychological loads are too grave, either alone or combined, and the recuperation and rest are not satisfactory. This theory has been successfully used in sport previously (e.g., Abrahamsen, Roberts & Pensgaard, 2012; Abrahamsen, Roberts, Pensgaard, & Ronglan, 2008; Eriksen, Murison, Pensgaard, & Ursin, 2005; Kristiansen, Abrahamsen, & Stensrud, 2012).

First of all, CATS (Ursin & Eriksen, 2004) is different from most stress theories because the stress load is regarded as potentially helpful in developing the ability to cope with stress if the stress is not excessively severe or sustained. As Ursin and Eriksen explain (page 572): "The stress response is a general, unspecific alarm response occurring whenever there is a discrepancy between what is expected or the 'normal' situation (set value) and what is happening in reality (actual value)." The alarm will occur in different situations that are considered novel, when there is a homeostatic imbalance, or when the athlete perceives a threat. The alarm is uncomfortable but helpful in order to "drive" the athlete to proper solutions and therefore

the alarm will continue until the discrepancy is eliminated. This can be accomplished in two ways, either by changing the set value (e.g. train an athlete to perceive the situation as normal by mental training or simulation training) or by change the here and now situation (actual value is changed to set value).Thus, compared with other theories coping is different than in CATS.

In CATS, coping is regarded as positive response outcome expectancies (PROE), meaning that if the athlete feels that he/she has the capacity to solve the situation and meet the demand, the alarm will drop. This is different from the ways of coping that traditionally has been used in sport research (e.g., (Kristiansen, Roberts, & Abrahamsen, 2008; Lafferty & Dorrell, 2006). Some sport examples could clarify the concept. An athlete might consider the resources (ways of coping) to be adequate to attain the desired outcome (PROE), which will then reduce the athlete's stress response. However, an athlete can also feel PROE when uncertain about the ways of coping; "I'm not sure about the strategy to use, but I know I can win!" The latter example will also reduce the athlete's stress level. As Ursin and Eriksen highlight, the ways of coping (or strategy chosen) does not predict the internal state and as a consequence "it does not predict health effects" (2004, page 579). PROE on the other hand does, as an athlete that has succeeded previously may have positive outcome expectancies that reduce stress. Therefore, this athlete will exhibit less likelihood to experience any negative consequences of stress in the long run (such as burnout).

Thus, stress management should be an important tool in athlete burnout prevention (Nigg, Borelli, Maddock & Dishman, 2008). One acknowledged technique that can help athletes to cope with the stressors of elite sport participation is mindfulness (e.g., (Gardner & Moore, 2004; Kee & Wang, 2007). This can work in several ways. As Kee and Wang points out, being mindful will help athletes perceive the present moment non-judgmentally as they desist assigning personal values to the process. Doing so will make stress activation less likely as there is no perceivable threat. Furthermore, being mindful could still maintain intentional, but accepting, focus on ones emotions, thoughts and sensations in the present moment. Thus, an athlete that perceives to be "stressed", or activated as outlined by CATS, will recognize this and may have the ability to lower stress by either accepting it or by changing their focus and thoughts. In addition to theoretical predictions (e.g., (Ursin & Eriksen, 2004), research supports that stress is related to the athlete burnout syndrome (Black & Smith, 2007; Gustafsson & Skoog, 2012; Raedeke & Smith, 2001; 2004).

Athlete Burnout

Athlete burnout is considered to be a multidimensional syndrome or construct (Raedeke & Smith, 2009; Coakley, 2009; Gustafsson et al., 2011), which consists of three central dimensions: 1) Emotional and physical exhaustion, 2) Reduced sense of accomplishment, and 3) Sport devaluation (Raedeke, 1997). Emotional and physical exhaustion seem to be the most obvious manifestation of burnout and are characterized by feelings of emotional and physical fatigue associated with training and competitions (Raedeke & Smith, 2009). Reduced sense of accomplishment is explained by perceived inefficacy and a tendency to negative evaluations of oneself, in terms of sports performance and own accomplishments. Athletes, who experience this phenomenon, perform below expectations and are unable to achieve personal goals (Raedeke & Smith, 2009). Sport devaluation is defined as a detached attitude towards the sport, reflected by negativity and a lack of concern regarding the sport itself and the performance quality (Raedeke & Smith, 2009). The most common consequence of high levels of burnout is lack of motivation (Goodger et al., 2007), which may lead to the unwanted outcome of dropout from sports (Moen, 2013).

Athlete burnout is a difficult and chronic state that has a long recovery phase (Shirom, 2005). Although the occurrence of athlete burnout is not fully understood (Judge, Bell, Theodore, Simon & Bellar, 2012), it is

suggested that the number of athletes who are suffering from burnout, seems to be rising (Gould & Dieffenbach, 2002). Chronic stress from various sources seems to be the most important antecedent for athlete burnout (Raedeke & Smith, 2001; Schaufeli & Buunk, 2003), which is in line with the predictions of the CATS (Ursin & Eriksen, 2004). Psychosocial factors (Cresswell & Eklund, 2006), excessive training stress and lack of recovery (Gould, Tuffey, Udry & Loehr, 1997; Gustafsson, Hassmén, Kenttä & Johansson, 2008; Lemyre, Treasure & Roberts, 2006), sport hassles (Cresswell, 2009), or perceived performance pressure from coaches (Price & Weiss, 2000) are only some of a wide range of stressors (or loads), which can contribute to the development of athlete burnout.

Mindfulness

Mindfulness has been described as paying attention on purpose in the present moment and without judgment (Kabat-Zinn, 1994). Thus, mindfulness has three principal components; non-evaluation (non-judgment), open receptivity and present-centeredness (Brown & Ryan, 2003). According to Weinstein and Ryan (2011) these three components together characterize the mindful-awareness state and are believed to work together in producing beneficial outcomes. A tendency towards open-mindedness and curious introspection has also been shown to be integral in this beneficial process (Martin, 1997; Teasdale, Segal, Williams, & Mark, 1995).

Several mindfulness programs have been developed (Gardner & Moore, 2004); Kabat-Zinn, 1982, 1990; Segal, Williams, and Teasdale, 2002). Mindfulness-based Stress Reduction (MBSR, Kabat-Zinn, 1982, 1990) is probably the most well-known of numerous mindfulness based interventions (Thompson, Kaufman, De Petrillo, Glass & Arnkoff, 2011). This program is a group-based mindfulness intervention originally designed as an adjunct treatment for patients with chronic pain (Keng, Smoski & Robins, 2011). The program consists of an eight-to-ten weeks course, in which groups of up to thirty participants meet twice a week for two and a half hours for mindfulness meditation training and instruction (Kabat-Zinn, 1990). In addition to mindfulness exercises in class, participants are asked to engage in home mindfulness practices and attend an all-day intensive mindfulness meditation retreat. The assumption of MBSR is that individuals learn to be less reactive and judgmental toward their experiences, and more able to recognize and break free from habitual and maladaptive patterns of thinking and behavior (Keng et al., 2011). Again, this will help avoid excessive stress activation as outlined in CATS (Ursin & Eriksen, 2004). Marks (2008) suggested mindfulness practice to be relevant for athletes in cases of performance development, performance dysfunction, performance impairment, and performance termination. The suggestion that mindfulness may improve athletic performance is supported by the theoretical overlap between mindfulness and "flow" (Thompson et al., 2011; Gardner & Moore, 2004; Kaufman, Glass & Arnkoff, 2009; Kee & Wang, 2008). "Flow" is described as a state of mind or consciousness, in which a person is completely absorbed in his or her actions and experiences a unity of body and mind (Csikszentmihalyi, 1990) that facilitates peak performance (De Petrillo, Kaufman, Glass & Arnkoff, 2009; Jackson & Csikszentmihalyi, 1999; Jackson & Eklund, 2002; Segal et al., 2002).

According to Marks (2008) an explanation for all presented positive effects of the mindfulness programs could be that mindfulness practice provides an opportunity to enhance concentration and non-reactivity. The emotional experience of stressful events is not denied during the practice, but acknowledged and accepted, while maintaining task-focus. Enhancement of continues attention reduces rumination and facilitates shift of attention focus to desired targets and impede thereby elaboration of unpleasant thoughts and feelings (Marks, 2008). This explanation fits well with the suggestions of Weinstein, Brown & Ryan (2009) about two primary ways through which mindfulness training may produce beneficial effects. Firstly, mindfulness

practice may promote a less defensive, more willing exposure to challenging and threatening events and experiences. This may reduce negative cognitive appraisals of those situations, thus leading to lower levels of perceived stress. Secondly, mindfulness training may foster an enhanced capacity to cope adaptively with situations, which are perceived as challenging, threatening, or harmful (Weinstein et al., 2009). They hypothesized that higher levels of mindfulness would be related to both, a lower tendency to appraise or interpret events as stressful and to more adaptive coping in stressful situations (Weinstein et al., 2009).

Mindfulness-based interventions are found to reduce stress symptoms (Baer, 2003; Grossman et al., 2004) and it is found that mindfulness is negatively associated with athlete burnout (Mc Cracken & Yang, 2008). It has also been found that the practice of mindfulness can help improve wellbeing (Brown& Ryan, 2003; Carlsson& Brown, 2005), physical health (Grossman et al., 2004), as well as to reduce pain, anxiety, and depression (Kabat-Zinn, Massion, Kristeller, Peterson, Fletcher, Pbert, Lenderking & Santorelli, 1992; Teasdale, Moore, Hayhurst, Pope, Williams & Segal, 2002).

This study aims to investigate the effect from a 12-weeks mindfulness intervention on perceived stress, perceived performance in school and sports, and athlete burnout among junior elite athletes. Based on the presented theoretical review we developed the following hypothesis:

H1: The Mindfulness training will have a positive effect on the athletes' mindfulness level.

H2: The Mindfulness training will have a positive effect on the athletes' perceived level of stress.

H3: The Mindfulness training will have a positive effect the athletes' perceived performances in sport.

H4: The Mindfulness training will have a positive effect on the athletes' perceived performances in school.

H5: The Mindfulness training will have a positive effect on the athletes' level of athlete burnout.

METHOD

Participants and Procedure

This study comprised of 77 Norwegian junior athletes in sports who all voluntarily participated in an experiment over a period of 12-weeks. The elite junior athletes came from different training groups at their schools in biathlon, cross-country skiing, shooting and track and field. The athletes from biathlon, cross-country skiing and shooting from one out of two schools were randomly chosen for the experiment group and the athletes from cross country skiing, biathlon and track and field from a second school were chosen for the control group. Thirty five athletes were asked to participate in the experiment group, whereas 29 of them chose to participate. Fifty athletes were asked to participate in the control group, whereas 48 chose to participate. All in all, 77 of the 85 athletes chose to participate in the study, which gives a response rate of 90, 5%. A gender breakdown of the subjects included 49 % men and 51 % women. Their average age was 18 ½ years old (ranging from 16 to 20).

Pre-test- Post-test Control- Group design

Experimental design of this study was a pre-test post-test control group design. After the junior elite athletes were randomly assigned into either the experimental or control groups, a pre-test was administrated. The junior athletes then participated in an online questionnaire, which measured the psychological variables in this study. Then a mindfulness program was administrated for a period of 12-weeks. Out of the 77 athletes who participated in the project at the pre-test, 50 athletes participated after 12-weeks, which give a response rate of 65% (23 in the experiment group and 27 in the control group).

The mindfulness program

The mindfulness intervention lasted 12 weeks in total,

divided into 4 continuous periods of three weeks. After each of these periods athletes, who agreed to take part in this intervention, were invited to a 2-hour mindfulness-class conducted by an experienced mindfulness coach. There, the training was discussed, the planning for the next period was made and mindfulness was trained. The mindfulness-intervention program consisted mainly of 2 different types of mindfulness training: a) sitting meditation with focus on breathing and b) body scanning (laying and standing position) with help of audio files in different length varying from 10-30 minutes. All participants received the files before the start of the first period. The mindfulness training-periods differed in content, volume and intensity (Table 1). This specific program is highly influenced by the principles defined by Kabat-Zinn (1982, 1990, 1994).

Throughout the whole intervention, participants were asked to write a personal mindfulness training-diary, including type of training, training-volume, and personal thoughts and findings linked to the program to assure the program followed up as good as possible. These diaries were used to improve the follow-up of the athletes during the program. Additionally, the mindfulness classes every 3rd week were observed by the first author to secure the program-content and to gain deeper understanding of the influence of the intervention throughout the program. These observations helped also to gain wider understanding of athletes' thoughts about the program and their follow up during the periods.

Table 1. *Overview of the 12-week mindfulness-intervention divided into 4 periods of 3 weeks.*

Period	Training plan	Goal
1	Minimum 5 times weekly; Mornings: Body-scanning (13 minute audio-file). Evenings: Meditation in sitting position with focus on breathing (10 minute sound file).	To train on keeping concentration and focus over longer periods of time in a relaxed way.
2	Minimum 3 times weekly; Mornings: 3-5 minute mix of meditation-body-scanning with focus on whole body in sitting or lying-position (without use of audio-file). Evenings: Body-scanning (30 min audio-file)	To get used to meditate individually without use of guiding or audio-files. To train the change of direction and intensity of focus.
3	Monday: Body-scanning in laying position (30 min audio-file) Tuesday: meditation in sitting position with focus on breathing (6 min) Wednesday: body scanning, (13 min audio-file) Thursday: meditation in sitting position with focus on breathing (6 min) Friday: Body-scanning in laying position (30 min audio-file) Saturday: no mindfulness training Sunday: no mindfulness Training	To train the different mindfulness skills.
4	Athletes were guided to make individual mindfulness training plans. The minimum weekly training volume was 90 minutes of self-chosen meditations. In combination with this period's training plan on formal meditation the athletes were asked to train non-formal meditation.	To maintain reached level of mindfulness and to learn participants to plan and train mindfulness individually

The general variables

The variables examined here include items and inventories such as age, gender, type of sport, performance level, type of school, need-satisfaction and degree of athlete-centered coaching. All measurements used in this study were based on previously developed scales proven to hold both satisfactory validity and reliability. The measurements were originally in English.

The measurements were translated into Norwegian and slightly adjusted for the purpose of this study by the authors.

The Mindful Attention Awareness Scale (MAAS)

To measure the degree of mindfulness the validated Mindful Attention Awareness Scale (MAAS) was used (Brown & Ryan, 2003). By use of a double Translation-Back-Translation technique this version was translated from English to Norwegian by the author. Participants reported how often they believed they currently had experiences referenced by each of the 15 items (e.g. ‘‘I do jobs or tasks automatically without being aware of what I am doing” or ‘‘I find myself preoccupied with the future or the past”) on a 6-point Likert scale ranging from “almost always” (1) to “almost never” (6). Higher scores indicated higher degrees of dispositional mindfulness.

The Perceived Stress Scale (PSS-14)

To measure stress, the Perceived Stress Scale (PSS; Cohen, Kamarck & Mermelstein, 1983) was employed. The PSS measures self-appraised stress (e.g., ‘‘During the past month, how often have you felt that you were unable to control the important things in your life?’’), and consists of 14 items rated on a 5-point Likert-type scale from 0 (‘‘never’’) to 4 (‘‘very often’’). The questions are general in nature, are, therefore, relatively context-free (Cohen & Williamson, 1988), and measure the degree to which respondents find their lives unpredictable, uncontrollable, and overloading, all of which are central to the stress experience (Cohen, Kamarck & Mermelstein, 1983). This questionnaire has been reported to have good construct validity (Cohen et al., 1983; Cohen & Williamson, 1988) and has been used in research investigating stress as a mediator in the link between optimism and burnout (Chang, Rand & Strunk, 2000). The PSS is a state measure whose test-retest reliability is adequate for short time periods (2 days, r.85), Cohen et al., 1983). The Swedish version has been validated using confirmatory factor analysis and has been found to have acceptable factor validity with an internal consistency (Cronbach’s alpha) of .84 (Smith, Gustafsson & Hassmén, 2010).

Perceived satisfaction with progress in sport and school

Individual performance from the Athlete Satisfaction Questionnaire (ASQ) was used to measure athletes’ perceived satisfaction with their own progress in sport (Riemer & Toon, 2001). This subscale seeks to measure the athlete's perceived satisfaction with his/her own task performance. Task performance includes a perception of absolute performance, improvements in performance and goal achievement. An example of item: “I am satisfied with the degree to which I have reached my performance goals during the season.” The athletes were asked to consider 4 items and how satisfied they were with their own progress in sport during the last year on a 7-point scale ranging from not at all satisfied (1), to extremely satisfied (7). The Cronbach’s alpha for the ASQ was .94 (pre-test and post-test). The athletes were also asked to consider 4 items and how satisfied they were with their own progress in school on the same liking scale.

The Athlete Burnout Questionnaire

A reduced version of the Athlete Burnout Questionnaire (ABQ) was translated into Norwegian using a double-translation-back-translation technique (Raedeke & Smith, 2009) and employed in the present study. The stem for each question was ‘‘How often do you feel this way?’’ Athletes were requested to rate the extent to which the items address their participation motives on a five-point Likert scale anchored by (1) “Almost Never” and (5) “Almost Always”. The original ABQ has three five-item subscales assessing the three key dimensions of burnout: (1) emotional and physical exhaustion, (2) devaluation of sports participation, and

(3) a reduced sense of accomplishment An example of items covering this dimension is “I feel so tired from my training that I have trouble finding energy to do other things”.

All measures have acceptable reliability as shown in Table 2.

Data analysis procedures

Data were analyzed by means of analysis of covariance (ANCOVA). ANCOVA is an extension of analysis of variance (ANOVA) and allows exploration of differences between groups while statistically controlling for an additional continuous variable. In the present study, the covariate is the participants’ scores on the pre-test. By considering these as the covariates one can account for pre-existing differences between the experiment and control group. In this study, ANCOVA uses a regression procedure to remove the variation in the dependent variable that is due to pre-existing differences between the experiment group and the control group before normal analysis of variance techniques are completed based on the adjusted/ corrected scores. By removing the influence of pre-existing differences ANCOVA increases the power or sensitivity of the F-test (Pallant, 2010). Thus, ANCOVA increases the likelihood that differences between groups are detected.

RESULTS

Descriptive statistics

Table 2 shows correlations between the study variables (measured at the pre-test) as well as number of items, statistical means, standard deviations, and Cronbach’s alphas at both the pre-test and post-test.

Table 2. *Correlations between the variables (pre-test) and descriptive statistics from the pre-test and post-test (both experiment and control group)*

Variable	1	2	3	4	5	6	7	8
1. The Mindful Attention Awareness Scale	-							
2. The Perceived Stress Scale	-.39**	-						
3. Perceived Performance in Sport	.15	-.42**	-					
4. Perceived Performance in School	.22	-.39*	.33**	-				
5. ABQ- Sum Athlete Burnout	-.48**	.49**	-.40**	-.30**	-			
6. ABQ- Exhaustion	-.48**	.43**	-.23*	-.23*	.87**	-		
7. ABQ- Devaluation	-.36**	.33**	-.31**	-.29**	.85**	.68**	-	
8. ABQ- Accomplishments	-.36**	.46**	-.45**	-.23*	.78**	.50**	.43**	-
Number of items	15	14	4	4	15	5	5	5
Mean (pre-test)	64.8	38.2	20.0	18.2	33.0	10.7	10.2	12.3
Mean (post-test)	63.8	37.6	18.2	18.2	36.4	11.8	11.3	13.4
Standard deviation (pre-test)	14.0	7.4	4.7	4.1	10.3	4.0	4.2	4.2
Standard deviation (post-test)	12.1	8.1	5.6	4.0	10.6	4.2	4.4	4.6
Cronbach’s alpha (pre-test)	.93	.84	.94	.96	.89	.83	.78	.80
Cronbach’s alpha (post-test)	.91	.86	.94	.96	.89	.86	.81	.83

* p < .05, * p < .01**. N=77.

The zero order correlations between the study variables vary from low to strong. The Cronbach’s alphas of the variables in this study varied from excellent to good across the pre-test and post-test scores.

We also calculated means and standard deviations for each of the study variables sorted by pre- post-test, and experiment- control group. The results are presented in Table 3.

Table 3. *Descriptive statistics from the pre-test and post-test for each group*

	Pre-test				Post-test			
	Experiment		Control		Experiment		Control	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1. The Mindful Attention Awareness Scale	60.07	10.07	67.32	8.42	60.87	12.06	66.30	11.75
2. The Perceived Stress Scale	38.11	7.21	38.26	7.54	37.48	7.70	37.78	8.48
3. Perceived Performance in Sport	20.93	4.55	19.54	4.81	18.00	6.30	16.63	4.97
4. Perceived Performance in School	17.33	2.92	18.74	4.57	17.96	3.01	18.37	4.80
5. ABQ- Sum Athlete Burnout	35.30	9.73	31.80	10.41	34.70	8.42	37.93	12.08
6. ABQ- Exhaustion	11.56	3.77	10.18	4.05	11.61	3.93	11.96	4.41
7. ABQ- Devaluation	11.74	4.00	9.34	4.10	10.91	4.16	11.56	4.60
8. ABQ- Accomplishments	12.00	3.94	12.28	4.30	12.17	3.98	14.41	4.89

Experiment group N=23, Control group N=27

The results may indicate that there are differences in the mean scores between the experiment- and control group. Initially differences in pre-treatment scores were examined on the MAAS, PSS, performance in school and sport, and ABQ and its dimensions. MAAS (P<.02) levels were higher in the control group than the experiment group, whereas ABQ devaluation (P<.02) levels were lower in the control group (Table 3). These inequalities are likely to have been compounded by block randomisation methodology but indicate the need to control for pre-treatment differences.

We therefore ran mixed between-within ANOVA to test differences in magnitude of change between groups. The results showed that for the MAAS the interaction between group and time was significant (F(1,48)=10.36, P=.002, n_p^2=.18), with the experiment group increasing in MAAS significantly more than the control group which decreased in MAAS. For the sport performance measure there was a main effect of time (F(1,48)=24.16, P<.000, n_p^2=.34), whereas both groups decreased in perceived performance. The ABQ showed a main effect of time (F(1,48)=18.26, P<.000, n_p^2=.28), and the interaction between group and time was significant (F(1,48)=19.38, P<.000, n_p^2=.29) with the control group increasing in ABQ significantly more than the experimental group. Exhaustion (F(1,48)=9.52, P<.005, n_p^2=.17), accomplishments (F(1,48)=6.93, P<.02, n_p^2=.13) and devaluation (F(1,48)=13.15, P=.001, n_p^2=.22) showed a main effect of time and the interaction between group and time were significant (F(1,48)=6.43, P<.02, n_p^2=.12),(F(1,48)=4.80,P<.05, n_p^2=.09) nd(F(1,48)=25.36,P<.000, n_p^2=.35) espectively.

Repeated measures t-test showed that the experiment group showed a significant change in the sport performance measure for pre to post test (t(22)=2.66, P=.014, r = .69), whereas the scores decreased. The analysis further showed that the control group showed a significant change in sport performance (t(26)=4.32, P<.000, r = .35), MAAS (t(26)=3.36, P=.002, r = .74), ABQ (t(26)=-6.28, P<.000, r = .80), exhaustion (t(26)=-4.30, P<.000, r = .71), accomplishments (t(26)=-3.36, P<.000, r = .69) and devaluation (t(26)=-5.69, P<.000, r = .69), for pre to post test.

ANCOVA analyses were employed to further investigate possible differences.

ANCOVA Analyses

Table 4 shows the results from the ANCOVA analysis.

Table 4. *Results from ANCOVA executives controlling for pre-test scores*

Variable	F	Df.	Sig.	Eta Squared
The Mindful Awareness Scale				
The Mindful Awareness Scale (pre-test)	51.039	1	.000	.521
Group[a]	3.098	1	.085	.062
The Perceived Stress Scale				
The Perceived Stress Scale (pre-test)	41.435	1	.000	.469
Group[a]	.234	1	.631	.005
Perceived Performance in Sport				
Perceived Performance in Sport (pre-test)	21.103	1	.000	.310
Group[a]	1.470	1	.231	.030
Perceived Performance in School				
Perceived Performance in School (pre-test)	2.445	1	.125	.049
Group[a]	.003	1	.956	.000
ABQ- Sum Athlete Burnout				
ABQ- Sum Athlete Burnout (pre-test)	58.977	1	.000	.557
Group[a]	14.894	1	.000	.241
ABQ- Exhaustion				
ABQ- Exhaustion (pre-test)	34.303	1	.000	.422
Group[a]	3.811	1	.057	.075
ABQ- Devaluation				
ABQ- Devaluation (pre-test)	51.352	1	.000	.522
Group[a]	18.334	1	.000	.281
ABQ- Accomplishments				
ABQ- Accomplishments (pre-test)	41.854	1	.000	.471
Group[a]	5.382	1	.025	.103

[a]Control,N=27 and experiment group N=23.

ANCOVA was used to adjust for pre-treatment differences on outcomes when testing for group differences on the same outcomes at post-intervention. At post-treatment there was a significant difference between the groups with the experiment group showing less increase in burnout scores than the control group ($F(1,54)=14.89$, $P<.000$, $\eta^2=.24$). The adjusted ANCOVA means for the burnout scores were 32.01 (experiment group) and 40.20 (control group). Devaluation scores ($F(1,54)=18.33$, $P<.000$, $\eta^2=.28$) and accomplishment scores ($F(1,54)=5.38$, $P<.05$, $\eta^2=.10$) increased less than the scores in the control group. The adjusted ANCOVA means for the devaluation scores were 8.92 and 13.26 (experiment- and control group respectively), and adjusted accomplishment scores were 12.21 and 14.38 (experiment- and control group respectively). The eta squared indicates that the effect sizes are large on the variables the sum of athlete burnout and the sub category devaluation (according to Pallant (2010) partial eta squared can be divided into small (.01), medium (.06), and large (.138)). There are medium effect sizes on the variables accomplishments, exhaustion and mindfulness.

DISCUSSION AND CONCLUSION

The present findings are promising for the use of mindfulness as a tool to help elite youth athletes avoid experiencing burnout (hypothesis H5). According to the Cognitive Activation Theory of Stress (CATS; (Ursin & Eriksen, 2004), the stress load might become harmful if it is too severe or it extends over time. Thus, being "stressed" is not harmful in itself, however if the activation continues over time without the possibility to recuperate, the end result will be illness. Elite youth athletes have to perform in several areas, such as sport, school and their personal life. Inability to balance all these demands could lead to burnout eventually.

The link between the total load and physical problems has been reported previously also. (Andersen & Williams, 1999) reported that athletes that had more negative life events and more peripheral narrowing during stress were more likely to get injuries than the group with the opposite profile. Similar results have been reported with injuries other places as well (e.g., (Johnson, Ekengren, & Andersen, 2005; Smith, Ptacek, & Patterson, 2000). However, stress has also been related to other problems. For instance (Kristiansen, Abrahamsen, & Stensrud, 2012) reported an association between reduced recovery, increased exhaustion and sport devaluation, and that breathing problems (by methacoline test) was related to concern about mistakes. Taken together the previous research demonstrates that there might be an association between being stressed and potential harmful effects in the long run, as predicted by CATS. (Ursin, 2009) explains that the real concern is sustained arousal, especially when there is no solution to solve the source of the stress. Ursin highlights that recovery is important to avoid the problems associated with sustained arousal and little control. Thus, learning tools to avoid excessive arousal (or activation) over an extended time period and have tools to feel in control might help athletes to avoid problems related to stress and burnout.

Theoretically there are several ways that mindfulness might help avoiding burnout. First of all, being mindful of the body reactions, thoughts and emotions will help athletes to prioritize rest when needed, because they will be more aware of themselves and their reactions. Secondly, the use of mindfulness techniques could help to calm the stress alarm as outlined by CATS (Ursin & Eriksen, 2004). Thirdly, research has shown that athletes that has been trained to perceived their performance anxiety as facilitative for their performance had higher self-confidence, lower anxiety and better performance (Thomas, Maynard, & Hanton, 2007). One reason for the findings of Thomas and colleagues might be that the athletes in the study stopped ruminating about their anxiety symptoms. Mindfulness might work in a similar fashion, as accepting the symptoms of arousal or activation will stop excessive thoughts about the symptoms. A consequence might be a perception of lower total stress load. Finally, when an athlete feels that it is ok to be anxious (e.g., feeling stressed), this might help the athlete to feel in control over the situation as well. Thus, mindfulness training might help the athlete avoid burnout as supported in the present study. However, in order to make stronger conclusions, more research is needed. Future research should try to replicate the present study with different groups of athletes.

In the present study, the other four hypotheses were not supported, although the difference between mindfulness scores between the intervention group and control group approached significance (hypothesis H1). That there were no other significant differences between the two groups may be threefold. First of all, these are highly elite junior athletes that might be mindful from the outset, with well-established stress coping skills. Thus, the groups have already been through a selection process in order to be students of a top sport schools. As evident in the Attentional Control Theory (Eysenck & Calvo, 1992), performance anxiety (one stress response) first and foremost affect the process efficiency rather than the performance itself. Eventually, when the athlete is no longer able to increase the mental effort,

then the performance suffers. In a similar vein could mindfulness help the athlete to stay more focused on the process, but this should not always translate to measurable performance. However, being mindful might help the athletes avoid the negative consequences of stress, such as burnout. Over an extended time period, this should help athletes to perform better, by keeping most of them "in the game". It could be that the effects of mindfulness on performance are something that takes longer time to show up, if at all. Future research should examine this in detail, especially investigating the long-term effects of mindfulness training.

As mentioned the athletes are highly elite. Thus, there might be flooring and ceiling effects due to the nature of the athletes in the present study. Again, future studies should try to replicate the findings with other groups of athletes to examine this in depth. A final reason why no other hypotheses were supported might be due to the environment the athletes take part in. In elite sport schools there are many highly competent trainers that might help athletes monitor their total stress load. Thus, the athletes could receive help in order to balance their daily lives and cope with different situations that might arise. In order to control for this in future studies, a control variable could be social support, as social support has been found to be an important stress buffer (e.g.,(Rees, Hardy, & Freeman, 2007).

In the present investigation it was found that elite athletes might gain from mindfulness training in order to avoid the negative effects of stress such as burnout. In order to help athletes to stay in the game and to maintain their well-being, mindfulness training should be implemented. The reasons why this might be so is grounded in stress theories, and such theories could inform future research as well as applied intervention packages.

REFERENCES

Abrahamsen, F., & Pensgaard, A. M. (2012). Longitudinal changes in performance anxiety among elite handball players. International Journal of Applied Sports Sciences, **24**, 31-42.

Abrahamsen, F., Roberts, G., Pensgaard, A., & Ronglan, T. (2008) Perceived ability and social support as mediators of achievement motivation and performance anxiety. Scandinavian Journal of Medicine & Science in Sports, **18**, 810-821. doi:10.1111/j.1600-0838.2007.00707.x

Andersen, M. B. & Williams, J. M. (1999). Athletic injury, psychosocial factors and perceptual changes during stress. Journal of Sports Sciences, **17**, 735-741. http://psycnet.apa.org/doi/10.1037/a0032698

Baer, R.A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. Clinical Psychology: Science and Practice, **10**, 125-143. doi: 10.1093/clipsy/bpg015

Black, J.M., & Smith, A.L. (2007). An examination of Coakley's perspective of identity, control and burnout among adolescent athletes. International Journal of Sport Psychology, **38**, 417-436.

Bompa, T. O., Haff, G. (2009). Periodization: theory and methodology of training 5th ed. Champaign,IL : Human Kinetics.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological wellbeing. Journal of Personality and Social Psychology, **84**, 822-848. doi: 10.1037/ 0022-3514.84.4.822

Carlsson, L. E., & Brown, K. W. (2005). Validation of the mindful attention awareness scale in a cancer population. Journal of Psychosomatic Research, **58**, 29-33. doi:10.1016/j.jpsychores.2004.04.366

Chang, E. C., Rand, K. L., & Strunk, D. R. (2000). Optimism and risk for job burnout among working college students: Stress as a mediator. Personality and Individual Differences, **29**, 255–263. doi: 10.1016/S0191-8869(99)00191-9

Coakley, J. (2009). From the Outside in: Burnout as an Organizational Issue. Journal of Intercollegiate Sport, **2**, 35-41.

Cohen, S., & Williamson, G. M. (1988). Perceived stress in a probability sample of the United States. In S. Spacapan & S. Oskamp (Eds.), The social psychology of health (pp. 31-67). Newbury Park, CA: Sage.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. Journal of Health and Social Behavior, **24**, 385-396. doi: 10.2307/2136404

Cresswell, S. L. (2009). Possible early signs of burnout: A prospective study. Journal of Science and Medicine in Sports, **12**, 393-398. http://dx.doi.org/10.1016/j.jsams.2008.01.009

Cresswell, S. L., & Eklund, R. C. (2006). Athlete burnout: Conceptual confusion, current research, and future directions. In S. Hanton & S. S. Mellaleu (Eds.), Literature reviews in sport psychology (pp.91-129). New York: Nova Science.

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. New York: Harper and Row.

De Petrillo, L. A, Kaufman, K. A., Glass, C. R., & Arnkoff, D. B. (2009). Mindfulness for long-distance runners: An open trial using Mindful Sport Performance Enhancement (MSPE). Journal of Clinical Sport Psychology, **4**, 357-376.

Eriksen, H. R., Murison, R., Pensgaard, A. M., & Ursin, H. (2005). Cognitive activation theory of stress (CATS): from fish brains to the Olympics. Psychoneuroendocrinology, **30**, 933-938. doi:10.1016/j.psyneuen.2005.04.013

Eysenck, M. W. & Calvo, M. G. (1992). Anxiety and Performance: The Processing Efficiency Theory. Cognition and Emotion, **6**, 409-434. doi: 10.1080/02699939208409696

Gardner, F. L. & Moore, Z. E. (2004). A Mindfulness-Acceptance-Commitment-Based Approach to Athletic Performance Enhancement: Theoretical Considerations. Behavior Therapy, **35**, 707-723. doi:10.1016/S0005-7894(04)80016-9

Goodger, K., Gorely, T., Lavallee, D., & Harwood, C. (2007). Burnout in sport: A systematic review. The Sport Psychologist, **21**, 127-151.

Gould, D., & Dieffenbach, K. (2002). Overtraining, underrecovery, and burnout in sport. In M. Kellman (Ed.), Enhancing recovery: Preventing underperformance in athletes. Champaign, IL: Human Kinetics.

Gould, D., Tuffey, S., Udry, E., & Loehr, J. (1997). Burnout in Competitive Junior Tennis Players: III. Individual Differences in the Burnout Experience. The Sport Psychologist, **11**, 257-276.

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. Journal of Psychosomatic Research, **57**, 35-43. doi:10.1016/S0022-3999(03)00573-7

Gustafsson, H., & Skoog, T. (2012). The mediational role of perceived stress in the relation between optimism and burnout in competitive athletes. Anxiety, Stress, and Coping, **25**, 183-199. doi:10.1080/10615806.2011.594045

Gustafsson, H., Kenttä, G., & Hassmén, P. (2011). Athlete burnout: An integrated model and future research directions. International Review of Sport and Exercise Psychology, **4**, 3-24. doi:10.1080/1750984X.2010.541927

Gustafsson, H., Hassmén, P., Kenttä, G., & Johansson, M. (2008). A qualitative analysis of burnout in elite Swedish athletes. Psychology of Sport and Exercise, **9**, 800-816. doi:10.1016/j.psychsport.2007.11.004

Gustafsson, H., Kenttä, G., Hassmén, P., & Lundqvist, C. (2007). Prevalence of burnout in competitive adolescent athletes. The Sport Psychologist, **21**, 21-37.

Jackson, S. A., & Csikszentmihalyi, M. (1999). Flow in sports: The keys to optimal experiences and performances. Champaign, IL: Human Kinetics.

Jackson, S. A., & Eklund, R. C. (2002). Assessing flow

in physical activity: The Flow State Scale-2 and Dispositional Flow Scale-2. Journal of Sport & Exercise Psychology, **24**, 133-150.

Johnson, U., Ekengren, J., & Andersen, M. B. (2005). Injury Prevention in Sweden: Helping Soccer Players at Risk. Journal of Sport & Exercise Psychology, **27**, 32-38.

Judge, L. W., Bell, R. J., Theodore, R., Simon, L., & Bellar, D. (2012). An Exploratory Examination of Burnout in NCAA Division II Athletes. Journal of Intercollegiate Sport, **5**, 230-240.

Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. General Hospital Psychiatry, **4**, 33-47.

Kabat-Zinn, J. (1990). Full catastrophe living: Using the wisdom of your mind to face stress, pain and illness. New York: Dell.

Kabat-Zinn, J. (1994). Wherever you go, there you are: Mindfulness meditation in everyday life. New York: Hyperion.

Kabat-Zinn, J., Massion, A. O., Kristeller, J., Peterson, L. G., Fletcher, K. E., Pbert, L., Lenderking, W. L., Santorelli, S. F. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. The American Journal of Psychiatry, **149**, 936-943.

Kaufman, K. A., Glass, C. R. & Arnkoff, D. B. (2009). Evaluation of Mindful Sport Performance Enhancement (MSPE): A New Approach to Promote Flow in Athletes. Journal of Clinical Sports Psychology, **4**, 334-356.

Kee, Y. H. & Wang, J. C. K. (2008). Relationships between mindfulness, flow dispositions and mental skills adoption: A cluster analytic approach. Psychology of Sport and Exercise, **9**, 393–411. doi:10.1016/j.psychsport.2007.07.001.

Keng, S. L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: a review of empirical studies. Clinical Psychology Review, 31, 1041-1056. doi: 10.1016/j.cpr.2011.04.006

Kristiansen, E., Abrahamsen, F. E., & Stensrud, T. (2012). Stress related breathing problems: An issue for elite swimmers. Journal of Swimming Research, In print.

Kristiansen, E., Roberts, G. C., & Abrahamsen, F. E. (2008). Achievement involvement and stress coping in elite wrestling. Scandinavian Journal of Medicine & Science in Sports, **18**, 526-538. doi: 10.1111/j.1600-0838.2007.00646.x

Lafferty, M. E. & Dorrell, K. (2006). Coping strategies and the influence of perceived parential support in junior national age swimmers. Journal of Sport Sciences, **24**, 253-259. doi: 10.1080/17461390500188702

Lemyre, P. N., Treasure, D. C., & Roberts, G. C. (2006). Influence of variability in motivation and affect on elite athlete burnout susceptibility. Journal of Sport and Exercise Psychology, **28**, 32-48.

Marks, D. R. (2008). The Buddha's Extra Scoop: Neural Correlates of Mindfulness and Clinical Sport Psychology. Journal of Clinical Sport Psychology, **2**, 216-241.

Martin, J. R. (1997). Mindfulness: A proposed common factor. Journal of Psychotherapy Integration, **7**, 291-312.

McCracken, L. M., & Yang, S-Y. (2008). A contextual cognitive- behavioral analysis of rehabilitation workers' health and wellbeing: Influences of acceptance, mindfulness, and values-based action. Rehabilitation Psychology, **53**, 479-485. doi: 10.1037/a0012854

McEwen, B. S. (1998). Protective and damaging effects of stress mediators. New England Journal of Medicine, **338**, 171-179.

Miller, T. W., Vaughn, M. P., & Miller, J. M. (1990). Clinical issues and treatment strategies in stress orientated athletes. Sports Medicine, **9**, 370-379. doi: 10.2165/00007256-199009060-00005

Moen, F. (2013). Burnout among Junior Athletes in

relation to their Perceived Progress Academically in School and in Sport. International Journal of Sciences, **2**, 76-84..

Nigg, C. R., Borelli, B., Maddock, J., & Dishman, R. K. (2008). A theory of physical activity maintenance. Applied Psychology: An International Review, **57**, 544-560. doi: 10.1111/j.1464-0597. 2008.00343.x

O'Toole, M. L. (1998). Overreaching and overtraining in endurance athletes. In R. B. Kreider, A. C. Fry, & M. L. O'Toole (Eds.), Overtraining in sport (pp.3-17). Champaign, IL: Human Kinetics.

Pallant, J. (2010). SPSS survival manual a step by step guide to data analysis using the SPSS program (4thed.).Maidenhead:OpenUniversityPress.

Price, M. S., & Weiss, M. R. (2000). Relationships among coach burnout, coach behaviors, and athletes' psychological responses. The Sport Psychologist, **14**, 391-409.

Raedeke, T. D. (1997). Is athlete burnout more than stress? A commitment perspective. Journal of Sport & Exercise Psychology, **19**, 396-417.

Raedeke, T. D., & Smith, A. L. (2001). Development and preliminary validation of an athlete burnout measure. Journal of Sport & Exercise Psychology, **23**, 281-306.

Raedeke, T. D., & Smith, A. L. (2004). Coping resources and athlete burnout: An examination of stress mediated and moderation hypothesis. Journal of Sport & Exercise Psychology, **26**, 525-541.

Raedeke, T. D., & Smith, A. L. (2009). The Athlete burnout questionnaire manual. Morgantown, WV: Fitness Information Technology.

Rees, T., Hardy, L., & Freeman, P. (2007). Stressors, social support, and effects upon performance in golf. Journal of Sport Sciences, **25**, 33-42.

Riemer, H. & Toon, K. (2001). Leadership and satisfaction in tennis: Examination of congruence, gender and ability. Research Quarterly for Exercise & Sport, **72**, 243-256.

Rowbottom, D.G. (2000). Periodization of training. In W. E. Garret & D. T. Kirkendall (Eds.), Exercise and sport science (pp.499-512). Philadelphia, PA: Lippincott Williams & Wilkins.

Schaufeli, W. B., & Buunk, B. P. (2003). Burnout: An overview of 25 years of research and theorizing. In M. J. Schabracq, J. A. M. Winnubst & C. L. Cooper (Eds.), The handbook of Work and Health Psychology, (pp.383-425). Chichester: Wiley & Sons.

Segal, Z. V., Williams, J. M., & Teasdale, J. D. (2002). Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse. New York: Guilford.

Semmer, N. K., McGrath, J. E., & Beehr, T. A. (2005). Conceptual issues in research on stress and health. In C. L. Cooper (Ed.), Handbook of stress medicine and health (pp. 1-44). Boca Raton: CRC Press.

Shirom, A. (2005). Reflections on the study of burnout. Work and Stress, **19**, 263-270. doi:10.1080/02678 370500376649

Smith, D. J. (2003). A framework for understanding the training process leading to elite performance. Sport Medicine, **33**, 1103-1126. doi: 10.2165/00007256-200333150-00003

Smith, R. E., Ptacek, J. T., & Patterson, E. (2000). Moderator effects of cognitive and somatic trait anxiety on the relation between life stress and physical injuries. Anxiety, Stress and Coping, **13**, 269-288. doi:10.1080/10615800008549266

Smith, A. L., Gustafsson, H., & Hassmen, P. (2010). Peer motivational climate and burnout perceptions of intensively sport involved adolescents. Psychology of Sport and Exercise, **11**, 453-460.

Teasdale, J. D., Segal, Z. V., Williams, J. M. G., & Mark, G. (1995). How does cognitive therapy prevent depressive relapse and why should attentional control (mindfulness) training help? Behavior Research and Therapy, **33**, 25–39.

Teasdale, J. D., Moore, R. G., Hayhurst, H., Pope, M., Williams, S., & Segal, Z. V. (2002). Metacognitive

awareness and prevention of relapse in depression: Empirical evidence. Journal of Consulting and Clinical Psychology, **70**, 275-287. doi: 10.1037/0022-006X.70.2.275

Thomas, O., Maynard, I., & Hanton, S. (2007). Intervening with Athletes During the Time Leading up to Competition: Theory to Practice II. Journal of Applied Sport Psychology, **19**, 398-418. doi:10.1080/10413200701599140

Thompson, R. W. Kaufman, K. A. De Petrillo, L. A. Glass, C. R. Arnkoff , D. B. (2011). One year follow-up of mindful sport performance enhancement (MSPE) with archers, golfers, and runners. Journal of Clinical Sport Psychology, **5**, 99-116.

Ursin, H. (2009). The development of a Cognitive Activation Theory of Stress: From limbic structures to behavioral medicine. Scandinavian Journal of Psychology, **50**, 639-644. doi: 10.1111/j.1467-9450.2009.00790.x

Ursin, H. & Eriksen, H. R. (2004). The cognitive activation theory of stress. Psychoneuroendocrinology, **29**, 567-592. doi:10.1016/S0306-4530(03)00091-X

Viru, A., & Viru, M. (2001). Biochemical monitoring of sport training. Champaign, IL: Human Kinetics.

Weinstein, N., & Ryan R. M. (2011). A Self-determination theory approach to understanding stress incursion and responses. Stress and Health, **27**, 4-17.

Weinstein, N., Brown, K. W., & Ryan, R. M. (2009). A multi-method examination of the effects of mindfulness on stress attribution, coping, and emotional wellbeing. Journal of Research in Personality, **43**, 374-385. doi:10.1016/j.jrp.2008.12.008