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# Relaxation techniques in sports: A systematic review on acute effects on performance

M. Pelka[a,*], J. Heidari[a], A. Ferrauti[a], T. Meyer[b], M. Pfeiffer[c], M. Kellmann[a,d]

[a] Ruhr University Bochum, Faculty of Sport Science, Unit of Sport Psychology, Gesundheitscampus Nord 10, 44801 Bochum, Germany
[b] Saarland University, Institute of Sports and Preventive Medicine, Campus, Building B8 2, 66123 Saarbrücken, Germany
[c] Johannes-Gutenberg University, Institute of Sports Science, Albert Schweitzer Straße 22, 55128 Mainz, Germany
[d] The University of Queensland, School of Human Movement and Nutrition Sciences, St. Lucia, Australia

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ABSTRACT

*Objectives:* The aim was to provide an overview on the current state of research on acute effects of relaxation techniques in sports.
*Design:* A systematic review of randomized controlled trials was conducted.
*Methods:* PubMed, MEDLINE, PsycINFO, and SPORTDiscus were searched until August 2014. Additionally, reference lists of retrieved articles and relevant reviews were hand searched. To be included articles had to examine the effects of relaxation techniques on performance in sports. Furthermore, they had to be published in English, in a peer-reviewed journal, available full text online, and designed as either treatment outcome, clinical trial, and/or randomized controlled trial. The dependent variable had to be a measure of athletic performance.
*Results:* Of the 8,501 articles retrieved after the databased literature search, 21 studies were included in the systematic review. Nine trials dealt solely with somatic relaxation techniques, five with cognitive techniques, and seven trials examined both branches within single studies. Biofeedback and hypnosis were found to be the most effective techniques over a range of performance measures.
*Conclusions:* This review showed that biofeedback and hypnosis can positively influence performance throughout different outcome variables consistently. On the contrary, other techniques that were proven effective in clinical environments did not show consistent results. However, results have to be treated with caution because of considerable lack of quality of some of the trials. Future studies need to consider the methodological flaws as well as the highly individual nature of relaxation techniques.


**Contents**



* Corresponding author.
*E-mail addresses:* Maximilian.Pelka@rub.de (M. Pelka), Jahan.Heidari@rub.de (J. Heidari), Alexander.Ferrauti@rub.de (A. Ferrauti), Tim.Meyer@mx.uni-saarland.de (T. Meyer), Mark.Pfeiffer@uni-mainz.de (M. Pfeiffer), Michael.Kellmann@rub.de (M. Kellmann).

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## 1. Introduction

Stress in performance settings, especially in sports, has been in the center of interest for almost a few decades (Hardy, 1992). It continues to be a diversely discussed topic due to its omnipresence in modern general society (Zeidner & Ben-Zur, 2014). The term stress is used to describe a process, caused by a load or demand beyond the level of normal functioning characterized by homeostatic dysregulation (Kellmann & Kallus, 2016). Following this definition, it has long been recognized that exposure to severe bio-psycho-social stressors (i.e., noise, pain, family, finances, social relationships, etc.) negatively affects a person's health status (Tennant, Langeludecke, & Byrne, 1985). Sustained imbalances already over short time periods between those factors and recovery could lead to critical disadvantages quickly (Bengtsson, Ekstrand, & Hägglund, 2013; Laux, Krumm, Diers, & Flor, 2015). In sports, consequences such as increased fatigue, poor concentration, disturbed mood, and altered eating and sleeping patterns are often associated with short-term decrements of performance (Brink et al., 2010). Athletes and coaches recognize the importance of competently dealing with those antecedents. In addition, regaining an adequate working state for consistently successful performance has come into the center of attention as well. Similarly, the focus shifted towards athletes' experiences that training programmes and competition calendars as overloaded. Therefore, research has started to address optimised recovery between and during training units and/or competitions (Ivarsson & Johnson, 2010; Nédélec et al., 2012, 2013). However, if adequate levels of recovery are achieved even high loads of stress can be managed (Kellmann, 2010). This is confirmed from a physiological point of view, too (Esch, Fricchione, & Stefano, 2003). The authors stated that balance is crucial in stress physiology, either in a static or dynamic way. Therefore, to be able to deliver peak and constantly stable performances, stressors have to be regulated by specific recovery strategies.

The concept of recovery strategies includes different ways to balance out those inadequacies and to achieve a state of well-being. These strategies potentially prevent imbalances from occurring in either training or competition settings, i.e., regarding acute effects, the re-establishment of pre-performance states and resources. Like the construct of stress, the recovery process has various dimensions, i.e., physiological, mood-related, psychological, behavioral, social, and emotional recovery (Kallus & Kellmann, 2000). Furthermore, recovery can be divided into action-oriented approaches that are self-initiated (e.g., exercising at low intensity) and passive approaches of complete rest. Birrer and Morgan (2010) adapted a model developed by Schnabel, Harre, and Krug (2008) on the potential psychological skills to cope with the psychological requirements for world-class sport performance. This framework was meant to represent the psychological demands of a specific sport. It discriminates between levels of psychological techniques such as relaxation, self-talk, imagery, goal setting, and mindfulness and psychological skills like recovery skills. Hereby, psychological skills can be developed through practicing psychological techniques, i.e., recovery skills are enhanced by qualified relaxation techniques. These skills and techniques are the foundations for world class performance. Following Birrer and Morgan (2010), trained recovery skills are essential to cope with training scope, training intensity, training years, injury and death risks, and duration, intensity, and continuity of competition impact. Essentially, recovery depends on a reduction of, a change of, or a break from stress (Kellmann, 2002) and is a gradual and cumulative process.

Naive recovery strategies, in terms of general recreational activities such as reading, sleeping, listening to music, or meeting significant others are important lifestyle issues in general. However, quality of firmly scheduled recovery time (i.e., half-time breaks) or incidental events (i.e., disruptions because of bad weather conditions) could be enhanced through systematic relaxation techniques. Relaxation techniques in sports basically follow long-term and short-term goals in training and competition. On a long-term level relaxation should support the overall handling of stressful situation in advance or order them in hindsight. A short-term goal is an unrestricted focus on essential parts of upcoming performances without losing appropriate activation levels through banning negative thoughts (Kellmann & Beckmann, 2014; Lehrer, 1996). In the end, all techniques should accelerate the relaxation response. This outcome manifests itself through neuro-muscular, cardio vascular, respiratory, and/or electro-dermal changes and is operationalized in terms of a decrease in muscle tonus, peripheral vasodilation, a decrease in respiratory rate, or a decrease in skin conductance response. As a consequence of these aims and potential outcomes, relaxation techniques in sports should foster the development of an inner balance, self-regulation, and accelerate recovery (Kellmann & Beckmann, 2014).

Given time is a scarce resource, the potential of designing these rather short periods according to one's favor is crucial. As relaxation is a psycho-physical process that consists of intentionally controlled behavior there are many different approaches leading to these outcomes (Benson, 1975; Jacobson, 1938; Lehrer, 2012). According to Smith (1999) and Kellmann and Beckmann (2014) yoga stretching, progressive muscle relaxation (PMR), breathing techniques, autogenic training, meditation, and imagery are the most frequently mentioned and executed relaxation techniques. A detailed classification of these techniques was made by, amongst others, Williams and Harris (1998), Davidson and Schwartz (1976), as well as Lehrer (1996, 2012) who divided the concept of relaxation techniques in two separate branches of methods. On one hand, somatic techniques focusing on the training of ones sensitivity to muscle tension and on the other hand the cognitive approach of mind-to-muscle techniques. They suggested that muscularly-oriented, somatic techniques (e.g., PMR, biofeedback, yoga, breathing techniques) have greater effects on the musculoskeletal system. Autonomically-oriented, cognitive techniques (e.g., autogenic training, hypnosis, meditation) though, mainly affect the autonomic nervous system. Strategies with predominant cognitive components were associated with decreases in amount of worrying, self-assessment of anxiety or pain, and an increase in the ability to concentrate (Jain et al., 2007). Strategies

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