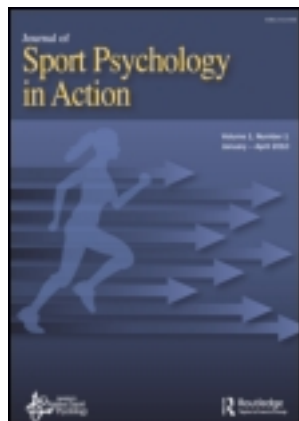


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Anxiety Management through Psychophysiological Techniques: Relaxation and Psyching-Up in Sport

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The purpose of this article is to describe the employment of relaxation and psyching-up techniques within the scope of support currently provided by psychologists in the Sports Science Department of the Brazilian Olympic Committee. The psychophysiological methods described here are used in the mental training of elite athletes in order to assist them in anxiety management and arousal regulation. The general principles of the practice of relaxation and psyching-up are presented, as well as the specific characteristics and procedures of each of the main techniques. This information is intended for sport consultants, coaches and other practitioners who use psychophysiological methods in their professional activities.

KEYWORDS *anxiety management, arousal regulation, performance enhancement, psyching-up, relaxation*

The state of anxiety is defined as an emotional response characterized by a subjective feeling of tension, apprehension, nervousness and worry associated with an arousal of the autonomic nervous system (Spielberger, 1979). A temporary anxiety condition would then comprise two components: a mental (cognitive) component consisting of negative expectations about success or negative self-evaluation (Martens, Vealey, & Burton, 1990); and a physiological (somatic) component corresponding to increased heart rate, shortness of breath, sweaty hands, butterflies in the stomach, increased muscle tension,

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cold sweat, etc. (Le Scanff, Hardy, & Larue, 1999). In a sport context, two factors during competitions lead to a perception of threat and thus, to the state of anxiety: (a) “uncertainty about the outcome,” namely, uncertainty about winning or losing; and (b) “importance of the outcome,” namely, the importance of obtaining extrinsic and intrinsic rewards (Marchant, Morris, & Andersen, 1998; Martens et al., 1990).

Sport performance is affected by anxiety, and the need to study this phenomenon has generated extensive scientific literature. Theories that have sought to describe the anxiety–performance relationship include: the “multi-dimensional anxiety theory of performance,” which stipulates the existence of a negative linear relationship between cognitive state anxiety and athletic performance and an inverted-U relationship between somatic state anxiety and performance (Martens et al., 1990); the “catastrophe model of anxiety and performance” which postulates that, depending on whether the cognitive anxiety level is low or high, the relationship between the physiological arousal and the performance will take the form of an inverted-U or a somewhat distorted bell-shaped curve, with a catastrophic drop in performance (Cox, 2012; Hardy & Parfitt, 1991); and the “individual zones of optimal functioning—IZOF,” according to which each athlete has an individual zone of (facilitative) anxiety where his/her best performance occurs, this zone being located either at the higher end, in the middle or at the lower end of the precompetitive state anxiety continuum (Hanin, 2007; Weinberg & Gould, 2006).

Other theories have sought to explain why an intense state of anxiety may prevent athletes from reaching a performance compatible with their aptitude, training and level of preparation. As Lundqvist (2006) stated, in the mental domain, the two leading hypotheses explaining how anxiety produces an adverse impact on attention patterns are: the “perspective of distraction and reduced working memory capacity” which stipulates that athletes shift their focus of attention from relevant information related to the task at hand to the characteristic worries of the state of anxiety; and the “perspective of conscious processing” which postulates that, under pressure, athletes would try to consciously control movements that have already become automatic, as if they were still in the first stages of motor learning. In the physiological domain, it has been observed that symptoms of anxiety hinder performance by increasing fatigue and downgrading motor coordination (Weinberg & Gould, 2006).

Regarding anxiety management, the so-called “psychophysiological techniques” are useful for producing effects that are antagonists of the state of anxiety: reduced muscle tension, heart rate and blood pressure, and increased alpha waves (Cacioppo, Tassinary, & Berntson, 2007). Among these techniques, the best known are relaxation techniques that can be defined as means through which individuals are able to reduce their muscle and psychological tension voluntarily.

Having trained their relaxation skills, athletes can rely on them on different occasions. Besides its usual application in anxiety management during competitions, relaxation may also be employed to relieve localized muscle tensions, facilitate the recovery process when the interval between two exhausting activities (training sessions or competition stages) is short, deal with insomnia prior to important events, store energy temporarily to use at the right moment, and optimize the cool-down period after sport practice.

Despite the fact that each relaxation technique has its own peculiarities, there are three principles that are common to all methods: (a) lowering of muscle tone, (b) focusing on the present moment and on body sensations, and (c) relaxing breathing. Focusing on the present moment is inherent to the practice of relaxation: Individuals need to concentrate on their ongoing physical sensations and internal experiences. The here-and-now focus antagonizes anxiety because anxious thinking is future-oriented and characterized by worries about outcomes (Hazlett-Stevens, 2008).

Breathing is the sole physiological function that can be directly controlled at any given time (Choque, 1998). In relaxation, breathing control is based on the application of “abdominal (or diaphragmatic) breathing” (Le Scanff, 2003) which is rhythmic, slow, and deep. This type of breathing differs from “thoracic (or chest) breathing” that is associated with stressful situations and characterized by an irregular, fast, and shallow breathing pattern (Davis, Eshelman, & McKay, 2000). Another important aspect of abdominal breathing is the adoption of a paced rhythm in which, in the case of relaxation, exhalation lasts three, four, or five times longer than inhalation—characterizing a relaxing abdominal breathing (Perreaut-Pierre, 2000).

First, in order to initiate the development of relaxation skills, an “introductory technique” comprising three phases can be used: (a) relaxing abdominal breathing; (b) a body scan—starting at the head and finishing at the feet—to detect localized muscle tensions; and (c) imagery of a peaceful and agreeable place, creating a controlled and vivid mental image that includes the different senses (visual, kinesthetic, auditory, etc.). It is important to note that mental images having more vividness—greater sensory richness—provoke greater physiological responses (Callow, Roberts, & Fawkes, 2006). Controllability is another key characteristic of an effective mental image: An individual should imagine precisely what he or she wants to imagine, but also be capable of manipulating aspects of the image that he or she wishes to change (Vealey & Greenleaf, 2010).

Second, it is important for the athlete to learn relaxation techniques from two different groups, which are classified according to the following paths: “muscle-to-mind” or “mind-to-muscle.” In techniques adopting the first of these paths, also called “somatic techniques,” body relaxation (through the reduction of muscle tension) enables a lowering of psychological tension. The most important example of muscle-to-mind techniques is “progressive relaxation.” Conversely, in techniques that use the mind-to-muscle path,

also called “cognitive techniques,” it is mental relaxation that causes body relaxation. The leading representative of this second group is “autogenic training.”

The technique named “progressive relaxation” was developed by Edmund Jacobson, a Chicago physician, who first introduced it in his book *Progressive Relaxation*, in 1929. According to this method, mental relaxation results from body relaxation (Chevallon, 1995). Progressive relaxation does not require imagination or suggestion (Davis et al., 2000) but only the tightening and subsequent relaxing of specific muscle groups. This happens progressively, going from one muscle group to the next. The objective of the tightening and relaxing phases is to increase the individual’s awareness of the difference between the presence and absence of muscle tension (Greenberg, 2008). Once the individual has developed his/her self-observation capacity through practice, he or she will be able to eliminate unwanted tensions in the muscle groups, without having to tighten them beforehand (Cox, 2012). Since the original Jacobson method was demanding and tedious, requiring many long sessions dedicated to each muscle group as part of a program lasting several months, shorter versions have been conceived for application in sport contexts (Le Scanff, 2003; Williams & Harris, 1998). A session lasting 25–30 minutes can involve all muscle groups (Williams & Harris, 1998): left arm, right arm, left and right legs, abdomen, back, and chest and shoulders, concluding with the neck and face muscles. Other variations of the technique include not starting with the left arm and, in some cases, applying resistance to an immovable object to help muscle contraction (Cox, 2012).

Autogenic training was developed by German physician Johannes Heinrich Schultz and initially presented, in 1932, in his work *Das Autogene Training (Konzentrierte Selbstentspannung)*. In this technique it is the mind that leads the body to relaxation. Through verbal stimuli (self-suggestion phrases), the subject provokes vasomotor and cardiorespiratory changes that are characteristic of rest (Le Scanff, 2003). Although the original Schultz method also comprises “meditative exercises” and “special exercises” (Davis et al., 2000), only the so-called “standard exercises” are used in the mental training of athletes. The standard exercises are sequenced in six steps:

1. focus on the sensation of heaviness in the arms and legs;
2. focus on the sensation of warmth in the arms and legs;
3. focus on the heartbeat;
4. focus on the breathing rate;
5. focus on the warmth of the solar (or celiac) plexus; and
6. focus on the sensation of freshness on the forehead.

The scientific basis for the use of the sensations of heaviness and warmth comes from observation and discoveries in the field of medical hypnosis.

The sensation of freshness on the forehead contrasts with the warmth experienced in this region during active problem solving and moments of intense mental activity (Sadigh, 2001).

Finally, it is useful for athletes also to learn how to relax through movement. Although most of the relaxation techniques require muscle rest, there are methods that, through slow and conscious movements, produce a relaxation response. An example of these techniques is “dynamic relaxation,” which was adapted from an exercise developed by Jacques Choque (1998) and uses slow arm, head, and trunk movements, while the elbows and knees are kept slightly flexed. It is important to note that these movements require a low level of muscle tone to be performed.

The relaxation response, as well as the state of anxiety, can be evaluated through (a) athletes’ verbal feedback (self-observation and subsequent verbal expression), (b) questionnaires (scientifically validated tools), (c) behavioral indicators (efficiency in performing a given task), (d) physiological indicators (e.g., heart rate and blood pressure), (e) biochemical indicators (e.g., hormones, neurotransmitters, and immune system substances), and (f) neurological indicators (brain waves analysis). Two examples of scientifically validated questionnaires are the *Revised Competitive State Anxiety Inventory-2* (CSAI-2R), which measures cognitive anxiety, somatic anxiety and self-confidence (Janelle & Naugle, 2012); and the *Ottawa Mental Skills Assessment Tool-3* (OMSAT-3), that evaluates 12 abilities including those of relaxation and activation (Durand-Bush, Salmela, & Green-Demers, 2001; Weinberg & Forlenza, 2012).

With respect to the physiological and neurological indicators of anxiety and relaxation, these can be detected and monitored by biofeedback equipment, which generally comprises biological sensors, an encoder and corresponding software. Such equipment captures, amplifies and transmits information to the individual, in a numeric, auditory and/or visual way, that allows him/her to regulate “involuntary” psychophysiological processes (Tenenbaum, Corbett, & Kitsantas, 2002). In the scope of sport performance, the potential effects of biofeedback increase when it forms part of a larger intervention package containing, for example, relaxation and visualisation techniques (Blumenstein, 2002).

Besides the ability to relax, athletes must also develop their psyching-up skill. Symptoms like fatigue, a feeling of lethargy, lack of enthusiasm and attention reveal that athletes’ energy is below the level required for a peak performance (Giesenow, 2011). In this event, athletes may rely on psyching-up techniques that can be defined as means of enabling an individual to increase his/her physiological and psychological activity voluntarily (Williams & Harris, 1998). Among these procedures, those that researchers consider to be “psyching-up strategies” and that have had their effects on performance tested—through strength tasks, for example—are attentional focus, self-efficacy statements (such as *I can do it*), imagery and preparatory arousal

(Shelton & Mahoney, 1978; Tenenbaum et al., 1995; Tod & McGuigan, 2006; Weinberg, Gould, & Jackson, 1980).

It is important to note that the optimal level of arousal differs according to sport discipline and an athlete's characteristics. The difference between the levels of arousal advisable for different disciplines can be explained by the complexity of the task at hand. Normally, tasks requiring fine motor control and limited strength demand low arousal, while tasks requiring gross motor control and a larger amount of strength need higher arousal levels (Giesenow, 2011; Woodcock, Cumming, Duda, & Sharp, 2012). Within a sport discipline, differences may exist between the participants' optimal levels of arousal based on the personality and "play style" of each one (Giesenow, 2011). Therefore, each athlete needs to identify his/her optimal level of arousal and be able to achieve and maintain this level when required (Robazza, Pellizzari, & Hanin, 2004).

In general, psyching-up techniques use the following measures: the standing position (different from the positions adopted in most of the relaxation techniques), activating abdominal breathing (inhalation lasts three or four times longer than exhalation), intensity keywords (self-talks including statements such as *come on* and *harder*), energizing imagery (mental images of vigorous animals, forces of nature, high power machines, etc.) and body movements (physical actions capable of increasing heart rate, blood flow, respiration, etc.) (Le Deuff, 2002; Taylor & Schneider, 2005).

"Self-induced activation" is an example of the psyching-up techniques. It is an adaptation of the exercise conceived in 1988 by Russian psychologist Grigori Raiport (Williams & Harris, 1998). This technique combines activating abdominal breathing, verbal phrases and a sequence of mental images that promote energy and a feeling of being alert and ready for action.

A free adaptation of the exercise developed by physician Edith Perreaut-Pierre (2000), "psychophysiological activation—adapted version" is an additional example of a psyching-up technique. This method starts with activating abdominal breathing, and later combines a physical warm-up (head, arms, trunk, legs), a specific respiratory pattern (inhalation, apnea, exhalation) and imagery of sport-specific activities. With respect to these mental images of sporting movements, the Holmes and Collin's PETTLEP model can be used as a 7-point checklist to help athletes create more effective imagery: physical (the stance, implements used/held and physical sensations), environment (the place where the imagery is performed), task (the content of the imagery), timing (the pace at which the imagery is completed), learning (the skill level of the athlete), emotion (the emotions felt during sport performance), perspective (the viewpoint of the athlete during imagery) (Wakefield & Smith, 2012).

A good resource that can be combined with relaxation and psyching-up techniques is the so-called "pre-task music" (Karageorghis, Terry, Lane, Bishop, & Priest, 2011). Depending on its characteristics (rhythm, melody,

harmony, cultural impact, associations with ideas and values), the music listened to before practicing sport may have a stimulant or sedative effect (Terry & Karageorghis, 2006). Athletes may select the music that best suits their objective: relaxation or an energy boost.

For successful development of relaxation and psyching-up skills, three stages of a mental training program are required: (a) “learning stage,” in which athletes learn different techniques and identify those best suited to their needs; (b) “training stage,” in which athletes repeat, adjust, make automatic and integrate the selected techniques into their training and competition routine; and (c) “application stage,” in which athletes use the techniques they have learned and practiced in the stressful context of competitions (Pineschi, 2010). The improvement of relaxation and psyching-up skills allows athletes to reduce or increase their level of arousal efficiently, in a shorter period of time, and without the need for a special site to facilitate the execution of the techniques.

Other important aspects for successful development of relaxation and psyching-up skills are: appropriately structured mental training sessions, the reinforcement of the athletes’ autonomy, and an effective integration of psychophysiological techniques into the practice of sport. The pedagogically recommended structure for the mental training sessions comprises three phases: briefing (presentation of technique to the athlete), execution of the technique, debriefing (analysis with the athlete of the effects obtained and guidance for personal practice to be carried out in-between sessions) (Pineschi, 2010). A strategy that can favor the autonomy of the athletes is the supply of short scripts so that they can carry out the techniques without assistance. Finally, the integration of these techniques into the training and competition routine, a critical phase in a mental training program, will demand that the consultant reflect with the athletes about when and how to use them—frequency, duration, intensity—but, at the same time, emphasizing the importance of individual effort and of the progressive (i.e., not immediate) nature of results in psychological work.

The methodology described herein has been applied to different Olympic sports, within the scope of psychology services provided by the Brazilian Olympic Committee (BOC). Since April 2010, the BOC psychologists have made use of, among other procedures, relaxation and psyching-up techniques that have helped athletes manage their level of anxiety and arousal, hence improving their sport performance.

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