Performance Enhancement & Health xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Performance Enhancement & Health

journal homepage: www.elsevier.com/locate/peh

Review

Psychological tools used for monitoring training responses of athletes☆

Anu Nässi[a,*], Alexander Ferrauti[a], Tim Meyer[b], Mark Pfeiffer[c], Michael Kellmann[a,d]

[a] Faculty of Sport Science, Ruhr University Bochum, Bochum, Germany
[b] Institute of Sports and Preventive Medicine, University of Saarland, Saarbrücken, Germany
[c] Department of Theory and Practice of Sports, Johannes Gutenberg University of Mainz, Mainz, Germany
[d] School of Human Movement and Nutrition Sciences, The University of Queensland, Brisbane, Australia

ARTICLE INFO

Article history:
Received 4 October 2016
Received in revised form 3 May 2017
Accepted 3 May 2017
Available online xxx

Keywords:
Monitoring
Questionnaires
Sport
Review
Training responses

ABSTRACT

Monitoring athletes' responses to training and other life stressors is crucial for implementing favourable training routines and achieving optimal performances. The purpose of this review is to provide an overview and evaluation of current psychological tools used in training contexts among athletes. The instruments discussed include the Profile of Mood States (POMS), the Emotional Recovery Questionnaire (EmRecQ), the Total Quality Recovery (TQR) scale, the Daily Analyses of Life Demands for Athletes (DALDA), the Recovery-Stress Questionnaire for Athletes (RESTQ-Sport), the Acute Recovery and Stress Scale (ARSS), the Short Recovery and Stress Scale (SRSS), and the Multi-Component Training Distress Scale (MTDS). Each measure has been shown to deliver valuable information for athletes and coaches regarding individual responses to training. These responses are measured by observing changes in mood, emotions, perceived stress and recovery, and sleep quality. Practitioners need to consider the appropriateness of each psychological tool in the context of their particular group. Regardless of which methods are employed, care should be taken to employ measurement in a systematic manner, provide timely feedback, and consider frequency as not to burden athletes too much. While psychological measures are an important part of avoiding maladaptive training responses, performance and physiological changes also need to be taken into account.

Contents

☆ Grant numbers and/or funding information: This work was supported by the German Federal Institute of Sport Science, and realized within RegMan – Optimization of Training and Competition: Management of Regeneration in Elite Sports (IIA1-081901/12-16).

* Correspondence to: Gesundheitscampus Nord 10, 44801 Bochum, Germany.
E-mail address: anu.naessi@rub.de (A. Nässi).

http://dx.doi.org/10.1016/j.peh.2017.05.001
2211-2669/

1. Introduction

A harmonious interplay between high training loads and appropriate recovery strategies represents a key element for elite athletes to perform optimally. Moreover, maintaining this balance plays a crucial role for the overall well-being of an athlete. Incorporating an adequate training plan is a complex process influenced by many factors that are often unique to an individual athlete and the respective sport (Hecksteden et al., 2016). Therefore, to ensure that a particular training plan is optimal for both performance and athlete well-being, athletes' responses to the training process should be monitored (Coutts & Cormack, 2014; Meeusen et al., 2013; Soligard et al., 2016).

There is growing consensus that the relationship between overall load, athlete health, and performance can be viewed as a continuum (Bourdon et al., 2017; Meeusen et al., 2013; Soligard et al., 2016). Here, underperformance is caused by either insufficient training loads, or as a result of critically excessive training. When periodization is implemented adequately, a period of intensified training is succeeded by sufficient recovery. This pattern results in enhanced sport performance, also known as the supercompensation effect (Brink, Visscher, Coutts, & Lemmink, 2012), which is a favourable outcome along the continuum. Part and parcel of supercompensation is a state of fatigue and reduced performance followed by an individually adjusted taper phase allowing for physiological and psychological recovery (Mujika, Padilla, Pyne, & Busso, 2004). Unfavourable responses occur when critically excessive training leads to a decrease of athletic performance, with problems also emerging regarding the well-being of an athlete (Kenttä & Hassmén, 2002). This superfluous training places an athlete further along the continuum at either non-functional overreaching or overtraining syndrome, dependent on the severity and duration of the imbalance. Non-functional overreaching describes extended decrease or stagnation in performance lasting several weeks or months, and overtraining syndrome lasts from months to years (Meeusen et al., 2013).

Several responses are reported which have been suggested to manifest dependent on where an athlete falls along this continuum. Following intensive training periods, adaptive outcomes can include the presence of short-term (lasting days, and not weeks) fatigue, and depressed immune cell function (Meeusen et al., 2013). Non-functional overreaching and overtraining syndrome are accompanied by altered hormonal regulation, depressed immune function and negative psychological symptoms (Meeusen et al., 2013). These psychological alterations may emerge as mood disturbances, reduced well-being, poor sleep quality, irritability or boredom (Nederhof, Zwerver, Brink, Meeusen, & Lemmink, 2008; Peterson, 2009; Twist & Highton, 2013). Of these, Rearick, Creasy, and Buriak (2011) listed reduced well-being and sleep quality as the most prominent variables affected by excessive training. Only long term rest together with a significantly reduced training load may lead to the re-establishment of the physiological and psychological balance of overtrained athletes (Kenttä & Hassmén, 2002; Raglin, 1993).

Notably, this balance is influenced by the amount of overall stressors (training-specific and general) combined with recovery (Lehmann, Foster, Gastmann, Keizer, & Steinacker, 1999). Thus, factors beyond external training loads, such as stressful life events, are involved in the possible over-accumulation of stressors in relation to an individual's recovery. For example, adjusting training loads may be appropriate if an athlete is experiencing greater distress as a result of a stressful life event (e.g., divorce), and this higher level of psychological stress may increase an athlete's injury risk (Soligard et al., 2016). Therefore, measurement tools for objective and subjective responses should be implemented to provide a holistic overview. Objective responses can be monitored by observing different physiological indicators and biochemical markers. These include monitoring heart rate variability (Buchheit, 2014) or examining the prevalence of creatine kinase, cortisol, and testosterone in samples of blood (Auersperger et al., 2014), urine (Coutts, Wallace, & Slattery, 2007) or saliva (Filaire, Bernain, Sagnol, & Lac, 2001). While these measures offer valuable information, no single physiological marker can predict performance outcomes (Borresen & Lambert, 2009). Subjective training responses are predominantly gathered through self-report measures (Taylor, Chapman, Cronin, Newton, & Gill, 2012). These instruments can be categorized based on the scope of the area they are focusing on. Namely, they may examine mood states, perceived stress and recovery, physical and behavioural symptoms, or a combination of those aspects (Saw, Main, & Gastin, 2016).

Research has found psychological reactions to changes in training loads to be more sensitive than physiological markers. Moreover, the findings are more consistent across studies among athletic populations (Raglin & Wilson, 2000; Saw et al., 2016) and they appear to occur prior to biochemical and hormonal changes (Auersperger et al., 2014). Furthermore, the measurement of many physiological markers requires laboratory testing, which can be both impractical and expensive for examinations in practice. In contrast, questionnaires can be easily and cost effectively administered to large groups without impeding training (Borresen & Lambert, 2009).

Up to the present moment, the available review articles addressing training monitoring in sport have examined the efficacy of multiple different indicators, including hormonal, biochemical, physiological, performance, and psychological markers (Buchheit, 2014; Halson & Jeukendrup, 2004; Laursen, 2010). Other reviews (Meeusen et al., 2013; Saw et al., 2016) discussing psychological tools have focused mainly on providing details about the capability of the measures to react to training responses, whereas little information is provided regarding background and applicability in practice. The primary aim of this paper is to present a comprehensive review of specific self-report measures used for monitoring the subjective aspects of training responses. More specifically, the objective is to offer insights regarding the purpose, structure, strengths, limitations and general considerations for applied use.

2. Methods

The selection of psychological monitoring instruments was determined by the following criteria: (1) A manual or studies published in peer-reviewed journals providing information about the psychometric properties (i.e., reliability and validity) exist. (2) Research documenting the use of the measure in a training or competitive setting has been conducted. (3) A focus on monitoring athlete's responses to training load is supplied. Searches were conducted between February and October 2016 using the following electronic databases: PubMed, SPORTDiscus, and Google Scholar. Based on that procedure, eight different psychological monitoring tools were chosen for this review. These are the (1) Profile of Mood States (POMS; McNair, Lorr, & Droppleman, 1992), the (2) Emotional Recovery Questionnaire (EmRecQ; Lundqvist & Kenttä, 2010), the (3) Total Quality Recovery (TQR; Kenttä & Hassmén, 1998), the (4) Daily Analyses of Life Demands (DALDA; Rushall, 1990), the (5) Recovery-Stress Questionnaire for Athletes (RESTQ-Sport; Kellmann & Kallus, 2001, 2016), the (6) Acute Recovery and Stress Scale (ARSS; Kellmann, Kölling, & Hitzschke, 2016), the (7) Short Recovery and Stress Scale (SRSS; Kellmann et al., 2016), and the (8) Multi-Component Training Distress Scale (MTDS; Main & Grove, 2009). According to a recent systematic review by Saw et al. (2016), the most commonly used self-report measures for monitoring purposes are the POMS, RESTQ-Sport and DALDA.

Please cite this article in press as: Nässi, A., et al. Psychological tools used for monitoring training responses of athletes. *Performance Enhancement & Health* (2017), http://dx.doi.org/10.1016/j.peh.2017.05.001