12-1-2017

Validation of The Short Recovery Stress Scale Questionnaire During Women's Volleyball In-Season Training

Asher Flynn
East Tennessee State University

Joseph Walters
East Tennessee State University

Henry Lang
East Tennessee State University

Alec Perkins
East Tennessee State University

Jacob Goodin
East Tennessee State University

See next page for additional authors

Citation Information

Flynn, Asher; Walters, Joseph; Lang, Henry; Perkins, Alec; Goodin, Jacob; and Bazyler, Caleb D.. 2017. Validation of The Short Recovery Stress Scale Questionnaire During Women's Volleyball In-Season Training. *ETSU Sports Science and Coach's College*, Johnson City, TN. https://www.sportscienceed.com/uploads/3/7/7/7/37770279/flynn_-_srss_volleyball_-_coach_ed.pdf

Validation of The Short Recovery Stress Scale Questionnaire During Women's Volleyball In-Season Training

Creator(s)
Asher Flynn, Joseph Walters, Henry Lang, Alec Perkins, Jacob Goodin, and Caleb D. Bazyler

VALIDATION OF THE SHORT RECOVERY STRESS SCALE QUESTIONNAIRE DURING WOMEN'S VOLLEYBALL IN-SEASON TRAINING

Asher Flynn[1], Joseph Walters[1], Henry Lang[1], Alec Perkins[1], Jacob Goodin[1], Caleb Bazyler[1]

[1]Center of Excellence for Sport Science and Coach Education, Department of Exercise and Sport Sciences, East Tennessee State University, Johnson City, TN, USA

INTRODUCTION: The goal of developing an annual training plan and subsequent programming is to enhance an athlete's performance. Continuous monitoring of stressors affecting the athlete's present state, as well as recovery from stress, can be used by coaches to detect early signs of overtraining and non-functional overreaching (Stone et al., 2007). A survey of a variety of high level programs found 84% use self-reported questionnaires as part of monitoring fatigue due to their cost-effective and practical means for monitoring (Taylor et al., 2012). Questionnaires such as the Daily Analysis of Life Demands for Athletes (DALDA), the Profile of Mood State (POMS), and the Recovery-stress Questionnaire (REST-Q) are too time consuming to be repeated often enough for effective monitoring and did not reflect an athlete's current recovery-stress state (RSS) (Nicolas et al., 2016; Brink et al., 2010). In response to these limitations the Short Recovery and Stress Scale questionnaire (SRSS) was conceived to provide a shorter (8 question) measurement tool for the current RSS of an athlete (Nässi et al., 2017). While correlations between the SRSS and other psychological measures (REST-Q) are encouraging (r=0.38 – 0.60), more investigation is required (Nässi et al., 2017). While the SRSS is a more economical measure for acute stress, analysis of this survey is comprised of interpreting changes in all 8 questions. Questionnaires, such as DALDA, provide a composite score to indicate RSS, increases the practical use for coaches due to the ease of analysis and intuitive understanding. Therefore, the purpose of this study was to further validate the SRSS against DALDA, and to investigate a simplified method of analysis of the SRSS to create global RSS scores in order to increase practicality.

METHODS: Eight female college volleyball players (20.51±1.36, range 18 – 21) were included in this study. This study was approved by East Tennessee State University Institutional Review Board, and all athletes provided written informed consent.

Athletes completed normal training (volleyball practice and resistance training) during this study. Investigators recorded session rate of perceived exertion (sRPE) at least 15 minutes after every training session. The athletes completed SRSS and DALDA each morning throughout the study. This protocol was carried out for 18 consecutive days, ending the morning after the final regular season match.

Both SRSS and DALDA were combined into one online questionnaire for ease of access and consistency of reporting for both surveys. The online questionnaire was sent to the athletes every morning via direct message with instructions to complete the form upon waking. The athletes were familiarized with this form during preseason training. The SRSS survey consists of eight questions (physical performance capability, PPC; mental performance capability, MPC; emotional balance, EB; overall recovery, OR; muscular stress, MS; lack of activation, LA; negative emotional state, NES; overall stress, OS) covering both recovery and stress states (4 recovery and 4 stress) with responses consisting of a Likert scale from 0 – 6 (does not apply – fully applies). The DALDA survey is 34 questions consisting of 2 parts, Part A (stress sources) and Part B (stress symptoms), with responses including "A – worse than normal", "B – normal",

and "C – better than normal". Only A responses of part B (DALDA-A) were considered for analysis.

Training load was calculated using Borg's modified rate of perceived exertion scale (RPE) with scores of 1-10 (Foster, 1998). Rate of perceived exertion was collected approximately 15 minutes after the training session and multiplied by the duration of the training session to calculate session RPE (sRPE) (Foster 1998). The sum of resistance training sRPE and practice sRPE were combined each day to calculate total training load (TTL).

Responses from the SRSS were considered together in their respective question subgroup (recovery or stress) in order to create a more "coach-friendly" analysis of the SRSS (private communication with Dr. Kellmann). The mean of recovery and stress questions were calculated as Recovery SRSS (rSRSS) and Stress SRSS (sSRSS) using the following formulas:

$$rSRSS = (PPC + MPC + EB + OR)/4 \qquad sSRSS = (MS + LA + NES + OS)/4$$

Pearson's product moment correlations were used to determine the relationship between TTL and each SRSS question, TTL and rSRSS and sSRSS scores, TTL and DALDA-A, DALDA-A and rSRSS and sSRSS scores, and between rSRSS and sSRSS scores. Correlations for SRSS questions and TTL were performed with a 1 and 2-day lag to validate the most appropriate lag to monitor SRSS responses to TTL. Correlations between TTL and rSRSS and sSRSS were performed with a 1-day lag. Correlations comparing DALDA-A and rSRSS and sSRSS, and between rSRSS and sSRSS were performed with no lag. Alpha criterion for analyses was set at $p<0.05$. Magnitudes for correlation coefficients were based on the following scale: trivial, ≤0.10; small, 0.10–0.29; moderate, 0.30–0.49; large, 0.50–0.69; very large, 0.70–0.89; and nearly perfect, ≥0.90 (Hopkins, 2002). All analyses were performed using SPSS (version 23).

RESULTS: Response rate for the survey was excellent, with only 4 missing responses out of 144 (97% response rate). Data was screened for bivariate outliers. Two data points met the criteria for outliers (Cook's distance greater than 1) but were retained due to those data points being responses to games and were considered as normal responses. Correlations between TTL and SRSS questions ranged from r= -0.673 – 0.824 (Table 1). Correlations between TTL and DALDA-A (lag 1d) was r= 0.490, p<0.05, and between TTL, rSRSS and sSRSS (lag 1d) was r= -0.500, p<0.05; and r= 0.739, p<0.01, respectively, indicating that a moderately large negative correlation was discovered between rSRSS and TTL, and a very large positive correlation was discovered between sSRSS and TLL. There were large to very large correlations between DALDA-A score and rSRSS and sSRSS scores of r= -0.737, p<0.01 and r=0.651, p<0.01, respectively. Correlation between rSRSS and sSRSS was r= -0.833, p<0.01.

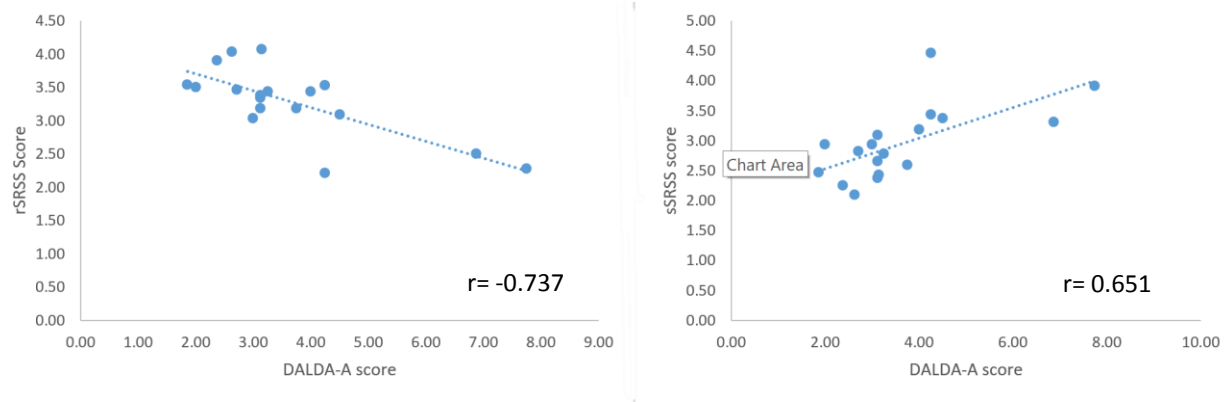
Table 1. Relationships between SRSS questions and TTL

	PPC	MPC	EB	OR	MS	LA	NES	OS
Lag 1d	-0.543*	-0.315	-0.154	-0.673**	0.824**	0.743**	0.227	0.771**

Lag 2d	-0.209	0.193	0.106	-0.105	0.094	-0.138	-0.063	-0.247

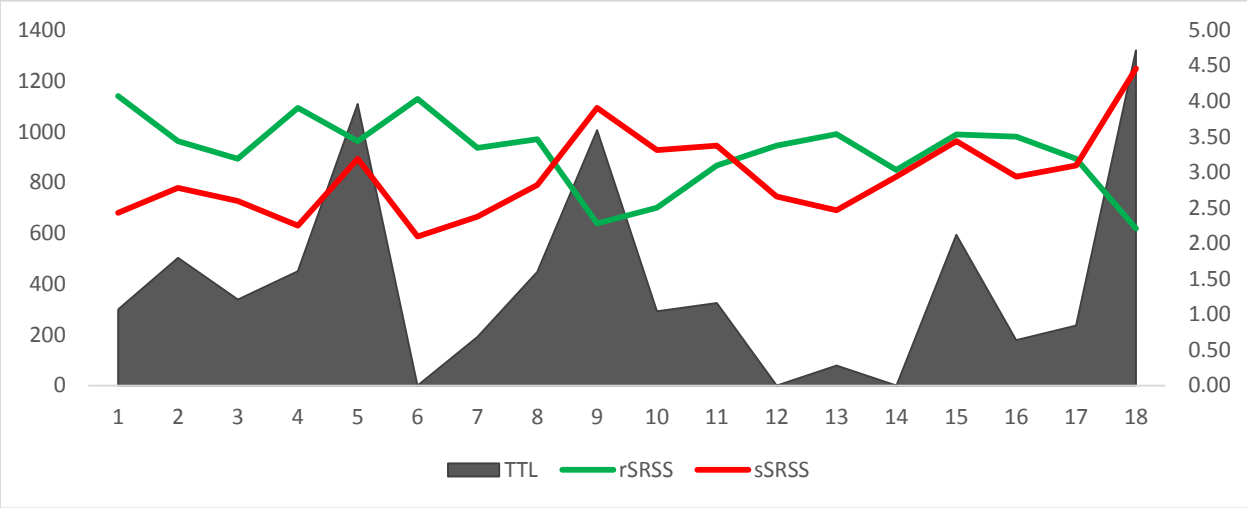
Note: PPC – Physical performance capability, MPC – Muscle performance capability, EB – Emotional balance, OR – Overall recovery, MS – Muscular stress, LA – Lack of activation, NES – Negative emotional state, OS – Overall stressed state. *p<0.05, **p<0.01

Figure 1. Scatterplots between rSRSS and sSRSS and DALDA-A scores



Note: Graph shows correlation between rSRSS, sSRSS and DALDA-A score (r=-0.737 p<0.01 rSRSS, r=0.651, p<0.01 sSRSS). Increased rSRSS scores indicate greater recovery and increased sSRSS scores indicate greater stress levels. Increased DALDA-A scores indicate greater symptoms of stress.

Figure 2. rSRSS and sSRSS scores with a 1-day lag.



Note: Increased rSRSS scores indicate greater recovery and increased sSRSS scores indicate greater stress levels.

DISCUSSION: The SRSS questionnaire was created to fill a void in psychological questionnaires for athletic populations for a short, but reliable and valid survey. Previous studies have validated the SRSS survey during high intensity training, including sprinting and resistance training (Pelka et al., 2017; Raeder et al., 2016; Wiewelhove et al., 2016). High levels of stress (i.e. low RSS) would be expected during high intensity training. Therefore, SRSS scores would be expected to follow a specific pattern (increased stress scores and decreased recovery scores) as a result of this type of training. The results from this study indicate the SRSS, with a 1-day lag, may be sensitive enough to detect RSS changes during normal in-season volleyball training.

These data show the SRSS to be a valid option when measuring in-season RSS of female volleyball players, although the standard method of interpreting responses for each question decreases the practicality for coaches.

In an attempt to increase the practicality of the SRSS as a daily monitoring tool, the use of average scores of recovery and stress questions, calculated as rSRSS and sSRSS in the present study, was investigated upon the advice of the creators of the SRSS. The average recovery and stress scores can allow a coach to determine how well an athlete is handling training (both their recovery and stressed states). The very large correlation between rSRSS and sSRSS, may allow future research to investigate the use of one composite score of an athletes RSS. Many coaches now have access to online forms that have the capability to automatically populate responses, which are in-turn linked to programs that can instantaneously update any analysis a coach prefers. An example is displayed in figure 2, where a graph is automatically generated from daily TTL, rSRSS, and sSRSS scores for an individual athlete or entire team. This ease of analysis and display can help a coach make alterations to the training plan based on the responses of that morning's survey. The sSRSS shows a stronger correlation to TTL than DALDA, which could provide the coach with a better monitoring tool of an athletes stressed state while using a survey with less questions.

While initial research has supported the validity and reliability of the SRSS, further research is required to validate the SRSS as a long-term way to monitor athlete RSS. Further research of the rSRSS and sSRSS analysis method is needed to establish validity and reliability in multiple sport populations is also needed.

REFERENCES:

Brink, M. S., Visscher, C., Arends, S., Zwerver, J., Post, W. J., & Lemmink, K. A. (2010). Monitoring stress and recovery: new insights for the prevention of injuries and illnesses in elite youth soccer players. *British journal of sports medicine*, *44*(11), 809-815.

Foster, C. (1998). Monitoring training in athletes with reference to overtraining syndrome. *Medicine and science in sports and exercise*, *30*, 1164-1168.

Hopkins WG. A new view of statistics: A scale of magnitude for effect statistics. *Sportscience*: http://www.sportsci.org/resource/stats/effectmag.html, 2002.

Montanus, M. (2016). The relationship between performance (tournament progression), daily stress and perceived exertion in male participants of professional squash tournaments (Doctoral dissertation, University of Cape Town).

Nässi, A., Ferrauti, A., Meyer, T., Pfeiffer, M., & Kellmann, M. (2017). Development of two short measures for recovery and stress in sport. *European Journal of Sport Science*, *17*(7), 894-903.

Nicolas, M., Vacher, P., Martinent, G., & Mourot, L. (2016). Monitoring stress and recovery states: Structural and external stages of the short version of the RESTQ sport in elite swimmers before championships. *Journal of Sport and Health Science*.

Pelka, M., Kölling, S., Ferrauti, A., Meyer, T., Pfeiffer, M., & Kellmann, M. (2017). Acute effects of psychological relaxation techniques between two physical tasks. *Journal of sports sciences*, *35*(3), 216-223.

Raeder, C., Wiewelhove, T., Simola, R. Á. D. P., Kellmann, M., Meyer, T., Pfeiffer, M., & Ferrauti, A. (2016). Assessment of Fatigue and Recovery in Male and Female Athletes After 6 Days of Intensified Strength Training. *The Journal of Strength & Conditioning Research*, *30*(12), 3412-3427.

Stone, M. H., Stone, M., & Sands, W. A. (2007). *Principles and practice of resistance training*. Human Kinetics.

Taylor, K., Chapman, D., Cronin, J., Newton, M. J., & Gill, N. (2012). Fatigue monitoring in high performance sport: a survey of current trends. *J Aust Strength Cond*, *20*(1), 12-23.

Wiewelhove, T., Raeder, C., Meyer, T., Kellmann, M., Pfeiffer, M., & Ferrauti, A. (2016). Effect of Repeated Active Recovery During a High-Intensity Interval-Training Shock Microcycle on Markers of Fatigue. *International journal of sports physiology and performance*, *11*(8), 1060-1066.