

Does Personality Matter When We Are Approaching the Subjective Perception of Overtraining Among Adolescents?

Radek Šíp, Iva Burešová

Masaryk University

Abstract

This article deals with the issue of overtraining among elite adolescent athletes. The aim of our study was to examine the relationship between certain personality traits, as perfectionism, extraversion, neuroticism and other Big 5 traits and subjective perception of training load (which is one of the best indicators of overtraining syndrome). We also focused on the relationship between a perceived training difficulty and perceived training load to find out, if there is some kind of integral relationship. To collect data we used a questionnaire, which was given to adolescent elite athletes playing team sports in a mid-season period. The results show significant relationship between perceived training load and overall perfectionism ($r=0.189, p<0.001$), extraversion ($r=-0.241, p<0.001$), neuroticism ($r=0.343, p<0.001$) and consciousness ($r=-0.287, p<0.001$). After the closer examination we found an interesting relation between single dimension of perfectionism and perceived training load, suggesting the contribution of maladaptive perfectionism on development of overtraining syndrome. Besides that, we differentiated athletes into two groups, according to the level of perceived training difficulty. Those, who perceived training as difficult to exhausting ($M=2,19, SD=0.50$) were significantly higher than low to medium group ($M=1.99, SD=0.47$) in the perceived training load $t(178)=-0.894, p=0.007$. Those results extend our knowledge of overtraining topic and can be used in coaching practice to help identify athletes with higher risk of overtraining, or even prevent these states among young athletes before they occur. Hereby results suggest the importance of psychological aspects in sport preparation.

Key words: Adolescence, personality, perfectionism, overtraining, sport

INTRODUCTION

An elite adolescent sport is becoming more advanced every year. Sport channels started broadcasting finals of elite juvenile competitions, more coaches are taking part of single training unit, parents tend to provide their child with skills coaches, nutritionist and even sport psychologist. An overall demand on young athletes increasing in form of higher training loads, more frequent training units and general stress on professionalism. Results matters. In a such competitive, achievement-centred environment one may find himself without means or time to cope the increasing demands and recover. That may lead to the development of maladaptive overload or even the overtraining syndrome. (Meeusen et al., 2006).

As mentioned above, young athletes tend to train several training units per week up to the point, where total number of units is higher than number of days in one week (that is due to working-out twice a day some days).

There are three main goals of training procedure. The first is known as Motor skill learning – a process in which an individual acquires new movements, gradually automates them and in the end is able to use them creatively. (Blahutková, & Sližik, 2014). Second one is Tactical adoption – which is aiming on a such skills as one's understanding and usage of game tactic or decision making. The third one is Physiological adaptation – A constant process of intentional overload

one's muscle capacity in order to disturb his or her homeostasis, which results in acute fatigue leading to an improvement in performance (Meeusen, Duclos, Foster, et al., 2013). Fundamentally, this improvement in performance is natural coping mechanism against physical load, caused by adaptive changes in three domains (Bernacikova, 2013): Adaption as increase of metabolic supplies (increase of ATP and glycogen level, etc.), Adaption as increase of body functional capacity (increase in both, aerobic and anaerobic capacity) and Morphological adaptation (muscle hypertrophy, ligaments strengthening, etc.).

However not every time are these adaptations enough to cope. When they become insufficient and cannot longer provide organism with means to withstand the training load, that is where pathological fatigue and overtraining begin. While suffering from these states, adaptations become maladaptive. Máček, Máčková, & Radvanský (2003) points out that general base of overtraining and maladaptive overload is inequality between length, intensity, frequency of training loads and necessary recovery. Almost universally decrease in performance occurs.

Having said that, such a maladaptive state does not happen overnight. That is why most of the authors (Meeusen, 2013, Armstrong, & Vanheest, 2002), see overtraining as a spectrum, starting with acute (non maladaptive) fatigue reaching up to the overtraining syndrome. The differences between single states are length of time necessary to recover and a way in which performance is affected. Table 1. illustrate this well.

Tab. 1: Overtraining spectrum (Meeusen, Duclos, Foster, et al., 2013)

Process	Training (overload)	Intensified Training		
Outcome	Acute Fatigue	Functional Overreaching (short-term OR)	Non-Functional OR (extreme OR)	Overtraining syndrome (OTS)
Recovery	Day(s)	Days – weeks	Weeks – months	Months – ...
Performance	Increase	Temporary decrement	Stagnation – Decrease	Decrease

Nevertheless, there are other factors, which contribute on developing these conditions besides having little or no time at all to regenerate. An increasing number of studies identified several of them: low self-esteem, parental or coach pressure, high level of anxiety (Kanmani, & Kalpana, 2016), early sport specialization (Jayanthi, Pinkham, Dugas, Patrick, & LaBella, 2013), perfectional concerns (Madigan, Stoeber & Passfield, 2016) or parent-initiated motivational climate (Brenner, 2007). The last one is especially relevant among youth athletes. Although some of the factors contributing on the development of the overtraining syndrome may be specific for adolescents, manifesting symptoms are the same as for the adults. They can be sort out according on the affected area.

The symptoms in the first group are psychological as sleep disturbances (Roy, 2015), loss of self-confidence, apathy, irritability, depression, anxiety, and confusion (Johnson, & Thiese, 1992) also poor concentration (Pearce, 2002) and decline in competitive drive and sexual libido may occur (Budgett, 1994), as well as muscular soreness often mentioned by athletes (Urhausen, & Kindermann, 2002). The symptoms in second group are physiological. One of the most frequent physiological symptom of overtraining is higher resting heart rate (Máček, Máčková & Radvanský, 2003), followed by changes in normal blood pressure, elevated body temperature, impeded respiration (Johnson & Thiese, 1992), weight loss (Budgett, 1990) and even amenorrhea among

girls (Roy, 2015). In third group immunological symptoms are. While suffering from overtraining, one exhibit considerable immune-suppression and increased stress (Wyatt, Donaldson & Brown, 2013). Also, upper respiration symptoms may occur, but surprisingly without affecting performance itself (Ferrari, Gobatto, & Manchado-Gobatto, 2013). The symptoms in fourth group are hormonal, as increase in cortisol level (Johnson & Thiese, 1992) or decrease in the level of testosterone (Roberts et al., 1993).

However the most significant and mentioned symptom is performance decrease, which cannot be explain by any other reason than overtraining.

Tab. 2: Symptoms of the overtraining with diagnostic suitability (Urhausen, & Kindermann, 2002, p.100).

Tool		Changes in OTS	Suitability
Sports-specific performance	(Sub)maximal exercise	↓	Gold standard; regular testing problematic (in most sports)
Ergometric performance	Anaerobic threshold	(↑)	Does not diagnose OTS, but targets other training errors
	Maximal exercise	↓ or ↔	Incremental graded tests less sensitive than tests-to-exhaustion (or time-trials)
Neuromuscular excitability	At rest	↓	Difficult method; needs more data
Mood profile	At rest	↓	Very sensitive; may be manipulated
Subjective complaints	At rest, submaximal exercise	↑	'Heavy legs': very common; sleep disorders: less common; may be manipulated
Borg-scale	Submaximal exercise	(↑)	Small changes
Heart rate	At rest	↔	↑ may indicate other problems (infection)
	Variability	?	Insufficient data
	Maximal exercise	(↓)	Rather small changes
Respiratory exchange ratio	(Sub)maximal exercise	↓	Limited data
Lactate	Submaximal exercise	(↓)	Does not diagnose OTS, but excludes other training errors
	Maximal exercise	↓	Typical change, but probably not in every sport
CK, urea	At rest	↔	↑ may indicate muscular overuse or prolonged carbohydrate depletion

Testosterone	At rest	↔	↓ may indicate high physiological strain?
Cortisol	At rest	↔	↑ may indicate high physiological strain
	Maximal exercise	(↓)	Differentiation between intensive training and OTS may be questionable
ACTH	Maximal exercise	↓	Very sensitive, differentiation between intensive training and OTS may be questionable
Catecholamines	Excretion (urine)	↓	Marked ↓ as late indicator of OTS
	Maximal exercise (plasma)	↓ or ↔	Parallels changes of lactate
ACTH = adrenocorticotropic hormone; CK = creatine kinase; ↓ = decreased; (↓) = slightly decreased; ↔ = unchanged; ↑ = increased; (↑) = slightly increased; ? = not established.			

When accessing overtraining syndrome, several measure tolls can be used. That is due to various number of different symptoms. There are two main diagnostic approaches: measuring athletes while they trains or measuring them while they are calm (rest day). Both approaches measure heartbeat, level of lactate in a blood, level of performance and other physio-humoral symptoms. Additionally, impaired mood and subjective complaints can be measured during calm measurement. (Urhausen, & Kindermann, 2002). These indicators seem to be one of the earliest symptom of overtraining syndrome (Urhausen, Gabriel, Brückner, & Kindermann, 1998, Foster, 1998).

To diagnose impaired mood several questioners were developed. The most used are: Profile of Mood states (POMS, McNair, Lorr, & Droppleman, 1992), The Recovery-Stress Questionnaire for Athletes (RESTQ Sport, Kellmann, 2010) or The Borg's Rating of Perceived Exertion (RPE, Borg, 1998).

Unfortunately, there is no unified treatment for athletes suffering from overtraining syndrome, due to various symptoms. The best thing afflicted athlete can do to improve his state is prolong rest time. Hoverer that may cause additional stress, especially if the afflicted athlete is competitive. In a such case, more active resting forms are recommended (Armstrong & Vanheest, 2002). Taking into consideration severity of overtraining syndrome and difficulty of curing it, the best solution to this issue may be early prevention.

The aim of this study was to explore the relationship between perfectionism, perceived training difficulty and perceived training load to further extend our knowledge of overtraining topic, to be able preventing these states among young athletes.

METODOLOGY

Participants

We gathered data from 180 young elite athletes, playing team sport (72 hockey players, 108 football players) on national or international level. Participants had a mean age of 16.1 years (SD = 1.4), varying from 14 to 19 years. In average, they trained 6 time a weak (SD = 1.1). Data were collected in a mid-season period.

Materials and procedure

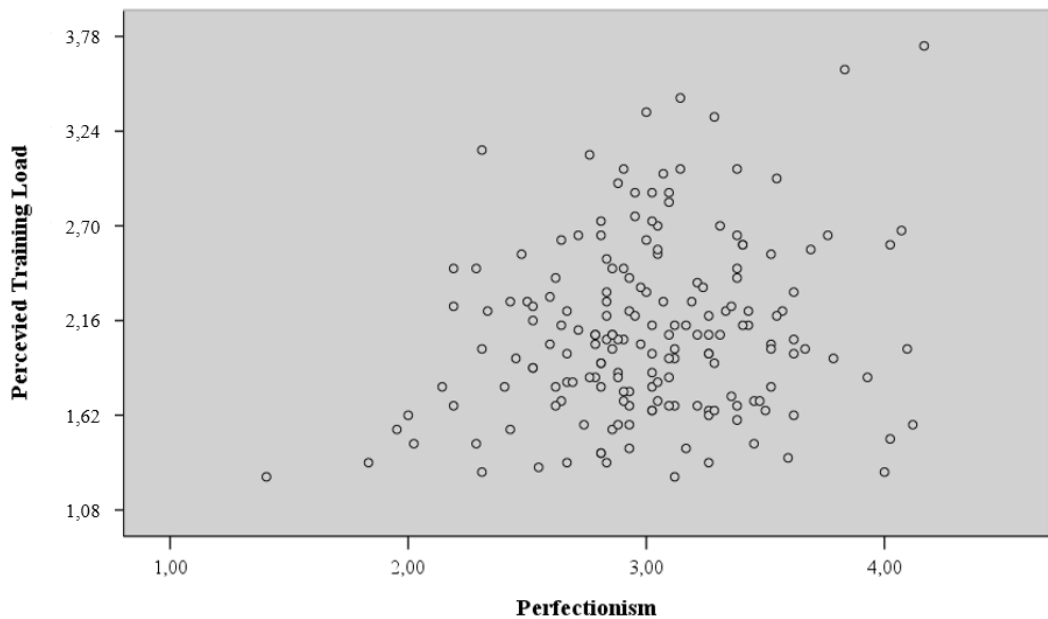
Participants were accessed all around Czech Republic and measurement usually takes place in a school class. They were asked to complete questionnaire packet containing four sections. The first section was focused on demographic items like type of sport, age, number of training per week etc. It also contained a question to measure perceived training difficulty by 5-point Likert scale (effortless, low, medium, difficult, exhausting). The second section contained a Czech version of Sport Multidimensional Perfectionism Scale – 2 (SMPS-2; Gotwals & Dunn, 2009). This questionnaire was invited directly to measure perfectionism among athletes. Respondents rate to which degree they agree with 42 items on a 5-point Likert scale. Questionnaire measures six dimensions: Personal Standards (PS), Concern Over Mistakes (COM), Perceived Parental Pressure (PPP), Perceived Coach Pressure (PCP), Doubts About Actions (DAA), Organization (ORG). The third section contained Czech version of Profile of Mood States (POMS; Stuchlíková, Man & Hagtvet, 2005). It is a scale used to assess transient, distinct mood states. It is often used by sport and experimental psychologists. Respondents rate if and how much they felt each of 37 items (mood states) in past week on a 5-point Likert scale. Questionnaire measures six dimensions: Tension, Anger, Fatigue, Depression, Confusion and Vigor. The fourth section contained Czech version of Big Five Inventory (BFI-44; Hřebíčková, Jelínek, Blatný et al., 2016). That is one of the most frequently used questionnaires to measure personality traits in nowadays psychology. Openness, Conscientiousness, Extraversion, Agreeableness and Neuroticism were measured through 5-point Likert scale on 44 items.

RESULTS

For each questionnaire and single scale an index of internal consistency was counted with generally satisfying results (POMS overall Cronbach's alpha was 0.90, BFI-44 Cronbach's alphas vary from 0.44 for Agreeableness to 0.73 for Neuroticism, SMPS-2 all Cronbach's alphas were above 0.70).

The hypothesis about the relationship between perceived load level and personality traits was confirmed. We found correlation between perceived load level (POMS results) and Extraversion (-0.241 , $p < 0.001$), Conscientiousness ($r = -0.287$, $p < 0.001$) and Neuroticism ($r = 0.343$, $p < 0.001$).

Also, the hypothesis about the relationship between perceived load level and perfectionism was confirmed with weak but significant relationship ($r = 0.189$, $p < 0.001$) – see Graph 1.



Graph 1: Correlation between perceived training load level (POMS) and overall perfectionism (SMPS-2)

Besides, when we analysed a single scales of perfectionism questionnaire, distinguish between adaptive and maladaptive perfectionism started to be noticeable. We found significant correlations between perceived load level and scale Concern over mistake, Doubts About Actions and Perceived coach pressure. All relationships between single dimensions of perfectionism and perceived load level are summarized in Table 3.

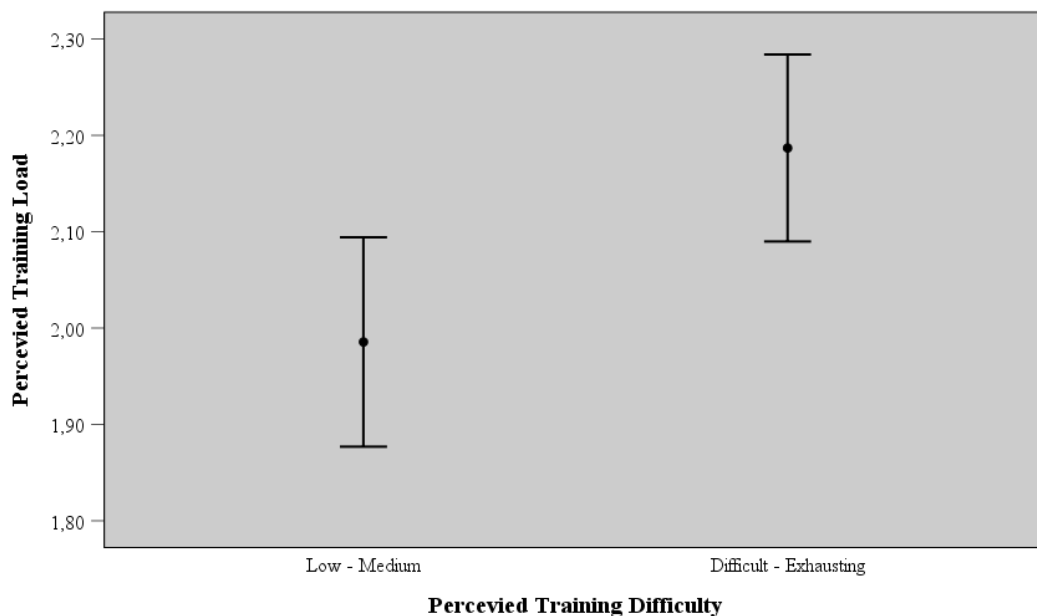
Tab. 3: Correlation between perceived training load level and dimensions of perfectionism.

Dimension of SMPS-2	POMS
Personal Standarts	-.094
Concern Over Mistakes	.242*
Doubts About Actions	.351*
Perceived Parental Preassure	.136
Perceived Coach Preassure	.181*
Organization	-.146

*Statistically significant correlations ($p < 0.05$).

Note I. Dimensions associated with maladaptive perfectionism are cursived.

Also, we hypothesised that subjective perceived training difficulty matters. Significant difference between groups in perceived training load according to perceived training difficulty was found. Those, who perceived training as difficult to exhausting ($M = 2.19$, $SD = 0.50$) were significantly higher than low to medium group ($M = 1.99$, $SD = 0.47$) in the perceived training load $t(178) = -0.894$, $p = 0.007$. – see Graph 2.



Graph 2: Group differences between perceived training load level according to perceived training difficulty.

No significant difference was found between athletes playing different sports. Furthermore, there was not found any significant difference between these two groups in a POMS, BFI-44 or SMPS-2 measurement. That is the reason why we used these two group as one.

DISCUSSION

In development of overtraining syndrome, several factors may serve as protective or risk factors. Our study confirms certain role of personality traits. Negative correlation between extraversion and level of overtraining may be explain by the fact, that extraverts tends to have wider social network, which was found as protective factor (DeFreese, & Smith, 2013). Furthermore, extraversion is personality trait characterised by positive emotions (Hřebíčková, Jelínek, Blatný et al., 2016) while POMS is based mainly around negative emotions. Conscientiousness itself may leads to better diet or higher compliance in a matter of regeneration etc. On the other hand, neuroticism may serve as risk factor of overtraining, due to smaller amount of positive emotions and higher irritability. Research showed negative correlation between neuroticism and sport performance (Kajtna, Tušák, Barić, & Burnik, 2004). That may lead, especially among perfectionist and highly goal-oriented athletes to lower self-esteem or even mood disturbance.

Mentioning perfectionism, athletes with its maladaptive form are in higher risk of injury (Madigan, Stoeber, Forsdyke, Dayson, & Passfield, 2017). They also tend to have lower self-esteem (Flett & Hewitt, 2005) and higher anxiety (Kawamura, Hunt, Frost & DiBartolo, 2001).

Longitudinal study has shown higher tendency of suffering from training distress among athletes with perfectionistic concerns (Madigan, Stoeber, & Passfield, 2016).

Our results are in line with these previous finding. Concern over mistakes and doubts about actions showed the strongest relationships with perceived training load. However, relationship with overall perfectionism was really weak. Therefore, we hypothesize that form of perfectionism may be the key factor. Since most of the scientist believes, that personality traits are biologically based (with some contribution of environment), it is the perfectionism what we can affect. Richardson, Rice, Sauer, & Roberts (2019) showed the effect of psychotherapy on perfectionism, declined perfectionistic concerns, leaving person with just non-maladaptive striving. Taking this study into consideration with our results, the importance of psychological aspects in sport preparation stands out.

Finally, we confirmed the importance of monitoring athlete's perception of training difficulty. That was already know before this study (Urhausen, Gabriel, Brückner, & Kindermann, W, 1998; Foster, 1998), but we proved that really simple question may provide valid answer. Therefore, we would like to encourage coaches to pay attention to athlete's feelings.

Limitation

Our work has clearly some limitations. As a main one we consider narrow approach of gathering information about overtraining syndrome. Thought, mood disturbance is one of the earliest and almost universal indicator of overtraining, physio-humoral analysis could have provide us with more overall and deeper data. Also, testing methods itself has several limitations. We think that not all POMS items in Czech version are easily understandable. Furthermore, in first section of questionnaire packet, the item asking the number of training per week, was not clearly understand with every participant equally. Thought, most of the participants answered in a same range, there were few who vary too much. Another limitation was Cronbach's alpha for Agreeableness in BFI-44 – just 0.44.

CONCLUSION

Adolescent sport does not seem to reduce stress on professionalism, neither sport clubs does not seem to decrease amount of single training units (or the volume) of young athletes. With this trend, parents, coaches, teachers and other persons, with direct supervision on young athletes has to extend their knowledge of overtraining issue, in order to be able to prevent these states, or at least be able to help young athletes cope them.

Since there is not an unified treatment for overtraining syndrome, wider knowledge, skills and creativity are necessities of paediatricians and even school and sport psychologist to be able to cure this condition.

References

- Armstrong, L. E., & Vanheest, J. L. (2002). The unknown mechanism of the overtraining syndrome. *Sports Medicine*, 32(3), 185–209.
- Bernacikova, M. (2013). *Regenerace a výživa ve sportu*. Brno: Masarykova univerzita.
- Blahutková, M., & Sližik, M. (2014). *Vybrané kapitoly z psychologie sportu: publikace DSP studia*. Brno: Masarykova univerzita.
- Borg G. *Borg's perceived exertion and pain rating scales*. Champaign, IL: Human Kinetics, 1998.
- Brenner, J. S. (2007). Overuse Injuries, Overtraining, and Burnout in Child and Adolescent Athletes [Online]. *Pediatrics*, 119(6), 1242–1245. <http://doi.org/10.1542/peds.2007-0887>

- Budgett, R. (1994). ABC of Sports Medicine The overtraining syndrome [Online]. *Bmj*, 309(6952), 465–8. <http://doi.org/10.1136/bmj.309.6952.465>
- DeFreese, J. D., & Smith, A. L. (2013). Teammate social support, burnout, and self-determined motivation in collegiate athletes [Online]. *Psychology Of Sport And Exercise*, 14(2), 258–265. <http://doi.org/10.1016/j.psychsport.2012.10.009>
- Ferrari, H. G., Gobatto, C. A., & Manchado-Gobatto, F. B. (2013). Training load, immune system, upper respiratory symptoms and performance in well-trained cyclists throughout a competitive season. *Biology of sport*, 30(4), 289–294. doi:10.5604/20831862.1077555
- Foster, C. A. R. L. (1998). Monitoring training in athletes with reference to overtraining syndrome. *Medicine & Science in Sports & Exercise*, 30(7), 1164–1168.
- Gotwals, J. K., & Dunn, J. G. H. (2009). A Multi-Method Multi-Analytic Approach to Establishing Internal Construct Validity Evidence: The Sport Multidimensional Perfectionism Scale 2 [Online]. *Measurement In Physical Education And Exercise Science*, 13(2), 71–92. <http://doi.org/10.1080/10913670902812663>
- Hřebíčková, M., Jelinek, M., Blatný, M., Brom, C., Burešová, I., Graf, S., Mejzlíková, T., Vazsonyi, A. T. & Zábrowská, K. (2016). Big Five Inventory: Základní psychometrické charakteristiky české verze BFI-44 a BFI-10. *Československá psychologie*. 60(6), 567–583.
- Jayanthi, N., Pinkham, C., Dugas, L., Patrick, B., & LaBella, C. (2013). Sports Specialization in Young Athletes [Online]. *Sports Health: A Multidisciplinary Approach*, 5(3), 251–257. <http://doi.org/10.1177/1941738112464626>
- Johnson, M. B., & Thiese, S. M. (1992). A review of overtraining syndrome—recognizing the signs and symptoms. *Journal of athletic training*, 27(4), 352–354.
- Kajtna, T., Tušák, M., Barić, R., & Burnik, S. (2004). PERSONALITY IN HIGH-RISKING.
- Kanmani, R., & Kalpana, D. (2016). Burnout Syndrome-Overtraining And Burnout in Young Athletes. *Indian Journal Of Applied Research*, 6(5), 484–486.
- Kawamura, K. Y., Hunt, S. L., Frost, R. O., & DiBartolo, P. M. (2001). Perfectionism, Anxiety, and Depression: Are the Relationships Independent? *Cognitive Therapy And Research*, 25(3), 291–301.
- Kellmann, M. (2010). Preventing overtraining in athletes in high-intensity sports and stress/recovery monitoring. *Scandinavian journal of medicine & science in sports*, 20, 95–102.
- Máček, M., Máčková, J., & Radvanský, J. (2003). Syndrom přetřénování. *Med Sport Boh Slov*, 12(1), 1–13.
- Madigan, D. J., Stoeber, J., & Passfield, L. (2016). Perfectionism and training distress in junior athletes: a longitudinal investigation [Online]. *Journal Of Sports Sciences*, 35(5), 470–475. <http://doi.org/10.1080/02640414.2016.1172726>
- Madigan, D. J., Stoeber, J., & Passfield, L. (2016). Perfectionism and training distress in junior athletes: a longitudinal investigation [Online]. *Journal Of Sports Sciences*, 35(5), 470–475. <http://doi.org/10.1080/02640414.2016.1172726>.
- Madigan, D. J., Stoeber, J., Forsdyke, D., Dayson, M., & Passfield, L. (2017). Perfectionism predicts injury in junior athletes: Preliminary evidence from a prospective study [Online]. *Journal Of Sports Sciences*, 36(5), 545–550. <http://doi.org/10.1080/02640414.2017.1322709>
- Madigan, D. J., Stoeber, J., Forsdyke, D., Dayson, M., & Passfield, L. (2017). Perfectionism predicts injury in junior athletes: Preliminary evidence from a prospective study [Online]. *Journal Of Sports Sciences*, 36(5), 545–550. <http://doi.org/10.1080/02640414.2017.1322709>.
- McNair, D. M., Lorr, M., & Droppleman, L. F. (1992). *Profile of Mood States (POMS)– Revised Manual*. San Diego, CA: Education and Industrial Testing Service.
- Meeusen, R., Duclos, M., Foster, C., Fry, A., Gleeson, M., Nieman, D., Raglin, J., Rietjens, G., Steinacker, J., & Urhausen, A. (2013). Prevention, diagnosis and treatment of the overtraining syndrome: Joint consensus statement of the European College of Sport Science (ECSS) and the American College of Sports Medicine (ACSM). *European Journal of Sport Science*, 13(1), 186–205.
- Meeusen, R., Duclos, M., Gleeson, M., Rietjens, G., Steinacker, J., & Urhausen, A. (2006). Prevention, diagnosis and treatment of the overtraining syndrome: ECSS position statement 'task force'. *European Journal of Sport Science*, 6(1), 1–14.
- Pearce, P. Z. (2002). A practical approach to the overtraining syndrome. *Current sports medicine reports*, 1(3), 179–183.
- Richardson C. M. E., Rice K. G., Sauer E. M. & Roberts K. E. (2019) Client perfectionism and psychological symptoms throughout psychotherapy, *Psychotherapy Research*, 29:5, 640–651, DOI: 10.1080/10503307.2017.1413854
- Roberts, A. C., McClure, R. D., Weiner, R. I., & Brooks, G. A. (1993). Overtraining affects male reproductive status. *Fertility and sterility*, 60(4), 686–692.
- Roy, B. A. (2015). Overreaching/Overtraining: More Is Not Always Better. *ACSM's Health & Fitness Journal*, 19(2), 4–5.
- SPORTS ATHLETES. *Kinesiology*, 36(1), 24–34.
- Stoeber, J., & Otto, K. (2006). Positive Conceptions of Perfectionism: Approaches, Evidence, Challenges. *Personality And Social Psychology Review*, 10(4), 295–319.
- Stuchlíková, I., Man, F., & Hagtvet, K. (2005). Dotazník k měření afektivních stavů: konfirmační faktorová analýza krátké české verze. *Československá psychologie*, 49(5), 459–467.
- Urhausen, A., & Kindermann, W. (2002). Diagnosis of overtraining. *Sports medicine*, 32(2), 95–102.
- Urhausen, A., Gabriel, H., Brückner, F., & Kindermann, W. (1998). Effects of two training phases of different intensities on the exercise-induced hormonal response and psychological parameters in endurance athletes. *Int J Sports Med*, 19(Suppl 1), S43.
- Wyatt, F. B., Donaldson, A., & Brown, E. (2013). The Overtraining Syndrome: A Meta-Analytic Review. *Journal of Exercise Physiology Online*, 16(2).