

Personality factors as predictors of overtraining syndrome in Czech performance athletes: The influence of neuroticism, conscientiousness, perfectionism and athletic identity.

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Published online: May 31, 2025

Accepted for publication: May 15, 2025

DOI:10.7752/jpes.2025.05121

Abstract

Overtraining syndrome (OTS) poses a considerable risk to athletes, especially those in competitive sports, owing to its detrimental effects on physical health, psychological well-being and athletic performance. Understanding how personality traits affect susceptibility to OTS is essential for developing effective prevention and intervention strategies, yet this area remains underexplored. This cross-sectional study investigates the relationship between personality traits – neuroticism, conscientiousness, perfectionism and athletic identity – and training stress among 178 Czech performance athletes aged 18-30. The goal is to determine how these traits influence training stress, a key precursor to OTS. The data were collected using validated psychological questionnaires, including the Big Five Inventory, the Athletic Identity Measurement Scale and the Performance Perfectionism Scale. Training stress was assessed via the Training Distress Scale, a validated tool for identifying early signs of overtraining. The study sample included athletes from both individual and team sports, and covered a range of disciplines from endurance-based to skill-based sports. Multiple regression analysis reveals that personality traits explain 32% of the variance in training stress ($p < .001$). Specifically, socially prescribed perfectionism ($\beta = 0.34$) and self-oriented perfectionism ($\beta = 0.30$) emerge as the strongest predictors of training stress, while conscientiousness appears to act as a mild protective factor ($\beta = -0.23$), potentially mitigating the negative effects of training stress. While personality traits, particularly perfectionism, significantly contribute to understanding susceptibility to OTS, they are not the sole determinants. This underscores the importance of adopting a holistic approach to athlete management, integrating psychological and social factors that influence OTS development. Future research should delve deeper into these additional factors to build a more comprehensive foundation for effective prevention and intervention strategies, ultimately supporting the overall well-being of athletes.

Key words: Big Five personality traits, perfectionism in sport, athletic identity, training distress, psychological risk factors

Introduction

Overtraining syndrome (OTS) is a complex and multifactorial phenomenon that can significantly negatively affect the performance and well-being of athletes. It represents a major challenge in sports science and medicine, marked by performance declines and disruptions across multiple physiological systems, including neurological, endocrine and immune functions (Richardson, Andersen, & Morris, 2008; Schweltnus et al., 2016). According to previous studies, the majority of elite athletes experience at least one episode of prolonged overtraining during their careers, which in some cases leads to premature termination of professional sports careers (Cadegiani, 2020). The aetiology of OTS is often linked to a combination of physiological, training, social and environmental factors. Nonetheless, psychological factors also play a crucial role and may increase susceptibility to OTS (Richardson, Andersen, & Morris, 2008). Despite this, the role of psychological factors, particularly personality traits, remains inadequately explored.

Young athletes are often subjected to intense demands and high expectations from both external sources and themselves, leading to significant stress. Nevertheless, it is not solely the magnitude of stress that contributes to inadequate recovery, overtraining and burnout. The way in which athletes perceive and manage these pressures is also critical (Armstrong et al., 2022; Pelka & Kellmann, 2017; Šíp & Burešová, 2020; Winsley & Matos, 2011). Specific personality traits can influence athletes' perceptions and responses to training loads, thereby influencing the risk of developing OTS (Šíp & Burešová, 2020). Research has identified that psychological risk factors, such as unidimensional athletic identity, limited autonomy and feelings of incompetence, contribute to overtraining. Additionally, high levels of motivation or over-motivation,

characterised by an intense drive to achieve goals regardless of their practicality, can further elevate the risk of overtraining (Tibbert, 2013; Winsley and Matos, 2011). Similar psychological patterns have been observed in amateur soccer referees, who reported higher sport devaluation and burnout levels compared to professionals, with burnout positively correlated with refereeing experience (De Gama et al., 2023).

Overtraining syndrome not only compromises physical condition but also undermines psychological stability and career longevity, especially in young adult athletes exposed to high-performance pressures. Although some studies have identified links between personality and training response, little is known about how enduring personality dispositions influence vulnerability to OTS in real-world competitive environments.

Previous research on OTS has predominantly focused on individual dimensions of the Big Five personality traits or perfectionism. The Big Five, with its dimension openness to experience, conscientiousness, extraversion, agreeableness and neuroticism, offer a robust framework for analysing personality differences (Gosling et al., 2003). Within this model, neuroticism and conscientiousness have emerged as significant predictors of OTS (Kanmani & Kalpana, 2016; Hutečková, Bartošová, & Frydrychová, 2017; Madigan et al., 2017; Šíp & Burešová, 2020). A review encompassing studies from 1999 to 2016 highlights neuroticism and conscientiousness as key factors that increase the risk of developing OTS among young elite athletes (Hutečková et al., 2017).

Athletes exhibiting high levels of neuroticism are more prone to experiencing negative emotions, such as anxiety, anger and depression, and tend to exhibit emotional and behavioural instability that adversely affects performance (Mirzaei et al., 2013). Such individuals often resort to avoidance coping strategies, potentially neglecting signs of overtraining (Allen et al., 2013).

In contrast, the impact of conscientiousness on OTS is less clear. Conscientiousness is generally linked with effective management of challenges and a healthy lifestyle (Křivohlavý, 2001). Highly conscientious athletes, who are often disciplined and organised, tend to manage training demands effectively, enhance performance and mitigate the risk of overtraining (Allen et al., 2017; Pelka & Kellmann, 2017; Šíp & Burešová, 2020). Studies consistently demonstrate that athletes with high levels of discipline, responsibility and goal orientation achieve superior results in both team and individual sports (Mirzaei, Nikbakhsh, & Sharififar, 2013; Rodrigues, Rodrigues, & Rebelo, 2023; Habib, Waris, & Afzal, 2019).

Research by Reatrick, Creasy and Buriak (2011) suggests that athletes with high ambitions and an intense focus on competition are more susceptible to overtraining. Extreme conscientiousness is often associated with perfectionist tendencies (Peters & King, 2012), tendencies that may contribute to OTS. Perfectionism can drive individuals toward perpetual dissatisfaction and the belief that greater effort is required to achieve or maintain perfection (Madigan, Stoeber, & Passfield, 2016; Raglin et al., 2000; Richardson, Andersen, & Morris, 2008). Perfectionist athletes may engage in more intense and prolonged training, increasing their risk of training-related distress (Flett & Hewitt, 2014).

Perfectionism is typically examined as a complex construct or through its specific dimensions, such as perfectionist striving and perfectionist concerns (Stoeber & Otto, 2006). While perfectionist concerns are often maladaptive, perfectionist striving may lead to more adaptive efforts towards achieving excellence (Stoeber, 2011). Research on the relationship between perfectionism and OTS remains inconclusive. A study by Šíp and Burešová (2020) found a significant association between maladaptive perfectionism and perceived training load, while overall perfectionism had a smaller effect. Longitudinal research by Madigan et al. (2017) indicated that overall perfectionism significantly predicted training distress, with perfectionist concerns linked to higher distress, suggesting their potential role in OTS development. Similarly, a study by Květoň, Burešová and Jelinek (2021) identified perfectionism as a significant predictor of overtraining and burnout. On the other hand, perfectionist striving may offer a protective effect (Madigan, 2017).

Other factors, such as avoidance coping strategies, further modulate the relationship between training stress and personality traits. Avoidance coping strategies can amplify the effects of training stress under high perfectionist concerns while mitigating distress levels under high perfectionist striving (Madigan, 2018).

Another significant factor in OTS development is athletic identity, a multidimensional construct that reflects the degree to which individuals identify with their athlete role. The literature on athletic identity and OTS is inconsistent. On the one hand, a strong athletic identity may serve as a protective factor by enhancing motivation and engagement in sports (Martin & Horn, 2013), with some studies linking a strong athletic identity to reduced burnout (Gustafsson et al., 2018). On the other hand, a strong athletic identity may increase vulnerability to overtraining by making athletes more susceptible to negative outcomes (Brewer, Van Raalte, & Linder, 1993; Gustafsson, Kenttä, & Hassmén, 2011; Kenttä, Podlog, Johnson, & Ivarsson, 2015; Richardson et al., 2008).

Understanding the interplay between personality traits and training load is crucial for athlete well-being. Developing personalised approaches that account for individual personality traits and training regimens is essential (Nordqvist, 2024). Current literature indicates that specific personality factors may heighten the risk of OTS in certain athletes. Future research should focus on detailed analyses of these interactions to improve prevention and intervention strategies and support the well-being and performance of young athletes.

Despite increasing attention to the psychological correlates of overtraining, significant gaps remain in understanding the role of enduring personality traits. Most previous studies have either focused narrowly on single traits or lacked integration with sport-specific stress responses. This research was therefore needed to identify which personality configurations increase or reduce vulnerability to OTS, especially in the context of young adult performance athletes exposed to high expectations and chronic training loads.

The current study builds on established frameworks in personality and sport psychology – particularly the Big-Five Model, multidimensional perfectionism theory and the concept of athletic identity – to examine how traits such as neuroticism, conscientiousness, perfectionism and athletic identity relate to perceived training stress. These constructs were selected based on previous findings linking them to stress and burnout in athletes, yet they have not been systematically examined together in the context of OTS.

Study design

This study employs a cross-sectional design to investigate the relationships between personality traits – specifically neuroticism, conscientiousness, perfectionism and athletic identity – and symptoms of OTS). A quantitative approach was utilised, involving a survey methodology with a structured set of questionnaires to collect demographic data, assess personality characteristics and measure OTS symptoms.

Data were collected using the LimeSurvey online platform. This online survey system was intentionally chosen to enable the reach of a wide and geographically diverse group of participants, minimise costs and facilitate the efficient transfer of data directly into analytical programs, thereby reducing the risk of data entry errors.

Sample

The sample comprised 178 Czech athletes, aged 18-30 years ($M = 21.7$, $SD = 4.0$), engaged in performance-level sports. This cross-sectional study included participants affiliated with sports federations and were active in regular competitions or training. The sample included athletes from various individual and team sports disciplines, primarily recruited from the Army Sports Centre Dukla and the Ministry of the Interior Sports Centre Olymp.

The cohort consisted of 80 men and 98 women. Prior to participation, all athletes were informed about the study's objectives and their ethical rights. The study received ethical approval from the Ethics Committee of the Faculty of Physical Education and Sport, Charles University (Application No.: 231/2022).

Data collection instruments

The test battery utilised in this study consisted of a demographic questionnaire, questionnaires mapping personality traits and questionnaire identifying symptoms of OTS. Some of these instruments were available in Czech, while others required translation into Czech using a committee approach. Prior to the main data collection, a pilot study was conducted, resulting in the modification of certain questionnaire items.

In this study, we employed the following tools:

Assessment of demographic variables

The demographic questionnaire collected basic information such as gender, age, primary sports discipline, level of competition, perceived training difficulty and the number of training hours per week, along with other relevant data. The questionnaire also inquired whether the respondent was concurrently engaged in studies or employment alongside their athletic pursuits.

Assessment of personality traits

The Big Five Inventory 44 (BFI-44): this inventory, based on the Five-Factor Model of personality, is a widely accepted framework for describing and interpreting personality traits (McCrae et al., 2000). The Czech version of the BFI-44, adapted by Hřebíčková et al. (2016), was used in this study. When self-assessed by adult respondents, it demonstrated acceptable psychometric properties, including reasonable internal consistency of the scales, corresponding retest reliability and an adequate factor structure. This inventory consists of 44 items, focusing on the Big Five dimensions: extraversion, neuroticism, openness to experience, agreeableness and conscientiousness. Scores are presented as the sum of responses for each item within each dimension. In our analysis, we concentrated on the neuroticism and conscientiousness scales, which were deemed most relevant to the objectives of our research.

Neuroticism is typically characterised by the degree of emotional stability, where higher scores indicate more frequent experiences of negative emotions such as anxiety or anger, while lower scores suggest greater emotional stability and calmer responses to stressful situations. Conscientiousness reflects the degree to which an individual is diligent, disciplined and responsible in fulfilling their duties and obligations. Higher conscientiousness scores indicate that an individual is reliable, organised and methodical, tends to plan and complete tasks, and is consistent and goal-oriented. Conversely, lower scores may indicate a lack of discipline, carelessness and a lack of motivation to complete tasks (Hřebíčková, 2004).

Assessment of athletic identity

Athletic Identity Measurement Scale (AIMS): this scale, developed by Brewer, Van Raalte and Linder (2012), was used in the translated version and includes ten items where respondents rate their agreement on a 7-point Likert scale. AIMS encompasses a first-order factor athletic identity and another three second-order factors – social identity, exclusivity and negative affectivity. The scale exhibits high reliability and internal consistency (Brewer et al., 1993).

Assessment of perfectionism

Performance Perfectionism Scale Sport (PPS-P): developed by Hill, Appleton and Mallinson (2016), it was translated into Czech and evaluates these parameters: self-oriented perfectionism, other-oriented perfectionism and socially prescribed perfectionism. The PPS-P consists of 12 items rated on a 7-point scale, specifically focusing on athletic performance. It is based on the perfectionism model by Hewitt and Flett (1991) and demonstrates strong psychometric properties.

Assessment of overtraining symptoms

Training Distress Scale (TDS): derived from the Profile of Mood States (McNair, Lorr, & Droppleman, 1971), measures key indicators of OTS, including physical (e.g. muscle pain, lack of energy) and psychological (e.g. irritability, lack of concentration) symptoms. The 19-item scale is a one-dimensional tool. It has been validated in multiple studies and its effectiveness has been demonstrated in assessing training stress and its impact on athletic performance (Grove et al., 2014; Kenttä, Hassmén, & Raglin, 2001).

Statistical analysis

The data were basic processed using Statistica 13.0 software. To assess the internal consistency of the primary scales for personality traits and training stress, Cronbach's alpha was calculated. This measure was used to evaluate the reliability of the scales, with acceptable values generally considered to be above 0.70 (Hulin, Netemeyer, & Cudeck, 2001). The scores for each scale were derived by summing the responses on the Likert scale.

The normality of the data distributions was assessed using the Kolmogorov-Smirnov test. For half of the monitored personality characteristics, the K-S test did not confirm the normal distribution of the data ($p > 0.05$). Consequently, Spearman's rank-order correlation coefficient was used to examine relationships between training stress and personality traits including neuroticism, conscientiousness, perfectionism and its subscales, and athletic identity and its subscales.

Following the correlation analysis, multiple regression analysis was conducted on those personality traits and subscales that exhibited statistically significant correlations with training stress. The regression analysis aimed to identify the extent to which these traits could predict training stress levels. The variables included in the regression model were neuroticism, conscientiousness, self-oriented perfectionism, socially prescribed perfectionism and the subscale of athletic identity – negative affectivity. This analysis sought to determine the relative contribution of each personality characteristic to the prediction of training stress and to identify the most significant predictors among them.

Results

Descriptive analysis of demographic information

Table 1 presents a comprehensive overview of the sample characteristics, including educational attainment, place of origin, perceived training difficulty, and the balance between training and other commitments such as studies or employment. The average number of training hours per week for the participants is reported as 12.3 hours ($SD = 5.75$).

Table 1 : Descriptive characteristics

Variable	Category	%
Education	Primary:	18.0
	Secondary:	57.3
	Bachelor's Degree:	11.8
	Master's Degree:	18.0
Place of Origin	Village	25.8
	Town (<20,000 inhabitants):	28.1
	Town (<50,000 inhabitants)	12.4
	City (<100,000 inhabitants)	7.3
	City (>100,000 inhabitants)	25.8
Perceived Training Difficulty	Moderately difficult	49.4
	Difficult	42.1
	Very difficult	5.7
	Easy	0.7
	Very easy	2.1
Combining with Study/Work	Study	79.8
	Work	29.8
	Study and work	12.9

Internal consistency of the primary scales was evaluated using Cronbach's alpha, with values ranging from 0.76 for self-oriented perfectionism to 0.84 for neuroticism. These values indicate very good reliability of the scales used in the study.

Correlation analysis

Spearman's rank-order correlation coefficients were calculated to explore the relationships between perceived training stress and various personality characteristics. The results, detailed in Table 2, reveal several significant associations. Higher levels of training stress were positively correlated with neuroticism, socially

prescribed perfectionism, self-oriented perfectionism and negative affectivity. Training stress showed a significant inverse relationship with conscientiousness. No significant correlations were found between training stress and athletic identity, its subscales (self-identity, social identity and exclusivity) or other-oriented perfectionism.

Table 2 : Results of relationship analysis between perceived training stress and personality characteristics

Dimension	Total score of TDS
N	0.45***
C	-0.24**
AC	0.13
SI	-0.12
SCI	0.03
E	0.09
NA	0.32***
SPP	0.31***
OOP	-0.11
SOP	0.30***

Note: * Marked correlations are significant at $p < .05$; ** $p < .01$; *** $p < .001$.

Table shows Spearman rank-order correlation coefficients, $n = 178$,

N = neuroticism; C = conscientiousness; AC = athletic identity; SI = self-identity; SCI = social identity; E = exclusivity; NA = negative affectivity; SPP = socially prescribed perfectionism; OOP = other oriented perfectionism; SOP = self-oriented perfectionism.

The analysis revealed that individuals exhibiting higher levels of neuroticism, characterised by heightened anxiety, emotional instability and pronounced responses to stress, also report elevated levels of training stress. This relationship underscores the impact of neuroticism on athletes' susceptibility to stress related to their training regimens.

Additionally, athletes who exhibit high levels of perfectionism, characterised by strict self-imposed standards and external pressures to achieve perfection, also demonstrate increased training stress. This finding highlights the role of perfectionistic tendencies in worsening stress levels among athletes.

While the overall correlation between athletic identity and training stress was not significant, a notable exception was observed in the dimension of negative affectivity. This dimension captures the extent to which athletes experience negative emotions or display tendencies toward depressive reactions, particularly in response to sports-related events or injuries. Athletes with higher negative affectivity, reflecting more pronounced negative emotional responses or greater difficulties in coping with injuries, tend to experience higher levels of training stress. This increased stress may contribute to a greater risk of developing symptoms of OTS.

Conversely, training stress was found to be negatively correlated with conscientiousness. Athletes who demonstrate high levels of responsibility, carefulness and discipline – traits associated with conscientiousness, experience lower levels of training stress. This suggests that individuals with strong motivational and effort-driven characteristics are better able to manage training stress effectively.

Multiple regression analysis results

To clarify the relationship between personality traits and training stress with greater insight, we conducted a multiple regression analysis (Table 3). To ensure the robustness of the regression model, diagnostics such as test for multicollinearity and analysis of residual patterns were conducted. These confirmed the absence of significant multicollinearity (VIF values: 1.48-3.4), and there is no strong autocorrelation between the residuals (Durbin-Watson: 1.98) supported the validity of the model's assumptions. The model demonstrated a moderate correlation coefficient ($R = 0.57$), indicating a substantial relationship between training stress and the set of independent variables (i.e., personality traits). The coefficient of determination ($R^2 = 0.32$) suggests that personality traits collectively account for approximately 32% of the variance of training stress highlighting their significant role. Although acknowledging that other factors may also contribute to the observed stress levels.

Table 3 : Results of multivariate regression analysis between personality traits and training stress

R	R ²	R ² adjusted	F	ANOVA, p
0.57	0.32	0.30	13.39	<.001

Subsequent analyses focused on identifying the strength of specific personality traits as predictors of training stress. The findings revealed four traits as particularly noteworthy predictors. The most influential predictor was socially prescribed perfectionism, with a standardised regression coefficient of $\beta = 0.34$. This indicates that higher levels of socially prescribed perfectionism are associated with increased training stress. Self-oriented perfectionism also emerged as a significant predictor, with $\beta = 0.30$, suggesting that self-imposed perfectionistic standards contribute to elevated training stress. Neuroticism was identified as another significant predictor, with $\beta = 0.28$, implying that higher neuroticism correlates with greater training stress. Conversely, conscientiousness showed a negative relationship with training stress, with a regression coefficient of $\beta = -0.23$, indicating that higher levels of conscientiousness are associated with reduced training stress.

In contrast, negative affectivity did not emerge as significant predictors in this analysis (Table 4).

Table 4: Regression analysis between personality traits and training stress

Variable	β	SE β
N	0.28***	0.08
C	-0.23***	0.07
NA	0.04	0.08
SPP	0.34***	0.11
SOP	0.30*	0.12

Note: * Marked correlations are significant at $p < .05$; ** $p < .01$; *** $p < .001$.

N = neuroticism; C = conscientiousness; NA = negative affectivity; SPP = socially prescribed perfectionism; SOP = self-oriented perfectionism.

These results underscore that neuroticism, self-oriented perfectionism and socially prescribed perfectionism exhibit a modest positive relationship with training stress, whereas conscientiousness shows a slight negative association. Athletic identity, in this context, appears to have a minimal impact on training stress.

Discussion

This cross-sectional study investigated the impact of personality traits on OTS among young adult performance athletes. Specifically, we examined the relationships between personality traits – neuroticism, conscientiousness, perfectionism, athletic identity – and training stress as indicators of OTS.

Our findings indicate that training stress is positively correlated with neuroticism, perfectionism and conscientiousness. Athletes exhibiting higher levels of neuroticism are more prone to experiencing intensified training stress, reflecting their greater susceptibility to stress-related manifestations. Elevated levels of both self-oriented perfectionism and socially prescribed perfectionism are also associated with an increased prevalence of overtraining. In contrast, conscientiousness shows a moderate negative correlation with overtraining symptoms, implying that conscientious athletes are better equipped to manage their training and recovery, thereby reducing their risk of overtraining. Interestingly, while athletic identity did not reveal a significant overall correlation with training stress, its dimension of negative affectivity emerged as a notable exception.

Our findings suggest that training stress interacts with various personality traits and characteristics, consistent with previous research indicating that extreme forms of these traits may contribute to the development of OTS. Neuroticism was moderately correlated ($r = 0.45$) with training stress, with neurotic individuals generally being more prone to anxiety and emotional reactions to stress (Hřebíčková et al., 2004; Schneider et al., 2004). This may explain the heightened perception of OTS symptoms. This conclusion aligns with earlier studies showing that athletes with high neuroticism tend to use ineffective coping strategies, thereby increasing their perception of stress (Kaiseler et al., 2012; Vollrath & Torgersen, 2000). Our results thus support the hypothesis of neuroticism as a significant predictor of training stress. The study by Šíp and Burešová (2020) also underscores the risk associated with this trait in relation to overtraining. Findings suggest that individuals with high neuroticism may be less capable in managing training loads, potentially negatively affecting their performance and increasing the risk of overtraining. However, the relationship between neuroticism and overtraining demands further longitudinal research to definitively establish causal links.

Perfectionism also emerges as a significant risk factor in the context of overtraining. Perfectionists may set unrealistic demands on themselves, leading to persistent dissatisfaction as they can never meet their desired level of perfection. Training stress is weakly correlated with self-oriented perfectionism ($r = 0.30$) and socially prescribed perfectionism ($r = 0.34$). These aspects of perfectionism reflect high self-imposed standards as well as pressure from others to perform perfectly. According to another study (Hill, Hall, & Appleton, 2010), socially prescribed perfectionism, which involves a desire for external validation and high standards set by others, is positively associated with burnout symptoms. This aligns with the concept of extrinsic motivation as outlined by Deci and Ryan (1991) in their Self-Determination Theory. Extrinsic motivation refers to behaviours driven by external rewards or pressures, such as approval from others or avoidance of criticism, which in some cases can lead to a sense of pressure and reduced well-being when those external demands become overwhelming.

In contrast, self-oriented perfectionism, which includes setting high personal goals and self-criticism, has only an indirect association with burnout symptoms, mediated by various coping strategies (Hill, Hall, & Appleton, 2010). From the perspective of Self-Determination Theory, self-oriented perfectionism may involve a combination of intrinsic and extrinsic motivational processes, depending on whether the goals are self-determined or primarily influenced by external pressures. This distinction highlights the importance of understanding the underlying motivational drivers when examining the relationship between perfectionism and burnout. Particularly among burned-out young athletes, perfectionistic tendencies often drive the belief that more training is necessary to achieve perfection (Appleton, Hall, & Hill, 2009). This can result in neglecting recovery and adopting imbalanced training regimes, increasing the risk of both physical and psychological issues. Perfectionism has been identified as a significant predictor of overtraining symptoms in several cross-sectional analyses of junior and youth athletes (Květoň, Jelínek, & Burešová, 2021; Madigan, 2017; Šíp & Burešová, 2020).

In contrast to maladaptive perfectionism, which may negatively impact mental health and quality of life, conscientiousness is weakly inversely correlated ($r = -0.23$) with training stress and may have a protective effect against overtraining symptoms. This is consistent with other studies highlighting the protective nature of this Big Five trait (Pelka & Kellmann, 2017; Šíp & Burešová, 2020). Higher levels of conscientiousness can improve athletes' health through better health behaviours, such as maintaining a healthy lifestyle, avoiding risky activities, adhering to preventive measures and effectively managing stress, which indirectly mitigate the negative effects of stress on health (O'Connor, 2009). Conscientiousness may play a key role in preventing overtraining. Athletes who are more conscientious may more effectively manage their training load, thereby reducing the risk of overtraining and its negative health consequences.

Few studies have explored the relationship between conscientiousness and overtraining. Our results are consistent with the study by Šíp and Burešová (2020), which examined the relationship between perceived training load and conscientiousness.

Our study found that athletic identity did not significantly correlate with training stress overall, except for the dimension of negative affectivity ($r = 0.04$). Negative affectivity reflects emotional responses to events such as injuries or poor performance, suggesting a potential connection to stress responses. However, no relationship was observed between training stress and other-oriented perfectionism.

The results from the multiple regression analysis offer a nuanced understanding of the interplay between training stress and various personality traits, including neuroticism, conscientiousness, negative affectivity, socially prescribed perfectionism and self-oriented perfectionism. The regression model reveals a moderate correlation coefficient ($R = 0.57$) between the set of independent variables and training stress, accounting for 32% of the variance in training stress ($R^2 = 0.32$). This indicates that while personality traits significantly influence the stress experienced during training, a comprehensive understanding of this relationship necessitates consideration of additional factors.

The analysis identifies socially prescribed perfectionism ($\beta = 0.34$) and self-oriented perfectionism ($\beta = 0.30$) as the most robust predictors of training stress. These findings suggest that individuals who face external pressures to achieve perfection and those who impose stringent personal standards are more likely to experience heightened training stress and increased susceptibility to OTS. Conversely, neuroticism ($\beta = 0.28$) and conscientiousness ($\beta = -0.23$) are weaker predictors, with neuroticism showing a slight positive association and conscientiousness a modest negative association with training stress. Negative affectivity did not emerge as a significant predictor in the regression analysis, indicating that its effects may be mediated by other variables or are less pronounced than initially suggested by correlation analysis.

Practical implications

Our results highlight the importance of addressing emotional instability and perfectionistic tendencies in athletes to alleviate the risk of overtraining. Coaches and sport psychologists could benefit from integrating personality assessments into their training regimens. Interventions should focus on enhancing stress tolerance and promoting balanced training and recovery. Cognitive-behavioural techniques, biofeedback and other targeted interventions could be effective in managing training stress and reducing the risk of OTS. Investigating the long-term impact of these personality traits on overtraining could provide valuable insight for designing more effective and comprehensive prevention and intervention strategies.

Study limitations

While this study provides valuable insight into the relationships between personality traits and sports performance, several limitations must be addressed. First, the reliance on quantitative questionnaire surveys may limit the depth of the analysis and offer only a surface-level understanding of the examined phenomena. It is important to note that the results are based on a sample of Czech athletes, predominantly from two institutional sports centres. For instance, the emphasis on discipline and performance within military-affiliated sports centres could amplify certain personality-driven stress responses. Therefore, caution should be exercised when generalising these results to broader or international populations. The age range of participants, primarily young adults under 30, may also constrain the generalisability of the results to other age groups.

Future research should include diverse cultural and institutional contexts to validate and expand upon the present findings, ensuring their applicability to a wider range of athletic populations. Further investigation into the role of social support and its interaction with personality traits in relation to overtraining could also provide valuable insights.

Conclusion

This study confirms that specific personality traits – particularly neuroticism and perfectionism – are positively associated with increased levels of training stress, whereas conscientiousness is negatively associated, indicating a protective effect. These findings contribute to a growing body of knowledge emphasising the psychological dimensions of OTS.

Theoretically, this research advances our understanding of how stable personality traits interact with sport-related stress responses. It supports the integration of Big Five traits and multidimensional perfectionism in

conceptualising vulnerability to OTS. Additionally, the study highlights athletic identity, particularly its negative affectivity dimension, as a potentially important variable in predicting stress responses in sport environments. Practically, the results underscore the value of incorporating personality assessment into routine athlete monitoring. Screening for high perfectionistic tendencies or elevated neuroticism may help identify athletes at higher risk of OTS, enabling targeted psychological support or tailored training adaptations. Coaches, sport psychologists and practitioners can use this information to promote resilience, balance performance pressure and improve long-term athlete development.

Future research should explore longitudinal designs to assess the predictive validity of these traits over time and to investigate the potential moderating role of contextual factors such as coaching style or social support. Such findings could further inform comprehensive prevention strategies and mental health programmes in high-performance sport settings.

Declarations

This work was supported by the project GAUK no. 165023, COOP SPOS AND GAČR 23-02573S.

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