Toronto Alexithymia Scale Scores in Professional Athletes, Former Professional Athletes, and Non-Athletes: A Comparative Study

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ABSTRACT

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The purpose of the present study is to investigate the correlation between athletic performance and alexithymia, as well as to explore the relationship between gender and alexithymia. Alexithymia is recognized as a personality trait that can be detrimental in various areas of an individual's life. Athletic performance consists physical, psychological, and emotional factors that collectively contribute to an athlete's success in sports. By understanding the relation between alexithymia and athletic performance, valuable insights can be gained regarding how emotional awareness and expression impact an athlete's abilities, motivation, and overall well-being. Examining the relationship between gender and alexithymia is imperative for a comprehensive understanding of how gender-related factors may interact with emotional processes and consequently affect athletic performance. The purpose of this study was to examine the disparities in Toronto Alexithymia Scale (TAS) scores and subscales between athletes and non-athletes, as well as between genders. A total of 171 participants, consisting of 45 athletes and 126 non-athletes, were recruited for this investigation. The data were analysed using SPSS independent sample t-tests and one-way ANOVAs. The findings of this study revealed significant differences in the TAS total score between male and female participants ($t(169) = -2.753$, $p = 0.007$). Furthermore, there were notable differences between male and female participants in four out of the six alexithymia subscales.

Upon conducting independent-samples t-tests for AA-s compared to NA-s there was a significant difference only in the subscale of difficulty identifying feelings, with AA-s

scoring significantly lower than non-athletes. The findings indicated that athletes exhibited lower scores in five out of the six TAS subscales, thereby providing support for previous research suggesting the positive impact of sports on mental health and well-being.

It is important to acknowledge that certain sports, such as basketball and extreme sports, might potentially benefit from individuals with elevated levels of alexithymia, as evidenced by their high scores on the TAS in this study. However, it is crucial to note that further research is required to explore this relationship due to the limited number of participants in the current study. This study contributes to the existing literature on the association between alexithymia and athletic performance, providing valuable insights for future investigations in this domain.

Key words: alexithymia, athletic performance, gender differences

TIIVISTELMÄ

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Tämän pro gradu -tutkielman tarkoituksena on selvittää korrelaatio urheilijan alexitymia-piirteiden ja urheilusuorituksen välillä, sekä tarkastella sukupuolten välisiä eroja suhteessa alexitymia-piirteisiin. Tutkimuksessa käytettiin Toronto Alexitymia -asteikkoa määrällisessä tutkimuskyselyssä. Tarkastelun päähuomio kohdistui vastaajien urheilija- ja ei-urheilija -statukseen sekä sukupuoleen. Lisäksi vastaustuloksista ilmeni urheilulajien välisiä eroja.

Alexitymiaa kuvataan persoonallisuuden piirteenä, jolla voi olla haitallisia vaikutuksia yksilön elämään usealla eri elämän alueella. Urheilusuoritus koostuu fyysistä, psyykkistä sekä emotionaalisista tekijöistä, jotka yhdessä vaikuttavat sen onnistumiseen. Korrelaation tunnistamisella voidaan kerätä arvokasta tietoa urheilijan tunnetietoisuudesta ja -ilmaisusta suhteessa urheilijan suorituskykyyn, motivaatioon ja hyvinvointiin. Sukupuolten välisten erojen ja alexitymia-piirteiden yhteyden tarkastelemisella voidaan ymmärtää, miten sukupuoleen liittyvät tekijät vaikuttavat urheilijan emotionaalisiin prosesseihin ja niin edelleen urheilusuoritukseen.

Kyselyyn vastasi 171 henkilöä, joista 45 oli urheilijaa ja 126 ei-urheilijaa. Kyselyn tulokset arvioitiin käyttämällä SPSS-ohjelmiston riippumatonta T-testiä sekä yksisuuntaista ANOVA-testiä. Tulokset havainnollistavat merkittäviä sukupuolten välisiä eroja alexitymia-piirteiden ilmentymisessä. Urheilijoiden ja ei-urheilijoiden välillä ainut merkittävä ero ilmeni vastaajien tunteiden tunnistamiskyvyssä, jossa urheilijoiden tulokset olivat huomattavasti alhaisempia ei-urheilijoihin verrattuna. Nämä tulokset samalla tukevat aiempia tutkimuksia urheilun ja mielenterveyden ja hyvinvoinnin positiivisesta yhteydestä. Lisäksi tuloksista selvisi, että tietyissä

urheilulajeissa, kuten koripallossa ja ekstriimi-lajeissa, alexitymia-piirteillä voi olla positiivinen vaikutus urheilusuoritukseen.

Tutkimuksen löydökset tukevat olemassaolevaa kirjallisuutta alexitymian ja urheilusuorituksen yhteydestä. Tulokset tuovat lisäarvoa tulevaisuuden tutkimukselle aiheesta.

Avainsanat: alexitymia, urheilusuoritus, sukupuolten väliset erot

ABBREVIATIONS

TAS	Toronto Alexithymia Scale
HIGH_TAS	A Toronto Alexithymia Scale score between 50-60.
CERTAIN_TAS	A Toronto Alexithymia Scale score over 60.
PA	professional athletes
FPA	former professional athletes
NA	amateur level athletes and non-athletes
AA	International or professional level athletes and former international or professional level athletes all together.
DIF	Difficulty Identifying Feelings
DDF	Difficulty Describing Feelings
EOT	Externally Oriented Thinking

CONTENTS

Introduction

Purpose of the study:

The purpose of this study is to provide a better understanding of how specific personality traits relate to athletic performance. By focusing on performance-specific personality traits, such as alexithymia, this study aims to contribute to the existing literature by providing a more comprehensive analysis of the factors that influence athletic performance (Schinke et al., 2016).

The relationship between personality traits and athletic performance has been a topic of interest for many years among researchers in sports psychology. Previous research has demonstrated a correlation between specific personality traits and athletic performance in different sports. It is believed that an individual's personality traits define their core, which can influence their behavior and, in turn, affect their performance in a particular sport. Understanding the relationship between personality and athletic performance is crucial for athletes, coaches, and trainers as it can help them identify and develop the personality traits necessary for success in a specific sport.

In this thesis, first we overview the literature of the Big Five model, which is a widely used personality model that includes five personality traits: extraversion, agreeableness, openness, conscientiousness, and neuroticism (Carver and Scheier, 2006). This review uses these findings and studies as the core of the research direction, as it is the most commonly used model in the past. To understand the shift of this direction, and the necessity changes in specifying a more reliable model to explore performance-oriented personality traits, it is necessary to familiarise us with the findings of these models. The review of this study then goes onto exploring how it is necessary to use these specific models to find specific personality traits that

can be developed to enhance athletic performance, such as Alexithymia. Finally, the recent findings of alexithymia research related to athletic performance will guide this review to our current research. Although previous studies have indicated that alexithymia may lead to difficulties in social interactions and emotional well-being, some studies suggest that this trait can be highly beneficial in managing anxiety and dealing with performance anxiety in athletes. This trait was chosen for researching as it is suggested in recent studies as one of the key predictors of certain characteristics that would be beneficial or detrimental in specific sports (Schinke et al.,2016).

The literature suggests that performance-focused personality traits are essential for optimal athlete performance. Despite of providing a meaningful base for exploring personality traits in this study, the Big Five Model has also limitations in identifying these personality traits, and it is necessary to consider different parts of personality that have a strong performance-oriented theoretical base. The concept of alexithymia is a fascinating area of research that suggests emotion regulation difficulties may actually be advantageous in high-pressure competition domains. Previous studies have suggested more research on these performance-focused personality traits and their interaction with the environment in which athletes perform (Schinke et al.,2016).

As mentioned above, while the Big Five Model has gained significant attention in sport psychology research, it has limitations in terms of identifying performance-focused personality traits. Therefore, it is necessary to consider personality variables that have strong performance-focused theoretical bases, such as narcissism, alexithymia, perfectionism, optimism, trait anxiety, and mental toughness.

Personality is a significant factor in the success of athletes, as different sports require specific personality traits for optimal performance. While research has been conducted to identify

broad personality characteristics that distinguish athletes from non-athletes, the focus should shift towards identifying performance-focused personality traits that go beyond the Big Five personality traits, such as Alexithymia. In addition, recent studies on elite gymnasts and cricketers demonstrate the significance of exploring interactions between personality traits and performance-related outcomes, rather than solely examining main effects of personality on performance.

Furthermore, alongside identifying performance-specific personality traits, it is important to investigate the interplay between personality traits and the athletic environment. Therefore, review goes on to exploring the concept of alexithymia and its potential significance in regulating emotions within high-pressure competitive domains (Schinke et al.,2016).

Alexithymia and Its Potential Benefits

Alexithymia is a personality trait characterized by an inability to recognize and express emotions. While it is comorbid with poor mental health and emotion regulation, research suggests that competitive environments may be attractive to individuals with this trait as they provide a means for emotional regulation through the experience and control of anxiety. Therefore, athletes with alexithymia may derive emotional benefits from exposing themselves to high-pressure environments, leading to a relative sense of well-being (Schinke et al.,2016).

Mastery of anxiety in high-risk environments leads to a relative sense of well-being, which can be particularly beneficial for those with emotional control difficulties. Recent research supports this theoretical position, indicating that alexithymic athletes may derive emotional benefits from exposing themselves to high-pressure environments. The article suggests that

emotion regulation difficulties, typically a hindrance in interpersonal relationships, may be beneficial in a high-pressure competition setting (Schinke et al.,2016).

Alexithymia and gender

The impact of gender on the relationship between personality traits and athletic performance has been a topic of interest in previous research (Foskett and Longstaff). Therefore, the study will investigate the potential gender differences in the relationship with alexithymia.

Alexithymic traits in professional level athletes, non-athletes and amateur level athletes and former professional athletes

The study will explore the differences in athletic performance across various categories, including professional level athletes (PA), non-athletes and amateur level athletes (NA), and former professional athletes (FPA). By examining these categories, the study aims to provide a better understanding of the factors that contribute to high levels of athletic performance.

The reason for including non-athletes was to compare the differences that were already found between athletes and non-athletes in alexithymia. Previous studies shows that certain sports show an elevated level of alexithymia, but most of the sport domains contribute to a lower level of alexithymia in athletes compared to non-athletes. Including former athletes to the study would be beneficial to overcome the shortcoming of previous studies not including this

category, as it is important to note that formerly participating in certain sports should still have an effect on personality traits such as alexithymia.

This research will add to the existing literature on the relationship between personality traits and athletic performance by exploring a specific trait, alexithymia. By analyzing the relationship between this trait and athletic performance, this study aims to provide a better understanding of the factors that influence an athlete's performance in specific sports. The findings of this research could have significant implications for the development of effective training programs to enhance athletic performance.

Research questions

The present research had four research questions:

Question 1. Is there a difference between professional athletes and non-athletes in their TAS scores?

Question 2. Is there a difference between former professional athletes and non-athletes in their TAS scores?

Question 3. Is there a difference between all professional athletes and non-athletes in their TAS scores?

Question 4. Is there a significant difference between male and female population in their TAS scores?

Literature review

The Big Five Model

The Big Five personality model, as outlined in Carver and Scheier's book, has served as the core for my personality analysis. As the main model that was used to investigate personality differences in athletes and most of the literature was based on this model, it is important to mention the findings that made future research more specific. Through a comprehensive review of relevant literature, I will identify differences and similarities in personality traits across various sports.

While the Big Five personality model has been used extensively over the past few decades to explore the links between personality and athletic performance, the findings of such studies have been inconsistent and have not provided a clear definition of what constitutes "elite" athletes. Therefore, in the second part of this thesis introduction, I will discuss my decision to change the methodology used to investigate the connection between personality traits and athletic performance.

Advanced psychology studies nowadays suggest that the Big Five personality model was insufficient in providing a comprehensive understanding of my research topic (Roberts, R., & Woodman, T. 2016). While most studies still use this model in personality research related to athletic performance, some have highlighted the potential benefits of using more specific

tools to examine the relationship between personality traits and athletic performance. Therefore, I will discuss the limitations of the Big Five personality model in the context of sports performance.

Recent research suggests that the traditional approach of examining the main effects of broad personality traits, such as extraversion and conscientiousness, on athletic performance may have limited value (Roberts, R., & Woodman, T. 2016). Instead, researchers should focus on specific personality traits with a strong theoretical basis for performance orientation. As a result, this study aims to explore variables beyond the Big Five model to identify those that are highly related to athletic performance.

The Big Five personality traits have long been a focus of psychological research and are widely used in the field of sport psychology to understand the relationship between personality and athletic performance. The Big Five dimensions include Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, and provide a comprehensive framework for examining the complex nature of personality (Carver and Scheier, 2006).

Personality and performance: Beyond the big five

Numerous data collection methods have been employed over the years to evaluate the association between the Big Five traits and athletic performance. As studies started to be more and more specified in certain personality traits, researchers found that certain sport domains are differentiated in more detailed traits. Therefore, a more thorough model is crucial to investigate these specific differences (Schinke et al. 2016).

Batta Klára's (2002) thesis examined the developmental effects of gymnastics, focusing on the evaluation of personality traits among Hungarian gymnasts compared to control groups. The study utilized Eysenck personality questionnaires to assess these traits. The results indicated that gymnasts demonstrated higher levels of introversion and increased risk awareness, influencing their decision-making process by adopting a more cautious approach. These findings challenge the conventional understanding of "super" personality traits typically associated with athletic performance. Consequently, this thesis underscores the necessity for future research that takes into account the unique characteristics of specific sports and recognizes the nuances within different disciplines.

High-risk sport domains

Monasterio et al. (2012) investigated the distinctive personality traits of BASE jumpers, who engage in one of the world's most perilous and deadly extreme sports. The study utilized the Temperament and Character Inventory (TCI) to identify the primary personality features of this unique population, which was compared against a control group of non-jumpers. The study's key finding reveals that BASE jumpers exhibit an unprecedentedly low level of harm avoidance, a characteristic that has not been observed in any other population to date. Despite the inherent dangers of this sport, it attracts only the most committed and skilled athletes, making it difficult to distinguish between elite and average jumpers. Overall, this study provides a unique insight into the personality characteristics of a specific population within the extreme sports community. This study suggests that extreme sport athletes could be potential beneficiaries of alexithymic traits.

These studies also highlight the need for further research that is tailored to specific sports and populations. Batta Klára's study provides insight into the unique personality traits of gymnasts, while Monasterio et al.'s research sheds light on the characteristics of a specific subset of extreme athletes. By acknowledging the nuances of different disciplines and populations, researchers can gain a more comprehensive understanding of the role of personality traits in sports performance.

Rhea and Martin (2010) conducted a study to investigate the variations in personality traits among traditional sport athletes, bull riders, and other alternative sport athletes. The main objective of the study was to discern distinctive personality characteristics among these groups, utilizing Zuckerman's Sensation Seeking Scale and Cattell's 16 Personality Factor Inventory. The results of the study demonstrated notable disparities among the groups. Specifically, alternative sport athletes, including bull riders and wakeboarders, displayed higher levels of sensation-seeking behavior and exhibited traits of introversion and self-sufficiency. These findings support the notion that different sports necessitate tailored coaching and rehabilitation programs that account for the unique personality traits of athletes. The outcomes of this study emphasize the significance of considering individual differences in personality traits when designing coaching and training programs for athletes. This study suggest the potential benefits of alexithymia for athletes in extreme sport domains.

Woodman, Cazenave, and Le Scanff (2008) explored the possible emotion regulation function of high-risk activities, using skydiving as a forum for investigation. The authors noted recent studies suggesting that high-risk sport may serve as a means of emotion self-regulation rather than mere sensation seeking. Emotion regulation involves initiating, maintaining, and modulating internal feeling states and physiological processes related to emotions, with the

adaptive objective of preventing stressful levels of negative and positive emotions and maladaptive behavior, while promoting emotional openness, flexibility, responsibility, and self-reflection. Ineffective emotion regulation can have negative effects on both short-term and long-term well-being, resulting in a limited emotional experience and potential physical or mental health issues.

Castanier, Le Scanff, and Woodman (2011) emphasized the need for more research on socially accepted behaviors, specifically high-risk sports, where individuals willingly engage in activities with recognized and controlled danger. While considerable research has been conducted on disinhibition behaviors associated with socially unacceptable actions, less attention has been given to understanding such behaviors in socially accepted contexts. They highlighted that previous studies investigating individual differences and the inclination towards risk-taking have primarily focused on the context of sensation seeking. However, despite the popularity of sensation seeking theory, several concerns have been raised relating to its conceptual and empirical basis. For example, sensation seeking theory does not adequately account for the full range of motives mentioned by risk takers themselves for participating in high-risk activities. In their study, Castanier, Le Scanff, and Woodman (2011) conducted a study to examine the impact of mountaineering on the emotional state of climbers, as well as the role of self-regulation strategies in this process. The researchers hypothesized that participating in the high-risk sport of mountaineering would lead to a decrease in negative emotions and an increase in positive emotions, and that the effectiveness of this emotional regulation would be influenced by self-regulation strategies, specifically escape from self-awareness and compensation. Regression analyses were conducted to analyze the data, revealing a significant decrease in anxiety from before to after the mountain route. The self-regulation strategy of escape from awareness was found to significantly contribute to the decrease in anxiety.

However, no significant interaction was observed for the compensation strategy, and no effects were found for judokas.

According to Breivik (1995) and Llewellyn and Sanchez (2008), high-risk sports involve accepting the potential for serious injury or death as an inherent aspect of the activity. In this study, 105 mountaineers and 73 judokas completed the Risk and Excitement Inventory and the Positive and Negative Emotions Scale before and after their respective activities. The findings of the study highlight the unique nature of high-risk sports in facilitating emotional regulation for individuals who seek to escape from self-awareness.

Mental health and sports

The studies exploring the mental health aspects related to alexithymic traits that would showcase their deficits and benefits especially in high-risk sport domains, will next be analyzed more in detail.

Foskett and Longstaff (2018) investigated the prevalence of signs of anxiety/depression and distress among elite athletes in the UK, as well as to identify variables associated with these signs in the same sample. The study was conducted using a cross-sectional survey that was distributed to a sample of elite athletes in the UK. The results showed that 47.8% of the overall sample exhibited signs of anxiety/depression, and 26.8% showed signs of distress. A significant association was found between gender and signs of distress, with female athletes showing a higher likelihood of exhibiting signs of distress. Additionally, career dissatisfaction was found to be a significant predictor of signs of anxiety/depression and distress, indicating that screening elite athletes for career dissatisfaction may help with the early detection

of mental health issues. Overall, the findings of this study suggest that a significant proportion of elite athletes in the UK experience signs of anxiety/depression and distress, highlighting the need for further research to better understand the prevalence of mental health issues in this population. The study also underscores the importance of addressing career dissatisfaction among elite athletes to support their mental health and well-being. The study provides valuable insights that can inform efforts to improve the mental health of elite athletes in the United Kingdom.

Correia and Rosado (2019) conducted a study using structural equation modelling to examine the relationship between gender, type of sport, and athletes' sport anxiety. The sample comprised 601 Portuguese athletes. The results indicated significant differences in sport anxiety between male and female athletes, as well as between individual and team sports. Specifically, female athletes and those participating in individual sports reported higher levels of general sports anxiety. These findings provide evidence that the appraisal of anxiety varies among athletes based on their gender and the type of sport they engage in. In summary, the study emphasizes the importance of understanding the influence of gender and type of sport on athletes' anxiety. By recognizing these factors, researchers and practitioners in sport psychology can enhance their assessment and intervention approaches to better support athletes' mental well-being and performance.

Numerous studies have found a strong link between individual emotional processes and risk-taking behaviors (e.g., Panno, Donati, Chiesi, & Primi, 2015). One theory, proposed by Taylor and Hamilton (1997), suggests that individuals may engage in risky behaviors to manage their negative emotions by shifting their focus away from their negative situation. Castanier et al. (2010) conducted a study on high-risk sportsmen and found that negative affect predicted risk-taking behavior only in those who regulate their emotions by avoiding

self-awareness. These findings imply that individuals with alexithymia, who want to avoid unwanted thoughts and feelings, may be more prone to engaging in risky behaviors as a way to regulate their emotions.

Limited research has been conducted on the emotion regulation function that high-risk sports might present. Woodman et al. (2008) conducted a study in which they found that alexithymic women experienced a significant increase in anxiety before a skydive, followed by a significant decrease in anxiety afterward. This finding suggests that high-risk sports may serve as a means for alexithymic individuals to regulate their anxiety. The present study aimed to replicate this finding using a sample of both men and women, with the hypothesis that alexithymic skydivers would exhibit greater emotional fluctuations compared to non-alexithymic skydivers.

The study recruited 87 skydivers and assessed anxiety levels and heart rate data on four occasions throughout a single day, both before and after the skydive. The results indicated that alexithymic skydivers experienced significantly greater emotional fluctuations than their non-alexithymic counterparts. This finding suggests that high-risk sports may provide an environment that fulfils the emotion regulation needs of individuals with alexithymia.

It is important to acknowledge that alexithymic individuals may interpret their physiological arousal as anxiety, while non-alexithymic individuals may be less likely to associate physiological arousal with anxiety. Furthermore, although high-risk sports have often been examined within the context of sensation seeking, the observed anxiety regulation in this study extends beyond mere sensation seeking.

Several limitations of the study should be noted, such as the absence of control for anhedonia. Nonetheless, the findings suggest that high-risk sports may serve a beneficial function for individuals facing emotional difficulties (Woodman et al., 2009).

Palazzolo (2020) discusses the relationship between anxiety and performance in the context of sports. While positive emotions are usually considered beneficial to an athlete's performance, the link between negative emotions, especially competitive anxiety, and performance remains unclear. Some view anxiety as a hindrance to performance, while others view it as a driver for success, citing athletes who thrive under the pressure of competition. Despite significant efforts to understand the connection between anxiety, emotions, and performance, there is currently no single model that is universally accepted by the scientific community. Palazzolo highlights the challenge of interpreting research on this topic, given the inconsistencies in variables measured and study frameworks. The complexity of this issue underscores the importance of further investigation to better understand the impact of emotions, and in particular anxiety, on athletic performance. Taken together, these studies provide insight into the effective and psychological processes involved in high-risk sports, highlighting the potential benefits and costs of engaging in these activities. Future research could further examine the role of self-regulation and alexithymia in affect regulation and risk-taking behavior, as well as the complex relationship between anxiety and performance in sports.

Bonnet, Bréjard, and Pedinielli (2017) conducted a cross-sectional study to examine individual differences in risk-taking behaviors among scuba divers. The study aimed to investigate the influence of personality dimensions, consisting positive and negative affect and alexithymia, on two types of behavior connected with scuba diving - deliberate risk-taking and controlled participation in a high-risk sport.

A total of 131 participants were included in the study, and their levels of extraversion-neuroticism, affectivity, and alexithymia were assessed. The results revealed that personality dimensions and affectivity played a significant role in predicting risk-taking behaviors among scuba divers. Furthermore, alexithymia demonstrated differential effects on the two types of risk-taking behavior and was found to be significantly associated with short-term risk-taking behavior.

This study highlights the importance of considering personality traits and affective variables in understanding risk-taking behaviors in the context of scuba diving. The findings suggest that alexithymia, specifically, may have implications for the engagement in different types of risk-taking behaviors among scuba divers. Further research is warranted to explore the underlying mechanisms and potential interventions that could promote safer participation in this high-risk sport. (Bonnet, Bréjard, & Pedinielli, 2017).

Cazenave, Le Scanff, and Woodman (2007) conducted a study to explore the psychological profiles and emotional regulation characteristics of women participating in risk-taking sports. The research sample consisted of 180 women, divided into three groups: women participating in non-risk sports (N=90), women engaging in risk-taking sports for leisure (N=53), and women participating in risk-taking sports professionally (N=37). Five questionnaires were administered to each participant to assess sensation seeking, gender identity, impulsivity, risk-taking tendencies, and alexithymia.

The results of the study revealed significant differences in profiles between the groups. Group 2, characterized by an escape profile, masculine gender identity, and high scores on sensation seeking, impulsivity, and alexithymia, and Group 3, characterized by a compensation profile, androgynous gender identity, average scores on sensation seeking, and low scores on impulsivity and alexithymia.

These findings suggest that professional women engaged in risk-taking sports may serve as a model for preventing detrimental risk-taking behaviors. The study contributes to the understanding of the relationship between physical activity, sports involvement, and alexithymia.

Moreover, the studies reviewed in this literature review indicate that factors such as training intensity, exercise addiction, and participation in risk-taking sports may be associated with higher levels of alexithymia. It is suggested that psychological assessment and emotional regulation training could be beneficial for athletes involved in intense sports practice or risk-taking behaviors. These findings emphasize the necessity of addressing emotional regulation skills in athletes to promote their well-being and mitigate the potential negative consequences associated with intense sports involvement. (Cazenave, Le Scanff, & Woodman, 2007).

Alexithymia

Alexithymia is a psychological construct that is characterized by difficulty in identifying and describing one's own emotions. While research on alexithymia related to sport and exercise is limited, it has been broadly studied in high-risk sport contexts. Within the high-risk sport literature, alexithymia has been viewed as a potential underlying motive for engaging in such activities. Two studies conducted with skydivers have supported this idea by suggesting that individuals with alexithymia might be drawn to high-risk domains. In addition, researchers have found alexithymia to be a forecaster of risk-taking behavior within the high-risk sport domain. Moreover, studies have suggested that the benefits of emotion regulation that high-risk sport participation provides can transfer to everyday life, resulting in reduced anxiety and improved abilities to cope with close relationships. (Woodman, Le Scanff, & Luminet, 2020).

In a comprehensive literature review, Taylor (2020) examined recent advancements in alexithymia theory and research, specifically pertaining to its relevance in psychosomatic medicine. The review delved into empirical investigations focusing on the relationships between alexithymia and emotion regulation, somatic illness and disease, neural correlates, and therapeutic interventions.

The findings of various studies indicate that alexithymia signifies deficits in cognitive processing and the regulation of emotions. These findings are supported by evidence demonstrating the association between alexithymia and detrimental styles of emotion regulation, low emotional intelligence, and interhemispheric transfer deficits. Furthermore, preliminary data suggest that psychotherapeutic approaches that prioritize enhancing emotional awareness and integrating symbolic and sub-symbolic components of emotion schemas may prove effective in mitigating alexithymic characteristics.

Despite the observed link between alexithymia and somatic disorders, further research is needed to establish the directionality of causality. In summary, alexithymia serves as a valuable construct for investigating the interplay between personality, emotions, and the development of specific somatic illnesses and diseases within the field of psychosomatic medicine (Taylor, 2020).

The Toronto-Alexithymia-Scale (TAS) is utilized as a validated measurement of alexithymia. A study by Franz et al. used a representative German sample and by investigated the factorial structure of the TAS. Data were collected from a random sample of the German population. The TAS sum score was normally distributed. Divorce, single and low social status were connected with elevated sum scores. Ten percent of the participants exceeded the TAS score of ≥61, meaning they had certain alexithymia. The TAS sum score is connected with important socio-demographic variables (Franz et al., 2008).

A study conducted by Taylor and Parker aimed to evaluate the construct validity of the Toronto Alexithymia Scale (TAS). Previous research had provided initial evidence of the scale's reliability and factorial validity. This study examined the relationship between the TAS and measures of personality traits that were theoretically linked or unrelated to alexithymia. It also investigated the scale's concurrent validity by comparing it to an observer-rated measure of alexithymia. The findings supported the convergent and discriminant validity of the TAS, as it showed correlations with scales from the NEO Personality Inventory, psychological mindedness, and need-for-cognition that aligned with theoretical predictions. The concurrent validity was also established through positive correlations with observer-ratings of alexithymia in behavioral medicine out-patients (Bagby, Taylor & Parker, 1994).

The construct of alexithymia has been studied in both high-risk sport contexts and the general population. In high-risk sport settings, alexithymia has been linked to risk-taking behavior and a potential underlying motive for engaging in such activities. Studies have suggested that participation in high-risk sports can provide benefits for emotion regulation, which can transfer to everyday life. Meanwhile, the Toronto-Alexithymia-Scale (TAS) is widely used as a validated measurement of the presence of alexithymia. A recent study provided population-based standardization and cut-off values for the German TAS version using a representative German sample. The study found that important socio-demographic variables, such as divorce, single status, and low social status, were associated with high TAS scores, and that 10% of the population exceeded the TAS sum score threshold. These findings provide valuable insights for researchers interested in studying alexithymia in sport and exercise settings as well as in the general population (Woodman, Le Scanff, & Luminet, 2020; Franz et al., 2008).

Barlow et al. (2015) conducted a series of studies to investigate the role of alexithymia in high-risk sports, proposing that individuals who struggle with identifying and describing their emotions may be more drawn to engaging in activities that offer intense emotional experiences. The authors hypothesized that high-risk sports, which often elicit easily recognizable emotions like fear, may attract individuals with alexithymia. However, they also noted that the pursuit of intense emotions within this domain could lead to increased risk-taking behavior and a greater likelihood of accidents. In Study 1, a sample of 762 participants was utilized, revealing a positive association between alexithymia and both risk-taking behavior and the occurrence of accidents and close calls. To further examine this relationship, mediation models were employed. These subsequent studies confirmed the initial findings, with alexithymia demonstrating a significant predictive role even when controlling for sensation seeking and anhedonia. The authors emphasize the implications of their model in terms of accident prevention and reducing close calls within high-risk sports. By understanding the relationship between alexithymia and risk-taking behavior, interventions can be developed to address the emotional needs of individuals with alexithymia, promoting safer participation in high-risk activities.

A study from Amemiya and Sakairi (2019) explored the relations between mindfulness, alexithymia, burnout, and performance efficacy between athletes using a longitudinal survey design. The study consisted of 125 university athletes with a mean age of 19.84 years. Participants completed the Athlete Mindfulness Questionnaire, Sport Alexithymia Scale, Burnout Scale for University Athletes, and Psychological Performance Efficacy Scale at three time points separated by two-month periods. The results revealed that mindfulness was significantly and negatively correlated with burnout, both directly and indirectly via alexithymic tendencies. Additionally, mindfulness was found to be positively and directly associated with self-evaluation of performance and indirectly associated with performance as

evaluated by a teammate, through burnout. The study findings suggest that mindfulness can potentially enhance performance and decrease burnout in athletes. Therefore, incorporating mindfulness practices into athletic training programs may prove beneficial in promoting athlete well-being and performance efficacy.

These findings were in line with the research of Zekioglu, Çam, Mutlutürk, Berdeli, and Çolakoglu (2014) where they investigate the relationship between intense physical training, the catechol-O-methyltransferase (COMT) gene polymorphism, and alexithymia. The study included a sample of 18 female and 77 male athletes, who were assessed using the TAS questionnaire and the polymerase chain reaction method to determine levels of alexithymia and the COMT gene polymorphism, respectively. The findings revealed that 15.8% of the participants were identified as alexithymic based on the TAS scores, while 84.2% were classified as non-alexithymic. Among the alexithymic subjects, 60% engaged in intensive training, compared to only 6.7% who trained lightly. In contrast, among the non-alexithymic athletes, 46.3% reported intensive training, while 20% engaged in light training. However, the study concluded that there was no significant relationship between TAS scores, the COMT gene polymorphism, and training magnitude. Taken together, the results from this study, along with the previously reviewed studies, suggest that incorporating mindfulness practices and considering genetic factors may be important considerations in promoting athlete well-being and enhancing performance efficacy (Zekioglu et al., 2014).

Allegre, Souville, Noel-Jorand, Pellegrin, and Therme (2007) conducted a study to explore the relationship between the intensity of physical activity and alexithymia in the discourse of swimmers. The study involved two groups of male swimmers with different levels of training intensity: 10 expert amateurs who trained for 22 hours per week and competed at the national or international level, and 10 amateur swimmers who trained for 6 hours per week and competed at the regional level. The study found that all swimmers exhibited alexithymic verbal

behavior, with a greater lack of articulateness observed in the expert group compared to the amateur group. These findings suggest the need for psychological assessment of athletes engaging in intense sports practice.

While alexithymia is often connected with numerous pathologies and considered to be detrimental to performance, there is also considerable suspicion that it may confer a performance advantage. However, there is a lack of data quantifying this effect, and the studies we identified are too heterogeneous (using different scales to measure alexithymia and different sports) to support a causal relationship. Most of the studies we reviewed were observational, so we cannot draw any definitive conclusions. This review opens up a new avenue for research on alexithymia potentially promoting performance in sports (Proença Lopes et al., 2022).

Panno et al. (2018) utilized the Toronto Alexithymia Scale (TAS-20) to measure alexithymia. Building upon previous research, the hypothesis posited that individuals with higher levels of alexithymia would exhibit greater risk preferences compared to those with lower levels, with the Externally Oriented Thinking (EOT) facet playing a significant role in this association. It was also predicted that impulsivity and venturesomeness would moderate the relationship between alexithymia and risk preferences, given their established links to risk behavior. This study, conducted with 113 undergraduate students recruited from the University of Rome, aimed to investigate the relationship between alexithymia and risk preferences across different domains. The participants completed the TAS-20 and I7 questionnaires in the first session, and the Cognitive Appraisal of Risky Events (CARE) questionnaire in the second session, one month later. The results revealed a positive correlation between alexithymia and risk preferences, as well as between the EOT facet of alexithymia and risk preferences, even after accounting for impulsivity and venturesomeness. The CARE questionnaire demonstrated good reliability and validity for assessing risk preferences across diverse

domains. These findings suggest that individuals with higher levels of alexithymia may engage in risky behaviors, particularly if they employ maladaptive strategies to regulate their emotions.

These studies have investigated the association between alexithymia and risk preferences, social problem-solving skills, and athletic performance. Overall findings suggest that alexithymia may have implications for individuals' risk-taking behavior, social skills, and personality traits. Additionally, there is evidence indicating a relationship between sports involvement, specific sports, and the levels of alexithymia. These findings should be considered when examining the connection between alexithymia and sports participation, as well as when designing interventions and support programs for individuals engaged in intense sports practice or risk-taking behaviors.

Methods:

The study employed an online questionnaire that was accessible to individuals through a provided link. The questionnaire was available in both Hungarian and English versions.

In order to achieve the goal of this study, a sample of participants were recruited from various athletic levels and classified into three categories: professional athletes (PA), former professional athletes (FPA), and a combined category of non-athletes and amateur level athletes (NA). The questionnaire was available for anyone with a link. Most of the participants were from Hungary with no athletic background; therefore, the recruitment became more targeted to find active or former athletes to participate.

A total of 171 participants were recruited for the study, representing diverse backgrounds from 14 different countries. The majority of participants were from Hungary (n = 104) and Finland (n = 48). The sample included both athletes and non-athletes, with ages ranging from 17 to 77 years. Table 1 presents an overview of the participants' nationalities.

Table 1

Nationality of the participants in frequency and percentage

	Belgian	1	,6
	Czech	2	1,2
	Finnish	48	28,1
	French	2	1,2
	German	3	1,8
	Hungarian	104	60,8
	Indian	1	,6
	Italian	1	,6
	Northern Irish	1	,6
	Polish	1	,6
	Russian	1	,6
	Slovakian	2	1,2
	Turkish	1	,6
	Total	171	100,0
	Nationality	Frequency	Percent

Progress of the survey:

Following the introduction of the study's purpose and obtaining participants' agreement to take part, the first section consisted of an informed consent form. This form outlined the data storage and utilization procedures, language proficiency requirement (C2 level in the chosen language of the questionnaire), and minimum age requirement of 16 years for participation. Subsequently, the second section of the questionnaire comprised general inquiries aimed at determining the participant's gender, nationality, and athletic level. The third and final section of the questionnaire involved either the Hungarian or English version of the Toronto Alexithymia Scale (TAS).

The participants' difficulties in identifying and describing their feelings, as well as their inclination towards externally oriented thinking, will be assessed using the Toronto Alexithymia Scale. To ensure inclusivity and maximize participation, both the Hungarian and English versions of the scale were employed. It is noteworthy that the minimum age requirement for study participation is set at 16 years that was followed by the TAS guidelines.

Materials: The study employed the Toronto Alexithymia Scale (TAS) to assess the participants' capacity to recognize and articulate their emotions, as well as their inclination towards externally oriented thinking. The TAS was available in both Hungarian and English versions. This scale consists of 20 items, and the scores from three subscales, namely Difficulty Identifying Feelings (DIF), Difficulty Describing Feelings (DDF), and Externally Oriented Thinking (EOT), were subjected to analysis.

Regarding the Difficulty Identifying Feelings (DIF) subscale, participants were categorized based on their scores to assess their ability to recognize and differentiate emotions. Those who obtained a low score (≤ 12) demonstrated a relatively good proficiency in identifying and distinguishing emotions. Participants with a moderate score (13-16) exhibited some difficulty in recognizing emotions, although not to a severe extent. Conversely, individuals with a high score (≥ 17) indicated a significant challenge in identifying and differentiating their emotions.

The Difficulty Describing Feelings (DDF) subscale evaluated participants' ability to verbally articulate their emotions. Those who received a low score (≤ 8) displayed a commendable capacity to express and describe their emotions verbally. Participants with a moderate score (9-12) experienced some difficulty in verbally describing emotions, albeit not to a severe degree. In contrast, individuals with a high score (≥ 13) faced significant challenges in verbally expressing their emotions.

The Externally Oriented Thinking (EOT) subscale measured the degree to which participants focused on external events rather than their internal emotional experiences. Participants with a low score (≤ 16) indicated a greater emphasis on internal emotional experiences. Those scoring within the moderate range (17-20) demonstrated a balance between internal and external focus. Conversely, individuals with a high score (≥ 21) displayed a tendency to prioritize external events over their internal emotional experiences.

The total score, obtained by summing the scores of all 20 items on the Toronto Alexithymia Scale (TAS), provided an overall assessment of participants' levels of alexithymia. Participants with a low total score (≤ 51) demonstrated a relatively low overall level of alexithymia. Those scoring within the moderate range (52-60) suggested a moderate level of alexithymia,

while individuals with a high total score (≥ 61) indicated a significant overall difficulty in identifying and describing emotions.

It is important to acknowledge that these interpretations serve as general guidelines for understanding the TAS subscale and total scores. However, it is crucial to consider the influence of individual differences and contextual factors when interpreting the results. For a comprehensive analysis based on a specific situation, it is advisable to seek guidance from a qualified mental health professional.

Athletic level was classified into three distinct groups: casual, national, and non-athletes grouped together in one category (NA); international or professional level athletes constituted the second category (PA); and former international or professional level athletes formed the third category (FPA). The inclusion of former athletes in the grouping was intended to leverage their scale scores, as it was anticipated that they would still exhibit similar scores as current athletes due to their athletic background. However, a limitation of the grouping approach was observed in the grouping of national level or amateur athletes together with non-athletes. Further differentiation between these two groups could have provided more precise and distinct outcomes.

Data collection took place between January 10th and March 1st, 2023. Data analysis: The collected data were analyzed utilizing the Statistical Package for Social Sciences (SPSS). Independent t-tests and one-way ANOVAs were employed to compute the relevant statistical measures.

Ethical considerations: Ethical considerations were thoroughly addressed in the informed consent statement provided to participants. The consent statement outlined the study's purpose, procedures, and emphasized the confidentiality of the data. To uphold anonymity, no

personally identifiable information was disclosed in the study's findings. Confidentiality measures were implemented to safeguard participants and mitigate potential harm.

Reliability and translation of the survey

The present study utilized the Toronto Alexithymia Scale (TAS-20), which includes both the Hungarian and English versions that were obtained from credible online sources. The adequacy of the TAS-20 translation has been extensively examined across 18 different languages, and its psychometric properties have been evaluated through confirmatory factor analysis (CFA) in 19 countries. These rigorous analyses provide robust support for the generalizability of the scale's three-factor structure across diverse linguistic and cultural backgrounds. Additionally, the internal consistency reliability of the full-scale TAS-20 and its first two factors demonstrated satisfactory to good levels in most translated versions. However, it is important to acknowledge that in cultures where English is not the primary language, the third factor exhibited lower internal consistency reliability. This disparity could be attributed to cultural variations or response biases arising from the negatively worded items within this factor. In conclusion, the findings of this study affirm the appropriateness of utilizing the TAS-20 in cross-cultural research, thereby suggesting that alexithymia may be a universal trait that transcends cultural differences (Taylor et al., 2003).

Results

In the present study, independent sample t-tests and one-way ANOVAs were employed to examine potential differences in scores on the alexithymia scale across participants' gender and athlete category. The dependent variable in each analysis was treated as a continuous variable measured at the interval or ratio level, while the independent variable was categorical, consisting of either two or three groups. It should be noted that the samples utilized in this study were independent, ensuring that there was no relationship between subjects in each sample. Specifically, individuals in one group could not be part of another group, and no subject in either group could influence subjects in the other group. Any contravention of this assumption would lead to inaccurate p-values.

Research question 1. Is there a difference between international level athletes and non-athletes in their TAS score?

The present study sought to examine whether significant differences existed between professional international athletes and non-athletes in their scores on the alexithymia questionnaire. Specifically, six different categories were compared, including the presence of alexithymia (TAS score over 60), high TAS scores indicative of possible alexithymia (TAS score over 50 but under 60), the overall TAS total score (ranging from 0 to 100), as well as the three subscales within the TAS, difficulties identifying feelings, difficulties describing feelings, and externally oriented thinking.

To assess the hypothesis, a one-way ANOVA was conducted to compare the TAS scores between professional international athletes and non-athletes. The results revealed no significant differences ($p < 0.05$) between the two groups across any of the six categories. Based on

these findings, it was concluded that there was insufficient evidence to support the presence of differences in means between the professional international athlete and non-athlete groups.

Table 2

Descriptives statistics, the means and SDs of the 3 athletic level groups on each of the 6 sub-scales measured in TAS

		N	Mean	Std. Deviation
total score	Non-Athlete	126	48,27	13,721
	Former Athlete	21	42,86	13,994
	Current Athlete	24	46,17	9,689
	Total	171	47,31	13,323
1. diff identify	Non-Athlete	126	16,32	6,716
	Former Athlete	21	14,24	7,085
	Current Athlete	24	14,17	5,467
	Total	171	15,76	6,632
2. describing	Non-Athlete	126	12,30	4,537
	Former Athlete	21	10,29	4,463
	Current Athlete	24	12,21	3,741
	Total	171	12,04	4,450
3. externally-oriented	Non-Athlete	126	19,65	5,345
	Former Athlete	21	18,33	4,768
	Current Athlete	24	19,79	4,324
	Total	171	19,51	5,139
High_TAS	Non-Athlete	126	,4048	,49281
	Former Athlete	21	,2857	,46291

	Current Athlete	24	,3333	,48154
	Total	171	,3801	,48684
Certain_TAS	Non-Athlete	126	,1587	,36688
	Former Athlete	21	,0952	,30079
	Current Athlete	24	,1250	,33783
	Total	171	,1462	,35434

Research question 2. Is there a difference between FPA-s and NA-s in their TAS scores?

To assess the hypotheses, a one-way ANOVA was utilized to compare past professional international athletes with non-athletes on six different categories of alexithymia as measured by the TAS. These categories included having a certain level of alexithymia in their TAS score (over 60), having a high TAS score indicating possible alexithymia (over 50 but under 60), the difference in their total score in the TAS (ranging from 0 to 100), and three subscales within the TAS. The results indicated that there were no significant differences ($p<0.05$) between the means of the two groups on any of the six categories. Therefore, it can be concluded that there is not enough evidence to support a difference between the means of the two groups in terms of their alexithymia levels.

These findings suggest that there may not be a significant difference in the prevalence of alexithymia between past professional international athletes and non-athletes. However, further research is needed to confirm these results and to explore potential factors that may contribute to the development of alexithymia in athletes and non-athletes alike.

Table 3

Multiple Comparisons of the 3 athletic level groups of each of the 6 subscales measured in TAS

Tukey HSD

Dependent Variable	Athlete categories	Athlete categories	Mean Difference	Std. Error	Sig.
total score	Non-athlete	Former athlete	5,413	3,129	,197
		Current athlete	2,103	2,957	,757
	Former athlete	Non-athlete	-5,413	3,129	,197
		Current athlete	-3,310	3,967	,682
	Current athlete	Non-athlete	-2,103	2,957	,757
		Former athlete	3,310	3,967	,682
1. diff identify	Non-athlete	Former athlete	2,079	1,557	,377
		Current athlete	2,151	1,471	,312
	Former athlete	Non-athlete	-2,079	1,557	,377
		Current athlete	,071	1,974	,999
	Current athlete	Non-athlete	-2,151	1,471	,312
		Former athlete	-,071	1,974	,999
2. describing	Non-athlete	Former athlete	2,016	1,043	,133
		Current athlete	,093	,986	,995
	Former athlete	Non-athlete	-2,016	1,043	,133
		Current athlete	-1,923	1,323	,316

	Current athlete	Non-athlete	-,093	,986	,995
		Former athlete	1,923	1,323	,316
3. externally-oriented	Non-athlete	Former athlete	1,317	1,214	,524
		Current athlete	-,141	1,147	,992
	Former athlete	Non-athlete	-1,317	1,214	,524
		Current athlete	-1,458	1,539	,611
	Current athlete	Non-athlete	,141	1,147	,992
		Former athlete	1,458	1,539	,611
High_TAS	Non-athlete	Former athlete	,11905	,11498	,556
		Current athlete	,07143	,10864	,788
	Former athlete	Non-athlete	-,11905	,11498	,556
		Current athlete	-,04762	,14576	,943
	Current athlete	Non-athlete	-,07143	,10864	,788
		Former athlete	,04762	,14576	,943
Certain_TAS	Non-athlete	Former athlete	,06349	,08385	,730
		Current athlete	,03373	,07923	,905

Former athlete	Non-athlete	-,06349	,0838 5	,730
	Current athlete	-,02976	,1063 0	,958
Current athlete	Non-athlete	-,03373	,0792 3	,905
	Former athlete	,02976	,1063 0	,958

Research question 3. Is there a difference between all Athletes (AA) and non-athletes (NA) in their Toronto alexithymia scale?

In the third category, which included both former and current professional international athletes referred to as "all athlete", with non-athletes(NA) in six different categories based on their scores in the TAS. Specifically, analyses were employed whether there was a significant difference ($p < 0.05$) in the proportion of individuals who scored above 60 in the TAS, indicating the presence of certain alexithymia; whether there was a significant difference in the proportion of individuals who scored above 50 but below 60, indicating possible alexithymia; the difference in the total TAS score between the two groups; and three subscales within the TAS.

Upon conducting independent-samples t-tests for each of these six categories, there was a significant difference ($p < 0.05$) only in the subscale of difficulty identifying feelings, with AA-s scoring significantly lower than non-athletes. The one-sided p-value for this result was 0.030.

Based on these findings, I concluded that there is not enough evidence to support a significant difference between AA-s and NA-s in terms of the presence or absence of alexithymia, apart from the difficulty identifying feelings subscale. Further research is necessary to confirm and explore the implications of this result.

An independent-samples t-test was conducted to compare the difficulty identifying feelings within the TAS for all athletes and non-athletes. There were significant differences (t (169) = 1.852, p = 0.033) in the scores with mean score for non-athletes (M = 16.32, SD = 6.716) was higher than and all athletes (M = 14.20, SD =6.200). The magnitude of the differences in the means (mean difference = 2.117, 95% CI: -0.140to 4.375) was significant. Hence, H3 was supported.

Table 4

Descriptives statistics, the means and SDs of the athletes and non-athletes on each of the 6 subscales measured in TAS

	Athlete status	N	Mean	Std. Deviation	Std. Error Mean
High_TAS	NA	126	,4048	,49281	,04390
	AA	45	,3111	,46818	,06979
Certain_TAS	NA	126	,1587	,36688	,03268
	AA	45	,1111	,31782	,04738
total score	NA	126	48,27	13,721	1,222
	AA	45	44,62	11,869	1,769
1. diff identify	NA	126	16,32	6,716	,598
	AA	45	14,20	6,200	,924
2. describing	NA	126	12,30	4,537	,404
	AA	45	11,31	4,161	,620
3. externally-ori-	NA	126	19,65	5,345	,476
ented	AA	45	19,11	4,544	,677

Table 5

Independent Samples Test of Athletes and Non-Athletes on each of the 6 subscales measured in TAS

						One-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
		F	Sig.	t	Df					
High_TAS	Equal variances not assumed	6,41	,01	1,136	81,234	,130	,09365	,08245	-,07040	,25770
Certain_ TAS	Equal variances not assumed	2,57	,11	,827	88,769	,205	,04762	,05756	-,06675	,16199
total score	Equal variances not assumed	,71	,40	1,696	88,899	,047	3,648	2,151	-,626	7,921
1. diff identify	Equal variances not assumed	,72	,40	1,923	83,445	,029	2,117	1,101	-,072	4,307

2. descibing	Equal variances not assumed	,45	,50	1,338	83,970	,092	,990	,740	-,482	2,463
3. externally-oriented	Equal variances not assumed	,82	,37	,652	90,452	,258	,540	,828	-1,105	2,184

Research question 4: Is there a significant difference between the male and female populations in their Toronto Alexithymia Scale (TAS) scores?

To assess the hypotheses if there is a significant difference between male and female populations in their scores on the Toronto Alexithymia Scale (TAS) in all subscales, an independent-samples t-test was conducted to compare the TAS total scores between males and females. The results revealed significant differences ($t(169) = -2.753$, $p = 0.007$) in the scores, with males ($M = 50.35$, $SD = 13.325$) obtaining higher mean scores compared to females ($M = 44.82$, $SD = 12.862$). The magnitude of the mean differences (mean difference = -5.532, 95% CI: -9.498 to -1.565) was statistically significant, supporting the hypothesis.

Furthermore, for the presence of possible alexithymia (high TAS scores), an independent-samples t-test was conducted. Since the assumption of equal variances was violated ($p < 0.05$ in Levene's test), the Welch's t-test, which adjusts for unequal variances, was used. The results demonstrated significant differences ($t(169) = -2.455$, $p = 0.015$) between males ($M =$

0.4805, SD = 0.50290) and females (M = 0.2979, SD = 0.45978) in the scores. The magnitude of the mean differences (mean difference = -0.18265, 95% CI: -0.32958 to -0.03571) was statistically significant, supporting the hypothesis.

In summary, the findings indicate that there is a significant difference between males and females in their TAS scores. Males tend to have higher total TAS scores, and a higher likelihood of possible alexithymia compared to females. These results suggest potential gender-related differences in alexithymia levels, highlighting the need for further exploration in this area.

Within the subscales, differences between males and females were examined. It was found that there was no significant difference in difficulty identifying feelings. However, there were significant differences ($p < 0.05$) in difficulty describing feelings and externally oriented thinking.

An independent-samples t-test was conducted to compare the difficulty describing feelings subscale within the Toronto Alexithymia Scale (TAS) for males and females. The results revealed significant differences ($t(169) = -2.924$, $p = 0.004$) in the scores. Males (M = 13.12, SD = 4.559) had higher mean scores compared to females (M = 11.16, SD = 4.180). The magnitude of the mean differences (mean difference = -1.957, 95% CI: -3.279 to -0.636) was statistically significant, supporting the hypothesis.

Similarly, an independent-samples t-test was conducted to compare the externally oriented thinking subscale within the TAS between males and females. The results showed significant differences ($t(169) = -4.228$, $p < 0.001$) in the scores. Males (M = 21.26, SD = 4.964) had higher mean scores compared to females (M = 18.07, SD = 4.849). The magnitude of the

mean differences (mean difference = -3.185, 95% CI: -4.672 to -1.698) was statistically significant, supporting the hypothesis.

In summary, within the subscales of the TAS, it was found that there was no significant difference in difficulty identifying feelings between males and females. However, there were significant differences in difficulty describing feelings and externally oriented thinking, with males exhibiting higher mean scores compared to females. These findings suggest potential gender-related differences in specific aspects of alexithymia and highlight the need for further investigation.

Table 6

Descriptives statistics, the means and SDs of the males and females on each of the 6 subscales measured in TAS

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Certain_TAS	Female	94	,1064	,30998	,03197
	Male	77	,1948	,39865	,04543
High_TAS	Female	94	,2979	,45978	,04742
	Male	77	,4805	,50290	,05731
total score	Female	94	44,82	12,862	1,327
	Male	77	50,35	13,325	1,518
1. diff. identify	Female	94	15,59	6,549	,675
	Male	77	15,97	6,769	,771
2. diff. describing	Female	94	11,16	4,180	,431
	Male	77	13,12	4,559	,520
3. externally-oriented	Female	94	18,07	4,849	,500
thinking	Male	77	21,26	4,964	,566

Table 7

Independent Samples Test of the males and females on each of the 6 subscales measured in TAS

						Two-Sided				
		F	Sig.	t	df	p	Mean Difference	Std. Error Difference	Lower	Upper
Certain_TAS	Equal variances assumed	10,883	,001	-1,631	169	,105	-,08842	,05420	-,19542	,01857
High_TAS	Equal variances assumed	14,460	<,001	-2,477	169	,014	-,18265	,07372	-,32819	-,03711
total score	Equal variances assumed	,004	,953	-2,753	169	,007	-5,532	2,009	-9,498	-1,565
1. diff. identify	Equal variances assumed	,086	,770	-,381	169	,704	-,389	1,022	-2,406	1,629
2. diff. describing	Equal variances assumed	1,015	,315	-2,924	169	,004	-1,957	,669	-3,279	-,636

3. externally-oriented	Equal variances assumed	,020	,888	-4,228	169	<,001	-3,185	,753	-4,672	-1,698

Discussion

The present study aimed to investigate the potential differences in alexithymia scores between males and females, as well as past and current professional athletes compared to non-athletes. The findings revealed a statistically significant difference in total alexithymia scores between males and females, with males scoring higher on average. This aligns with previous research that has also reported higher levels of alexithymia among males (Correia and Rosado, 2019).

Contrary to previous research, our study did not find significant differences in most alexithymia scores between past and current professional athletes compared to non-athletes in the six subscales examined. These results could challenge the hypothesis that athletes, especially those involved in high-risk sports, may be more susceptible to alexithymia, but with further investigation our study only involved one athlete from an extreme sport background, who indeed scored significantly high on the TAS, therefore in line with previous studies (Monasterio et al. 2012, Rhea and Martin, 2010).

Overall, our study's results highlight the need for continued exploration of the factors contributing to alexithymia in athletes. The absence of a significant difference in alexithymia scores between professional athletes and non-athletes suggests that factors other than athletic involvement may play a significant role in the development and manifestation of alexithymia. Further investigations are warranted to better understand the interplay between sports participation, gender, and alexithymia, and to identify potential protective or risk factors associated with alexithymia in the athletic population.

The lack of significant differences found in our study may be attributed to the specific demographics of our sample. The participants in our study were diverse in terms of age and nationality, which could have influenced the results. Additionally, the inclusion of both past and current professional athletes in the same group may have masked any potential differences between these subgroups.

Despite these limitations, our findings suggest that there are gender differences in alexithymia scores among athletes, with males scoring higher on average in almost all subscales. These results are consistent with previous research that has also reported higher levels of alexithymia among males (Levant et al., 2009; Correia and Rosado, 2019).

Based on the findings of our study, it is worth noting that 11% of athletes in our sample exhibited certain alexithymic characteristics, while 20% of non-athletes showed similar tendencies. Although the difference between the two groups was not statistically significant, the disparity in prevalence rates raises interesting questions that require further investigation.

One possible explanation for the observed differences in alexithymia prevalence rates between athletes and non-athletes is the development of emotional regulation skills through athletic training. Engaging in sports and physical activities may provide athletes with opportunities to learn and practice strategies for managing and expressing their emotions effectively (Jones et al., 2018). By engaging in regular exercise and participating in team dynamics, athletes may develop better emotional processing and regulation abilities, which could contribute to lower rates of alexithymia.

Although no significant differences were observed between athletes and non-athletes, notable trends were identified in the data. Specifically, the overall mean scores of athletes were

slightly lower than those of non-athletes, indicating that athletes may possess better emotional regulation skills and lower levels of alexithymia compared to non-athletes. This finding aligns with previous research suggesting that physical activity and exercise can have a positive influence on emotional regulation and mental well-being (Foskett & Longstaff, 2018).

Understanding the relationship between specific sports and emotional regulation holds promise for enhancing athletes' psychological well-being. By tailoring interventions to the specific demands of various sports, athletes can be better supported in their emotional regulation processes, thereby optimizing their performance and overall mental health.

In summary, the results of this study provide evidence supporting the notion that engaging in sports participation is associated with positive effects on emotional regulation and may serve as a valuable approach for promoting mental health and well-being. These findings underscore the significance of further exploration by researchers, coaches, and practitioners into the potential advantages offered by sports and exercise in relation to mental health, specifically regarding alexithymia and other related mental health conditions. By continuing to investigate this area, valuable insights can be gained, leading to the development of targeted interventions and strategies to harness the potential benefits of sports participation for individuals experiencing emotional difficulties (Cazenave, Le Scanff, & Woodman, 2007).

Furthermore, the results indicated that athletes performed significantly better than non-athletes on the subscale assessing difficulty in describing feelings, providing further support for the idea that athletes may possess superior emotional management abilities compared to non-athletes. These findings hold particular relevance in light of the increasing interest in utilizing sports and exercise as a means of promoting mental health and overall well-being.

Although the sample size in our study was relatively small, it contributes to the existing literature on the association between sports participation and alexithymia. Nonetheless, future studies should consider investigating specific sports and focusing solely on professional athletes, as our findings suggest that variations in the prevalence of alexithymia may exist across different sports.

Moreover, in our study, it was notable that 2 out of the 3 professional basketball players scored high in alexithymia, while the third player exhibited possible alexithymia. This observation suggests that basketball may be a sport in which alexithymic characteristics are prevalent and may even have certain benefits. This finding indicates that specific sports, such as basketball, may require distinct emotional regulation strategies compared to other sports. These results highlight the importance of further investigating the impact of specific sports on emotional regulation and alexithymic traits.

Additionally, when examining the data for specific sports, it was noteworthy that a participant with a background in an extreme sport domain scored significantly high in all alexithymia subscales. This finding emphasizes the significance of investigating the effects of various types of sports on emotional regulation and alexithymia (Monasterio et al. 2012, Rhea and Martin, 2010).

Limitations to the study

It is important to note that the current study had some limitations. The sample size was relatively small, and the study design was cross-sectional. While the design was beneficial for

group comparisons, it limited the ability to establish causality or make definitive conclusions about the relationship between alexithymia and athletic status.

Another limitation of this study is the grouping of athletic levels, whereby national-level athletes were grouped together with non-athletes, potentially masking any differences in personality traits between these two groups. Additionally, due to the stringent criteria for inclusion in the international level group, a majority of participants fell into the non-athlete category, limiting the ability to detect differences in personality traits between athlete categories.

Furthermore, the limited number of PAs and FPAs suggested significant differences in athletes and their counterparts, but no significant results were found. In general, most sports correlated with lower TAS scores, but specific sports resulted in high TAS scores, evening out the median. Finally, the recent study found significant differences between male and female scores in the TAS, meaning if there was a significant difference between males and females in some of the athletic categories that would alternate the results.

Applicability of the research and recommendations for future research

Future studies would benefit from a larger and more diverse samples, utilizing longitudinal designs, that could provide further insights into complex relationships between athletic status and alexithymia. Researchers could benefit from more varied athlete level groups, as well as a larger sample size of international level athletes to improve the generalizability of findings. Further investigation is needed to uncover the underlying mechanisms through which physi-

cal activity and sports participation impact emotional regulation and mental health. Also, upcoming research can utilize remaining in specific sport domains, and research only specific sports, especially extreme sports and high-risk sports, to further prove their high or low level of TAS score tendencies of the athletes within. Finally, the recent study found significant differences between male and female scores in the TAS. This is crucial for upcoming research as the gender differences would jeopardize the results of the findings. Researchers should have an equal number of participants from the same gender in each subgroup they are researching, or solely focusing on one gender to overcome fluctuation in the results.

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Appendices:

Appendix A: SPSS file

https://drive.google.com/file/d/1G-Tim0D9SZYktqA8FKtxmmPyTAJxVRSB/view?usp=drive_link

Appendix B: Online questionnaire with informed consent and Hungarian and English TAS included

https://forms.gle/eAzF4wEvbX4SQga39