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Exploring the relationship between well-being and match playing time in elite U-17 footballers

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ABSTRACT

Aim: Our study aimed to investigate the relationship between playing time and well-being in Danish under-17 elite level football players.

Methods: Throughout the 2021/22 competitive playing season, the World Health Organization-5 index (WHO-5) was administered bi-weekly to assess well-being. Playing time was separately collected from an official database.

Statistics: A cross-lagged panel model with a multi-level set-up was applied.

Results: Average response rate was $67 \pm 14\%$ (mean $\pm$ SD) with a significant variation observed throughout the investigation period. Average prevalence of well-being levels below the WHO-5 cut-off values for depression and anxiety (≤ 13 points, with ≤ 7 indicating severe symptoms) was $10 \pm 12\%$. At least once during the season, 55.4% of all players had well-being levels indicating potential mental health concerns. Also, temporal patterns in well-being were observed, with more players having levels closer to the cut-off value during pre-season than towards the end of the season. Cross-lagged effects were found between measures of playing time and well-being on the day after a match (MD + 1). This indicates a relationship between match involvement and psychological well-being.

Summary and practical implications: Playing time seems to be associated with well-being in male youth elite football players. Frequent well-being monitoring and thoughtful playing time management in youth academy football may provide individualized player support throughout the playing season and proactively safeguard mental health.

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Soccer; youth football; sport psychology; performance indicators

Introduction

In elite-level football, the mental and emotional states of players play a crucial role in their performance and long-term development. This assertion is supported by evidence from sports psychology (Hanton et al. 2005; Birrer and Morgan 2010; Sarkar and Fletcher 2014). Recently, the unique demands of youth elite level football, including intense training regimens, frequent competitive match play and intensified travelling schedules was shown to influence mental stress and well-being (Ivarsson et al. 2015; Andersen TR, Kästner B, et al. 2023). As such, monitoring and safe-guarding holistic well-being of youth elite football players is of paramount concern.

Recognition of well-being as a multi-factorial construct encompassing psychological, emotional, and social dimensions has gained considerable attention within the sporting community (Ehnold et al. 2024). Well-being refers to the multifaceted state of optimal health and fulfilment encompassing both subjective and

objective dimensions (Ryff and Keyes 1995; Keyes 1998; Diener 2009). In football, well-being may involve positive mental and emotional experiences, a sense of purpose and engagement in football-related activities, constructive social relationships within the team, and the pursuit of excellence and mastery (Lundqvist and Sandin 2014). As such, well-being is not only characterized by physical fitness, health, and performance but also by positive psychological states, connection to the sport, and the ability to navigate the demands of elite competition, and maintenance of a high level of mental and emotional health (Madsen et al. 2021).

The need to measure well-being on a frequent basis throughout the competitive season emerges as a critical imperative (Ivarsson et al. 2015). Frequent assessment of well-being may enable coaches, sports psychologists, and support staff to gain valuable insights into evolving needs and experiences of youth footballers. By employing validated measurement tools, stakeholders may

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identify players at risk and proactively implement targeted interventions to safeguard general player welfare (Breslin et al. 2017). Moreover, regular monitoring may foster a culture of accountability and prioritizes the holistic development of football players beyond their athletic achievements (Madsen et al. 2021; Andersen TR, Kästner B, et al. 2023).

The theoretical framework aligns with the World Health Organization's 5-point well-being index (WHO-5), which assesses overall well-being based on positive mood, vitality, and general interest in daily activities (WHO 1998). The WHO-5 questionnaire thus serves as a valuable tool to quantitatively measure and monitor critical aspects of well-being, providing a holistic approach to youth elite level player monitoring.

Previously, well-being and the influence of significant others (the team, coaches, and parents) has been cross-sectionally studied in a group of male youth elite level football players from Northern Italy. The study found a combined influence on player well-being from significant others, in particular on player self-acceptance and the sense of having a purpose in life (Reverberi et al. 2020). Also, well-being has been examined and shown to be related to perceived talent development environment (TDE) in Swedish male youth elite level players (Ivarsson et al. 2015). In addition, a Danish study on 239 youth elite level players revealed that female as well as male players showed depression and anxiety symptoms higher prevalence than those of the general population in similar age-groups. The study also demonstrated that female and male youth elite players expressing medium to high levels of well-being also had low depression scores. Also, the study showed that the stress levels generally increased for youth players in their late teens. This was not the case for well-being emphasizing the dynamic state of mental health (Keyes 2002). Finally, a recent study conducted in under-19 female and male Danish national team players showed that well-being was decreased during international playing periods but not during domestic playing periods (Andersen TR, Kästner B, et al. 2023) illustrating the role of playing context on mental health. In summary, several studies have examined well-being and its relation to factors relevant to the elite football environment. However, the use of cross-sectional and case-study designs, low response rates and small samples sizes limits the previous findings. Also, the influence of well-being on a football player's ability to perform appears to be largely unexplored in youth elite level football although a relation may exist.

In addition to the importance of monitoring psychological well-being in elite youth football, it is equally important to consider how match involvement may

influence players' mental states. Playing time has been identified as a central factor in athletes' sporting experiences, with greater participation often linked to feelings of competence, relatedness, and recognition within the team environment. Conversely, reduced or inconsistent playing opportunities may contribute to frustration, lower motivation, and heightened emotional stress, particularly in developmental stages where athletes are striving for progression and selection. Previous research has shown that limited match exposure can negatively affect athletes' psychological well-being and emotional balance (e.g., Pelka et al. 2018; Eskandarifard et al. 2022). However, few studies have examined this relationship longitudinally within elite youth football. Integrating playing time into well-being monitoring may therefore provide critical insights into the holistic development and support needs of young players.

Thus, the aim of the present study was 1) to investigate individual and group-level fluctuations in well-being (WHO-5) during a full competitive playing season in male under-17 premier league players, and 2) explore how well-being and match playing time influence each other over time using a multi-level cross-lagged panel model.

Methods

Study design and experimental procedures

Ethical approval for this study was obtained from the Ethics Committee of Southern Denmark (Identifier: 20,212,000–89). Written informed consent was obtained from all participants and their legal guardians.

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

The study protocol aimed to explore changes to physical and psychological performances as well as player injury patterns during a full competitive season in male youth elite football players. All participants provided written informed consent to participate in the study, with the informed consent form being signed by a parent/legal guardian prior to enrollment and before completing any study procedures. The study protocol was reviewed and approved by the local ethic committee (Ethic Committee of Southern Denmark, Identifier: 20,212,000–89).

Players for the study were identified through initial outreach to the administrative offices of all clubs participating in the Danish male under-17 premier league. The inclusion criteria specified that participants must be male youth elite football players listed on the first-team roster for an under-17 squad competing in

the Danish under-17 premier league during the 2021/22 season. Exclusion criteria included declining to participate in the study or an unwillingness to comply with the protocol procedures throughout the study period.

Throughout the playing season, the WHO-5 questionnaire was individually completed bi-weekly (i.e., once every two weeks) on a day following an official league match (MD + 1) except during the non-competitive mid-season break and during designated UEFA national team camp breaks. During the mid-season break, the WHO-5 protocol was completed monthly by all players. During UEFA breaks, the WHO-protocol was not completed. In total, the WHO-5 protocol was completed 19 times throughout the study period. SurveyXact (Ramboll 2021) was used to distribute and collect the completed questionnaires. In case of a player failing to comply, a dedicated employee at each of the participating clubs was contacted to provide a response reminder to the non-responding player.

Participants

Thirteen out of 14 Danish male under-17 premier league clubs accepted to participate in study procedures related to psychological performance evaluation. Of a total of 325 eligible players, 300 chose to participate in the study. Seventy-four players left the study during the season due to various reasons (e.g., changing club, promotion to the U19 team squad, substantial injuries, and poor response rate) as previously reported (Andersen TR, Drevesfeldt A, et al. 2023). Data from these players were retained up until the point of withdrawal but were not included in subsequent analyses after they left the study. The mean age of the players was 15.9 yrs ($SD = 0.6$; Range: 15–17 yrs).

Measurements

The World Health Organization-5 index (WHO-5)

The World Health Organization-5 index (WHO-5) (WHO 1998) was used to evaluate players well-being. On a Likert-scale ranging from 0 (at no time) to 5 (all the time), players were asked to think about the last 2 weeks and answer 5 questions (e.g., 'I have felt cheerful and in good spirits' and 'I have felt active and vigorous'). A total score was calculated by the sum of the five answers and multiplying the raw score by 4 (min 0 to max 100) with higher scores indicating good well-being ($\alpha = .95$). Based on the total score, participants were categorized into different well-being levels. The WHO-5 has previously shown adequate levels of internal consistency in a sport context ($\alpha's \geq .70$) (Belz et al. 2018).

In the present study, the WHO-5 was chosen because it provides a brief, validated, and reliable assessment of general well-being. Although originally developed for use in clinical and public health settings, the WHO-5 has increasingly been applied in non-clinical populations, including youth and athlete groups. Recent reviews highlight that well-being is a critical outcome in elite youth athletes, but that sport-specific measurement tools remain limited (Gwyther et al. 2024). Within this context, the WHO-5 offers a standardized and sensitive index of positive mood, vitality, and general interest that complements athlete-specific monitoring tools. Its brevity also makes it suitable for repeated large-scale data collection, thereby allowing the capture of fluctuations in well-being across the season in a feasible manner.

In this study, the following cut-off values were used to determine the presence of anxiety and depression (Topp et al. 2015):

Depression cut-off values

A total score of 13 or less was used as the cut-off level indicating possible low mental health (i.e., depression) (Topp et al. 2015). This cut-off value is consistent with previous research suggesting that a score below 13 may indicate poor well-being and a need for further evaluation for depression. Additionally, a score of 7 or less was considered to indicate severe depression, necessitating immediate attention.

Anxiety cut-off values

While the WHO-5 was originally developed as a screening tool for reduced well-being and depression, low scores have also been associated with broader mental health concerns, including anxiety symptoms, due to overlapping impacts on subjective well-being (Topp et al. 2015). In this study, a total score of 13 or less was therefore applied as a general cut-off to indicate potential risk for depression or anxiety, with a score of 7 or less reflecting severe risk. It should be emphasized that the WHO-5 does not distinguish between depression- and anxiety-specific symptomatology, but rather signals reduced well-being that may warrant further assessment. These thresholds were applied in line with recommendations from general and clinical populations to ensure comparability with prior research, although some studies in athlete samples have applied lower thresholds (Belz et al. 2018).

Playing time

Match involvement in the Danish under-17 premier league during the 2021/22 competitive season was evaluated with data obtained from the Wyscout platform. The

Wyscout platform is recognized for its detailed and accurate data, making it a reliable source for comprehensive match statistics and player performance metrics. Seasonal playing time granted in conjunction to the specific games in which well-being measures were obtained were included for subsequent analysis. The total season data included the cumulative playing time for each player, while the specific game data detailed the minutes played in individual matches. All raw and processed well-being and playing time data are provided in Supplementary Material 1 (Excel file).

Statistics

All data analyses and statistical modelling were conducted using SPSS Statistics 27 (Ramboll 2021) and Mplus version 8.10 (MPlus statistical Software version 2017). Cronbach's alpha was used to test internal consistency reliability of WHO-5 and data were checked for normality and outliers. Each measure of the WHO-5 was classified into 'at risk' or 'not at risk' based on the suggested cut-of (WHO 1998). Response rate was for each time point calculated as the number of respondents relative to the total number of included players expressed in percentage. Similarly, incidence prevalence was expressed as the number of players reporting WHO-values below the suggested cut-of relative to the number of respondents. To investigate the relationship

between well-being and playing time, a cross-lagged panel model with a multi-level set-up was applied. In the model the following parameters were, on within-person level, specified; (a) cross-sectional associations, (b) autoregressive effects within constructs over time, and (c) cross-lagged effects between the two variables over time, including the pathways from playing time to subsequent well-being and from well-being at MD + 1 to playing time in the following match. Markov Chain Monte Carlo simulation procedures with a Gibbs sampler was used. All models were estimated using 100,000 iterations (50,000 are used as burn-in by default in Mplus). We considered a potential scale reduction (PSR) factor around one was considered as evidence of convergence (Muthén and Asparouhov 2012). We calculated a 95% credibility interval (CI) for all parameters and the null hypothesis was rejected if the 95% CI did not include zero. All numbers are presented as mean with standard deviation (SD) unless otherwise stated.

Results

The questionnaire was distributed to a total of 329 players with 300 completing the questionnaires during the investigation period. The average response rate was $67 \pm 14\%$ (range: 25.6% – 79.9%) with the lowest response rate observed towards the end of the study period (Figure 1).

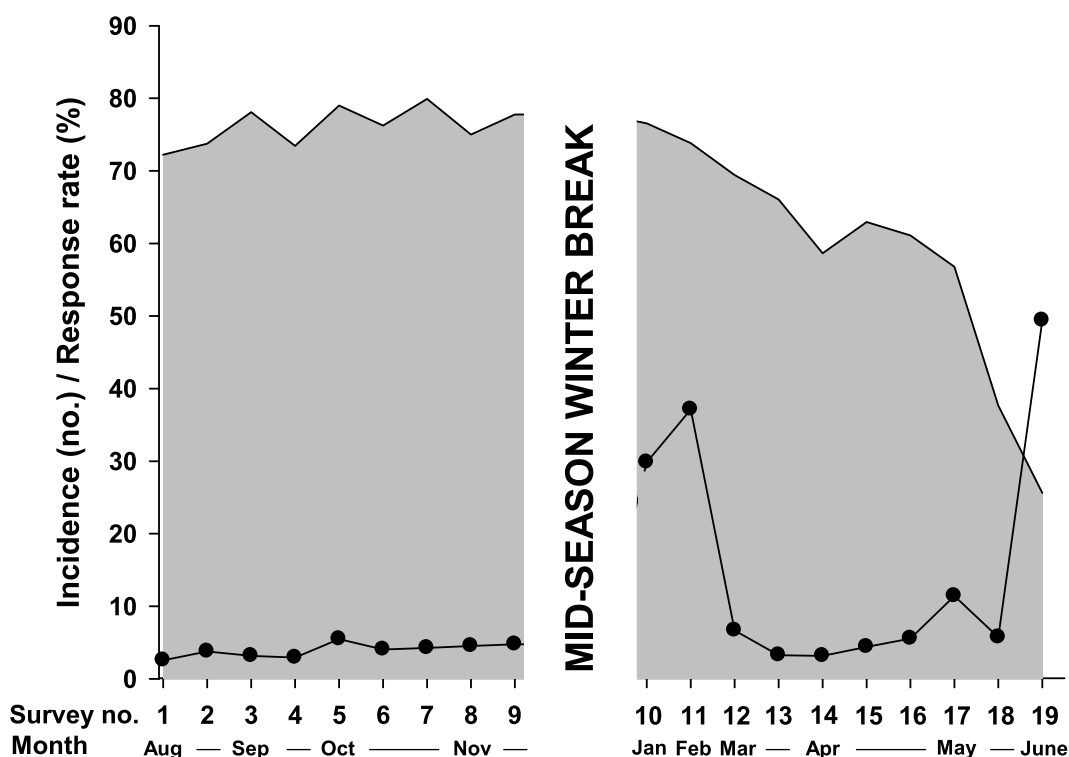


Figure 1. Seasonal variation in well-being incidence and response rate among Danish under-17 elite football players.

The average below cut-off prevalence was $10 \pm 12\%$ (range: 2.6% – 49.4%). Throughout the investigation period, 55.4% of all players had on at least one occasion a WHO-score below the cut-off value. Also, 103 players (31.8%) had below cut-off well-being scores (50 out of 100) more than once, and 3.4% of the players had a WHO-score below the cut-off value on four or more occasions. Towards the beginning and the end of the second half of the playing season an increased number of players reported WHO-scores closer to or below the depression and anxiety cut-off.

Cross-lagged panel model analysis showed credible autoregressive effects for both well-being ($\beta = .28$, 95% CI = [.24, .32]) and match involvement ($\beta = .32$, 95% CI = [.29, .35]). The results showed a credible cross-sectional relationship ($r = .21$, 95% CI = [.18, .24]) between seasonal playing time and overall well-being (Figure 2). In addition, isolated match involvement had a positive cross-lagged association with overall player well-being ($\beta = .10$, 95% CI = [.07, .13]). Also, playing time during a single match had a credible cross-lagged effect on well-being estimated at MD + 1 ($\beta = .07$, 95% CI = [.04, .10]). In contrast, the reverse temporal pathway was not significant, as well-being at MD + 1 did not predict playing time in the subsequent match (95% CI included zero).

Discussion

Our study investigated seasonal patterns of reduced well-being among Danish male U17 elite football players and the temporal associations between well-being and match playing time. The findings provide novel insights into how well-being fluctuates across a competitive season and highlight important considerations for safeguarding player health and development in youth football environments.

In terms of the temporal associations, we found that greater playing time was associated with higher well-being, both across the season and at MD + 1 following a match. However, the reverse pathway was not supported, as well-being at MD + 1 did not significantly predict playing time in the subsequent match. These associations, while statistically credible, were small in magnitude, suggesting that although match involvement appears to influence players' well-being, short-term fluctuations in well-being did not determine selection or match exposure in the following week.

Another important finding was the high prevalence of reduced well-being across the season. More than half of the players (55.4%) reported a WHO-5 score below the cut-off for possible depression or anxiety at least once, and 3.4% reported such scores on four or more occasions. This indicates that a substantial proportion of elite youth players may be at risk of compromised mental health during a playing season. Our findings align with

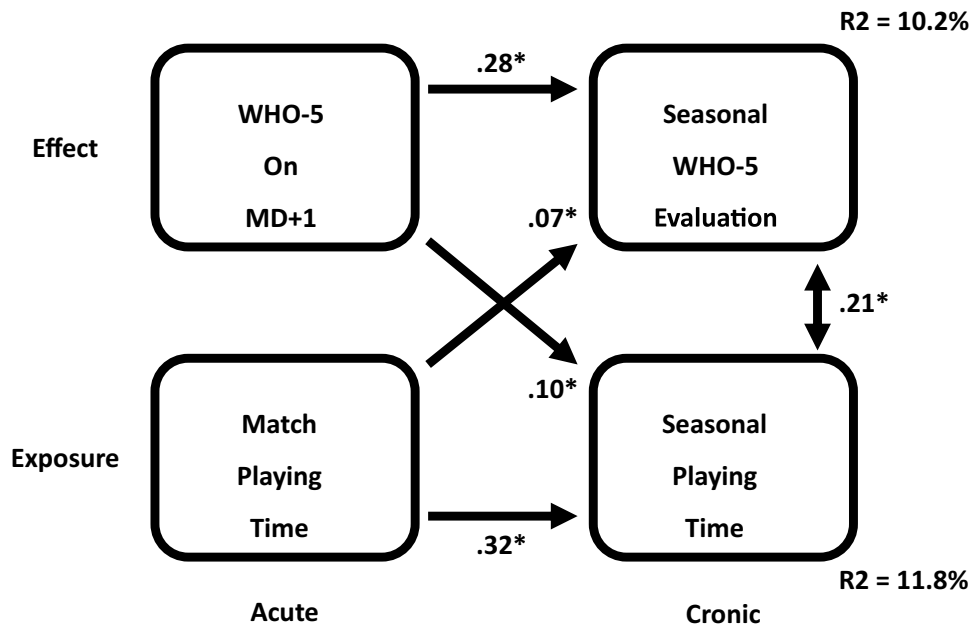


Figure 2. Cross-lagged panel model estimation using players well-being levels (over a full competitive season and on the day after a match (MD+1)) and playing time in male under-17 premier league players.

previous research showing a high prevalence of reduced mental health in elite athletes (Rice et al. 2016) and underscore the need for systematic monitoring and early support strategies.

Furthermore, our study identified significant relationships between playing time and player well-being. Hence, players who had more playing time exhibited higher levels of well-being. This highlights the importance of sporting success and active participation in major events (i.e., match play) on perceived mental health in youth elite footballers. Conversely, players with fewer playing minutes are reported to be affected on an emotional level, experiencing higher emotional stress and reduced balance compared with their playing counterparts (Eskandarifard et al. 2022; Pelka et al. 2018). Our results suggest that playing time and player well-being are related over the course of a season. This was evidenced by the influence of MD + 1 playing time on overall well-being, as well as the association between MD + 1 well-being scores and seasonal playing time. Although these effects were small to moderate in size, they highlight the interconnectedness of competitive opportunities and psychological well-being, emphasizing the importance of holistic player development strategies that address both performance and mental health (Altarriba-Bartes et al. 2020).

In general, sport activities have been shown to improve well-being (Strahler et al. 2021). However, various sport-specific factors that contribute to the mental health of youth athletes may become more prominent in elite contexts. In this study, crossed-lagged panel model analysis revealed that groups of players with different match exposure and well-being profiles may be produced during the time course of a playing season. As such, frequently non-selected players may be at greater risk of experiencing reduced mental health. Talent development environment (TDE) perception appears to be an important factor. Specifically, high quality TDE – characterized by supportive coaching, positive team culture, and effective development structures – has been shown to be related to higher levels of well-being, whereas, in contrast, low quality TDE – which may lack these positive attributes, appears related to lower well-being in Swedish youth level football (Ivarsson et al. 2015). Hence, football clubs need to carefully consider their ability to succeed in creating successful talent development environments with effective well-being strategies that encompass considerations of several factors including preconditions (e.g., human, material, and financial), daily routines and processes (e.g., training, school, games), and the player's individual development (Ryom et al. 2020).

Overall, our study underscores the importance of considering player well-being in youth football environments and emphasizes the potential role of playing time as a modifiable factor in promoting positive mental health outcomes. Future research should explore additional determinants of player well-being and investigate interventions aimed at optimizing mental health support within youth football programs. By prioritizing the holistic development of young athletes, stakeholders may create nurturing environments conducive to both athletic success and personal well-being. However, it is noteworthy that the relationship between playing time estimated at MD + 1 and well-being at MD + 1 was not significant, suggesting that immediate post-match well-being may not be directly influenced by the amount of playing time. This discrepancy warrants further investigation into the specific factors contributing to player well-being in the immediate aftermath of matches.

Strength and limitation

Several strength and limitations apply to our study. Firstly, to the best of our knowledge, this study is the first to present larger scale longitudinal data on mental health in male youth elite football players. As such, this investigation was part of a comprehensive study protocol which provides an important addition to the general understanding of seasonal well-being fluctuation within an elite context. This may assist future decision-making processes of talent development program practitioners. Secondly, the response rate remained satisfactory throughout the study period (mean: $67 \pm 14\%$; range: 25.6% – 79.9%) suggesting a consistent level of engagement from the participants. This is comparable to other studies on adult elite female (Madsen et al. 2020) and male (Madsen et al. 2021) players using similar designs. Data collection reliability is crucial for ensuring the validity and generalizability of our findings, and it should be noted, that the response rate was reduced towards the end of the investigation period. However, a limitation relates to participant attrition: 74 players ($\approx 25\%$ of the initial cohort) left the study during the season. Data from these players were included up to the point of withdrawal; however, the progressive loss of participants – together with lower response rates toward the end of the study may have reduced the representativeness of late-season measurements and may have contributed to the observed seasonal trends. Attrition is a common challenge in longitudinal research on elite youth athletes and should be considered when interpreting the generalizability and temporal patterning of our findings.

The study relied on elite youth players' self-reports using the SurveyXact-platform. This method may lead to

limitations due to inherent biases, such as social desirability and introspective ability (Madsen et al. 2021; Yıldırım and Güler 2022). Similarly, the use of gatekeepers to assist data collection may limit the findings of our study. In some clubs, the gatekeepers were club-based specialists (e.g., sports psychologists or physical trainers), while others were university student interns. Diverse data collection may impact data validity as the social desirability might be worse in clubs using club-employed specialists to assist the data collection (Fisher 1993). However importantly, gatekeepers did not have access to any data at any time during the data collection period, which was communicated to the players before but also frequently during the study period.

A key limitation of this study is the use of the WHO-5 as the sole measure of well-being. Although validated in clinical and general populations and shown to be reliable in youth and athlete groups (Belz et al. 2018), its application in sport-specific contexts remains less established. Reviews of elite youth athletes highlight a lack of consensus on suitable tools, with few designed specifically for sport (Gwyther et al. 2024). While the WHO-5 offered a practical and sensitive means of monitoring seasonal fluctuations, it may not fully capture sport-related stressors or performance emotions. In addition, the cut-off values applied were derived from general and clinical populations, which may not fully capture the unique stressors or response tendencies of elite youth athletes. Moreover, the WHO-5 does not differentiate between depression and anxiety, meaning that low scores reflect a general risk of reduced well-being rather than a disorder-specific profile. Evidence from athlete populations suggests that lower thresholds may be more appropriate (Belz et al. 2018), underscoring the need for sport-specific validation and, ideally, the combination of WHO-5 with athlete-focused instruments to achieve a more comprehensive assessment of mental health in this context. This limitation is particularly relevant when interpreting prevalence estimates in the present study, as applying population-general thresholds may either over- or underestimate the proportion of athletes truly at risk.

The Wyscout-platform was used to collect playing minutes in our study. Within the Wyscout-platform, some of the participating players had more than one data profile. In these cases, the Danish FA's website was used to cross-reference official league and international match data, respectively. Data from non-competitive matches was collected via gatekeepers or club contacts.

The authors acknowledge that using playing minutes as the sole measure of success may provide an overly simplistic representation of a player's competitive engagement and development. While match participation in elite

football is often considered a proxy measure of player value football (Sarmiento et al. 2018), it does not capture other performance-related and psychological factors that may contribute to fluctuations in well-being. Playing time alone does not account for contextual aspects such as positional differences, tactical roles, training load, or off-field stressors, all of which may influence a player's psychological state. Additionally, match participation does not reflect subjective experiences such as role satisfaction, perceived fairness, or psychological resilience, which could play a significant role in mental well-being. Future studies should consider integrating additional performance and psychological indicators (e.g., resilience, fear of failure, anxiety, mental stress) to obtain a more nuanced understanding of the relationship between well-being and competitive participation. Finally, our study was conducted in a single male under-17 youth league in a Nordic country. Therefore, our findings may not apply to other genders, age-groups or football cultures.

Practical implications

Based our results, several practical implications may apply to youth football development programs in the Nordic countries.

Screening and support for mental health

A considerable proportion of players reported well-being scores below the WHO-5 cut-off, suggesting potential risk for depression or anxiety. Regular mental health screening protocols may therefore be valuable within youth football programs, alongside training for coaches and staff to recognize early warning signs and provide appropriate support or referral to mental health professionals.

Seasonal well-being monitoring

The fluctuation in players' well-being scores across different periods of the season highlights the importance of ongoing monitoring throughout the year. Programs should consider implementing systematic assessments of players' mental well-being at various intervals, such as pre-season, mid-season, and post-season, to identify trends and intervene early if needed.

Managing playing time

Although the associations between playing time and well-being were small to moderate, they suggest that thoughtful playing time management may support player well-being. Coaches might consider balancing

developmental goals with attention to players' psychological and physical health by rotating squads, ensuring rest, and providing meaningful opportunities for participation.

Individualized player support

Recognizing the impact of playing time on players' well-being, clubs should adopt a personalized approach to player management. This includes considering factors such as each player's physical condition, psychological resilience, and personal circumstances when making decisions about playing time allocation.

Continued research and evaluation

Finally, ongoing evaluation remains essential to strengthen evidence-based practices. By monitoring well-being, assessing interventions, and integrating emerging research, programs can refine approaches to better support the holistic development of young athletes.

By cautiously integrating these implications, youth football development programs in the Nordic countries may take proactive steps to safeguard the mental well-being of players and promote their overall growth and success both on and off the field.

Summary

Our study found that a substantial proportion of male youth elite football players reported WHO-5 scores below the clinical cut-off for depression or anxiety at least once during a full competitive season. A smaller subgroup (3.4%) reported low well-being scores repeatedly. The occurrence of reduced well-being varied across the season, with increased prevalence during periods such as off-season preparation and the final stages of the season. Furthermore, the study identified temporal associations between playing time and player well-being, indicating that match involvement and psychological health evolve in tandem over time. These findings underscore the need for youth football programs to systematically monitor player well-being, evaluate the impact of support strategies, and tailor their approaches to foster both mental health and athletic development.

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Author contributions

CRediT: **Esben Elholm Madsen:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Andreas Ivarsson:** Data curation, Formal analysis, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, Writing – review & editing; **Thomas Rostgaard Andersen:** Conceptualization, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing.

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Data and code availability statement

All statistical analyses were based on the dataset and syntax provided in the publicly available Zenodo repository: <https://doi.org/10.5281/zenodo.15622019>: This includes the anonymized WHO-5 scores, playing time data, and full model specifications used for replication.

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