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The effects of training conditions on athletes' mental health throughout the COVID-19 pandemic: Psychometric validation of the Persian athlete psychological strain questionnaire

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Abstract

This study focuses on examining how different training conditions impact the mental well-being of athletes during the COVID-19 pandemic. It also aims to validate the Athlete Psychological Strain Questionnaire (APSQ) in the context of Iranian society. This descriptive survey was conducted on a population consisting of Iranian male and female sportspersons (16 to 40 years old), of whom 300 sportspersons were selected as the sample using snowball sampling. The tools used in this study were the APSQ, Kessler-10 Scale, and Ryff Mental Well-Being Scale, which were used online. SPSS 23 and AMOS 22 were used for data analysis. Confirmatory factor analysis (CFA) was utilized to assess the validity of the questionnaire, while the reliability of the questionnaire was examined through the application of Cronbach's alpha coefficient. Furthermore, Pearson's correlation test was employed to assess the concurrent validity of the questionnaire. Furthermore, discriminant analysis and ROC curve were utilized for examining the discriminant validity and cut-off point.

Findings: Results indicate that sportspersons who had stopped playing sports during the COVID-19 pandemic suffered more psychological strain than those who continued playing sports during this period. The number of training sessions per week and the duration of each training session exhibited a significant inverse relationship with psychological strain. However, concern about progress and athletic burnout had a significant positive association with psychological strain. Furthermore, the validity and reliability of the APSQ were proved among Iranian athletes.

Conclusion: The mental well-being of athletes is correlated with the extent of their training. The psychometric validation of the APSQ was confirmed in Iranian athletes. Therefore, researchers can use this scale to examine and detect early psychological strain and the psychological

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consequences of COVID-19 among these athletes. Early detection of psychological problems by this instrument may aid in improving athletes' mental health.

Introduction

Facing the modern world of sports is an important mental challenge for athletes. Emotional stability is very important and necessary for athletes. For a successful sports life, sportspersons must focus on clear-cut, specific, and planned goals. They come across opportunities to assess themselves and their opponents in sports competitions. The absence of these opportunities in athletes' lives increases their psychological problems, deprives them of self-confidence, and affects their professional commitment and personal health [1,2]. In general, athletes require psychosocial and emotional stability and strengthening them in competitive experiences, such as management of successes, flexibility, and acceptance of failures [3]. These people are exposed to various stressful factors, psychological strain, and psychological disorders such as poor performance, perfectionism, competition for choice, adverse life events, and general (non-sports) factors [4]. As a general stressful factor in athletes, unexpected coexistence with the unknown COVID-19 has posed physical, psychological, and economic consequences. In addition, it has caused highly traumatic situations that can lead to a risky future for them [5]. The WHO's recommendations resulted in the cancellation and postponement of many sporting events for social distancing. Most countries adopted quarantine measures to prevent the outbreak and recurrence of this disease [6]. These efforts disrupted people's daily lives, prevented sportspersons from training in an appropriate environment, and led to negative impacts at cognitive, behavioral, and emotional levels. The sports world was severely affected during the COVID-19 pandemic when sportspersons could not train and participate in competitions [7]. Recent studies conducted on the effects of quarantine measures implemented during the COVID-19 pandemic have shed light on the numerous adverse consequences experienced by athletes [8,9]. Indeed, according to some studies, mental health challenges are experienced by sportspersons just like the general population, which is why they are not safe [9—11]. Moreover, a literature review shows that exercise creates a protective impact, thus preventing mental disorders. For instance, a study comparing general health in female sportspersons and non-sportspersons [12] revealed that sportspersons are different from non-sportspersons in severe depression and anxiety and have more resilience. Şenışık et al. also found that sportspersons exhibited superior mental well-being compared to individuals who do not engage in sports activities amidst the COVID-19 pandemic. Considering the belief that sports prevent mental disorders, there seems to be no agreement about the presence of mental problems among sportspersons [13]. Nevertheless, present studies comparing mental health between elite sportspersons and the general population have shown that athletes' mental problems are often undetected as they hide these problems from their coaches and teammates owing to mental toughness. Besides, sportspersons suffering from these problems may not inform their teammates or coach so that they may not lose their position and be deprived of competing with their opponents [9,11]. In general, it can be stated that although quarantine and other confinements derived from the COVID-19 pandemic are new historical phenomena, such problems are similar to sports injuries that sportspersons face at different stages. These injuries have consequences and challenges for them, including suspension or restriction of sports activities, loss of independence, change in the sports environment, suspension or limitation of unrelated sports activities, loss of opportunity to enhance individual and collective sports records, and individual and social changes (e.g., early retirement due to alterations in the tournament schedule). In addition, it may cause larger problems like drug abuse, depression, social isolation, anxiety, suicide, low self-esteem, and sleep disorder [14—17]. In this respect, a literature review shows extensive research on the effect of COVID-19 on the mental problems of athletes. For example, a comprehensive analysis of prior research has determined that the implementation of quarantine measures can have detrimental psychological consequences, such as the development of post-traumatic stress symptoms, heightened levels of anger, confusion, and an increased propensity for violent behavior [18]. Another study also showed that quarantine directly correlates with drug use [19]. In their recent study, Bertrand et al. [20] examined the impact of the COVID-19 pandemic on the exercise routines, dietary patterns, and physical fitness of Masters cyclists. The findings indicated that there was an increase in sedentary behavior during the worldwide spread of the COVID-19 pandemic. No statistically significant disparities were observed in the duration of training, physical fitness, or dietary habits over a period of three months. In a recent study conducted by Mon-López et al. [21], it was discovered that the period of isolation due to the COVID-19 pandemic had a detrimental effect on individuals' exercise habits, resulting in a decrease in both the volume and intensity of physical activity. Additionally, the study revealed that the isolation period also had a negative impact on sleep quality. Graupensperger et al. [22] examined the impact of athletic identity, teammate interactions, and mental health among student-sportspersons in the context of the COVID-19 pandemic. The study revealed that student sportspersons who had strong social connections and support from their teammates during this challenging period were more likely to preserve their athletic individuality and experience improved mental well-being. These findings underscore the significance of social communication with peers and the role of identity in navigating the unique circumstances brought about by the COVID-19 pandemic. Pillay et al. [10] reported that COVID-19 had nutritional, physical, and psychological results and a negative impact on athletes' safety and general health. A literature review also shows

that a sudden interruption in the training program made most sportspersons set new goals during the coming seasons. For sportspersons at the end of their competitive period, this interruption means an early and sudden closure in their field, which increases hostile feelings during quarantine [23]. Sportspersons may not have trained for a long time due to quarantine, which may make them worried that it will harm their athletic performance and skills [24]. In addition, since the training conditions were not the same as normal conditions, some sportspersons trained at home alone with no supervision [25]. Several individuals underwent training in camps located away from their residences, where they were subjected to enforced isolation, excessive leisure time, and a lack of clear objectives [26]. Other sportspersons were probably exposed to levels of non-training and inappropriate training stimuli [27]. However, different people may exhibit different psychological reactions to this situation. Some may be able to have effective coping mechanisms, while others may exhibit a more pessimistic reaction to it. Uroh and Adewunmi [27] found that the athletes' age does not predict psychological distress and the duration of participation (years) in sports. Nevertheless, the category of sports participation and athletic identity could predict the psychological distress level to a definite extent. Sportspersons participating in separate sports experienced more psychological distress than in team sports. This result is confirmed by other studies, reporting that the nature of individual sports makes the sportspersons of such sports more susceptible to mental distress compared to team sports sportspersons [28,29]. Furthermore, individuals who possess a stronger sense of athletic identity tend to exhibit lower levels of psychological distress compared to those with a weaker athletic identity [27]. The results of other studies also indicated that non-professional and professional sportspersons have the same signs of psychological distress [4]. In addition, there are certain risk indicators that are applicable to both the general population and athletes, such as negative life events, which can result in similar levels of psychological distress [8,29].

In general, the cancellation of sports competitions worldwide, the closure of sports venues and spaces, the lack of special facilities for training, the lack of accompaniment of teammates and guidance from coaches, the decrease in desire, and the increase in stressful conditions had negative effects on athletes' level of training. Consequently, these factors lead to many qualitative damages for sportspersons and the world of sports [30]. This condition can destroy athletes' daily lives and physical and mental. Therefore, it is imperative to thoroughly examine and diagnose any potential psychological issues in order to mitigate the decline of their mental well-being. Therefore, the mental health and well-being of elite sportspersons should be comprehended. In this regard, the increased interest and greater need to understand the mental and psychological complexities of sportspersons have resulted in the validation and experimental development of specific questionnaires for athletes. These instruments are appropriate for assessing the manifestations of mental health in the surrounding context and facilitating the timely identification of mental health conditions. Therefore, preventing and intervening in the mental disorders of sportspersons seem essential in these conditions. However, there are limited reliable and valid screening tools to recognize the early indicators of athletes' mental problems and potential signs of their mental health. An example of a specific questionnaire for sportspersons is the APSQ. According to Rice et al. [31,32], APSQ is a reliable screening tool for predicting athletes' psychological strain. Based on the mentioned points, the literature and evidence show that the outbreak of COVID-19 can affect athletes' activity levels and training, change their lifestyle, and alter their psychological characteristics [31].

Accordingly, The objective of this study was to examine the psychological stress and training intensity experienced by athletes during the COVID-19 pandemic, as well as to validate the Persian version of the APSQ among Iranian athletes. It was hypothesized that sportspersons who continue to exercise in COVID-19 conditions would display lower levels of athlete psychological strain with higher training load similarly associated with lower athlete psychological strain. In addition, sportspersons who were more concerned about progress and burnout were expected to report higher levels of athlete psychological strain (to ensure that different sports at the individual and team levels are equally divided into two groups, the sample was homogenized in the two groups and 61 samples were placed in each group).

Materials and methods

Participants

The present work was performed on 317 sportspersons utilizing a web-based survey. In this respect, using 300 or more cases is recommended by some academics. The factor analysis results are influenced by the particular sample from which the data is collected. Therefore, the size of the sample plays a crucial role in evaluating the correlations. Increasing the number of observations enhances the obtained correlations' reliability. For the majority of factor analytic objectives, a sample size of 50 do not provide adequate reliability of the association coefficient. On the other hand, considering sample sizes higher than 1000 is satisfactory. The adequacy of sample size could be assessed as follows: $1000 \leq$, excellent; 500, very good; 300, good; 50, 200, fair; 100, poor; and $100 >$, very poor [33]. The sample's mean age was 27.48 years. The inclusion criteria were the age of higher than 16 years and fluency in Persian. All participants submitted written informed consent.

Measurement instruments

The APSQ is a concise self-administered survey designed for use within the realm of elite sports. It contains ten items (e.g., 'I found myself preoccupied with persistent concerns regarding my subpar performance over the course of the previous four weeks') scored on a 5-point scale from 'never' (=1) to 'always' (=5). The total score was derived by adding the responses to the 10 items, resulting in a range of 10 to 50. The high scores represented higher psychological distress. More recently, A two-step approach was employed in the initial step of emerging the original version of APSQ [34]. The study sample consisted of 1007 currently active Australian male athletes who are competing at an elite level in professional sports (SD = 4.16; M = 23.67). Various tests of

differential item functioning were performed along with CFA and exploratory factor analysis (EFA), with the samples assigned randomly into validation (n = 510) and calibration (n = 497) samples. A second order was validated using EFA and a three-factor model. The calibration sample was subjected to parallel analysis to support this finding. Self-Regulation, External Coping domains, and Performance were the subscales with 50.44 % of the total scale variance. In the second-order model, the path coefficient from the upper factor, specifically referred to as "Athlete psychological strain", to each factor was found to be equal to or greater than 0.8. CFA revealed the superior goodness-of-fit (GOF) of the model. Among the Australian male athletes, the mean score for the 10 items was 14.67 (SD = 5.47).

Two bilingual researchers translated APSQ into Persian. Two other bilingual investigators then confirmed the translation. The questionnaire's cultural adaptation and backward and forward translation were based on a suggested method [35,36]. Initially, two proficient Persian translators, who are native speakers of the language, undertook the task of translating the English version of the APSQ (including the original items, instructions, and response options) into Persian. These translators possess expertise in the field of research being conducted. Afterward, the translators deliberated their translations to change any untranslatable concept or word and create a comparable rendition of the original version easy-to-comprehend and conceptually semantic. Finally, they agreed on a single version [37]. The APSQ was then translated backward by an individual proficient in both the English and Persian languages, with English being their native tongue. The researchers who originally developed the APSQ compared the original version and the backward-translated questionnaire to correct any inaccuracies or misunderstandings.

The translated questionnaire was employed to assess the acceptability, comprehensibility, understandability, difficulty, and clarity of the questionnaire items, options, and instructions among a selected group of respondents. In this context, the cognitive interviews conducted in person involved a proficient Persian speaker who provided feedback to the participants in order to address any potential confusion or errors in translation [35,36]. The participants in the study were also asked to evaluate the level of comprehension for each item using a numerical rating scale (within the range of 10=very difficult to comprehend to 0 = very easy to comprehend). In conclusion, the participants conveyed their understanding of each item by expressing their interpretations of the questionnaire items. The questionnaire contains three parts, including self-regulation, performance, and external coping. For example, socialiazation with teammates, difficulties for doing desired things, and so on are some questions included regarding the self-regulation. Subsequently, each item was reiterated to validate the respondents' perceptions. The questionnaire's content validity was then assessed by ten experts in the field qualitatively and quantitatively.

One of the most extensively utilized measures of global psychological distress is the Kessler-10 (K-10) offered by [38]. In the current study, the utilization of the aforementioned measure was employed to assess the degree of convergent validity in relation to the APSQ. In this study, the distress levels of the participants over the course of the

previous four weeks were assessed and categorized based on their scores. The responses provided by the participants to the various items were used to determine these distress levels (i.e., "Around how often did you feel despairing?") are made on a 5-point scale (i.e., "Never" = 1 to "Always" = 5). Epidemiological samples were used to develop and validate K-10. This tool is suggested as a suitable screening instrument or simple outcome measure to assess treatment improvement for usual mental disorders like depression and anxiety [39]. The K-10 represents strong psychometric features [40] across different populations [41] and cultures [42].

The Ryff Mental Well-Being Scale (RMWBS) [43] is an 18-item self-report scale that evaluates favorable elements associated with mental well-being (i.e., "I like most parts of my personality"). The RMWBS was utilized in the present work to evaluate divergent validity with the APSQ. Participants were asked to provide responses on a 7-point scale, which were based on their experiences over the past two weeks (i.e., "Strongly agree" = 1 to "Strongly disagree" = 7). The psychometric features of the RMWBS were supported by population-level studies as a measure of mental well-being.

The demographic and training questionnaire included age, gender, city of residence, education rate, marital status, sexual orientation, occupational status (along with sports), sports history, type of sport, the highest level of competition, athletic level, continuing training during COVID-19 conditions, training days per week, minutes of training per day [21], worrying about athletic progress during the global outbreak of the COVID-19 pandemic and suffering from sports burnout amidst the COVID-19 pandemic.

Procedure

After explaining the method and objective of the research to the participants and ensuring the anonymity and confidentiality of their participation, all participants signed the informed consent online. Next, the participants were asked to complete some online self-report questionnaires. The Ethics Committee of Islamic Azad University (IR.IAU.KHUISF. REC.1400.334) approved the study.

Data analysis

The samples were characterized using descriptive statistics. First, the validity of the factor structure of the questionnaire was investigated via CFA utilizing AMOS22 (Armonk, NY, USA). The factorial validity was assessed using parsimonious comparative fit index (PCFI), normed chi-square (CMIN / DF) Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), comparative fit index (CFI), and root mean square error of approximation (RMSEA). Regarding the cut-off values of TLI and CFI, the adequate fit is represented by an index value of more than 0.90. The goodness-of-fit (GOF) is expressed by an index value of over 0.95 [44]. For SRMR and RMSEA, a cut-off value smaller than 0.06 and 0.08 represents a good and adequate fit, respectively. Taking into account the predetermined values for PCFI cut-off values, the adequate fit is represented by an index value of over 0.50, while the cut-off values of the normed chi-square value of less than 5 show a suitable match .

Divergent validity and convergent validity were determined using the There are significant correlations between the RSPWB and certain patterns (divergent validity showed by significant negative associations) and K-10 (significant positive associations demonstrate convergent validity). The reliability was assessed via composite reliability (CR) and Cronbach's alpha coefficient. Satisfactory reliability was represented by the values of ≥ 0.70 for CR and α [34]. The APSQ's ability to accurately identify higher psychological distress, as measured by the K-10, was determined by analyzing the receiver operator characteristic (ROC) curve. This analysis took into account both the specificity and sensitivity of the APSQ.. The specificity and sensitivity of the APSQ total score were identified through some ROC curve analyses to discriminate severity levels on the K-10. Finally, reporting high distress by athletes using the APSQ correctly was assessed using the area under the curve (AUC) value.

Results

Participants included 317 sportspersons who completed questionnaires, of whom 144 (45.4%) were female. The average age of the sample was 27.48 with a standard deviation of 8.27 years (see Table 1).

Confirmatory factor analysis

Data revealed a satisfactory fit to the 3-factor model (Figure 1): χ^2 (32) = 74.08, TLI = 0.924, CFI = 0.946, RMSEA = 0.065, 90% CI (0.045 and 0.084), PCFI = 0.673, CMIN/DF=2.31, and SRMR = 0.057.

Convergent validity, divergent validity, and reliability

The convergent validity was demonstrated by three domains of the APSQ with K-10 scores and divergent validity with RSPWB scores (Table 2). Table 3 shows the internal reliability, descriptive statistics, and correlations among studied variables. The reliability of the 3 factors was generally

adequate (CR = 0.72−0.95; α = 0.70−0.79). As anticipated, the zero-order factor correlations between APSQ and dimensions with K-10 were positive (r = 0.36−.67), and correlations between APSQ and dimensions with RSPWB were negative (r = −0.19 to −0.54)

Zero-order correlations between APSQ dimensions with the K-10 were negative and significant. Associations between APSQ and its dimensions with well-being were negative and significant.

Specificity and sensitivity

Considering ROC curve analysis, the full sample was used (N = 317). The diagnostic odds ratio of the three different cut-off points showed that the highest APSQ cut-off point was more effective in distinguishing cases compared to the moderate or high cut-off points. The moderate and high cut-off points had lower levels of specificity and sensitivity. The results of Bootstrap validated the AUC values (Table 3).

As shown in Table 4, most of the sample (N = 256, 80.8%) continued their training amidst the global outbreak of the COVID-19 virus. Here, the mean period of exercise per week was 3.4 days and 77.85 min. The mean level of concern for athletic development amidst the global outbreak of the COVID-19 virus was 2.89 and the mean of sports burnout was 2.68.

Our findings supported this hypothesis (Table 5). Sportspersons not continuing to exercise during the amidst the global outbreak of the COVID-19 virus reported higher psychological strain than exercising athletes. The relationship between the frequency of training days per week and the duration of training per day with psychological strain was found to be significant and inversely related. The correlation between worry about athletic progress and athletic burnout is also positive and significant with psychological strain.

Discussion

The objective of this study was to investigate how different training conditions during the COVID-19 pandemic impact the mental well-being of athletes. Additionally, the researchers aimed to validate the APSQ (Athlete Psychological Strain Questionnaire) in Iranian athletes. Results revealed that athletes, owing to non-continuing training during the COVID-19 pandemic, underwent greater psychological stress than those who had training during this period. Also, sportspersons with longer training periods were less concerned about their progress and athletic burnout and experienced less psychological strain amidst the COVID-19 pandemic.

The more frequently athletes trained each week and the longer they trained each day, the lower their psychological strain was. In other words, an increase in their training during the day and week reduced their psychological strain level during the COVID-19 pandemic. There is consistency between these findings and those of studies by Loprinzi [34], Hamer et al. [45], and Campbell and Turner [46]. The authors demonstrated that engaging in regular physical activity is linked to a reduced likelihood of developing mental disorders, while also enhancing safety and preserving moral stability . These results align with the research

Table 1	The characteristics of the participants.			
	f	%	M	S
Gender				
Male	173	54.6	−	−
Female	144	45.4	−	−
Number of sports disciplines	25	−	−	−
Experience				
1−5 years	86	27.1	−	−
5−10 years	70	22.1	−	−
More than 10 years	161	50.8	−	−
Competitive level				
Club	164	51.7	−	−
National	118	37.2	−	−
International	35	11	−	−
Type of sport				
Team-based sport	167	52.7	−	−
Individual sport	150	47.3	−	−
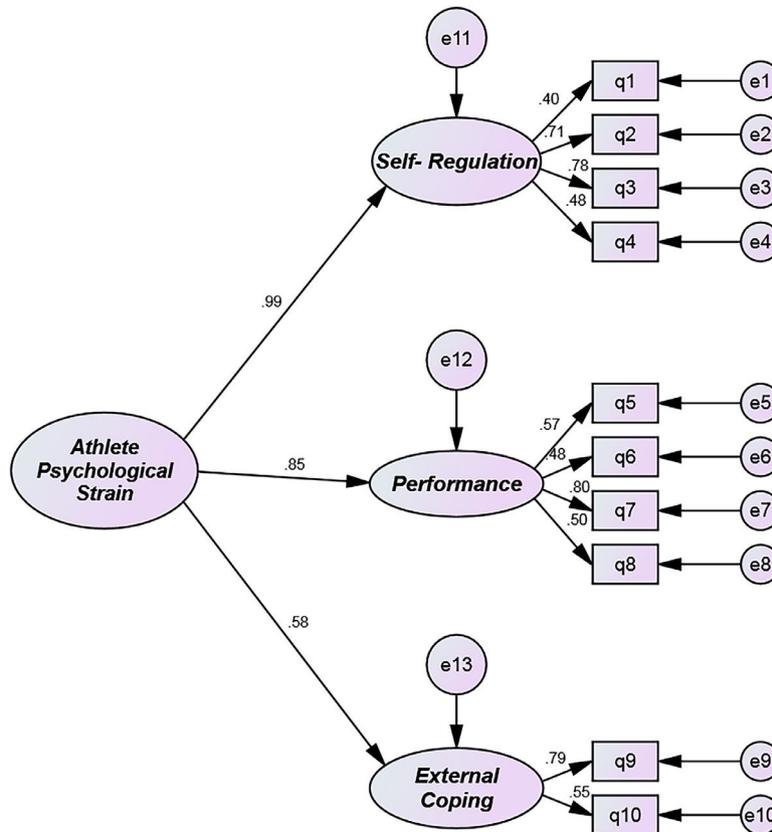
Fig. 1 The hierarchical structure ASPQ, Confirmatory factor analysis (CFA) with standardized coefficients.

Table 2 The descriptive statistics, correlations, and reliability within the examined variables (*n* = 317).

	CR	α	M(SD)	1-self-Regulation	2-Performance	3-External Coping	4-ASPQ-total	5-k-10
1-self-Regulation	0.72	0.71	8.33(2.94)	—				
2-Performance	0.83	0.72	8.51(3.27)	0.64**	—			
3-External Coping	0.81	0.70	3.02(1.35)	0.21**	0.19**	—		
4-ASPQ-total	0.84	0.79	19.87(6.07)	0.87**	0.89**	0.42**	—	
5-k-10	0.95	0.88	21.23(8.5)	0.59**	0.57**	0.36**	0.67**	—
6- RSPWB	0.80	0.74	95.72(13.1)	−0.33**	−0.32**	−0.19**	−0.37**	−0.54**

** $p < .01$, *: $p < .05$. CR: composite reliability, M: Mean, SD: Std. Deviation, α: Cronbach's alpha coefficient.

conducted by Mon-López et al. [21,47], which suggests that the COVID-19 quarantine period impacts both training intensity and the recovery process. Besides, in line with our study, other studies have shown that those who do not have regular training with high volume and repetition exhibit fewer

symptoms of depression and anxiety [48]. There is ample evidence indicating that individuals who were unable to maintain their regular exercise regimen during the COVID-19 pandemic experienced heightened psychological stress. Moreover, those spending more time doing moderate-to-

Table 3 ASPQ ROC curve and cut-point values.

ASPQ cut-off	ASPQ positive (% distribution)	Sensitivity%	Specificity%	Likelihood Ratio	AUC (95 % CI)	BC AUC (95 % CI)	Youden's Index	K-10 category
≥15 Moderate	N = 221 (upper = 69)	84.6	60.4	2.14	0.783***	0.877***	0.83	Moderate
≥17 High	N = 190 (upper = 59)	80.5	66.1	2.37	0.788***	0.875***	0.84	High
≥20 Very high	N = 136 (upper = 42)	96.6	85.5	6.66	0.783***	0.872***	0.86	Very high

*** $p < .001$.
AUC: area under curve; APSQ: Athlete Psychological Strain Questionnaire; K-10: Kessler 10; BC: Bias corrected.

Table 4 Descriptive findings on the concern level about progress in sports exercise and sports burnout during the COVID-19 Pandemic.

	Mean	SD
Amidst the global outbreak of the COVID-19 virus, how often did you exercise on average?	3.4	2.002
During the COVID-19 condition, On average, how many minutes a day did you train per day?	77.85	49.14
How worried are you about your athletic progress during the COVID-19 epidemic?	2.89	1.36
How much do you think you suffered from sports burnout during the COVID-19 epidemic?	2.68	1.36

Table 5 Comparison of athletes' psychological strain in two groups and correlation between psychological strain and number of training days per week, minutes of training per day exercise concern and burnout.

	Independence Sample T-Test				Correlations			
	Have you continued to exercise during COVID-19 conditions		T	Effect size (d)	Number of training days per week	Minutes of training per day	Concerns about sports progress	Sports burnout
	Yes Mean (Sd)	No Mean (Sd)						
N	61	61			317	317	317	317
1-self-Regulation	5.16(0.95)	9.26(0.84)	9.11**	0.64	−0.353**	−0.242**	0.235**	0.349**
2-Performance	4.95(0.90)	9.09(0.78)	8.33**	0.61	−0.384**	−0.236**	0.33**	0.362**
3-External Coping	2.23(0.49)	3.26(0.73)	5.06**	0.42	−0.327**	−0.209**	0.228**	0.29**
4-ASPQ-total	12.34(1.45)	21.62(1.68)	10.41**	0.69	−0.42**	−0.224**	0.254**	0.429**

$*p < p < .05.$
$**\ p < .01.$
$***p < .001.$ Mean differences determined by tests and degree of freedom were 120 for independent samples.

vigorous training showed fewer symptoms of depression and anxiety [48]. Overall, reviewing the literature shows that performing physical activities and staying committed to sports can help reduce anxiety and psychological strain [49]. The reason behind this outcome is the calming effects of physical activity and exercise on both biological and psychological processes associated with physical activities. Regular exercise is a decent treatment for health and reduction of psychological strain. This may lead to a direct decrease in negative emotions, impact the maintenance of the immune system, and promote overall improvement in mental well-being. Engaging in sufficient physical activity can lower levels of stress hormones and potentially enhance unfavorable conditions and mental and physical disturbances [50]. Endorphin, secreted because of physical activity to improve mood, serves as a natural pain reliever and decreases the stress hormones level such as cortisol and adrenaline. Moreover, physiological adaptation can be caused by participation in regular physical activity, thereby reducing behaviors that lead to stopping exercise and stress and anxiety. As previous studies have shown, exercise and physical activity can increase neurotransmitters, norepinephrine, dopamine, serotonin, and endorphins, making them very effective in positive psychological and mood changes. On the other hand, the beneficial The psychological and social factors related to engaging in physical activity for psychological disorders, like anxiety, are also significant and include the

experience of feeling self-efficacy and freedom from daily stress factors. Based on this finding, physically active people present fewer symptoms of depression and anxiety than inactive people [44,51]. Furthermore, as an important protector against stressful events, exercise has a key role and decreases psycho-emotional strain. Therefore, physically active sportspersons exhibit fewer symptoms of anxiety, depression, and psychological strain than inactive sportspersons [52]. As a result, it can be said that active sportspersons experienced less psychological strain during the COVID-19 pandemic, which helped them face hardships and times of crisis more successfully. Exercise helps people feel strong in facing problems. Individuals with higher self-efficacy and commitment to sports do not feel despair, anxiety, and failure in difficult situations; they actually face problems believing they can successfully tackles the problems in life [53].

The study findings indicate that athlete-specific distress can be categorized into moderate, high, and very high levels, which are represented by scores equal to or greater than 15, 17, and 20, respectively [43]. The findings of this research showed that sportspersons who did not do any sports activities during the quarantine showed impaired physical fitness and body composition. They also showed greater psychological strain. The findings of the study align with previous studies conducted by Calzada-Rodríguez et al. and Qi et al. [53,54]. Qi et al. found that the inactive

lifestyle of sportspersons during the COVID-19 pandemic increased the risk of getting a wide range of mental illnesses and disturbed their psyche [55].

Factors such as limited social interaction, increased economic uncertainty, inadequate evaluation of training conditions, and the cancellation of sports events can contribute to stress, anxiety, and exhaustion for athletes [56,57]. Research has shown that athletic burnout can influence athletes' mental health and sports performance. According to our study findings, Bai et al. demonstrated that being exposed to psychological stress during the COVID-19 pandemic raised the likelihood of experiencing athletic burnout [58]. Karakose et al. discovered a significant correlation between psychological distress caused by COVID-19 and job burnout associated with it. The authors demonstrated that the level of psychological distress among individuals contributed to an increase in job burnout [59]. Many studies have reported a correlation between basic psychological needs, anxiety, stress, and athletic burnout. In this regard, a moderate to robust negative relationship existed between anxiety and basic psychological needs [59]. Individuals may also experience stress and burnout owing to insufficient responses to basic psychological requirements [60,61]. Many studies recommend doing exercises like high-intensity interval training (HIIT), which facilitates metabolism, and yoga or nerve-calming exercises, which help calm the mood and improve sleep quality amidst the COVID-19 pandemic [62,63]. Physical activity amidst the COVID-19 outbreak seems to minimize negative emotions. In addition, the number of training days recommended during this period is slightly higher than that recommended prior to the COVID-19 outbreak. In this connection, 60 min of daily moderate physical activity is suggested to keep physical and mental health. Therefore, it appears that individuals require supplementary physical activity in order to manage the psychological stress and negative emotions that arise from the outbreak of a disease and the implementation of social distancing measures [64]. Participating in sports, being active, and biological mechanisms (e.g., neurogenesis, reduced inflammation, increased antioxidant activity, increased anti-anxiety hormones), and other individual factors (e.g., athletes' increased self-esteem, self-efficacy level, athletic identity, commitment, training duration, and type of sports activity (team or individual sports) can be directly related to their mental well-being during the COVID-19 pandemic [64]. Besides, it should be noted that the APSQ is applicable and valid for the daily life of athletes in any time condition. Physical activity is a source of health and can potentially control psychological disorders and increase the quality of life and mental well-being.

Another finding of this study is the psychometric validation of the APSQ. The APSQ was shown to have good construct validity, and the relevant model was accepted using CFA. The concurrent validity results indicated a considerable positive association between APSQ and psychological distress and a notable inverse association between psychological well-being and APSQ. Therefore, the simultaneous convergent and divergent validity of this questionnaire was confirmed. The results also revealed acceptable reliability of the questionnaires using criteria including Cronbach's alpha, composite reliability, and split-half coefficient. As for the discriminant validity and the cut-off point, the results indicated that the cut-off point was confirmed based on the findings of the main questionnaire in the Iranian sample. Besides, the questionnaire had good discriminant validity with specificity and sensitivity levels of 100 %. Generally, our results indicated the psychometric validation of this questionnaire in the Iranian athlete population. Accordingly, researchers can use this scale for early detection of athletes' psychological strain and the psychological consequences of COVID-19 in them. The findings of present study are in align with the outcomes reported by Rice et al. [65]. Thus, the early discovery of psychological strain by this instrument may assist in improving athletes' mental health. In particular, the APSQ seems to help coaches and sports psychologists identify the high and low psychological strain and monitor sportspersons over time.

Limitations and future research

One of the constraints of this study was the relatively small sample size and the limited number of participants. Furthermore, athletes may exhibit hesitancy in divulging their mental health symptoms in order to avoid the negative connotations and prejudices often associated with mental health disorders. Therefore, the data should be generalized with caution. Besides, gender differences were not compared due to the limited representation of male and female athletes, as well as the variation in psychological stress experienced in different individual and team sports.. Hence, additional research with larger sample sizes is necessary in order to establish more robust generalizations based on the findings.

Conclusion

The fast outbreak of the coronavirus created concerns for physical and mental health throughout the world. Therefore, people encountered several mental health problems, with athletes being no exception. The results confirmed the psychometric validation of the APSQ. Therefore, researchers can use this scale for early detection of athletes' psychological strain and the psychological consequences of COVID-19 in them. Early detection of mental health problems by this tool may help improve athletes' mental health. The present research aimed at examining how different training conditions impact the mental well-being of athletes during the COVID-19 pandemic. It was hypothesized that sportspersons who continue to exercise in COVID-19 conditions would display lower levels of athlete psychological strain with higher training load similarly associated with lower athlete psychological strain. Findings also revealed that sportspersons involved in sports activity and training during the COVID-19 pandemic experienced less psychological strain than those who avoided training. The higher the training load, the lower the psychological strain. Besides, sportspersons who were worried about their progress experienced more psychological strain. In general, quarantine and isolation can increase athletes' psychological strain. Thus, maintaining physical activity and regular exercise in a safe environment, either at home or in a safe camp, is a significant approach to maintaining athletes' mental well-being. Considering the

complex psychological consequences of the quarantine period and the changing environment in the modern world, it seems that countries' sports centers and officials should create special safe centers to train athletes. Also, they should hire sports psychologists to provide online interventions, helping sportspersons reset their goals and adapt to conditions like quarantine.

Author contributions

All authors approved this manuscript for publication with a substantial, intellectual, and direct contribution.

Conflicts of interest

The authors have disclosed that they have no conflicts of interest.

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