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What are the most relevant psychological symptoms in athletes? An analysis using the Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Depression, Anxiety and Stress Scale (DASS-21) and Athlete Burnout Questionnaire (ABQ).

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Abstract
Sport provides many benefits to its practitioners. However, stress, anxiety and depression are connected to sports competitions and have been a problem for those who are involved directly or indirectly (athletes, coaches and families). This article analyses the key symptoms approached by the following inventories: Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Depression, Anxiety and Stress Scale (DASS-21) and Athlete Burnout Questionnaire (ABQ), based on the data of 272 athletes from Mato Grosso/Brazil. The answers to all questions were tabulated and compared to the total scores of their respective subscales through Pearson correlation. It was then possible to list the most significant and least significant symptoms in each inventory, giving an indication of what psychological symptoms are more relevant in athletes. Our results suggest that many athletes have low reinforcement from sport activities, which connects symptoms of "Reduced sense of accomplishment", Devaluation and Anhedonia. The most scored Stress issues suggest that athletes also have increased arousal rates, linked to symptoms of irritability and tremors/muscle spasms. It is likely that psychological problems arising out of them are fortuitous combinations of these two characteristics.
Key Word: Stress; Anxiety; Psychology, Health

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I. INTRODUCTION

Sporting has been widely associated with health, with most literature listing its beneficial effects for the athlete. However, stress, anxiety and depression are linked to sports competitions and have been an issue for those who directly or indirectly are involved (athletes, coaches and families). Thus, we see the need for an appropriate instrument to monitor the psychological conditions of athletes, in order to improve not only their performance, but also their quality of life.

According to the traditional model, stress is a condition marked by a state of exaltation and mainly psychological changes that favour alarm reactions. In this model, the change of behaviour originates from an overproduction of stimulatory neurotransmitters and/or lack of inhibitory neurotransmitters. When this situation is maintained and/or the individual does not have organic resources or behavioural repertoire to return to the initial state, stress can turn into anxiety. This is characterized by alterations in the functioning of organs and glands, also exacerbating alarm reactions, such as tachycardia, sudoresis, tremors, etc. In a chronic condition, there may be a failure in the production of stimulatory or inhibitory neurotransmitters, leading to depression. As a general characteristic, there is an extinction of certain behaviours typical of a healthy individual, what we name apathy, insomnia, anhedonia, etc (Clark, 1991, Boyer, 2000).

Valle (2007) explains that there is a relationship between the performance of athletes and their stress levels, emphasizing the importance of understanding and intervening to improve performance in training and competition. Performance may be modified by the way the stress is perceived by the individual. Anxiety can be considered an unrealistic fear accompanied by physiological and behavioural symptoms (Greenberg, 2002), which may be beneficent or maleficent to the athlete's performance (Raglin, 1993).

Given the high competitiveness in the sports world, the Sport Psychology has developed questionnaires adapted specifically for athletes. Today, we believe that giving psychological support for the athlete is as important as caring for their nutritional quality, if high performance is a goal (Humara, 1999).

This work sought for key symptoms on the scales commonly used to measure stress, anxiety and depression. We suggest the bases for a questionnaire adapted from the most significant issues of several standard instruments and we draw attention to substantial differences between stress-related changes of behaviours in ordinary people and in athletes. It is a step to establish a specific instrument for athletes, which would help students of Physical Education and Psychology areas and may help athletes in self-monitoring their psychological problems.

II. METHODS

Sample selection

We interviewed 272 athletes from sports federations of Mato Grosso state between December/2013 and July/2015, all of them serviced by the project MULTIPROFISSIONAL CARE: IN SPORT AND HEALTH, provided by the Faculty of Physical Education of the Federal University of Mato Grosso - Cuiaba. Athletes were 80% male, players of Athletics (19), Boxing (1), Bodybuilding (17), Soccer (111), Indoor soccer (11), Football (6), Jiu-jitsu (6), Judo (17), Karate (19), Kung-fu (5), MMA (2), Swimming (14), Taekwondo (6), Shooting (6), Volleyball (31) and Beach volleyball (1). All tests in this project were guided by the rules of the Research Ethics Committee of the Julio Müller University Hospital and all athletes signed Informed Consents. The data presented here are a cut-out from three projects approved under the numbers 658/CEP-HUJM/09, 25620713.3.0000.5541 and 40660514.4.0000.5541.

Students of Psychology interviewed the athletes in groups, on days different from the ones used for Physical and Performance evaluations. Each interview lasted about 20 min, held in air-conditioned rooms of the Faculty of Physical Education.

Instruments

Beck Depression Inventory (BDI) is a questionnaire measuring levels of depression, developed from 1961 and validated as a Portuguese version in 1998 by Gorenstein and Andrade. It shows a high reliability (81% in non-patients and 88% of patients) with clinical diagnosis of depression according to DSM-IV-TR. It consists of 21 symptoms and attitudes such as sadness, pessimism, sense of failure, etc. Each item has 4 to 5 alternatives expressing levels of severity of depressive symptoms, scored from 0 (absence of the symptom). The final score is given by the sum of scores on all items, interpretable as follows: up to 9 points means no or minimal depressive symptoms, 10-18 points means mild to moderate depression, 30-63 points means severe depression.

Beck Anxiety Inventory (BAI) is a questionnaire consisting of 21 items about the severity of somatic symptoms, affective and cognitive anxiety, developed for psychiatric patients by Beck (1988). The symptoms are scored from 0 ("not bother") to 3 ("it was hard to bear") and lead to a sum of all scores. The reference values are: Normal $\leq$ 21; Moderate 22 to 35; Severe $\geq$ 36.

Depression, Anxiety and Stress Scale (DASS-21) is a questionnaire that simultaneously evaluates the emotional states of depression, anxiety and stress. The long version DASS-42 was developed by Peter Lovibond in the University of New South Wales, Australia and a short version called DASS-21 was produced (Ribeiro, 2004) and validated (Apostolo, 2006). The instrument is divided into 3 independent scales for symptoms of depression (dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia), anxiety (arousal of the autonomic nervous system, musculoskeletal effects, situational anxiety and subjective experiences such as aggression) and stress (difficulty relaxing, nervous excitement, easy disturbance/agitation, irritability/exaggerated reaction and impatience). Each question scores 0-3 the frequency of a symptom and 3 final scores are obtained by the sum of the items and duplication of operations for setting into the DASS-42 parameters.

The reference values for Stress are: $\leq$15 normal; 16-25 mild or moderate; $\geq$ 26 severe. For Anxiety: $\leq$ 7 normal; 8-14 mild or moderate; $\geq$ 15 severe. For Depression: $\leq$ 9 normal; 10-20 mild or moderate; $\geq$ 21 severe.

Athlete Burnout Questionnaire (ABQ) was developed from the work of Christina Maslach and Susan Jackson in 1981, which defined the burnout syndrome as a set of psychological disorders linked to work, with particular issues in every profession, In the case of sportsmen, the Pires (2006) work settled the Syndrome on the simultaneous occurrence of 3 symptoms: Emotional exhaustion (characterized by feelings of extreme fatigue); Reduced sense of accomplishment (represented by lack of reward from achievements and challenges) and Sport Devaluation (reflects a negative self-image, particularly with regard to the ability to succeed at work). The interpretation of the scores was through the frequency of feelings related to each of the three dimensions, scored from 1 (does not occur) to 5 (occurs frequently). The reference values for characterizing the syndrome are: Emotional exhaustion $\geq$ 15; Reduced sense of accomplishment $\geq$ 17; Sport devaluation $\geq$ 6.

All athletes received detailed observations on their scores and their coaches were instructed on how to proceed when the scores leaded to suspect of a pathological condition.

Data analysis

We tested data for normality and compared the answers to all questions with the total scores of their respective subscales through the appropriate statistic correlation. Symptoms with the highest correlations and $P \leq 0.05$ were taken as the most significant ones. The mean values ± standard deviation for each issue was used as reference to identify common symptoms (higher means) or rare symptoms (lower means).

III. RESULTS

Most significant questions

The questions in inventories were correlated to their respective scales or subscales to indicate which ones could replace the subscale as a whole, because they reflect with reasonable fidelity the overall score of the subscale, Table 1 shows these results.

Table 1 - Questions with the highest Pearson correlations

Inventory	**Subscale**	**Question**	**$R_{Pearson}$**
BAQ	Emotional exhaustion	Q4. I feel extremely tired with my participation in sport.	0.70
		Q12. I am exhausted by the mental and physical demands of the sport.	0.70
	Sport devaluation	Q6. I do not care so much as before about my performance.	0.85
		Q11. I feel less worried than before about being successful.	0.81
BAI		Q5. Fear of the worst happening	0.66
		Q7. Heart pounding or racing	0.64
		Q10. Nervous	0.69
		Q12. Hands trembling	0.66
BDI		Q4. Loss of pleasure	0.61
		Q5. Guilty feelings	0.64
		Q4+Q5	0.75
DASS-21	Stress	Q8. I felt that I was using a lot of nervous energy	0.76
		Q18. I felt that I was rather touchy	0.70
	Anxiety	Q7. I experienced trembling	0.72
	Depression	Q3. I couldn't seem to experience any positive feeling at all	0.69
		Q10. I felt that I had nothing to look forward to	0.71

Notes: The values shown are results of the Pearson correlation between the scores of each question and the total score on the referred scales / subscales. In all cases, $P < 0.0001$. Data were collected from 272 athletes who responded to Burnout Questionnaire for Athletes (BAQ), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI) and Depression, Anxiety and Stress Scale (DASS-21).

Less significant questions

Some questions are often significant for the general population in which the questionnaires were validated, but find little significance to the population of athletes, resulting in very low correlations with their scales and subscales. Table 2 below presents these results.

Table 2 - Questions with the lowest Pearson correlations

Inventory	**Question**	$\mathbf{R_{Pearson}}$
BAI	Q1. Numbness or tingling	0.34
	Q9. Terrified	0.27
	Q16. Fear of dying	0.24
BDI	Q21. Loss of interest in sex	0.23
	Q19. Weight loss	0.27
	Q11. Irritability	0.29

Notes: The values are results of the Pearson correlation between the scores of each question and the total score on the referred scales / subscales. Here, we show correlations around 0.30 or below. We did not find values so low for BAQ and DASS-21 questions. In all cases, $P < 0.0002$. Data were collected from 272 athletes who responded to Burnout Questionnaire for Athletes (BAQ), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI) and Depression, Anxiety and Stress Scale (DASS-21).

Common symptoms pointed by the questionnaires

Despite being not good monitors of the psychological state of the athletes, the symptoms reaching the highest scores in the various questionnaires can give an idea of how athletes respond to stress. Table 3 shows these results.

Table 3 - Questions with the highest scores

Inventory significant scores	**Subscale**	**Question**	**n (%)**
BAQ 3 pts or higher	Reduced sense of accomplishment	Q1. I am [not] doing a lot of things that are worth in sport.	92 (34)
		Q14. I [do not] feel successful in sport.	56 (21)
BAI 2 pts or higher		Q2. Feeling hot	45 (17)
		Q10. Nervous	51 (19)
BDI 2 pts or higher		Q4. Loss of pleasure	24 (9)
		Q11. Irritability	47 (17)
		Q13. Indecisiveness	32 (12)
DASS-21 2 pts or higher	**Stress**	Q8. I felt that I was using a lot of nervous energy	32 (12)
		Q11. I found myself getting agitated	34 (13)
		Q12. I found it difficult to relax	29 (11)

	Anxiety	Q2. I was aware of dryness of my mouth	20 (7)
	Depression	Q3. I couldn't seem to experience any positive feeling at all	18 (7)
		Q10. I felt that I had nothing to look forward to	14 (5)
		Q13. I felt downhearted and blue	20 (7)

Notes: The values shown were chosen as number of athletes that clearly scores out above the average of its scale or subscale. The percentages were calculated with respect to the total interviewed athletes. Data were collected from 272 athletes who responded to Burnout Questionnaire for Athletes (BAQ), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI) and Depression, Anxiety and Stress Scale (DASS-21).

Rare symptoms pointed by the questionnaires

Rarer symptoms are precisely those who are absent particularly in the population of athletes, although not in the general population. As well as the most scored symptoms, the least scored ones help a lot when defining how the stress presents itself in athletes. Table 4 shows these results.

Table 4 - Questions with the lowest scores

Inventory significant scores	**Subscale**	**Question**	**n (%)**
BAQ 3 pts or higher	Emotional exhaustion	Q3. The effort I make practicing sport could be better spent doing other things.	19 (7)
		Q8. I feel "destroyed" by the sport.	10 (4)
		Q12. I am exhausted by the mental and physical demands of the sport.	18 (7)
BAI 2 pts or higher		Q8. Unsteady	3 (1)
		Q9. Terrified	1 (0)
		Q20. Face flushed	3 (1)
BDI 2 pts or higher		Q1. Sadness	4 (1)
		Q7. Self-dislike	6 (2)
		Q9. Suicidal thoughts or wishes	3 (1)
		Q10. Crying	9 (3)
		Q17. Tiredness or fatigue	4 (1)
		Q18. Loss of appetite	3 (1)
		Q19. Weight loss	7 (3)
		Q21. Loss of interest in sex	3 (1)

Notes: The values shown were chosen as number of athletes that clearly scores above the average of its scale or subscale. The percentages were calculated with respect to the total interviewed athletes. Data were collected from 272 athletes who responded to Burnout Questionnaire for Athletes (BAQ), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI). The Depression, Anxiety and Stress Scale (DASS-21) did not present any eligible question for this table.

IV. DISCUSSION

Significant symptoms in the athletes

This paper presents the results of highest and lowest Pearson correlations of the following inventories: Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Depression, Anxiety and Stress Scale (DASS-21) and Athlete Burnout Questionnaire (ABQ), with the primary goal of listing the key symptoms in each scale.

The DSM-IV-TR defines Depression through the dimensions (1) Sadness or feelings of emptiness, (2) Anhedonia or loss of interest, (3) Significant weight loss or gain, (4) Insomnia or hypersomnia, (5) Psychomotor agitation or retardation, (6) Fatigue, (7) Feelings of worthlessness or guilt, (8) Difficulty in concentrating and (9) Suicidal ideas. In diagnosing Depression, at least symptoms (1) or (2) and 4 more symptoms must be present.

The Beck Depression Inventory (BDI), assessing the severity of depressive symptoms, draws attention as no question correlated above R = 0.70, denoting that depressive symptoms are more or less independent on from each other in athletes. The most significant symptoms were Dissatisfaction (Q4) and Guilty feelings (Q5), which have a very strong correlation when added (R = 0.75). Dissatisfaction was also one of the most scored symptoms, indicating a latency factor linked to depressive Anhedonia in athletes.

It is noteworthy that even taking Anhedonia as one of the two possible axis for the development of depressive symptoms, we found only 3% of the athletes with BDI scores above 20 points; general non-clinical population estimates are varied, but probably more than 15% score to such values (Veerman, 2009). General population means are typically 5-8 points, while we found a 5.5 ± 5.7 result for athletes (Creamer, 1995, Veerman, 2009).

In the DASS-21 inventory, the most relevant issues regarding the frequency of depressive symptoms were "I couldn't seem to experience any positive feeling at all" (Q3) and "I felt that I had nothing to look forward to" (Q10). Both are among the most scored issues of the inventory, happening to be symptoms are of great reliability. These two symptoms are also associated with the depressive Anhedonia, which seems to be very active in athletes.

Anxiety is defined by the dimensions (1) Exaggerated concern, (2) At least 3 symptoms among (2a) Restlessness, (2b) Fatigue, (2c) Lack of concentration, (2d) Irritability, (2e) Tension or muscle spasms and (3) Significant interference of symptoms with the social and labour activities. In the Beck Anxiety Inventory (BAI), the most significant symptom was Nervousness (Q10), with high scores and correlation, *i.e.* a reliable marker of anxiety associated with "Exaggerated concern". Other important symptoms were: "Fear of the worst happening" (Q5), "Heart pounding or racing" (Q7) and "Hands trembling" (Q12). In the DASS-21 inventory, which marks the frequency of anxiety symptoms, an important marker was "I experienced trembling" (Q7). Among the athletes, autonomic mechanisms of anxiety such as a "racing heart" are features necessary for the proper sports performance. However, a "manageable trigger" for these "symptoms" is necessary. When such autonomic arousals are present without a proper trigger or in combination with psychological symptoms such as Q5, they can be a marker of anxiety psychopathology.

As occurs with Depression, it is not common to find high BAI scores among athletes. In fact, we did not find even one of the 272 athletes above 35 points (clinical level) and less than 4% scored above 21 points. For a non-clinical population, reported means are 9-13 points (Creamer, 1995, Osman, 1993), while we found 6.3 ± 6.4 points for athletes.

Stress is not a psychopathology, but a condition predisposing some psychopathologies. In DASS-21 inventory, the most frequent stress markers were symptoms such as "I felt that I was using a lot of nervous energy" (Q8) and "I felt that I was rather touchy" (Q18). Now Q8 is a symptom of Anxiety in BAI (associated with Concern) and Q18 is one of the most scored symptoms in BDI (associated with Irritability). Thus, it seems clear that such symptoms are reliable in both intensity and frequency, although we should in this case relocate Irritability as an indicator of Stress and not of Depression.

The Burnout syndrome has major alignments with the Depression, though being strongly linked to work, hence their study in several areas. The Emotional exhaustion scale of the ABQ is equivalent to the Fatigue symptom of Depression. In athletes, this dimension was primarily represented by "I feel extremely tired with my participation in the sport" (Q4) and "I am exhausted by the mental and physical demands of the sport" (Q12). Q12 was one of the least scored symptoms of the inventory. This denotes that Emotional exhaustion / Fatigue that is not common among athletes, but its appearance must be viewed with some importance.

The Devaluation dimension in ABQ is equivalent to Loss of interest, one depressive symptom. It was represented mainly by "I do not care so much about my sports performance as before" (Q6) and "I feel less worried about being successful in sports than before" (Q11). Both symptoms were medium appearance.

The ABQ dimension "Reduced sense of accomplishment" is equivalent to Anhedonia. This dimension had no major representative symptoms, but came to group the most scored questions of the inventory. Highly scored questions such as "I [am not] doing many things that are worth in sport" (Q1) had poor correlations with the subscale total, indicating a common feature of the athletes and not really a symptom. The symptom "I [do

not] feel successful in sport" (Q14) was also highly scored. Again, we see a significant appearance of Anhedonia among athletes.

Symptoms not significant in athletes

In the BDI, the lowest correlations (R < 0.3, according to Dancey and Reidy, 2004) were: Q21 (loss of sexual interest), Q19 (weight loss) and Q11 (irritability). Questions 19 and 21 were "rare symptoms", but the question 11 was very well scored, giving the impression that Irritability is a common symptom in both clinical and non-clinical populations, that can be removed from the inventory of depressive symptoms (at least for athletes). The rarest depressive symptoms Sadness (Q1), Self-dislike (Q7), Suicidal thoughts (Q9), Crying (Q10), Fatigue (Q17), Changes in appetite (Q18), Weight loss (Q19), Loss of interest in sex (Q21) are not particularly rare in the general population, showing that the depressive pattern of athletes is different from what may be usual. In particular, the depressive dimensions Sadness and Fatigue (discussed above) appear to be almost absent in athletes, even though Fatigue may signalize the development of Burnout syndrome.

Some symptoms listed in BAI such as Q1 (Numbness or tingling), Q9 (Terrified) and Q16 (Fear of dying) were below the inventory's exclusion criteria (R <0.3), showing that they are symptoms unrelated to anxiety in athletes, although not being such in general population. Q9 is a "rare symptom", but others may simply have other causes. Other rare symptoms were "Unsteady" (Q8) and "Face flushed" (Q20).

V. CONCLUSION

In athletes, the onset of Depression seems linked to the symptoms "Anhedonia or loss of interest" (which is common and important) and Guilt (a critical symptom), and very rare symptoms such as Sadness, Fatigue and Suicidal thoughts. Weight maintenance is part of the basic care for athletic performance, so gains or losses we cannot seen it as a "symptom". Anxiety appears to develop from the symptoms "Exaggerated concern", Irritability and Tremors/Muscle spasms, Fatigue being a rare symptom. These two models make the Depression and Anxiety symptoms of athletes to track a way very characteristic of this career.

Taking Behaviourism as a guide, it would be no excess to presume that athletes have a low reinforcement from sport activities, what connects the symptoms of "Reduced sense of accomplishment", Devaluation and Anhedonia. The most scored Stress symptoms suggest that athletes also have an increased arousal rate, linked to symptoms of Irritability and Tremors/Muscle spasms. It is likely that psychological problems arising come from a fortuitous combination of these two characteristics.

Disclosure statement

The authors reported no potential conflict of interest.

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