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ORIGINAL ARTICLE

Individuals' depression and anxiety might be influenced by the level of physical activity and expertise: a pilot study on elite volleyball players and amateur athletes

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Abstract

Purpose To compare depression and anxiety between elite volleyball players (VP) and amateur athletes (AA).

Methods Depression and anxiety levels were assessed in 31 elite VP and 26 AA. The International Physical Activity Questionnaire was administered to assess physical activity level (PAL). Beck Depression Inventory II (BDI-II) and State-Trait Anxiety Inventory-Form Y 1–2 were administered to assess an individual's depression and anxiety levels.

Results VP showed a significantly lower depression ($p = 0.018$) and trait anxiety ($p = 0.038$) levels than AA (BDI-II z-score $= -0.27 \pm 0.82$ vs 0.32 ± 1.11 in VP and AA, respectively; STAI-Y2 z-score $= -0.28 \pm 0.85$ vs 0.34 ± 1.08 in VP and AA, respectively). A significant main effect of gender was observed for STAI-Y1 ($p = 0.025$) and STAI-Y2 ($p = 0.014$). In detail, females had higher state and trait anxiety levels than males. PAL did not significantly adjust values of participants (AA and VP) in BDI-II, STAI-Y1, and STAI-Y2.

Conclusion Results suggest that the practice of supervised volleyball sport, rather than unsupervised recreational activity, might positively influence an individual's depression and anxiety levels. Moreover, physical exercise specialists should consider a different psychological approach when working with females than males.

Keywords Anxiety · Depression · Volleyball · Physical activity

Introduction

Mental health is an important topic of investigation and it does not mean that being involved in a sport activity is a sign of good health [1]. The relationship between physical activity (PA) and mental health has been previously investigated, showing that PA could positive influence an individual's mental health [2]. Also, the relationship between physical performance and mood has been investigated in athletes [3]. For instance, Lane [3], showed that excitement and strength were associated with a good performance; on the contrary, depression was associated with a poor performance.

Scientific literature has been focused on depression and anxiety in professional and amateur athletes practicing different types of sports [4, 5]. Cerin and Barnett [6] showed that competitive sports anxiety might influence the relationship between cognitive levels and affective levels in professional martial arts athletes. The way in which competitive sports anxiety influences the relationship between cognitive levels and affective levels depends on the personal perception of an event and on the subject's ability to cope with a state of anxiety in relation to that event, as in the case of a competition. Therefore, this relationship may be strongly influenced by the contest and the mental state of the athletes and it could change based on the approaching date of the competition [6]. Other studies have been focused on mood during a competition. For instance, Murgia et al. [7] found

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that the mental state at the beginning of the race was not a reliable predictor of the performance throughout the race in cyclists. Moreover, high-performing cyclists maintained a more positive mood profile than their low-performing counterparts at the end of a multi-stage race. Bäckmand et al. [8] showed that the mental state of experienced athletes differs from that of amateur athletes.

The number of people who are actively involved in team sports (at various levels) around the world is astounding. Despite around 800 million people who play volleyball at least once a week [9] there are very few studies regarding the psychological state of volleyball players [10, 11]. Volleyball is a team sport played at all levels (e.g., youth, amateur, Olympic, and professional) and requires sudden movements, such as jumping, hitting, and blocking [12, 13]. Volleyball could also be a recreational team sport which, like other team sports, has positive health effects [9]. Although, Kioumourtzoglou et al. [14] showed that professional volleyball players had better cognitive, motor, and perceptual abilities than amateur players. However, they did not study the volleyball players' mental state characteristics [14]. Raglin and Morris [15] showed that volleyball players exhibit considerable variations in pre-competition anxiety. Moreover, Weber et al. [10] studied the symptoms of anxiety and depression in young athletes. It was shown that some young athletes are at risk of developing symptoms of both anxiety and depression.

With regard to regular physical activity (PA) with moderate intensity, such as walking, cycling, or non-competitive sports, it was shown that sport has a significant positive effect on physical and mental health [16]. All PA involving muscle contractions require more caloric intake compared to the body being at rest [17]. It was also determined that PA might decrease the negative effects of aging, such as memory and posture deterioration, observed in older adults [18–20]. Stubbs et al. [21], showed that low PA levels are associated with increased prevalence of anxiety in amateur athletes. Practicing regular PA could be a strategy for managing anxiety in young adults. Regular PA may be particularly beneficial to those experiencing higher levels of anxiety [22]. Anxiety and depression are spread in young adults [23] and they are recognized as a risk factor for cardiovascular disease [24]. There is a distinct correlation between sedentary lifestyle and intense anxiety levels; a sedentary individual has approximately three times more chances of having high anxiety levels when compared to a physically active individual [25]. While scientific studies have focused on anxiety in volleyball players and on the relationship between physical activity levels and anxiety in amateur athletes, it is yet not concluded whether the players' expertise (athlete vs amateur athlete) or the amount of physical activity might influence the subject's anxiety and depression levels. To our knowledge, there are no studies which compare the state of mind of professional volleyball players and that of amateur athletes. Therefore, the aim of this study was to analyze depression and anxiety levels in professional volleyball players and amateur athletes.

Methods

Participants

Thirty-two professional volleyball players (VP) and 32 amateur athletes (AA) were enrolled in this cross-sectional study. One volleyball player and six amateur athletes dropped out from the study. Therefore, only 31 professional volleyball players and 26 amateur athletes took part in the study.

The VP were professional volleyball players of the Italian second division championship, 20 males and 11 females, and they have been practicing professional volleyball for over 5 years. Moreover, VP have been training at least 4 days a week. AA were a group of athletes who practise sports activities without the supervision of a physical education specialist. They did not follow an individualized and standardized physical training program. Therefore, AA have been practicing unsupervised physical activity, such as walking and cycling, or occasionally have been involved in soccer matches or gym workouts for 2–3 times a week. AA were not engaged in any organized and supervised physical activity over the last 5 years. Participants did not receive any financial incentives. This study was conducted according to the Declaration of Helsinki and was approved by the ethics committee at the Calabria Region (protocol n. 20 on 17th Jan 2019). All participants underwent clinical examination to exclude any counterindications of the study protocol. Inclusion criteria consisted of age ranging from 18 and 40 years old. The exclusion criteria were physical impairment, severe psycho-cognitive diseases, any neuropathy or autonomic dysfunction, drugs intake, and absence of fitness medical certificate. Subjects' anthropometric and physical fitness characteristics are depicted in Tables 1 and 2.

Procedures

VP were recruited from "*Raffaele Lamezia Volley*" and "*Top Volley Lamezia*" teams of Lamezia Terme and "*Volley Cosenza*" team of Cosenza. Participants belong to AA were involved in unsupervised recreational activities (e.g. gym and walking). Participants underwent a clinical investigation interview before being enrolled and a careful interview to investigate their level of physical activity. Participants provided informed consent and permission to use their data for research purposes. They were instructed to complete a short questionnaire about their daily PA, sedentary behaviors, and psychological status. Subjects performed a series of body composition, and physical fitness (PF) tests.

Table 1 Subjects' anthropometric characteristics

Variables	VP		AA		Pooled	
	Male ($n=20$)	Female ($n=11$)	Male ($n=15$)	Female ($n=11$)	VP ($n=31$)	AA ($n=26$)
Age (years)	28.9 ± 7.1	25.5 ± 5.2	24.4 ± 3.4	23.4 ± 4.3	27.7 ± 6.6	24.0 ± 3.8
Weight (kg)	83.2 ± 9.4	63.2 ± 6.5	78.8 ± 12.8	57.1 ± 4.9	74.7 ± 12.4	68.7 ± 12.5
Height (m)	1.88 ± 0.06	1.70 ± 0.07	1.79 ± 0.07	1.63 ± 0.08	1.81 ± 0.11	1.71 ± 0.09**
BMI (kg/m^2)	23.4 ± 2.9	21.9 ± 1.9	24.5 ± 3.3	21.1 ± 1.5	23.1 ± 2.5	22.8 ± 2.4
Muscle mass (kg)	40.6 ± 5.3	27.5 ± 3.8	33.7 ± 4.4	25.2 ± 4.3	35.9 ± 7.9	30.1 ± 6.1**
Fat mass (%)	12.6 ± 6.7	21.4 ± 5.5	20.5 ± 5.4	23.3 ± 4.4	15.7 ± 7.5	21.7 ± 5.1

Data are presented as mean ± SD

BMI body mass index, *VP* volleyball players, *AA* amateur athletes

**$p < 0.01$ vs VP

Table 2 Participants' physical fitness results

Variables	VP		AA		Pooled	
	Male ($n=20$)	Female ($n=11$)	Male ($n=15$)	Female ($n=11$)	VP ($n=31$)	AA ($n=26$)
PAL (MET)	5368.0 ± 3339.8	5476.7 ± 2221.0	2344.5 ± 2302.7	2877.7 ± 2832.5	4072.1 ± 3274.3	4177.2 ± 2817.5**
SJT (cm)	62.8 ± 10.2	40.0 ± 9.7	43.9 ± 13.2	32.2 ± 6.1	47.5 ± 15.7	39.0 ± 12.1**
SR (cm)	8.8 ± 5.1	6.4 ± 6.2	− 0.3 ± 9.1	2.0 ± 7.0	7.9 ± 5.5	0.6 ± 8.5**
10 × 5 m (s)	17.1 ± 1.2	18.9 ± 2.1	20.1 ± 1.4	22.0 ± 1.6	17.7 ± 1.8	20.9 ± 1.7**
VO_{2max} (ml min^{-1} kg^{-1})	40.3 ± 4.9	36.8 ± 10.2	39.2 ± 3.0	42.8 ± 14.4	39.0 ± 7.3	40.7 ± 9.6

Data are presented as mean ± SD

PAL physical activity level, *SJT* squat jump test, *SR* sit-and-reach test, *10 × 5 m* rapidity test, VO_2 oxygen consumption, *VP* volleyball players, *AA* amateur athletes

**$p < 0.01$ vs VP

Psychological assessment

Beck Depression Inventory scale, Second Edition (BDI-II) was used to investigate the subjects' depressive symptoms [26]. The BDI-II consists of 12 items assessing the severity of sadness, pessimism, past failure, loss of pleasure, feelings of guilt, self-punishment, self-pity, low self-esteem, suicidal ideation or wishes, crying, agitation, loss of interest, indecisiveness, feelings of worthlessness, loss of energy, change in sleeping patterns, irritability, change in appetite, concentration difficulty, tiredness or fatigue, loss of interest in sex [27]. For each item, the participants were required to rate on a scale of 4 ranging from 0 to 3 the severity of the symptoms in the last two weeks. Total BDI-II score varies from 0 to 63 with higher scores reflecting high levels of depression (score > 16 for depression symptom) [26, 28]. The internal consistency of BDI-II showed an $\alpha = 0.87$ and a test–retest reliability ranged from $r = 0.65$ to 0.86 depending on the time frame of the retest [26]. The Spielberger State-Trait Anxiety Inventory (STAI-Y) has been specifically developed to evaluate state and trait anxiety by means of two parallel versions, the State Anxiety Inventory-Form Y1 (STAI-Y1) and the Trait Anxiety Inventory questionnaire-Form Y2 (STAI-Y2), respectively [29]. The two versions can be used independently from each other [30, 31]. The STAI-Y1 was used to assess state anxiety. State anxiety is considered as a transitory emotional condition characterized by a subjective perception of a feeling of tension and apprehension and by a strong activity of the autonomic nervous system of tension [30]. The STAI-Y2 was used that measures trait anxiety. Trait anxiety is considered, instead, as a general tendency to respond with anxiety to perceived threats in the environment, and as a relatively stable characteristic of an individual [30]. The STAI-Y1 consists of 20 items that evaluate how the respondent feels right now while the STAI-Y2 questionnaire consist also of 20 items that evaluate how the subject feels generally. All items are scored on 4-point Likert scale ("not at all", "somewhat", "moderately" or "very much so" for STAI-Y1; "almost never", "sometimes", "often", "almost always" for STAI-Y2) and both scales are self-report; scoring is reversed for 10 STAI-Y1 items and 9 STAI-Y2 items. The total score for both scales ranges from 20 to 80 [30, 31]. For both STAI questionnaires, high scores indicate high levels of anxiety (score > 40 for STAI-Y1 and score > 40 for STAI-Y2 for anxiety symptoms). Internal consistency coefficients for the STAI-Y1 and STAI-Y2 scales ranged from 0.86

to 0.95 and test–retest reliability coefficients have ranged from 0.65 to 0.75 over a 2-month interval [29].

Body composition

Weight and height were measured using a scale and a stadiometer to the nearest 0.1 kg and 0.1 cm, respectively. Body mass index (BMI) was calculated as ratio between weight and square of the height (kg/m^2). For each subject, percent of fat mass (FM) and muscle mass (MM) were measured by hand-to-foot bioelectrical impedance method (Tanita BC 601, Tokyo, Japan) with standard clothing (i.e., underwear).

Physical fitness assessment

After a warm-up exercise consisting of 5 min light running and 3 min stretching, all subjects performed a series of PF tests. Before each physical test, a research assistant provided the participants with a demonstration and verbal explanations. To minimize the effects of fatigue, testing stations were organized in the following order: squat jump test (SJT), sit-and-reach test (SR) to assess the hamstring muscles' flexibility, 10 × 5 test to test sprint performance, and 20 m shuttle run (20 m-SRT) to test aerobic capacity following the suggestion and instruction described in [32] for SR, 10 × 5 m, 20 m-SRT tests and the protocol by [33] for SJT. In their protocol, the volunteers had their fingers on the right hand marked with white chalk [33].

Physical activity measurement

The IPAQ [34] was used to self-report PA. Questions focused on the amount of time spent in vigorous PA, moderate PA, and walking. Responses were scored using established data screening and weighting procedures to create a single PA (METmin) score.

Statistical analysis

The SPSS statistical package (Version 23.0 for Windows; SPSS Inc., Chicago, IL, USA) was used for data analysis and presented as mean ± SD. A post hoc power analysis was conducted using the software package (G*Power 3.1.9.2 software). The effect sizes and the alpha level used for this analysis were 0.25 and 0.05, respectively. The post hoc analyses revealed that the statistical power for this study was 0.50 for detecting a medium effect. Before further analysis, normal distribution of the dependent variables was tested by applying the Kolmogorov–Smirnov test. This test showed that STAI-Y1 and BDI-II variables had skewed distributions, STAI-Y2 was normally distributed. Therefore, STAI-Y1, STAI-Y2, and BDI-II were transformed in z-score values. Two-way ANCOVA was performed for each measured parameter (STAI-Y1, STAI-Y2, and DBI-II), with group (VP vs. AA) and gender (males vs. females) as between-participants factors and PAL as covariate. Statistical significance was set a priori at $p \leq 0.05$.

Results

ANCOVA revealed that PAL did not significantly adjust values of athletes (volleyball and amateur) in state anxiety ($p = 0.82$), trait anxiety ($p = 0.93$) and BDI-II ($p = 0.71$).

A significant main effect on the group was observed on STAI-Y2 ($p = 0.04$; $F_{1,52} = 4.52$; ηp^2 0.08) and on BDI-II ($p = 0.02$; $F_{1,52} = 5.97$; ηp^2 0.10). In detail, trait anxiety and depression levels were lower in VP than AA (STAI-Y2 z-score = − 0.28 ± 0.85 vs 0.34 ± 1.08 in VP and AA, respectively; DBI-II z-score = − 0.27 ± 0.82 vs 0.32 ± 1.11 in VP and AA, respectively) as reported in Fig. 1. Moreover, a significant main effect of gender was observed on STAI-Y1 ($p = 0.03$; $F_{1,52} = 5.304$; ηp^2 0.09) and STAI-Y2 ($p = 0.01$; $F_{1,52} = 6.450$; ηp^2 0.11). In detail, males showed lower state and trait anxiety levels than females (STAI-Y1z-score = − 2.23 ± 0.16 vs 0.37 ± 0.20 in males and females, respectively; STAI-Y2 z-score = − 0.23 ± 0.16 vs 0.41 ± 0.20 in males and females, respectively).

Discussion

The aim of the study was to investigate if the mood or the physical fitness of the athletes was influenced by their level of experience or level of physical activity. Our results show differences in depression and trait anxiety score between VP and AA but not in state anxiety score. Furthermore, the level of PA did not adjust values of athletes (volleyball and amateur) in any of the studied variables. A significant difference in gender was observed for state and trait anxiety. In detail, females AA had higher scores then males on STAI Y1 and STAI Y2. The females of the AA group showed pathological anxiety scores (STAI-Y1 and STAI-Y2 cutoff > 40). Our findings are in line with Kessler et al. study [35], which showed that the prevalence of generalized anxiety disorder is higher in women (6.6%) than in men (3.6%) [35]. Moreover, although not significantly, AA showed higher depression score than VP. These results are in line with the idiosyncratic perspective of the individual zones of optimal functioning model which suggests that positive and negative emotions can be functional or dysfunctional, depending on the interpretation of the subjects [36]. The study by Kais and Raudsepp [37], showed how the state of anxiety of athletes before a beach volley match, allows to predict the athlete's performance during the match. The same authors have also shown that coaches and athletes should rather focus on the

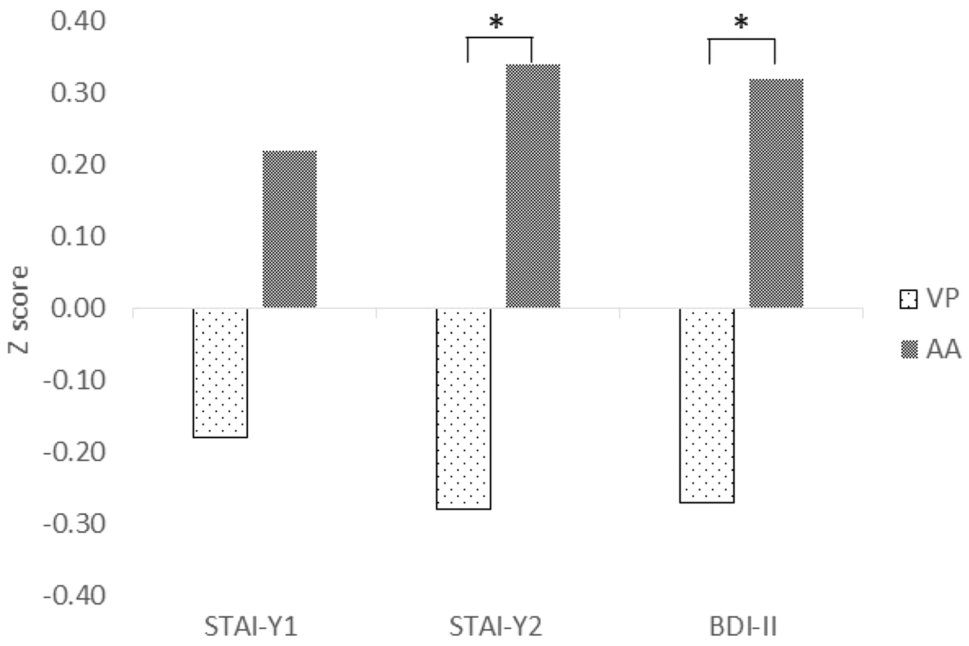

Fig. 1 State Anxiety Inventory-Form Y1 (STAI-Y1), Trait Anxiety Inventory-Form Y2 (STAI-Y2), and Beck Depression Inventory second edition (BDI-II) in volleyball players (VP) and amateur athletes (AA). *$p \leq 0.05$ vs VP

perception that they have of their own state of anxiety and sporting self-esteem rather than on the intensity of their anxiety state.

The social characteristics of a team sport such as volleyball should encourage a positive rather than a depressive attitude, as showed by Pedersen and colleagues [38] who investigated the effect of team sports on psychological health and quality of life. They showed that the participants of a sport team have a higher degree of enjoyment and intrinsic motivation mainly due to the social interaction during the activity. Moreover, these participants had even improved physical function, psychological well-being, and quality of life [38]. It is important to remind that state anxiety is a temporary condition of tension and apprehension with an increased activation of the psychophysiological system, which is functional in reacting to both real and imagined dangerous and stressful situations, such as sport competition.

Our results are in line with those reported by Milavić et al. [39]. With a study performed on a sample of 180 female and 106 male volleyball players they demonstrated that the group of least efficient male volleyball players was characterized by a very low-level self-confidence, while the most efficient group of volleyball players was characterized by a somewhat lower level of cognitive and somatic anxiety [39]. Also Vaccaro et al. [40] showed that anxiety was significantly decreased after social dance practice in older intermediate-level dancers independently of gender [40]. Therefore, we might speculate that subjects in a better physical condition show lower depression and anxiety levels [41]. These results are also in agreement with those reported by other studies regarding healthy and non-healthy population. For instance, Setiyowati et al. [42] showed that higher muscle strength is related to lower depression levels. Fry and colleagues [43] showed that subjects who performed better in jumping tests had greater perceptions of anxiety and Tekur et al. [44] showed that seven days intensive residential yoga programs seem to reduce pain, anxiety, and depression, and improve spinal mobility in patients with chronic low back pain. Furthermore, Craft and Landers [45] showed that individuals who exercised were less depressed than individuals who did not exercise. These studies suggest that anxiety levels might depend on the type of activity performed. We are aware of some important study limitations. First, the small sample size does not lead to a definitive result. Therefore, this pilot study should be implemented with a higher number of volleyball teams and recreational athletes. Second, we did not assess different team sports and recreational activities. It could be possible that different types of team sports could influence the participants' depression and anxiety levels differently.

Conclusion

In conclusion, VP had lower depression and trait anxiety levels than AA indicating that the practice of regular and supervised volleyball activity might positively influence the participants' mental state. Moreover, females showed a higher anxiety score than males, suggesting the use of a different gender approach. We believe that this study highlights the positive psychological effects of PA on the professional athletes. These results might be useful to all professionals who work with an interdisciplinary team to optimize psychological and physical intervention to prevent psychological

issues. Further examination of the relationship between PA, type of sport and psychological characteristics, may add valuable information in terms of the choice of the PA for young people as well. Moreover, further studies are needed to provide more information and insight over long-term benefits.

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Data availability The data used to support the findings of this study are available from the corresponding author upon request.

Declarations

Conflict of Interest The authors declare that they have no conflicts of interest regarding the publication of this paper.

Informed consent Participants were informed about the aim and design of the study and that participation was voluntary. Written, informed consent for data collection was obtained.

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