SPORT TK: Revista Euroamericana de Ciencias del Deporte, vol. 7 n.º 2, 39-44 © Copyright 2018: Servicio de Publicaciones de la Universidad de Murcia
Recibido: 12/07/2017 Murcia (España)
Aceptado: 12/06/2018 ISSN edición web (*http://revistas.um.es/sportk*): 2340-8812

Aspects related with physical exercise dependence in university students

Aspectos relacionados con la dependencia al ejercicio físico en estudiantes universitarios

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Abstract: The aim of the current study was to determine the predominance of symptoms of physical exercise dependence in university students and its relationship with variables such as, dedication to practicing sport, trait anxiety, mood, quality of sleep and adherence to a low fat diet. A total of 240 athletes were evaluated, (age: M = 21.1, SD = 4.2). The results showed that 6% have a risk of exercise dependence and was higher in the following cases: women, students below the age of 20, those who practice more weekly sessions and more sport experienced students. The risk of exercise dependence seems to be related with a higher frequency of weekly training sessions, mood alterations, sleep problems, anxious tendency and lower adherence to a low fat diet. These results show psychological indicators and signs of exercise dependence disorder that are evaluable by a sport psychologist for an early detection and intervention.
Key words**:** Exercise addiction, anxiety, mood states, sleep, diet, prevalence.
Resumen: Es objeto de este estudio determinar la prevalencia de sintomatología de dependencia al ejercicio físico en universitarios y su relación con variables como la dedicación a la práctica deportiva, ansiedad rasgo, estado de ánimo, calidad del sueño y adherencia a una dieta baja en grasa. Se evaluaron a 240 deportistas (edad: M = 21.1, *dt* = 4.2). Los resultados mostraron como un 6% presentaron riesgo de dependencia al ejercicio físico. Son más los casos entre las mujeres, menores de 20 años, los que practican más sesiones semanales de entrenamiento y son más experimentados. El riesgo de dependencia al ejercicio físico aparece relacionado con una mayor frecuencia de las sesiones semanales de entrenamiento, alteraciones en el estado de ánimo, problemas de sueño, propensión ansiosa y la menor adherencia a una dieta baja en grasas. Estos resultados muestran indicadores psicológicos y signos del trastorno de dependencia al ejercicio físico evaluables por un psicólogo deportivo para su detección temprana o intervención.
Palabras clave: Adicción al ejercicio, ansiedad, estado de ánimo, sueño, dieta, prevalencia.

Introduction

Exercise dependence is considered as an inherent necessity to do physical exercise in an excessive way with effects on the psycho-physiological state. This is an aspect that affects obsessive cognitions towards the concern of practising sport activities (Hamer, & Karageorghs, 2007), triggering a clinical deterioration (Hausenblas, & Downs, 2002). Risk of physical exercise dependence prevalence in athletes has been represented recently by 8.7% (Reche, De Francisco, Martínez-Rodríguez, Ros-Martínez, 2018). There seems to be certain controversy as for the age of appearance of this disorder. Most investigations support that exercise dependence affects mostly young athletes jóvenes (Allegre, Therme, & Griffiths, 2007; Lindwall, & Palmeira, 2009), however, others do not find any associations (Klein et al., 2004). As with gender, there is a similar situation, as different studies have shown differences within genders whilst others have not Allegre et al., 2007; Reche, Martínez-Rodríguez, & Ortín, 2015).

Activities with an aerobic predominance have been indicated to fight negative effects of anxiety and slight depressive states (Mc Donald, & Hodgdon, 1991); needing a minimal level or medium grade of activity to achieve a favourable influence on the symptoms (Annesi, 2000). It has been concluded that physical exercise produces beneficial effects on people's health (Lubans, Foster, & Biddle, 2008; López et al, 2017, 2018), improving the sensation of wellbeing and mood (Ekkekakis, & Acevedo, 2006).

However, an excessive and uncontrolled practice of physical exercise can cause opposite effects. Amongst the negative effects are withdrawal symptoms caused by the absence of physical activity; social, family or labour problems and presence of increasing injuries caused by not ceasing physical activity (Adams, Miller, & Kraus, 2003). Also, depression may be triggered when exercise is stopped (Morris, Steinburg, Sykes, & Salmon, 1990) but if activity is not paused, a state of fatigue will be produced which deteriorates physiological conditions altering sport performance and even leading to a situation of overtraining (Lemyre, Roberts, & Stray-Gundersen, 2007). This situation can then lead to a negative psychological response, harming the individual's mood (Jones, & Tenenbaum, 2009). In this way, exercises with excessively high intensities favour negative effects on athletes like anxiety and depression (Acevedo et al., 2007). On the other hand, improvements in sport performance and the attainment of an "ideal" body im-

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age promoted by the media and understood as an increment of muscle mass with a low proportion of body fat are also culprits in the presence of mood disorders, food disorders and anxiety. Eating habits can be a main focus of obsession for individuals with a high level of demand and perfection that in numerous cases precede exercise dependence or eating behaviour disorders (Ricciardelli, & McCabe, 2004).

Another variable that can influence on the general state of health and mood of an athlete is the individual's perception of sleep (Abad, & Guilleminault, 2005). It has been found that sleep restriction and sleep debt tend to accumulate, which then negatively affects cognitive function, mood, daytime sleepiness, reaction time, learning tasks, memorizing, cardiorespiratory function and sport performance (Van Dongen, Maislin, Mullington, & Dinges, 2003). Physical inactivity has always been considered as a factor that increases the probability of sleep alterations (Chasensm, & Yang, 2012), whilst physical activity is associated with improved sleep quality (Kline et al., 2012). Nevertheless, overtraining may produce opposite effects (Youngerstedt, O'Connor, & Dishman, 1997).

More investigation is needed to find out precipitating and perpetuated factors associated with exercise independence (Hausenblas, & Downs, 2002). The objective of this study was to discover the prevalence of dependent symptoms of physical exercise in university students; and to know if there is a relationship between these and sport dedication, mood, trait anxiety, sleep quality and adherence to a low fat diet. These questions will facilitate information on psychological aspects that can affect athlete's abilities and performance with the purpose of carrying out sport recommendations in relation to sport planning.

Method

Participants

The study was done with 240 university students, 200 men and 40 women, aged between 18 and 43 (age: M = 21.1, SD = 4.2) from the Sport and Exercise Science Degree from universities of the Valencian Region. Amongst the participants, 46% of the university athletes were under the age of 20 and 54% were 20 years old or over; 16.3% were woman and 84% men. 35% of the university athletes have up to 5 years sport experience and 65% had more than 5 years of sport experience. 66% of the athletes train up to four sessions a week and the remaining percentage more than four sessions a week and up to a maximum of 15 sessions (Table 1 and Table 2).

Table 1. Contingency depending on number of training sessions, years of sport experience; and their age.

		Age < 20 y. o.		Age ≥ 20 y. o.		Total	
Training Sessions	**Until 4 sessions**	77	47.2%	86	52.8%	163	66.3%
	Over 4 sessions	37	44.6%	46	55.4%	83	33.7%
Total		114	46.3%	132	53.7%	246	100%
Sport Experience	**Until 5 years**	44	50.6%	43	49.4%	87	35.4%
	Over 5 years	70	44%	89	56%	159	64.6%
Total		114	46.3%	132	53.7%	246	100%

Table 2. Contingency depending on number of training sessions, years of sport experience; and their gender.

		Female		Male		Total	
Training Sessions	**Until 4 sessions**	28	17.2%	135	82.8%	163	66.3%
	Over 4 sessions	12	14.5%	71	85.5%	83	33.7%
Total		40	16.3%	206	86.7%	246	100%
Sport Experience	**Until 5 years**	21	24.1%	66	75.9%	87	35.4%
	Over 5 years	19	11.9%	140	88.1%	159	64.6%
Total		40	16.3%	206	86.7%	246	100%

Measures

An ad hoc questionnaire was elaborated that contained socio-demographic information (age and gender) and sporting information (weekly training sessions and sport experience). The revised Spanish version of the Scale of Exercise Dependence was used (EDS-R) of Sicilia and González (2011). This scale is formed of 21 items with numbered answers from 1 (never) to 6 (always) like the Likert format. The scale allows the obtainment of a global score of exercise dependence (as this score increases there is a higher risk of dependency) and a score for each of the seven symptoms that defines it (three items per sub-scale): tolerance (i.e.: "I constantly increase the frequency of physical activity to achieve desired benefits and

effects"), abstinence (i.e.: "I practice physical exercise to avoid feeling anxious"), desired effects (i.e.: "I practice physical exercise during longer periods than first planned"), lack of control (i.e.: "I am unable to reduce the intensity of my physical exercise") suppression of other activities (i.e.: "I think about doing exercise when I should be concentrating on my work or in class"), time (i.e.: "I dedicate a lot of time practicing physical exercise") and continuation ("i.e.: I carrying on practising sport even when I am injured").

This scale allows us to classify individuals by risk of dependency (RD), symptomatic but independent (SID) and asymptomatic independent (AID). The RD group is formed of individuals with scores higher than 5 in three criterions. The SID group is formed by those with scores of 3 to 4 in three or more criterions or obtain scores of 5 to 6 combined with scores of 3 to 4 in three criterions, without reaching the requirements to be included in the RD group. The AID group is formed by individuals with a minimum score of one to two in at least three criterions, without reaching the requirements of incorporation in the SID group.

Through the instrument reliability analysis, consistency coefficients were obtained (Cronbach alpha) of .86 in tolerance, .80 in abstinence, .78 in desired effects, .80 in lack of control, .66 in suppression of other activities, .85 in time and .82 in continuation.

The Profile of Mood States test (POMS; McNair, Lorr, & Droppleman, 1971) was also applied in its reduced version of 29 items, adapted and validated in Spanish (Fuentes, García-Merita and Balaguer, 1995). This questionnaire values the individuals mood on a Likert type scale (0 = nothing, 1 = a little, 2 = moderately, 3 = quiet a lot, 4 = a lot) with dimensions of tension, depression, anger, energy and fatigue. In the reliability analysis, consistency coefficients (Cronbach alpha) were obtained of .71 in tension, .84 in depression, .85 in anger, .78 in energy and .85 in fatigue.

Also, the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970) was used. It consists in an auto administered test of 20 items valuing each one of the items from 0 to 3 on the Likert scale (0 = almost never, 1 = sometimes, 2 = often, 3 = almost always). It measures Trait Anxiety (TA) as anxiety tendency is relatively stable over time and can be considered as the general tendency of the individual's anxiety. The internal consistency coefficient (Cronbach alpha) of the scale is of .84 for fatigue.

On the other hand, the Athens Insomnia Scale (EAI-8; Soldatos, Dikeos, & Paparri-Gopoulos, 2000) is an auto applied test that consists in 8 items scored between 0 and 3, with a total score between 0 and 24. This test evaluates the difficulty of sleep induction, night-time awakenings, early awakening, total sleep duration and total sleep quality, accused disturbance as consequence of sleep problem and/or interference with daily activities and problems with the sensation of wellbeing, functioning and daytime somnolence. In this questionnaire the reliability analysis proved a consistency coefficient (Cronbach alpha) of .70.

Finally, the individual assessment of the level of adherence to a low fat diet (ALFD) was measured using the PREDIMED questionnaire of adherence to a low fat diet (Estruch et al., 2006). This questionnaire is formed of nine items that refer to eating habits. A higher score (maximum of nine points) corresponds with a higher adherence to a low fat diet. Following, we can observe some questions and scores depending on the answers given by the individuals: How many tablespoons of oil do you take a day, including those used for frying, cooking, dressing and in food eaten away from home? (1 tablespoon: 10ml): ≤ 2 = 1 point; How many rations of butter, margarine, fat, mayonnaise, creamy ice-creams or cream do you consume in a week? (Ration spread: 12g, ice-cream: 100g): ≤ 1= 1 point. This questionnaire shows a consistency coefficient (Cronbach alfa) value of .71.

Procedure

In first place, authorization was solicited from the universities to proceed in the administration of the questionnaires and to obtain the collaboration from the delegates of each year. The students were asked to assist to a meeting where the investigation was explained and how the questionnaires are to be given out and filled in. We insisted that any type of questions or doubts that emerged during the completion of the questionnaires were to be resolved before the questionnaires were taken away. All students participated in a voluntary and individual manner and had to sign a consent form. An exclusion criterion of the questionnaires was missing essential information and/or necessary items. The procedure was approved by the Ethics Committee of the participating universities. All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Data analysis

The design of the current study was descriptive and correlational with a transversal character. Descriptive analysis was done calculating mean, standard deviation, frequencies and percentages to determine prevalence of symptoms to exercise dependence. Correlational analysis was used to evaluate relationships between variables using the correlation coefficient of Pearson. The results were analyzed with the statistic program SPSS 21.0. The assumed level of confidence used to make interpretation and data analysis was of $p < 0.05$.

Results

Following is the descriptive analysis that refers to exercise dependence of the participants, where 6% show risk of dependence (RD), 65% have symptoms but are not dependent (SID) and 29% are asymptomatic (AID). Depending on the gender we can observe that women have 12% risk of dependence, 42% have symptoms but are independent and 45% are asymptomatic. In men only 4% have risk of dependence, 70% have symptoms but are not dependent and 26% are asymptomatic. If we observe the age groups we found that individuals under the age of 20 show 6% risk of dependence, 66.7% symptoms but independent and 27% asymptomatic. In the case of university students aged 20 or over, 5% are at risk of dependence, 65% have symptoms but have no dependence and 30% are asymptomatic. Depending on weekly training sessions, 10% show risk of dependence when the individual practices more than four weekly sessions, whereas only 4% are risk dependent if they practice four sessions or less a week. Of those who practice four or more sessions there are 72% with symptoms but no dependence with this percentage at 62% in those who only practice 4 or fewer sessions. Those who practice with more frequency are 18% asymptomatic compared to 34% of those who train less. Finally, in relation to sport experience, the more experimented athlete has 7% risk of dependence compared to 3% of those who have less experience, 62% are symptomatic but independent versus 71% and 31% are asymptomatic compared to 25%.

On the other hand, the results suggest that exercise dependence maintains an interdependent relationship with mood alterations in athletes ($p < .01$). The same occurs with weekly sessions dedicated to training ($p < .01$), trait anxiety ($p < .05$), sleep problems ($p < .01$); but this did not happen with sport experience. The results also reflect a significant relationship with an increase of fat consumption in the diet and a lower adherence to a low fat diet ($p < .05$) (Table 4).

Table 3. Descriptive symptoms of exercise dependence prevalence differentiating gender, age groups, weekly training sessions and sport experience expressed in number of individuals and percentage (n, %).

		RD		SID		AID		TOTAL	
Gendre	Female	5	12.5%	17	42.5%	18	45%	40	100%
	Male	9	4.4%	144	69.9%	53	25.7%	206	100%
Total		14	5.7%	161	65.4%	71	28.9%	246	100%
Age Groups	<20	7	6.1%	76	66.7%	31	27.2%	114	100%
	>20	7	5.3%	85	64.4%	40	30.3%	132	100%
Total		14	5.7%	161	65.4%	71	28.9%	246	100%
Weekly Sessions	<4	6	3.7%	101	62%	56	34.4%	163	100%
	>4	8	9.6%	60	72.3%	15	18.1%	83	100%
Total		14	5.7%	161	65.4%	71	28.9%	246	100%
Sport Experience	≤5	3	3.4%	62	71.3%	22	25.3%	87	100%
	>5	11	6.9%	99	62.3%	49	30.8%	159	100%
TOTAL		14	5.7%	161	65.4%	71	28.9%	246	100%

RD: Risk of dependence; **SID:** have symptoms but are not dependent; **AID:** Asymptomatic.

Table 4. Correlations between symptoms of exercise dependence, weekly training sessions, sport experience, mood, trait anxiety, insomnia and adherence to a low fat diet (ALFD).

	Exercise Dependence	Sessions	Sport Experience	Mood	Trait anxiety	Insomnia
Sessions	.29**					
Sport Experience	-.05	.00				
Mood	.18**	-.04	.00			
Trait anxiety	.15*	-.09	-.05	.56**		
Insomnia	.21**	.09	-.07	.13*	.25**	
ALFD	-.16*	-.06	-.02	.01	.05	--17**

** The correlation is significant at 0.01 level (bilateral).

*The correlation is significant at 0.05 level (bilateral).

Discussion

Exercise dependence is an infrequent pathology (Morris et al., 1990). In university students it represents a low proportion in the same lines as recent studies (Reche et al., 2015; Reche et al., 2018). Most exercise dependence cases are in women, athletes below the age of 20, those with more weekly training sessions and in athletes with more sport experience.

University students at risk of exercise dependence dedicate more weekly training sessions than the rest. They dedicate a significantly higher amount of time exercising which is one of the most characteristic symptoms of dependence disorders (Reche and Gómez, 2014; Reche et al., 2015). Consistent with studies that say that addiction to exercise triggers in individuals repeated frequencies during the same day and an increment of training days, as well as, absence of resting time, even when they are not in an adequate condition to carry on (Adams et al., 2003; Allegre et al., 2007).

There is a relationship between mood alterations (tension, depression, anger, lack of energy and fatigue) and exercise dependence, as proved in other studies (Modolo, 2009; Reche et al., 2015). Moderate exercise doesn't always reduce tension levels and in excess can produce negative repercussions (Rosa, de Mello, Negrão and de Souza-Formigoni, 2004). Also, highly dedicated athletes or even dependent, have an anxious high propensity and sleep problems, coinciding with preceding studies (Acevedo et al., 2007).

Scientific evidence supports the benefits of exercise on sleep quality and manifests that exercise reduces insomnia problems and even helps to fight these problems. However, in our study, interdependent relationships were observed between exercise dependence and problems getting to sleep, which is a variable, related with mood alterations and adherence difficulties to a low fat diet. These are questions that confirm conclusions of Ricciardelli and McCabe (2004).

Lack of sleep is one of the parameters that affect sport performance, increases fatigue and mood disorders, producing a deficit in cognition capacity and worsening quality of life (APA, 1994).

Following Reche and Gómez (2015) exercise dependence seems to be related with higher intake of fat in the diet and possible eating disorders. Symptoms or psychological indicators of exercise dependence in training periods have been identified in university athletes as a higher frequency of training sessions per week, mood alterations (tension, depression, anger, lack of energy and fatigue), sleep problems, anxious propensity and an increase in the consumption of fat in the diet with less adherence to a low fat diet (difficulties in calorie restriction). Not showing any relationship with sport experience of the students. This doesn't allow us to recognize signs of the disorder for early detection or intervention.

It would be relevant that in the intervention programs with athletes evaluate the variables: weekly sessions of training, alterations in the mood, sleep problems, anxious propensity and the lower adherence to a low fat diet; sensitive to psychological disorders such as a dependence on physical exercise.

With regard to limitations of the study, it would be interesting to perform a study that detects the relationship of symptoms of exercise dependence with the intensity of sessions, as it has been mentioned in other studies that not only frequency and volume influence on exercise dependence but also the intensity of the exercise (Adams et al., 2003) is a determining factor (Allegre et al., 2007; Hausenblas, & Downs, 2002). Also, relating each dimension of dependence with the added variables and investigate in other populations, such as, teenagers or adults in general.

Conflict of interests

Authors declare that they have no conflict of interest.

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