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Personality, Exercise Addiction and Orthorexia: A research contribution.

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ABSTRACT

Background: The objectives of the study were to verify the presence of exercise addiction and orthorexia in the population identified, as well as the relationship between these two variables, and to investigate whether alexithymia and impulsivity are personality traits associated with sport addiction or orthorexia.
Methods: The sample, consisting of 140 subjects (between 17 and 52 years old), who practiced bodybuilding, crossfit, calisthenics, powerlifting, or who attended fitness courses, were given: a personal data sheet, the Barrat Impulsiveness Scale-11, the exercise Dependence Scale-Revised, the Toronto Alexithymia Scale-20 and the Bratman Test.
Results: The percentage of subjects with sports addiction is 13% and part of the sample reports symptoms of orthorexia. There is a relationship between exercise addiction and orthorexia, and there are traits of impulsivity and alexithymia in dependent subjects or at risk of addiction. An association was found between alexithymia and impulsivity.
Conclusions: Reading the results, it is clear that the obsession with a healthy lifestyle can manifest itself not only in the food area, but also in the sports field, and that impulsiveness and alexithymia are associated with addiction to sports, probably because this represents a strategy to stem dysregulated emotional states.

Keywords: *Exercise addiction*; *Orthorexia*; *Impulsivity*; *Alexithymia*; *Behavioral Addictions*.

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Introduction

In recent times, there are many sports undertaken in the gym such as Bodybuilding, Crossfit, Powerlifting, Calisthenics, as well as the many group fitness courses (zumba, body pump, etc.), which are gaining more and more popularity. All these sports activities allow you to improve both your physical fitness and your athletic performance (endurance, flexibility, speed, agility, coordination, balance, power).

Bodybuilding is a discipline that, through weight training and adequate nutrition, allows the development of mass muscle and the reduction of fat mass, and therefore to obtain a harmonious and sculpted body. The Crossfit, created by Greg Glasmann, is a training program consisting of a mix of aerobic and anaerobic exercises (running, squat, deadlift, burpees, pull-up, wall ball, clean and jerk, snatch etc ..), chosen and grouped in a daily workout called WOD. Powerlifting, on the other hand, is a strength sport, the purpose of which is to train the athlete to lift as much weight as possible in three basic exercises: deadlift, bench press and squat. Finally, the Calisthenics is one type of training which consists of performing free body exercises, such as front levers, push ups, tractions, muscle ups, planche, etc.

Both the male and female body prototypes contemplated by our socio-cultural context and disseminated through social media, such as images of muscular men (Leit et al., 2001; Labre, 2005) and thin and toned women (Aubrey, 2010), both the fact that satisfaction with one's body has become an important dimension of the concept of self, a source of self-esteem for men and women (McCabe & Ricciardelli, 2004), may have contributed to the spread of the sports previously mentioned. It may have been what helped their popularity also the socio-political model of well-being, which underlines how important it is to protect one's health by adopting healthy behaviors, such as regular exercise and healthy eating (Crawford, 2006; Delaney & McCarthy, 2014; Lee & Macdonald, 2010; Wright, O'Flynn & Macdonald, 2006), in order to reduce the risk of cardiovascular disease, cancer, diabetes, etc. (Loef & Walach, 2012). Much is said, in fact, about the negative consequences, on health, of a sedentary lifestyle and an improper diet (Lee et al., 2012; World Health Organization, 2010), and regarding the importance of constant physical exercise, known for the benefits it brings to psycho-physical health (Ernest, 1998; Thompson, 2005; Giada et al., 2008) of adults (Warburton, Nicol & Bredin, 2006) and of developing subjects (Piko & Keresztes, 2006).

While on the one hand the percentage of obese and sedentary subjects is always higher, on the other hand, the percentage of people who develop an obsession with sport and a balanced diet is increasing. In fact, there is a steady increase in research that investigate the deleterious effects of the

extremes of healthy behaviors (sports and healthy food), which, paradoxically, when they take obsessive-compulsive character, can become harmful to the well-being of the person, who could develop addiction to physical exercise or orthorexia nervosa.

Exercise addiction and orthorexia

There are sportsmen who express an obsessive approach to physical activity and tend to overdo their workouts, becoming subject to risk of exercise addiction.

Physical exercise addiction is a form of behavioral addiction, characterized by tolerance to usual frequency training that turns into increasing amounts of time dedicated to it; withdrawal symptoms if the frequency of activity is reduced; continuous exercise despite the presence of pain and injury (Adams & Kirkby, 2002; Berczik et al., 2012; Hausenblas & Downs, 2002, Landolfi, 2013). It is not yet present among the forms of addiction described by the DSM-V, therefore criteria listed by the DSM-IV for the diagnosis of substance dependence are used to identify the condition.

Exercise addiction symptoms have been reported by several athletes: ultra-marathoners (Allegre et al. 2007), crossfitters (Lichtenstein & Jensen, 2016), a sample of subjects who regularly attend fitness centers (Costa et al. 2012), students sports science sports (Szabo & Griffiths 2007; Nuzzo, Schindler & Ryan, 2013), triathletes (Blaydon, Lindner & Kerr, 2002; Youngman, 2014), soccer players (Lichtenstein et al., 2014) bodybuilders and powerlifters (Hale et al. 2010). A research conducted on the Italian territory has shown that bodybuilders have high levels of exercise tolerance, which pushes them to increase the amount training to obtain the desired effects and benefits (Oliva, Costa & Cuzzocrea, 2013).

These individuals may also have impaired social functioning and, concomitantly, other psychiatric disorders, including food disorders such as anorexia nervosa and bulimia nervosa (Blaydon & Lindner, 2002, Bratland-Sanda et al., 2010), other forms of addiction (Muller et al., 2015; Villella et al., 2011) and mood disorders (Weinstein et al., 2015).

Among the causes or risk factors related to exercise addiction could be: physiological factors (dopamine release and endorphins, which determine a sensation of pleasure and positive emotions) (Ferrari 2011; Goldberg 1988; Farrell et al. 1982), factors relational (social difficulties), personality issues such as impulsive traits (Gayatri Kotbagi et al., 2017) or alexithymic (Iacolino, Pellerone & Lombardo, 2017; Manfredi & Gambarini, 2015), but also a personality characterized by obsessive-compulsive tendencies (Oberle, Watkins & Burkot, 2017), emotional and cognitive factors, such as body image disorders, hypercriticism towards oneself, dissatisfaction with one's own body (Freire et al., 2020; Iacolino, Pellerone & Lombardo, 2017; Longobardi et al, 2017).

Regarding body dissatisfaction, a study (Freire et al., 2020) conducted on 60 subjects who practice bodybuilding or crossfit, has identified this as a probable risk factor for developing exercise addiction: those who exhibited high levels of body dissatisfaction also showed higher levels of risk behaviors for developing exercise addiction or of real addiction. In addition, the highest levels of bodily dissatisfaction were women, this is probably due to psychological and socio-cultural factors that enhance the stereotypes in force on the female body, while showing higher levels of dependence from exercise were the bodybuilders, compared to the crossfitters.

By orthorexia nervosa we mean the pathological obsession with healthy and natural food: Bratman defines it as "a disorder disguised as a virtue" (Bratman, 1997). In DSM-V, orthorexia is described in the chapter "Avoidant / Restrictive Disorder of Food Intake".

Orthorexics exhibit obsessive thoughts about food, compulsive behaviors regarding planning / research / preparation of food, progressive social isolation resulting in feelings of anxiety and depression (Bratman & Knight, 2000; Dunn & Bratman, 2016), and a strict restriction of the food range (elimination of gluten, sugar, lactose, non-organic food ..), often accompanied by nutritional deficiency. When they violate these doctrinaire diets, orthorexic individuals can experiment strong sense of guilt and self-shame.

Bratman identifies various causes of orthorexia including covert conformity, the desire to control, fear of others and of being judged, the creation of an identity, food puritanism, the total illusion of security, kitchen spirituality. In addition to the causes defined by Bratman, among the reasons or risk factors identified in the literature there could be previous eating disorders, but also a personality characterized by perfectionism and obsessive-compulsive tendencies (Hayes et al., 2017; Koven & Senbonmatsu, 2013; Arusoglu et al. 2008).

Therefore, behind these food fundamentalisms of gluten-free, sugar free, no-ogm, animal-free, no-carb, there are hidden worries, anxieties, fears, and such dietary behaviors put in place by orthorexics can only represent an attempt to hide them or deal with them in a dysfunctional way. Feeding these behaviors are also the mass media, protocols advertised by dieticians, nutritionists, who emphasize the distinction between good and bad food, all this information is absorbed by people and re-meaning based on the subjectivity of each.

There are not many studies in literature that investigate, in detail, the percentages of orthorexic subjects in samples consisting of participants who play sports in the gym: most of these are made on champions of convenience, such as university students.

Relationship between Exercise Addiction and Orthorexia

Several researches have shown the relationship between orthorexia nervosa and exercise addiction (Oberle, Watkins & Burkot, 2017; Rudolph, 2017; Haman, Lindgren & Prell, 2017; Malmborg et al. 2017). This association originates from internal, related reasons the benefits deriving from a healthy lifestyle, such as wanting to safeguard one's physical and psychological health (e.g. reduction of stress) and the desire to achieve optimal physical fitness (Bratman & Knight, 2000; Dunn, & Bratman, 2016): these motivations not only guide eating habits of subjects with orthorexic symptoms, but also the quantity of their workouts (Oberle, Watkins & Burkot, 2017). Furthermore, a relationship between obsessive-compulsive tendencies and orthorexia has been demonstrated in literature (Hayes et al., 2017; Koven & Senbonmatsu, 2013; Arusoglu et al. 2008): obsession with a healthy lifestyle and a perfect body can manifest not only in the food area, but also in the sports field, and vice versa (Oberle, Watkins & Burkot, 2017).

Although the results are not statistically significant, research has shown that subjects that report orthorexic symptoms, compared to the controls to those who did not have these symptoms but still led a healthy lifestyle, showed greater consumption of supplements (omega 3, vitamins, proteins, ..) in order to increase their energy and their concentration, there was a greater use of medical therapies (yoga), and a strong motivation to train to improve their physical and psychological health (Oberle, Klare & Patyk, 2019).

However, the causes associated with sport addiction and orthorexia, the relationship between these two constructs having been demonstrated, could coincide and represent risk factors for the development of both, in particular the presence of a personality characterized by perfectionism and obsessive-compulsive tendencies (Oberle, Watkins & Burkot, 2017). Hence the idea of verifying and empirically investigating the possible relationship between the two psychological constructs.

Exercise Addiction, Impulsivity and Alexithymia

Various researches have tried to investigate whether there is a relationship between certain personality traits, such as impulsivity and alexithymia, and exercise addiction.

Impulsivity is defined as the inability to resist a push or temptation, even if it is harmful to oneself or to others (American Psychiatric Association, 2013).

Many scholars have developed epistemological models of impulsivity (Whiteside & Lynam, 2001; Eysenck, 1993; Dickman, 1990; Cloninger, 1986), and a significant contribution was also offered by Barrat and Patton, who proposed a model of impulsivity characterized by 3 dimensions: motor impulsivity, attentional impulsivity and non-planning impulsivity (Barrat & Patton, 1983).

Motor impulsivity is the tendency to act without thinking and is characterized by a lack of perseverance, while attentional impulsivity or cognitive is the tendency to make decisions quickly, following incomplete reflections on situations, and is characterized by inattention and cognitive instability. Finally, non-planning impulsiveness is typical of those who lack planning, fail to plan their future behaviors, and have poor self-control and intolerance to cognitive complexity.

From the analysis of the literature, it emerges that many studies have demonstrated the relationship between behavioral addictions and impulsivity (Billieux & Van der Linden, 2010; Dawe, Gullo, & Loxton, 2004), but few have investigated the association between the psychological characteristic individual and, specifically, exercise addiction. A research, conducted on students aged 18 to 25, found that there was a relationship between exercise addiction and impulsiveness, in particular with the emotional components of the latter (Gayatri Kotbagi et al., 2017): this result suggests that exercise addiction is a coping strategy, such as eating disorders (Bø et.3 al., 2016; Billieux et al., 2008; Selby, Anestis, & Joiner, 2008), useful in alleviating negative emotional states (Freimuth et al., 2011; Szabo, 1995; Thompson & Blanton, 1987).

In addition to impulsiveness, alexithymia has also been studied in relation to exercise addiction.

Alexithymia (from the Greek "alexithymia", which means "mood without words") is a deficit in the cognitive processing of emotions, in which it determines the lack of awareness on one's own emotional-affective states. The typical characteristics of alexithymia are the inability to identify and verbalize emotions, pragmatism (cognitive style oriented towards the outside) and the poverty of symbolic and dream (Sifneos, 1973). It has long been considered a stable personality trait, although it has been shown that there are situational variables that can determine or accentuate it. Alexithymics can feel emotions, but they cannot identify, distinguish, describe and regulate them. Psychic suffering resulting from affective dysregulation, can lead these subjects to regulate their emotions through behaviors that show a risk to their health (addiction to substances, sports, eating disorders). Many scientific studies show a relationship between alexithymia and substance dependence (De Berardis et al. 2009; De Rick et al., 2009; Thorberg et al. 2009; De Timary et al. 2008; Evren et al. 2008; De Rick & Vanheule, 2007; Farges et al. 2004; Hope et al. 2004; Loas et al. 2000;) or behavioral addictions (De Berardis et al., 2009; Parker et al. 2005; Lumley, Roby 1995), including exercise addiction.

The relationship between alexithymia and exercise addiction was studied in a sample of subjects who attended fitness centers (Manfredi & Gambarini, 2015), in a population of swimmers (Allegre et al., 2007) through the analysis of the narrative accounts of participants, in sports university students (Iacolino et al., 2017;), and also in a sample of paratroopers in which it was shown that the

skydiving represented a strategy used by alexithymic women to regulate their emotions (Woodman, Cazenave & Le Scanff , 2008).

As for substance addictions, and behavioral addictions it is hypothesized that these have, for alexithymics, a function compensatory for the emotional-affective states of unregulated (Manfredi & Gambarini, 2015), cause of psychic suffering. Through physical activity, they would be able to suppress a non-mentalized emotionality and, given the rise in endorphin levels, experience a feeling of wellness.

As for the motivations for practicing sports, it has been seen that alexithymic subjects rarely report practicing sports to improve physical appearance: the underlying reasons were others, including habit (Manfredi & Gambarini, 2015).

From the analysis of the literature it emerges that the personality traits described (impulsivity and alexithymia) could represent risk factors for the development of exercise addiction.

Objectives and experimental hypotheses

The objectives of this experimental study were to investigate, in a sample of sportsmen who practice Bodybuilding, Powerlifting, Crossfit, Calisthenics or fitness classes, the presence of individuals at risk of exercise addiction and orthorexia nervosa, and to study if there is a relationship between these two variables. Furthermore, the relationship between physical exercise addiction and psychological individual characteristics, such as impulsivity and alexithymia, was investigated.

It is speculated that sportsmen who practice these now very popular sports may report symptoms of exercise addiction physical and orthorexia nervosa, and that, assuming that obsession with a healthy lifestyle and a perfect body occurs in several areas, these two variables could have a positive relationship.

The presence of impulsivity and alexithymic traits has also been hypothesized in subjects who report symptoms of addiction to exercise, given that, as found by several studies, sport represents a way to regulate negative or dysregulated affective states.

Another objective of the study was to look at qualitative variables such as motivation to practice sports, integration, doping, the favorite drinks of athletes, and to increase knowledge about the world of fitness.

Method

Participants

The study was carried out on a sample of healthy subjects consisting of 140 athletes (M = 88; F = 52), aged between 17 and 52, who trained at Body Building (60), Powerlifting (22), Crossfit (29), Calisthenics (10) or fitness classes (19). Most of the men in the study was justified by the type of sport, where, in general, there is a prevalence of men. However, more recently, these are sports that stand increasing popularity among women.

Procedure

The participants in the research, geographically distributed in Italy, were recruited either through social networks (Instagram and Whatsapp) or from sports centers. They were asked to fill in a series of questionnaires, either online or paper format. Prior to compilation of the test, consent was gained from each participant in the study, they were informed about the objective of the research, as well as being assured of their voluntary participation, the absolute anonymity of the data and the use being only for scientific research purposes. Refusal to participate did not involve any penalty or loss. No participant received payment for participation.

The data collection took place from 15th-02-2020 to 22nd-04-2020.

Instruments

After consenting to participate in the study, the subjects completed a series of questionnaires consisting, in the following order, of a data sheet, from the Barrat Impulsiveness Scale-11 (BIS-11), from the Exercise Dependence Scale-Revised (EDS-R), from Toronto Alexithymia Scale-20 (TAS-20) and the Bratman Test (TB).

The personal data sheet considered many variables including age, sex, educational qualification, marital status, years of sport, weekly training frequency, the daily hours usually spent training, participation or not in competitions. There were some questions that investigated the lifestyle (nutrition, food supplementation, smoking, doping) and some personal body characteristics (weight and height) of the subjects, it also asked to indicate, among various alternatives, the preferred drinks and motivations to practice sports.

Impulsiveness. For the evaluation of impulsiveness, the Italian version of the Barrat Impulsiveness Scale-11 (BIS-11) (Fossati et al., 2001), consisting of 30 items, evaluated on the basis of a Likert scale from 1 to 4. The theoretical model underlying this questionnaire by Barrat and Patton, the first to create the tool based on the impulsivity model they proposed, was characterized by 3 dimensions: motor impulsivity, attention impulsivity and non-planning impulsivity (Barrat & Patton, 1983).

The BIS-11 allows to investigate 6 first-order factors (attention, cognitive instability, motor impulsivity, perseverance, self-control, and cognitive complexity) and 3 second-order factors derived from them (attention + cognitive instability = motor impulsivity; impulsivity motor + perseverance = attention impulsiveness; self-control + cognitive complexity = impulsivity from non-planning). There are not standardized cut-off scores and the sum of the second order factors allows to have a quantitative score of impulsivity in general, which oscillates between 30 and 120. The scale has good reliability and validity (Fossati et al., 2001).

Exercise addiction. The assessment of exercise addiction took place through the Italian version of Exercise Dependence Scale-Revised (EDS-R) (Costa et al., 2012), a self-assessment questionnaire consisting of 21 items, assessed based on a Likert scale from 1 to 6. The first to implement this tool were Downs, Hausenblas and Nigg (2004), based on the criteria used by the DSM-IV for the diagnosis of substance dependence. It is a screening tool, useful for identifying individuals at risk of addiction exercise, but it is not used to make official diagnoses as specific criteria for sport addiction do not yet exist.

The 21 items of the EDS-R are grouped into 7 subscales: withdrawal (abstinence, anxiety and irritation, which occur when the subject reduces the quantity training); persistence (tendency to train even in the presence of injuries); tolerance (need to increase the amount of exercise physical to obtain the desired effects and results); lack of control (unsuccessful attempts to reduce the amount of exercise); reduction of other activities (social, work, school); time (large amounts of time spent training); effects of intention (workouts take longer than expected).

It is possible to have both a single score for each subscale, and a total quantitative estimate derived from the sum of the individual scores of each subscale: the higher the global score, the higher the sport addiction. In addition, the EDS-R also allows you to obtain data nominal that is to classify the subjects in "dependent", "symptomatic non-dependent", "asymptomatic non-dependent".

The subjects are classified in the category: "employees" if they obtain an average score of 5-6 in at least 3 factors of the EDS-R, which correspond to the addiction criteria described by the DSM-IV for the diagnosis of substance dependence; "Non-dependent-symptomatic", if obtain an average score of 3-4 on at least 3 EDS-R factors and do not meet the criteria for "dependent subjects", these are those who are not addicted but still at risk for developing sports addiction; "Not asymptomatic employees" if they have an average score of 1-2 in at least 3 EDS-R factors and do not meet the criteria for "symptomatic non-dependent", these are subjects who report no symptoms and are not at risk of addiction. The Italian version has good psychometric features (Costa et al., 2012).

Alexithymia. For the assessment of alexithymia, the Italian version of the Toronto Alexithymia Scale-20 (TAS-20) (Bressi et al., 1996), a questionnaire divided into 20 items evaluated on a scale

from 1 to 5, grouped into 3 subscales (difficulty in identifying the feelings, difficulty in describing feelings, outward-oriented thinking). It is possible to obtain both a single score for each subscale, and a total score derived from the sum of the individual estimates, ranging from 20 to 100. Based on the total score, subjects are classified into: "Non alexithymic" (score between 20 and 50), "Borderline" (score between 51 and 60), "alexithymic" (score between 61-100).

The Italian TAS-20 has demonstrated good internal reliability and adequate test-retest reliability (Bressi et al., 1996).

Orthorexia. Orthorexia was assessed using the Bratman Test, a screening test consisting of 10 dichotomous items that investigate the presence of orthorexia. Based on the score obtained, the subjects are classified into: "Normal" (score between 0 and 3), "Orthorexia" (score between 4-8), "Severe Orthorexia" (score between 9-10).

Results

Demographic statistics of the sample

The sample of healthy subjects consisted of a total of 140 athletes (M = 63%; F = 37%) aged between 17 and 52: for this population sample, the average age was around 25-26 years (M = 25.75; SD = 6.36). Regarding education qualifications 7% of the subjects possess a middle school diploma, 54% of the diploma and 39% of the degree, while as for the marital status, 37% are single, 47% are engaged, 7% are married and 9% live with their partner. No participant is divorced or widowed.

Most of these athletes practice bodybuilding (42.9%), 20.7% do crossfit, 15.7% powerlifting, 13.6% participate in fitness courses, and, finally, 7.1% practice calisthenics.

The reference population usually train on average 4 days a week for about two hours. Furthermore, it is also deduced that 73% of subjects do not participate in official competitions (73% vs 27%) and 71% train alone (71% vs. 29%).

Based on specific information regarding personal body characteristics (weight and height), collected through the questionnaire, it was possible to calculate both the BMI of each subject and, in general, the mean value (M = 23.59) of this variable. It should be emphasized that the BMI has a limit: it does not distinguish fat mass and lean mass, i.e., it does not specify whether the weight is related to fat or muscle, so it could misclassify some subjects, such as bodybuilders for example.

From the statistical analysis of the values obtained from the questions that investigated the lifestyle (nutrition, supplementation, smoking, doping) of participants, 83% of sportspeople say they undergo a diet: of this 83%, more than half identify that they do this to improve their physical

condition (eg weight loss, muscle growth or definition), while a minority of subjects transcribes to follow a diet simply to have a healthy eating style, to improve one's performance, or to compete.

In the registry section of the test battery administered, the subjects were asked if they smoked cigarettes: 79% of subjects declared that they did not smoke and only 27% answered affirmatively. Regarding food supplementation and the doping phenomenon, all athletes claim to be aware of these arguments, moreover 60% declare to use food supplements (protein powder, creatine, amino acids, vitamins and Omega 3) and only 2% reveal that they use doping substances.

Multiresponse questions were also asked, investigating how participants learned about these supplements: these questions provided for the possibility of expressing more than one answer, since the means of communication can be different places through which subjects were informed of these substances. The percentages were calculated on the total of those who declared who is aware of food supplements (N = 140) and doping drugs (N = 139).

With reference to the favourite drinks, the possibility was given to express more preferences: still water was, however, the most popular drink indicated by the sample population.

Ultimately, as regards the motivation to practice sports, it was possible to indicate a maximum of the three reasons considered the most important. Most athletes are motivated to train to improve their physical condition, for passion, to relieve stress and, a lower percentage, to express one's abilities. The first variable was indicated well by 84.3% of the sample, the second by 63.6%, the third by 62.1% and the fourth by 26.4%. Only a minority marked, among the more choices expressed, the other options present (work, socialization, therapeutic purpose,..).

Statistical analysis: presence of exercise addiction, orthorexia, impulsivity and alexithymia

All the data relating to the various questionnaires were added up and, where necessary, the reverse items were turned over (as in the scale of impulsiveness and alexithymia), since some values were expressed in inverse ratios. Thereafter, based on the cut-off scores (illustrated in the "tools" section) of each questionnaire, the frequencies and the corresponding percentages of the results obtained were calculated to the EDS-R, TB and TAS-20 questionnaires, and the average of the results obtained on the BIS-11 scale. The sample data emerged, compared with the scores cut-offs, are shown below.

The 34% of subjects fall into the category of asymptomatic non-employees (non-employees), the 54% in the symptomatic (at risk) non-dependent category, and 13% showed a real addiction to physical exercise. The average of the scores obtained on the EDS-R is 63.97 (SD = 18.52).

As for orthorexia, the 27% of subjects do not report orthorexic symptoms, compared to 67% which instead reported some symptoms of orthorexia and 6% of severe orthorexia.

With regards to impulsiveness, the average score of the sample is 56.5 (SD = 9.41).

Ultimately, 76.4% of the participants are not alexithymic, compared to 14.3% who are among the borderline and 9% among the alexithymics.

Statistical analysis: correlations between variables

The data analysis, carried out with the SPSS statistical program, was aimed at verifying the existence of relationships between the dimensions of EDS-R, TB, BIS-11 and TAS-20 questionnaires, through the calculation of the Correlation Coefficients with the Pearson method and the significance of the 2-tailed null hypothesis. From Table 1, in general, there seems to be a positive correlation and statistically significant, as long as low, between exercise addiction and orthorexia nervosa ($r = 0.28$; $p < 0.01$), and among the results obtained at EDS-R and the weekly amount of training ($r = 0.22$; $p < 0.01$). The presence of orthorexia nervosa (TB) seems to be correlated with "withdrawal (abstinence)", "tolerance", "lack of control", "reduction of other activity", "time", "effects of intention", such as with the measure of addiction to physical exercise (EDS-R).

EDS-R VARIABLES	TB
Withdrawal	.21*
Continuance	.048
Tolerance	.27**
Lack of control	.25**
Reduction in other activities	.19*
Time	.27**
Intention Effects	.21*
Total	.28**

* = $p < 0.05$ ** = $p < 0.01$

Table 1 - Pearson correlations between the scores obtained on the EDS-R and TB questionnaires.

With regard to impulsivity and alexithymia, it has been seen that there is a statistically significant positive correlation between exercise addiction and personality traits ($r = 0.26$; $p < 0.01$).

In particular, as reported in table 2, positive correlations were found between EDS-R's factors ("withdrawal", "continuance" and "reduction of other activities") and attention and motor impulsivity (BIS-11).

	BIS-11 VARIABLES		
EDS-R VARIABLES	Attention Impulsivity	Motor Impulsivity	Non planning Impulsivity
Withdrawal	.24**	.19*	.18*
Continuance	.27**	.21*	.06
Tolerance	-.019	.01	-.03
Lack of control	-.01	.12	.13
Reduction in other activities	.38**	.31**	.25**
Time	0.59	.051	.025
Intention Effects	0.14	.072	.15

* = $p < 0.05$ ** = $p < 0.01$

Table 2 - Pearson correlations between scores obtained on the EDS-R and BIS-11 questionnaires.

The total score obtained in regarding of the Exercise Dependence Scale-Revised (EDS-R) seems to be positively related with the total score of Alexithymia ($r = 0.26$; $p < 0.01$).

In particular (table 3), "difficulty identifying feelings" and "difficulty in describing feelings" seem to be positively related with "abstinence" and "reduction of other activity" of EDS-R.

Furthermore, a statistically significant positive correlation was also found between the "Externally-oriented thinking" and the "reduction of other activities", "Lack of control", "time" and "effects of intention" of the EDS-R. It is possible to note that the variables have somewhat low correlations, therefore they are not perfectly superimposable.

	TAS-20 VARIABLES		
EDS-R VARIABLES	Difficulty identifying feelings	Difficulty describing feelings	Externally-oriented thinking
Withdrawal	.36**	.18*	.13
Continuance	.11	0.14	.11
Tolerance	-.07	-.01	.03
Lack of control	.11	.17	.18*
Reduction in other activities	.24**	.28**	.30**
Time	-.02	.04	.21*
Intention Effect	-,01	.20	.18*

* = $p < 0.05$ ** = $p < 0.01$

Table 3 - Pearson correlations between scores obtained on the EDS-R e TAS-20 questionnaires.

An average positive correlation was found between impulsivity and alexithymia ($r = 0.44$; $p < 0.01$).

Ultimately, no relationship was found between orthorexia and the impulsivity and alexithymia traits (table 4), except a low positive correlation between the orthorexia (TB) and the "Externally-oriented thinking" factor of the TAS-20 ($r = 0.18$; $p < 0.05$).

BIS-11 VARIABLES	TB
Attention Impulsivity	.02
Motor Impulsivity	.16
Non planning Impulsivity	.14
Total	.14
TAS-20 VARIABLES	**TB**
Difficulty identifying feelings	.06
Difficulty describing feelings	-.06
Externally-oriented Thinking	.18*
Total	.07

* = $p < 0.05$; ** = $p < 0.01$

Table 4 - Pearson correlations between scores obtained on TB questionnaire and the BIS-11 and the TAS-20.

Discussion

The prevalence of exercise addiction in the sample studied is 13%, this demonstrates, being in line with other data existing in the literature (Lichtenstein & Jensen, 2016; Manfredi & Gambarini, 2015), as it is a form of addiction that can be present in subjects practicing sports in the gym. Moreover, about 54% meet the EDS-R criteria for "not dependent but symptomatic", therefore a high percentage of sportsmen are at risk for developing a form of sports addiction. From the observation of the data obtained, it is clear that these sportsmen tend to develop high exercise tolerance indices, which pushes them to increase the quantity training to obtain the desired effects and benefits, and therefore to increase the amount of time dedicated to sports, which is also demonstrated by a study conducted on bodybuilders by Oliva, Costa & Cuzzocrea (2013).

As for orthorexia, based on the Bratman test criteria, 67% report some symptoms, while 6% fall within the "severe orthorexia" category.

With reference to the hypothesized relationship between exercise addiction and orthorexia, it is possible to confirm our first hypothesis of research, as a significant positive relationship was found between the two variables, as illustrated by other studies (Haman, Lindgren & Prell, 2017; Malmborg et al. 2017; Oberle, Watkins & Burkot, 2017; Rudolph, 2017;), even if this relationship appears to be medium-low.

This means that exercise addiction and orthorexia could both be present in a subject, probably because, a relationship between obsessive-compulsive tendencies and orthorexia has been demonstrated in the literature (Hayes et al., 2017; Koven & Senbonmatsu, 2013; Arusoglu et al. 2008), the obsession with a healthy lifestyle and a perfect body can manifest itself not only in the food area, but also in the sports field, and vice versa.

It is also possible to confirm the second research hypothesis, as a significant positive relationship between addiction was found from exercise, impulsivity and alexithymia: this shows that those with alexithymic traits and higher levels of impulsivity they also tend to report symptoms of exercise

addiction, but not symptoms of orthorexia, as no relationship between cost last and these personality traits. The relationship could be explained by the fact that the obsession and excess with the activity could represent a coping strategy to deal with (dysfunctionally) negative emotional states (Freimuth et al., 2011; Szabo, 1995; Thompson & Blanton, 1987) or dysregulated, resulting from high levels of impulsivity or difficulty in identifying and describing one's own feelings.

The results are however in line with studies conducted both on sports subjects and on university students (Allegre et al., 2007; Iacolino et al., 2017; Kotbagi et al., 2017; Manfredi & Gambarini, 2015), and also on a sample of paratroopers (Woodman, Cazenave & Le Scanff, 2008). The statistically significant positive correlation between alexithymia and impulsivity could suggest that alexithymics show high levels of impulsiveness as they compulsively resort to addictive behavior to fill their emotional gaps. In particular, the correlation found between all the dimensions of impulsiveness, the concrete thinking of alexithymics and the reduction of other activities connected to the increase in physical exercise, it could suggest that the activities preferred by these are precisely those that do not require a social interaction (Manfredi and Gamberini; 2015).

Finally, the main reasons identified, which guide subjects to practice sports or to undertake a diet, are linked to objectives physicists (Oberle, Watkins & Burkot, 2017; Dunn, & Bratman, 2016; Bratman & Knight, 2000).

Conclusions

The objectives of this experimental study were to investigate, in a sample formed by sportsmen who practice Bodybuilding, Powerlifting, Crossfit, Calisthenics or fitness courses, the presence of exercise addiction and orthorexia nervosa, and to study if there is a relationship between these two variables. Additionally, the relationship between exercise addiction and characteristics was also investigated personality, such as impulsiveness and alexithymia.

13% of subjects were found to be addicted to sport, while 67% and a lower 6% reported symptoms of orthorexia, respectively or severe orthorexia.

From these results it is clear that sport addiction and orthorexia are two of the present and increasingly common problems in world of fitness, probably due to the prototypes of male and female bodies contemplated by our socio-cultural context and widespread through social media, the extremization of the model of well-being and healthy behaviors, and psychological factors that can derive such anxieties, concerns about one's body image or acceptance in the social group, but also due to personality traits. Furthermore, a relationship was found between exercise addiction and orthorexia, although not perfectly superimposable, demonstrates that these problems can occur simultaneously in the same subject.

The research also shows how personality traits such as alexithymia and impulsivity are variables associated with sport addiction, probably because for these subjects sport represents a compensatory strategy to stem negative or dysregulated emotional states resulting from their emotional difficulties. The association, on the other hand, found between alexithymia and impulsivity suggests that alexithymics have high levels of impulsiveness as they compulsively resort to sports to fill emotional gaps, from which they are rewarded from the release of dopamine and endorphins. In summary, these traits could represent real risk factors for the development of exercise addiction. The qualitative data collected, concerning the motivation to practice sports, show how most of the subjects who decide to attend a gym and engage in sports such as bodybuilding, crossfit, calisthenics, powerlifting, or simply participate in of fitness classes, does it to improve their body composition. However, there is no lack of those who practice these sports from a purely passionate standpoint or to relieve stress, which demonstrates how physical exercise is a strategy used not only to improve physical health, but also mental health. In relation to nutrition, on the other hand, most of the subjects declare that they support a diet primarily for aesthetic goals, for the purpose of muscle growth or definition, others also for competition.

As for doping and supplements, most of the participants use proteins, amino acids, creatine, vitamins, but do not use doping substances.

In addition to represent a research contribution in the field of sport and non-sport psychology alone, it is the first study investigating exercise addiction not only in bodybuilders and crossfitters, but also in those who practice powerlifting and calisthenics, emerging sports nowadays, and which screens the presence of orthorexic symptoms in a sample of people who practice these activities. It was also possible to study how exercise addiction may be associated to orthorexia, impulsiveness and alexithymia, as well as investigating qualitative variables (motivation to practice sports, motivation diet, supplementation, doping) whose data obtained enrich the knowledge on the world of fitness and sport in general. There was no loss of participants, since the assessment was carried out only once.

The proposed research is a transversal study, which therefore does not allow the establishment of real direct causal relationships. Also, some factors inherent to the study, such as ad hoc sampling, the use of self-report tools (social desirability, acquiescence), the lack of a control group consisting of non-sporting subjects or those who play another sport, and some factors inherent to the subjects, such as history and responsiveness to the assessment, could have influenced the results. The disturbance variables listed could also explain the low correlation between the psychological constructs investigated.

From an application point of view, this study is interesting because it delves into increasingly common problems in sports and as an object of interest for scientific research.

A reading of this research could be useful to inform psychologists, nutritionists, personal trainers, about these emerging issues in the world of sport and raise awareness in identifying any subjects at risk of sport addiction or orthorexia, who have certain personality traits risk factors or those who adopt dysfunctional behaviors (eg intense physical exercise, paying excessive attention to food labels, etc.) obsessive indices.

Eventually, group health promotion intervention projects could also be carried out, involving various professionals in the sector (psychologists, nutritionists, personal trainers) who aim to protect the physical and psychological health of athletes. THE projects should include activities aimed at food education, improving self-esteem, problem solving skills, management of emotions, and should allow the experimentation of functional strategies to face emotional difficulties, replacing dysfunctional behaviors, such as the abuse of physical exercise or the obsessive control of food, usually used to escape or manage their anxieties and worries. In addition, they should also help sportsmen to "replace a black and white vision with a color vision", that is to interpret a healthy lifestyle as something flexible, not rigid.

As for the psychological treatment of exercise addiction, it should first clarify what caused the addiction to appear, what variables determine the persistence of the disorder and whether there are concomitant disorders that worsen the situation. In addition, it is essential to work with the patient to develop more appropriate sports behaviors and effective coping strategies to deal with stressful situations that replace excessive exercise. In parallel, the use of psychoeducational programs can also be an effective component of the treatment, as there is often insufficient knowledge of the negative effects of extreme exercise on health.

In the context of orthorexia, useful psychological interventions are multidisciplinary ones, which involve the psychological aspect and the dietary aspect. From a psychological point of view, it is necessary to make the person aware of his obsession with a healthy lifestyle, as well as work on both the sense of inadequacy hidden behind the obsessions and on the variables that underlie this disorder disguised as virtue. From a food point of view, the psychologist-nutritionist collaboration could be a positive factor.

Future studies could be made to replicate this research, overcome the underlying limitations, and, through a design of longitudinal research, investigate whether the personality variables observed (impulsivity and alexithymia) can represent real risk factors for the development of exercise addiction and may have a causal relationship with it: this would also allow identify any mediating and moderating variables and the mechanisms underlying the relationships.

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