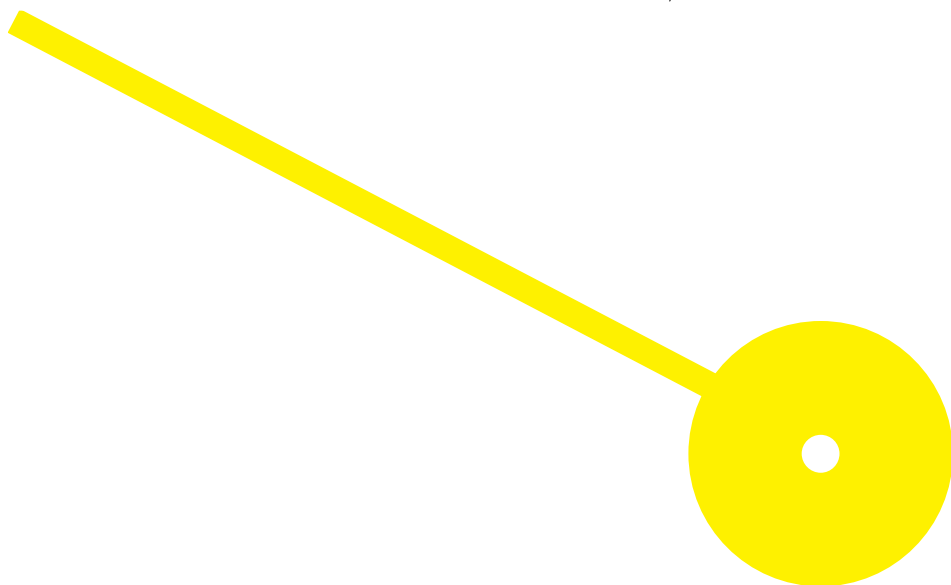




Relationship between internet use, physical exercise, appearance anxiety, and the use of supplements to improve image and performance: a national study

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Relationship between internet use, physical exercise, appearance anxiety, and the use of supplements to improve image and performance: a national study

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À minha família de sangue e à família que eu escolhi pela atenção constante.

Ao meu marido, que me apoia em todos os desafios e aplaude cada conquista.

Abstract

Internet changes daily life. Sometimes, its use could lead to an incessant quest to achieve the perfect appearance. The aims of this study were to study internet use, addiction to exercise, appearance anxiety and the use of image and performance-enhancing drugs (IPEDs), correlation between those variables and differences between sexes. The participants responded to an online survey, consisting of questions about sociodemographic characteristics, the nine-item problematic internet use questionnaire (PIUQ-9), the exercise addiction inventory (EAI), the appearance anxiety inventory (AAI), and questions about the use of IPEDs. This study comprised 375 participants, of which 74,4% were women ($n = 274$), with a median age of 39.00 ($P75 = 48.00$; $P25 = 26.00$). The results showed high percentages of risk of PUI (37.6%), addiction to exercise (27.2%), appearance anxiety (20.0%) and consumption of IPEDs (22.1%). The logistic regression analysis revealed that those above the cut-off point in EAI and AAI total scores were more at risk of using IPEDs. Although the internet could make daily life easier, our results showed that when it becomes problematic it could be correlated with appearance anxiety and exercise addiction. This study helps to better understand this phenomenon allowing the development of appropriate interventions and preventive measures.

Keywords: Internet, Exercise Addiction, Appearance Anxiety, IPEDs.

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1. Introduction

Since the advent of the internet, the number of people using it worldwide has been increasing. It has dramatically changed daily life, making social relationships easier (Kato et al., 2020; Sinha et al., 2021). Some factors, such as the Covid-19 pandemic, were changing people's social behaviour, leading to an exponential growth in interactions mediated by social media sites, mainly in the last decade, allowing users to create, share and participate in social networks (Isom et al., 2017; Rounsefell et al., 2020). As of October 2023, there were approximately 4.95 billion social media users worldwide, accounting for 61.4% of the global population (Statista, 2023). Social media enables people to make new friends and keep contact with social network members without geographical or time restrictions (Cheng et al., 2021). It can seem like an artificial world in which people live a dream life with perfect vacations and relationships and a healthy lifestyle without faults (Bailey et al., 2020). Although the internet has made social life easier, problematic use can impair users' psychosocial functioning and well-being (Cheng et al., 2021; Fineberg et al., 2018; Sinha et al., 2021).

Internet and social media misuse or/and overuse are an emergent problem that has raised public concern globally (Cheng et al., 2021; Kato et al., 2020), with prevalence studies being conducted in many different countries (Cheng et al., 2021). Although it has become a recurrent research topic, the reported prevalence rates may be influenced by different conceptual approaches (Pan et al., 2020).

The concept of internet addiction is characterised as an experience of intense preoccupation and difficulty managing time with using the internet and decreased social interaction in the real world (Ryding & Kaye, 2018). However, this concept is not included in the 5th edition of the Diagnostic & Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013) because there is still debate and controversy surrounding about it, in which researchers acknowledge much conceptual disparity and the need for further work to fully understand internet addiction and its constituent disorders (Fineberg et al., 2018; Ryding & Kaye, 2018). In fact, addiction is not to the internet itself, but to the behaviours/activities that it enhances. The most used concept have been problematic usage of the internet (PUI) (Fineberg et al., 2018).

PUI can be characterized by excessive and not efficient internet use and clinical features of behavioural addiction, such as preoccupation, compulsive behaviour, lack of control and functional impairment (Kato et al., 2020). This presupposes a variety of problematic behaviours, including excessive internet surfing and social networking, that can lead to maladaptive lifestyles (Burkauskas et al., 2022; Fineberg et al., 2018; Kato et al., 2020). In addition misuse or/and

overuse of the internet could be comorbid with various psychiatric disorders such as substance use disorder, attention-deficit hyperactivity disorder and depression (Kato et al., 2020).

Once social media content is poorly regulated (Rounsefell et al., 2020), prolonged exposure to screen and online information and advertisements might have an impact on people's mood, body image, performance and physical exercise (Burkauskas et al., 2022).

Body image is experienced on a continuum from positive to negative (Rounsefell et al., 2020). Popular online applications allow users to modify everything about themselves, from skin tone to the size of their physical features, leading to unrealistic self-expression of an ideal body that may further reinforce risky behaviours among vulnerable individuals (Bailey et al., 2020).

Fitspiration is a term of a trend that arose around 2013 in which social media users continuously post photos and videos displaying "perfect bodies" or inspirational messages encouraging exercising, often accompanied by pictures showing the pre and post-fitness changes in the body (Cataldo et al., 2022; Dores et al., 2021). Fitspiration contents support the ideal of a fit body, gained through the combination of physical exercise and a balanced diet. People that post the information do not underline the importance, pleasure and health benefits of exercise, but encourage physical workouts, often beyond the human physical limits (Cataldo et al., 2022). Physical exercise is being increasingly used as a path to boost appearance, rather than the improvement or maintenance of a healthy body or as a pleasurable activity (Cataldo et al., 2022; Dores et al., 2021). Although excessive exercise has not been formally defined as an addiction in the DSM-5 (DS-5; APA, 2013), the concept has been increasingly debated as part of a wide range of other behavioural (Cataldo et al., 2022). Excessive and problematic physical exercise, sometimes called "compulsive exercise," "excessive exercising," or "exercise addiction" is a matter of increasing global concern. Social pressure to have a perfect body as a synonym of personal value and success, particularly in Western societies, is transforming the value and meaning attributed to the practice of exercise (Dores et al., 2021). This may explain why other potentially detrimental consequences associated with fitspiration are appearance-related anxiety and body image dissatisfaction (Cataldo et al., 2022). Prolonged exposure to fitspiration contents affects overall quality of life increasing negative mood, lower self-esteem and discontent with their body or appearance (Cataldo et al., 2022; Holland & Tiggemann, 2016; Rounsefell et al., 2020).

Body dissatisfaction has been correlated with PUI in a recent meta-analysis (n = 32.295 participants) (Burkauskas et al., 2022). There appears to be a link between internet misuse and overuse and specific over-exercising subgroups with appearance concerns (e.g., populations at risk of developing eating disorders) in which the internet mediates the relationship between

obsessionally/sensation seeking and appearance-concern behaviour (Burkauskas et al., 2022; Holland & Tiggemann, 2016).

Dissatisfaction with body image and anxiety related to their appearance can motivate behaviours aimed at physical and mental well-being. In extreme cases, anxiety about appearance may be symptomatic of body dysmorphic disorder (BDD), classified under the DSM-5's Obsessive-Compulsive and Related Disorders. This disorder is characterized by great dissatisfaction with small features in appearance, along with a great desire to eliminate these aspects. BDD causes considerable distress and significantly interferes with physical and social functioning (Dores et al., 2021). Although the specific etiology and pathophysiology of BDD are still under debate, within the spectrum of severe obsessive-compulsive behaviours, this is one of the most likely mental disorders to manifest alongside problematic exercise, eating disorders and addictive behaviour (Corazza et al., 2019). This is an under-recognized and underdiagnosed condition because people suffering from it rarely seek intervention for the condition itself (Dores et al., 2021).

Problematic exercise has been also associated with the escalating consumption of Image and performance-enhancing drugs (IPEDs), also known as lifestyle drugs (Dores & Carvalho, 2023; Dores et al., 2021; Shibata et al., 2021). IPEDs are widely used as an easy way to achieve personal image and sports-performance goals in a short time (Kruijver et al., 2023). International research has revealed that the majority of IPEDs users are no longer confined to groups of elite competitive bodybuilders and athletes but recreational athletes, such as recreational gym users (Brennan et al., 2017; Kruijver et al., 2023), where the main factors that influence the use are athletic performance, appearance enhancement, the appearance of health and body image disturbance (Brennan et al., 2017). IPEDs include a wide range of products, which are presented as having the potential to improve mental and physical functions, such as enhancing muscle structure and function and modifying the aging process and cognitive performance (Dores et al., 2021). Nowadays IPEDs use is starting to be normalized supported by a cultural emphasis on physical appearance (Brennan et al., 2017). The internet seems to be the channel most frequently used to obtain information about IPEDs and to buy them (Kruijver et al., 2023), with thousands of sites dedicated to promoting their use (Brennan et al., 2017). However, IPEDs might contain undisclosed ingredients with potential damaging effects (Dores et al., 2021).

This work aims to analyse the dependence on internet; characterize the risk of exercise addiction, the risk of appearance anxiety and the consumption of IPEDs; investigate the relationship between internet use, practice of physical exercise, anxiety about appearance and the consumption of IPEDs; explore differences between sexes with regard to these same

variables. Considering the increasing use of social media and its impact on people today, we hypothesize that individuals might engage more compulsively in exercise, mainly when self-directed negative feelings, such as anxiety about their own body, come into play. According to the literature, higher values of risk of exercise addiction and consumption of IPEDs are expected among the male group and of appearance anxiety, indicative of the risk of BDD, among the female group.

2. Materials and Methods

This is a national cross-sectional observational study.

2.1. Participants

This study comprised participants that live in Portugal, from both sexes, aged 18 years and above from a wide range of the general Portugal population.

From all the people living in Portugal, 417 participants entered the study; however, 10.1% ($n = 42$) have not finished filling out the online survey or have provided blank sections in the survey. Thus, their data were removed from the sample, leaving a final sample of 375 individuals in total. All the 375 participants live in Portugal but eight (2.1%) are British/Irish, one is White Other (0.3%) and 366 (97.6%) have other nationality (Portuguese ($n = 362$), French ($n = 2$), Brazilian ($n = 1$) and Mozambican ($n = 1$)).

The sociodemographic characteristics of study participants are displayed in Table 1 and the scores of the scales and online time in Table 2. The median age of study participants was 39.00 ($P75 = 48.00$; $P25 = 26.00$) and the majority were females ($n = 279$; 74.4%).

The sample was divided into two groups according to sexes (male or female).

2.2. Instruments

The study Keep Fit 3 comprised a questionnaire about sociodemographic information (e.g., age, sexes, weight, nationality) and questions about presence of habitual exercise, mental illness, IPEDs use, the Nine-Item Problematic Internet Use Questionnaire (PIUQ-9; Demetrovics et al., 2008; Portuguese translation Does, Geraldo & Carvalho, 2023), the Appearance Anxiety Inventory (AAI; Veale et al., 2014; Portuguese translation Does et al., 2020), and the Exercise Addiction Inventory (EAI; Terry et al., 2004; Griffiths et al., 2005; Portuguese translation Does et al., 2020).

The PIUQ-9 (Demetrovics et al., 2008; Portuguese translation Does, Geraldo & Carvalho, 2023) was used as self-report screening instrument for problematic internet use. Each item is

rated on a five-point Likert scale (ranging from “never” to “always/almost always”), ranging the final score from 9 to 45. Higher scores indicate higher risk of PUI (Laconi et al., 2019). The internal reliability was good (Cronbach’s $\alpha = 0.851$).

The AAI (Veale et al., 2014; Portuguese translation Does et al., 2020), was used to assess individuals’ anxiety levels related to body image in general and indicates symptoms associated with BDD. It is a self-report questionnaire that has ten items. In its original version, each item is rated on a Likert scale ranging from 0 (not at all) to 4 (all the time), with a maximum of 40 points. Higher scores indicate a higher occurrence of appearance anxiety (Veale et al., 2014). In the version of this study, the AAI included a four-point Likert scale ranging from 1 (not at all) to 4 (all the time), for a maximum of 40 points. The cutoff score, for this version, of ≥ 21 is indicative of a risk of BDD (Mastro et al., 2016). The higher scores suggest a higher risk of appearance anxiety/BDD was defined using the same. A high internal reliability was observed for the total sample (Cronbach’s $\alpha = 0.911$).

The EAI (Terry et al., 2004; Griffiths et al., 2005; Portuguese translation Does et al., 2020) was used to assess the level of engagement in physical activity. It contains six questions that reflect the six general components of addiction (salience, mood modification, tolerance, withdrawal symptoms, social conflict, and relapse). The items are rated on a 5-point Likert scale, where 1 represents “strongly disagree” and 5 “strongly agree”. The total score range is from 6 to 30, with a score of ≥ 24 being indicative of exercise addiction. The higher scores indicate a higher risk of exercise addiction. The internal reliability of the EAI for the total sample was acceptable (Cronbach’s $\alpha = 0.701$). The scale has been validated in various nations/translations (Griffiths et al., 2005).

2.3. Procedures

A snowball sampling technique, a non-probabilistic mode, was used to recruit a convenience sample of individuals from the public who use the internet, with volunteer nature. Recruitment mainly occurred via posts on health and well-being social media platforms, not necessarily fitness related, namely, Facebook, LinkedIn, WhatsApp, Twitter, and Instagram.

Data collection was implemented using the web-based survey platform Qualtrics. The survey, made available from May 2023 to February 2024, provided information about the study (i.e., aims and assurance of anonymity and confidentiality), the formal online consent and the various instruments. All the instruments were translated and back-translated from English into Portuguese. No compensation was given upon completion, and the engagement rate was not

monitored. However, questions were asked throughout the questionnaire in order to verify the participants' attention.

The data were stored in a secure platform at the University of Hertfordshire. The collected data was exported from Qualtrics to IBM SPSS Statistics 25 (IBM Corp, Armonk, NY) for analysis.

2.4. Ethics

The study was approved by the Human Sciences Ethics Committee at the University of Hertfordshire, the UK (HSK/SF/UH/00104) and by the Ethics Committee at Escola Superior de Saúde, Polytechnic of Porto, Portugal (E0117). It complied with the Declaration of Helsinki and the European General Data Protection Regulation. The study's presentation included the project's description and aims, followed by an informed consent form. Upon agreement to participate, a link to the questionnaire was sent to participants.

2.5. Statistical Analysis

The software Statistical Package for the Social Sciences (SPSS) for Windows, version 17.0 (SPSS Inc., Chicago, Illinois) was used for statistical analyses. Normality checking, was performed using the Kolmogorov-Smirnov and Shapiro-Wilk tests.

Descriptive analyses (frequency, central tendency and dispersion measures) were used for the following variables: sociodemographic characteristics (age, sex, education, occupation, physical activity, online time), use of IPEDs, the PIUQ-9, the AAI and the EAI scores.

Given the lack of definition of ranges for classification of the PIUQ-9 score, this scale was divided into four classifications with equal intervals. For data with minimum scale value a and maximum value b , the amplitude of each interval was determined by $h = (b-a)/4$. The choice of a uniform distribution of the classes is justified by the fact of the score be obtained in a linear manner, from the simple sum of the answers, with scores varying from one to five. The choice of four classes allows for a clear classification: the lowest level indicates absence of dependence, the second level indicates mild dependence, the third level indicates moderate dependence, and the fourth indicates severe dependence. Therefore, the classification of the scale is well defined, contemplating the four ordinal levels of understanding the scale.

As the normality tests did not yield adequate values, non-parametric tests were employed: the Mann-Whitney test, was used to compare independent groups, and Spearman's rank correlation coefficient was used to test the correlation between age, weight, exercise, online time, AAI and EAI.

Binary logistic regressions were calculated to inspect how age, sex, PIUQ-9 scores, EAI and IPEDs use predict appearance anxiety and how age, sex, PIUQ-9 scores AAI and EAI predict IPEDs use.

All analyses were conducted at a significance level of 5% ($p < 0.05$).

3. Results

The sociodemographic and other characteristics (results of the scales, internet use) of study participants are displayed in Tables 1 and 2. Most participants practiced physical activity (82.1%) and were employed (76.0%). From all of the participants 22.1% used IPEDs.

Table 1 – Sociodemographic characteristics

Socio-demographic Variables		<i>n</i> (%)
<i>n</i> = 375		Median (P75; P25)
Sex	Female	279 (74.4%)
	Male	96 (25.6%)
Level of formal education	High School	70 (18.7%)
	Undergraduate Degree	221 (58.9%)
	MSc Degree	60 (16.0%)
	PhD	12 (3.2%)
	Other	12 (3.2%)
Occupation	Unemployed	10 (2.7%)
	Employed	285 (76.0%)
	Self-employed	40 (10.7%)
	Student	60 (16.0%)
	Retired	5 (1.3%)
Professional athlete		6 (1.6%)
Mental disorder		22 (5.9%)
Physical activity		308 (82.1%)
Age		39.00 (48.00; 26.00)
Weight		65.00 (77.00; 59.00)

Note. P = percentile

Table 2 – Characterization of IPEDs consumption, internet use and results of the PIUQ-9, EAI and AAI scales

Variables	<i>n</i> (%)
<i>n</i> = 375	Median (P75; P25)
IPEDs use	83 (22.1%)
Online time (hours/week)	9.00 (14.00; 5.00)
Online time for work/study (hours/week)	4.00 (8.00; 2.00)
Exercise (minutes/week)	100.00 (180.00; 20.00)
PIUQ-9	16.00 (21.00; 13.00)
AAI	15.00 (19.00; 12.00)
EAI	21.00 (24.00; 17.00)

Note. P = percentile

Dividing the total scores of AAI and EAI according to the cut-off, 20.0% of the sample had a risk of appearance anxiety and 27.2% risk of excessive exercise. More than half of the participants (62.4%) did not had risk of PUI (Table 3).

Table 3 – Percentage of participants above the cut-off (AAI and EAI) and in different levels in PIUQ-9

				<i>n</i> (%)
				<i>n</i> = 375
AAI ≥21				75 (20.0%)
EAI ≥24				102 (27.2%)
PIUQ-9	Without risk (9-18)			234 (62.4%)
			Slight risk (19-27)	111 (29.6%)
	With risk (19-45)	141 (37.6%)	Medium risk (28-36)	28 (7.5%)
			Serious risk (37-45)	2 (0.5%)

Note. Cut-off of AAI = 21 (above represents risk of appearance anxiety; cut-off of EAI = 24 (above represents risk of exercise addiction)

Of the participants that used IPEDs, most of them purchased IPEDs in the pharmacy (50.6%), followed by online (38.6%). Most of the participants that used IPEDs had supervision or professional advice (65.1%).

Table 4 – IPEDs: source of purchase and supervision

<i>n (%)</i>		
<i>n = 83</i>		
Source of purchase	Pharmacy	42 (50.6%)
	Food store	15 (18.1%)
	Fitness/ specialised shop	31 (37.3%)
	Black market	2 (2.4%)
	Online	32 (38.6%)
	Other	6 (7.2%)
Supervision or professional advice	Yes	54 (65.1%)
	No	29 (34.9%)

Dividing the sample into male and female groups (Table 5), it is possible to observe that there are significant differences between the two in terms of weight, AAI and EAI total scores and online time. The female group has a significantly higher AAI score, stating a greater risk of BDD and lower EAI score, suggesting a lower risk of exercise addiction. The female group also spends more time online ($p = 0.039$) and uses fewer IPEDs (20.4%) compared to male group.

Table 5 – Descriptive analyses in female group and male group and differences between groups.

	Median (P75; P25)		Mann-Whitney test (<i>U</i>)
	Female	Male	(<i>p</i> -value)
Age	37.00 (47.00; 26.00)	41.00 (53.00; 27.00)	11739.000 (0.071)
Weight	62.00 (70.00; 56.00)	80.00 (85.00; 70.00)	4788.500 (< 0.001)
Online time (hours)	9.00 (14.00; 5.00)	8.00 (12.75; 4.00)	15281.500 (0.039)
Physical activity (minutes)	100.00 (180.00; 28.00)	110.00 (180.00; 10.00)	13682.500 (0.750)
PIUQ-9 total	16.00 (21.00; 13.00)	17.00 (21.00; 12.00)	13570.500 (0.845)
AAI total	15.00 (20.00; 13.00)	13.00 (16.00; 11.00)	17439.000 (< 0.001)
EAI total	20.00 (24.00; 17.00)	22.00 (25.00; 18.00)	11566.500 (0.046)

Note: P = percentile

In this sample, age, AAI total score and EAI total score had a weak correlation with Online time ($r_s = -0.230, p < 0.001$; $r_s = 0.123, p = 0.017$; $r_s = 0.205, p < 0.001$, respectively). Online time also had a positive weak correlation with PIUQ-9 ($r_s = 0.255, p < 0.001$). PIUQ-9 was negative correlated with age ($r_s = -0.375, p < 0.001$). AAI total score was positively related to the PIUQ-9 total score with a moderate correlation ($r_s = 0.421, p < 0.001$). EAI total score had a positive weak correlation with PIUQ-9 total score ($r_s = 0.182, p < 0.001$) and a positive moderate correlation with exercise ($r_s = 0.433, p = 0.001$) (Table 6).

Table 6 – Spearman's rank correlation and *p*-values between age, weight, online time, exercise, PIUQ-9, AAI and EAI

	Weight	Online	Exercise	PIUQ-9	AAI	EAI
Age	0.220 (<0.001)	-0.230 (<0.001)	-0.167 (0.001)	-0.358 (<0.001)	-0.375 (<0.001)	-0.107 (0.380)
Weight		-0.066 (0.206)	-0.144 (0.005)	0.015 (0.773)	-0.009 (0.855)	-0.051 (0.323)
Online			0.101 (0.050)	0.255 (<0.001)	0.205 (<0.001)	0.123 (0.017)
Exercise				0.051 (0.327)	0.047 (0.360)	0.443 (<0.001)
PIUQ-9					0.421 (<0.001)	0.182 (<0.001)
AAI						0.980 (0.058)

Binary logistic regression on risk of appearance anxiety, an indicator of BDD classified as 0 ("no risk") or 1 ("risk") based on the total score of the AAI, included sex (1 for "male" or 2 for "female), age, PIUQ-9 total score (0 for total score <19 or 1 for total score ≥ 19), EAI total score (0 for total score < 24 or 1 for total score ≥ 24) and IPEDs consumption (0 for "not used" or 1 for "used") (Table 7).

The probability of having appearance anxiety was about twice as high for female participants compared to male participants (odds ratio (OR) = 2.626, 95% CI 1.005–6.866, *p* = 0.049). Age was also significant and was negatively related to appearance anxiety (odds ratio (OR) = 0.925, 95% CI 0.890–0.959, *p* < 0.001), as age increases the risk of appearance anxiety decreases. Another significant predictor of appearance anxiety was PIUQ-9 total score (OR = 1.135, 95% CI 1.071–1.203, *p* < 0.001). This indicates that higher total scores on PIUQ-9 increase the risk of appearance anxiety.

Table 7 – Binary logistic regression on risk of appearance anxiety

		<i>B</i>	ES	Wald	df	<i>p</i>	Odds ratio	Confidence interval (CI)	
								Min	Max
Appearance anxiety	Sex	0.966	0.490	3.878	1	0.049	2.626	1.005	6.866
	Age	-0.079	0.019	17.089	1	<0.001	0.925	0.890	0.959
	PIUQ-9	0.127	0.030	18.281	1	<0.001	1.135	1.071	1.203
	EAI	-0.595	0.385	2.389	1	0.122	0.552	0.259	1.173
	IPEDs	-0.780	0.401	3.787	1	0.052	0.459	0.209	1.006
	Constant	-1.599	1.107	2.086	1	0.149	0.202		

Binary logistic regression on IPEDs consumption, classified as 0 ("used") or 1 ("not used"), included sex (1 for "male" or 2 for "female"), age, PIUQ-9 total score (0 for total score < 19 or 1 for total score ≥ 19), AAI scores (0 for total score < 21 or 1 for total score ≥ 21) and EAI scores (0 for total score < 24 or 1 for total score ≥ 24 (Table 8). EAI and AAI were significant predictors of IPEDs consumption ($p < 0.001$ and $p = 0.002$ respectively). The probability of consumption of IPEDs increases when participants have a total score of AAI ≥ 21 compared to when they have a total score < 21 (odds ratio (OR) = 1.065, 95% CI 1.023–1.109). The probability of using IPEDs also increases when participants have a total score of EAI ≥ 24 compared to when they have a total score < 24 (odds ratio (OR) = 1.092, 95% CI 1.039–1.147).

Table 8 – Binary logistic regression on risk of IPEDs consumption

		<i>B</i>	ES	Wald	df	<i>p</i>	Odds ratio	Confidence interval (CI)	
								Min	Max
IPEDs use	Sex	-0.398	0.297	1.795	1	0.180	0.672	0.376	1.202
	Age	0.006	0.011	0.035	1	0.563	1.006	0.985	1.028
	PIUQ-9	0.011	0.025	0.181	1	0.671	1.011	0.963	1.061
	AAI	0.063	0.021	9.382	1	0.002	1.065	1.023	1.109
	EAI	0.088	0.025	12.089	1	<0.001	1.092	1.039	1.147
	Constant	-3.961	1.110	12.731	1	<0.001	0.019		

4. Discussion

The objectives of the present study were to investigate the PUI (e.g., dependence of the social media); characterize the risk of exercise addiction, the risk of appearance anxiety, and the consumption of IPEDs; investigate the relationship between internet use, anxiety about appearance, practice of physical exercise and the consumption of IPEDs; also explore differences between sexes with regard to these same variables; investigate the predictors (sex, age, PIUQ-9, AAI and EAI) of appearance anxiety and consumption of IPEDs.

In this study 37.4% of the participants had a slight to serious risk of PUI which may involve various online behaviors, namely social networking. Studies carried out by Dane & Bhatia (2023), Mabe et al. (2014) and Corazza et al. (2019) indicate that exposure to social media content represents a risk of developing body image disorders. According to Behar (2010), in Western culture, advertisements and messages are constantly disseminated, which contributes to creating, displaying and perpetuating beauty standards that are difficult to achieve. Other studies found that the use of social networks increases self-esteem and self-compassion (Gentile et al., 2012) and still others that state that the effect of social networks on well-being is small (Orben & Przybylski, 2019) or non-existent (Heffer et al., 2019). However, these results, positive and non-existent effects, were about social networks and not to the internet use itself.

The prevalence of risk of exercise addiction in the sample was 27.2% which is higher than in Dores et al. (2021), Griffiths et al. (2005), Shibata et al. (2021), Szabo et al. (2013), Szabo & Griffiths (2007) and Villella et al. (2011) studies. When the training becomes obsessive and compulsive, it could negatively impact well-being and become harmful and lead to body image dysmorphia (Maida & Armstrong, 2005; Mosley, 2009).

Of the sample, 20.0% of the participants had appearance anxiety, possibly indicating at-risk of BDD. This result was superior not only to the scores reported in the general population, where the prevalence of BDD ranges between 0.5% and 3.2% (Dores et al., 2021; McGrath et al., 2023), but also those found in the population at risk, such as individuals undergoing surgery aesthetics, dermatology and rhinoplasty patients (6–15%) (Prichard & Tiggemann, 2005). However, the result was lower than those found in an international sample of users of fitness environments, where these values are very high (38.5%) (Corazza et al., 2019; Dores et al., 2021).

Some interesting results emerged when there was a comparison between both sexes about appearance anxiety. In this study, women seem to have more risk of appearance anxiety. A recent study by Griffiths & Stefanovski (2019) on exposure to fitspiration contents, highlighted that women tend to be more subjected to fitness-related images compared to men. Therefore, it seems that appearance anxiety is associated with body image concerns (Barron et al., 2021;

Cohen et al., 2017; Griffiths & Stefanovski, 2019). These findings are also in line with the results obtained in this study through logistic regression, be male or female was a predictor of risk of appearance anxiety. However, a lot of research has been focused exclusively or predominantly on female samples (Griffiths & Stefanovski, 2019). This fact makes it necessary to be cautious when stating that sex can be considered a predictor of appearance anxiety.

In this study, it was possible to verify a positive correlation between PIUQ-9 total score and the risk of appearance anxiety (AAI total score). Also, PIUQ-9 could be a predictor of appearance anxiety, when the addiction to the internet increases, the risk of appearance anxiety increases. Recent meta-analysis has suggested that PUI can have a significant effect body dissatisfaction, drive for thinness and dietary restraint (Ioannidis et al., 2021).

Another finding was that age was negatively correlated and could be a predictor of appearance anxiety. Older people seem to present a lower risk of having appearance anxiety than younger. This result can be explained by varied reasons, one of which is the greater exposure of younger people to social networks and the media (Shannon et al., 2022). De Sousa Silva et al. (2020) analysed the image construction considering the impact of Instagram on the self-assessment of body image. The authors observed that the body image considered as a "standard" in this network creates a desire to reconstruct the body and one's own identity, which can cause suffering and psychic exhaustion. Younger individuals are usually also less able to neutralize emotions in situations that cause stress and discontent (Campos et al., 2020) and when in contact with influences such as social media, may present greater social anxiety due to the appearance of the body. This may precede other clinical conditions, such as eating disorders, mood disorders, and behavioural changes (Altamura et al., 2001; Beucke et al., 2016; Murray et al., 2012).

Regarding IPEDs use, from the sample 22.1% had used them (e.g., hormones, whey protein, creatine, multivitamin supplement). According to the literature, IPEDs are consumed as a fast solution to achieve unrealistic standards of beauty and strength (Yesalis et al., 2000). Some of the motivators for IPEDs use were found to be enhanced appearance (Cataldo et al., 2022; Van Hout, 2014), increased musculature (Petrocelli et al., 2008), increased strength (Smith & Stewart, 2012) and body image disturbance (Cataldo et al., 2022; Sagoe et al., 2014). Participants in field studies have reported that its use is aimed at building an aesthetically pleasing physique (Perry et al., 2005; Jennings et al., 2014). Most of the participants (65.1%) acquired it with medical supervision and professional advice. This percentage is relatively high compared to previous studies, in which medical supervision was verified in only 4.5% of the participants (Corazza et al., 2019). However, captivated by fake marketing strategies, users of this type of substances may not be aware of the contamination risks of purchased products with undisclosed, psychoactive,

and potentially toxic ingredients (Jagim et al., 2015; Mooney et al., 2017). As observed in other studies, the use of IPEDs in gym culture is often considered safe, acceptable, and necessary in obtaining ideal bodies, disregarding damages potentially associated (Jagim et al., 2015; Mataix, 2012).

This study showed that the use of IPEDs could be predicted by the risk of excessive exercise and the risk of appearance anxiety. In previous studies, namely in Altamura et al. (2001), Duarte & Pinto-Gouveia (2016), McLean & Paxton (2019), Shih & Kubo (2005) and Vartanian (2012) body image dissatisfaction could be associated with eating disorders, mood disorders and addictive disorders, apparently resulting from the desire to achieve an ideal body and represents consequently greater vulnerability to IPEDs consumption to improve the image and performance (Jagim et al., 2015; Mooney et al., 2017). Also, it was shown that 15% of those at-risk for excessive exercising may have co-occurring substance addictions (Sussman et al., 2011), although this was not confirmed by other investigations (e.g., Szabo et al., 2017).

PUI, exercise addiction, appearance anxiety and use of IPEDs are factors that influence the concept of health. The World Health Organization, in 1946, established as a definition of health "The state of complete physical, mental and social well-being and not just the absence of disease" which highlights the relevance of ensuring that individuals feel good in all aspects of their lives, including their aesthetic satisfaction (Carvalho & Figueiredo, 2020). The area of aesthetics, namely Dermatofunctional Physiotherapy, is a multidimensional field that requires professional competencies, soft and hard skills, (e.g. knowledge, skills and attitudes), namely about treatments, ensuring safety and efficacy in procedures (Rolim et al., 2022). One of the main motivators for pursuing aesthetic treatments includes improving well-being and correcting aesthetic concerns. The development of aesthetic health provides not only the construction of body image, but also rehabilitation and the promotion of the physical, mental and social health of individuals (Maisel et al., 2018). Therefore, it seems evident that a successful aesthetic procedure would lead to fundamental emotional improvements, such as self-enhancement of body image, greater self-esteem, consequently impacting quality of life and mental health (McKeown 2021; von Soest et al., 2009). However, people may feel dissatisfied with the results obtained, regardless of the quality of the treatment (Romanssini et al., 2020). A study conducted in 2011 revealed that 21-59% of clients who underwent cosmetic surgery had higher scores in body dissatisfaction and more symptoms of psychiatric disorders than the general population (Mulken et al., 2012). Aesthetic treatment in population with mental disorders can be very challenging, mainly because, in most cases, patients do a lot of procedures and are not satisfied with the results (Ritvo et al., 2006). It is essential to avoid exaggerations (e.g., a huge number of aesthetic procedures, large

implants) in the aesthetic area, as pointed out by Rolim et al. (2022), professionals in this field should be aware of behaviours that indicate significant distortions in body image or any other problem that is not their specialty. In these cases, it is imperative that the professional refers the client to an appropriate professional before performing any aesthetic procedure (Rolim et al., 2022).

This study had some limitations, such as be a non-probabilistic sample, absence of structured clinical interview to assess mental disorders referred on questionnaire, self-report on the use of IPEDs, not validated by any biological test. In this study, the sample was community and not clinical, so the results obtained may not allow us to highlight possible correlations and draw conclusions about possible predictors, since most of the sample did not present PUI, risk of addiction to exercise or appearance anxiety. In addition, the number of participants scoring equal or above the cutoff points of EAI and AAI was small, and the sample had a great difference between the number of male and female participants, so the interpretations of the results should be cautious. Regarding that the study had a sample for convenience the results cannot be extrapolated to the population in general. Since in this study the variable used was the PUI, future studies will be important to use the variable use of social networks as a predictor of exercise addiction, appearance anxiety, and consumption of IPEDs. Further research is needed to better understand the relationship between PUI, namely social media, appearance anxiety, excessive exercise and image-enhancing drug use, to allow for more effective interventions and preventive measures. It is also important to raise awareness about appearance anxiety and risk of BDD, and excessive physical exercise and risk of exercise addiction, so that professionals could be more alert to these conditions and can refer them to specialized professionals, whenever necessary, to enhance the most appropriate intervention.

5. Conclusion

Nowadays, physical appearance increasingly plays a dominant role in everyday life. The search for perfection may be the factor that motivates the practice of physical exercise, more than the promotion of health, well-being or pleasure, and may increase the risk of addiction to exercise.

In this study, almost half of the participants were at some risk of PUI. Although not a high percentage, in this study about 20% of the sample presented a risk of excessive physical activity, greater vulnerability on the part of male participants, and appearance anxiety, with the female sample being more vulnerable. Regarding the use of IPEDs, those who use them the most showed greater dependence on physical exercise and greater anxiety about appearance.

In short, this study allows a greater knowledge about phenomena that the literature signals as worrying and growing around body image. It thus signals the importance of greater attention by the community in general and professionals in the areas of mental health, aesthetics and sports to identify individuals at risk in order to promote prevention measures and earlier and more specialized interventions.

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