

Biopsychosocial factors affected by muscle dysmorphia: to what extent do clinical assessment questionnaires cover them?¹

Fatores biopsicossociais afetados pela dismorfia muscular: até que ponto os questionários de avaliação clínica os abrangem?

Factores biopsicosociales afectados por la dismorfia muscular: ¿en qué medida los cubren los cuestionarios de evaluación clínica?

<https://doi.org/10.15332/2422474X.10291>

[Research Article]

Alexa Alves de Moraes²
Daniella Araújo de Oliveira³
Hugo Gabriel Feitosa de Souza⁴
Pedro Zavagli Suarez⁵
Miguel Araujo Carneiro-Júnior⁶

Received: January 16, 2024

Accepted: May 16, 2024

Cite as:

Alves de Moraes, A., Araújo de Oliveira, D., Feitosa de Souza, H. G., Zavagli Suarez, P., & Carneiro-Júnior, M. A. (n.d.). Factores biopsicosociales afectados por la dismorfia muscular: ¿en qué medida los cubren los cuestionarios de evaluación clínica?. *Cuerpo, Cultura Y Movimiento*, 14(2), 150-174.

<https://doi.org/10.15332/2422474X.10291>



¹ Research article. Funded by Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES). Linked to the Exercise Biology Laboratory. Federal University of Viçosa. Viçosa. Brazil.

² Department of Physical Education, Federal University of Viçosa. Viçosa – Minas Gerais, Brazil. E-mail: alexa@ufv.br ORCID: <https://orcid.org/0000-0001-6882-3773>

³ Department of Physical Therapy, Federal University of Pernambuco. Recife – Pernambuco, Brazil. E-mail: daniella.aoliveira@ufpe.br ORCID: <https://orcid.org/0000-0002-6013-978X>

⁴ Department of Physical Therapy, Federal University of Pernambuco. Recife – Pernambuco, Brazil. E-mail: hugogfeitosa@gmail.com ORCID: <https://orcid.org/0000-0003-3247-5310>

⁵ Department of Physical Education, Federal University of Viçosa. Viçosa – Minas Gerais, Brazil. E-mail: zs.pedro@gmail.com ORCID: <https://orcid.org/0000-0001-5501-8556>

⁶ Department of Physical Education, Federal University of Viçosa. Viçosa – Minas Gerais, Brazil. E-mail: miguel.junior@ufv.br ORCID: <https://orcid.org/0000-0001-5354-7913>

Abstract

Background: muscle dysmorphia (MD) affects several health-related aspects. Assessing how MD questionnaires cover biopsychosocial domains helps clinicians to better describe health status and set treatment goals. **Aim:** to identify clinical questionnaires for MD and link their content with the International Classification of Functioning, Disability and Health (ICF). **Methods:** a literature review identified MD questionnaires. The instruments' items were linked to the ICF. **Results:** four questionnaires were identified: ACQ, MASS, MDDI and MDI. Forty-four significant concepts were identified from the seventy-two questionnaire items and linked to twenty-six ICF categories, with predominance of body functions (42,4%, n = 11 categories), activities and participation (34,6%, n = 9), environmental factors (19,2%, n = 5), and body structures (3,8%, n = 1). **Conclusion:** All instruments focused on body functions, and they poorly covered body structures and environmental factors. MASS and ACQ presented the most diverse coverage of categories, enabling broader assessment of health aspects.

Keywords: international classification of functioning, disability and health, vigorexy, patient-reported outcome measures, muscles, health status.

Resumo

Introdução: a dismorfia muscular (DM) afeta diversos aspectos relacionados à saúde. Avaliar como os questionários de DM abarcam os domínios biopsicossociais auxilia profissionais de saúde a descrever melhor o estado de saúde dos pacientes, bem como definir metas de tratamento. **Objetivo:** identificar questionários de avaliação clínica para DM e vincular seu conteúdo à Classificação Internacional de Funcionalidade, Incapacidade e Saúde (CIF). **Método:** conduziu-se uma revisão da literatura que identificou questionários de DM e, em seguida, os itens dos instrumentos foram vinculados à CIF. **Resultados:** identificaram-se quatro questionários: ACQ, MASS, MDDI e MDI. Os questionários totalizaram 72 itens, dos quais foram identificados 44 conceitos significativos e vinculados a 26 categorias da CIF, com predominância de funções do corpo (42,4%, n = 11 categorias), atividades e participação (34,6%, n = 9), fatores ambientais (19,2%, n = 5) e estruturas do corpo (3,8%, n = 1). **Conclusão:** todos os instrumentos focaram nas funções do corpo e pouco abarcaram estruturas do corpo e os fatores ambientais. MASS e ACQ apresentaram as mais diversas coberturas de categorias, possibilitando uma avaliação mais ampla dos aspectos de saúde.

Palavras-chave: classificação internacional de funcionalidade, incapacidade e saúde, vigorexia, medidas de resultados relatados pelo paciente, músculos, nível de saúde.

Resumen

Introducción: la dismorfia muscular (DM) afecta varios aspectos relacionados con la salud. Evaluar cómo los cuestionarios de DM cubren los dominios biopsicosociales ayuda a los profesionales de la salud a describir mejor el estado de salud y establecer objetivos de tratamiento. **Objetivo:** identificar cuestionarios clínicos para la DM y vincular su contenido con la Clasificación Internacional del Funcionamiento, la Discapacidad y la Salud (CIF). **Métodos:** se realizó una revisión de la literatura identificando cuestionarios de DM; después de eso, se vincularon los ítems de los cuestionarios al contenido del CIF. **Resultados:** se identificaron cuatro cuestionarios: ACQ, MASS, MDDI y MDI. Se reconocieron 44 conceptos significativos a partir de los 72 ítems del cuestionario y se vincularon a 26 categorías de la CIF, con predominio de funciones corporales (42,4%, n = 11 categorías),

actividades y participación (34,6%, n = 9), factores ambientales (19,2%, n = 5) y estructuras corporales (3,8%, n = 1). Conclusión: todos los instrumentos se centraron en las funciones corporales y cubrieron mal las estructuras corporales y los factores ambientales. MASS y ACQ presentaron la cobertura más diversa de categorías, lo que permitió una evaluación más amplia de los aspectos de salud.

Palabras clave: clasificación internacional del funcionamiento, discapacidad y salud, vigorexia, medición de resultados informados por el paciente, músculos, estado de salud.

Introduction

Muscle dysmorphia (MD) is a newly described psychopathological condition characterized by an excessive preoccupation in increasing one's muscle mass, being recognized as a type of body dysmorphic disorder on the obsessive-compulsive disorder spectrum in the Diagnostic and Statistical Manual of Mental Health Disorders, 5th edition (DSM-5) (Pope et al., 1997; Rubio-Aparicio et al., 2020).

This condition is more prevalent among young men, particularly those who participate in activities that require increased muscle mass, e.g. bodybuilding and weight lifting (Fabris et al., 2018; Pope et al., 2000). Despite the fact these individuals are usually lean and more muscular than average people, they feel small and usually try to hide their own body, demonstrating intense shame and embarrassment (Grieve, 2007; Olivardia et al., 2000). Thus, health-risk attitudes and behaviors, such as overtraining, overly restrictive diets, besides using physique-enhancing drugs, are common among people with MD (Pope et al., 1997).

Although physical and psychological factors involved in MD are commonly highlighted, its etiology and consequences encompass a more complex biopsychosocial framework that culminates in functional impairments and losses in quality of life. As an example, the strict diet and exercise routines may interfere in academic and labor performance. Furthermore, body shape preoccupation may cause social, occupational, recreational, and even affective relationships avoidance, as such individuals tend to avoid situations that require body exposure (Grieve, 2007; Olivardia et al., 2000).

Thus, considering MD impacts not only mental and body functions – as several aspect of an individual's quality of life are usually compromised as well -, instruments that are capable of assessing patients through a biopsychosocial perspective have been increasingly required. Moreover, a broad and appropriate assessment of MD symptoms allows health professionals to correctly identify people at risk of developing MD, as well as evaluating the efficacy of multidisciplinary treatments (Rubio-Aparicio et al., 2020).

In view of similar health demands, the World Health Organization developed the International Classification of Functioning, Disability and Health (ICF), which helps professionals to describe health status through a holistic perspective, aiming at better understanding and measuring the impact of health disorders, as they may impact several

life domains (Duijnisveld et al., 2013; Quick & Brown, 2020a; WHO, 2001). According to the ICF model, functionality is a dynamic relationship between people's health condition and contextual factors, such as support, access to assistance, and public policy, which can work either as barriers or as facilitators. This way, clinical assessment considering the ICF perspective allows for a more accurate and realistic description of an individual's health condition, as it will not be restricted to a clinical diagnosis only (Araujo & Buchalla, 2015; WHO, 2001).

In addition, the use of self-reported measures has been encouraged among health professionals, because they are able to evaluate a patient's perception of their own condition, thus adding substantial value to the biopsychosocial assessment approach (Davidson & Keating, 2014; Quick & Brown, 2020). Based on this, identifying how those instruments contemplate the health domains proposed by the ICF framework provides a practical overview of health aspects covered by each instrument, helping practitioners to select the most adequate tool for assessing the specific demands of each patient with MD. Furthermore, this analysis is helpful for researchers to identify health factors not covered in such questionnaires, enabling them to develop instruments with specific focuses on dimensions affected by MD.

Thus, in view of the need for better investigating how MD questionnaires address health-related domains, the present study aims to (1) identify questionnaires specifically developed and validated for assessing individuals with MD and (2) examine to what extent they cover biopsychosocial factors, by linking the matching content between the questionnaires' items and the ICF.

Material and methods

The present study encompassed two phases, the first one consisting of a literature review aimed at identifying questionnaires specifically designed for assessing individuals with MD; and in the second phase, the questionnaires' items were linked to ICF categories, as proposed by the methodology of Cieza et al. (2019).

Literature review

The literature review was conducted in February 2023, by two independent researchers (HGFS and AAM), who compared the results found in each database in a consensus meeting. In case of disagreements, a third researcher (DAO) would be required to solve them.

The search consisted of entering the expression "Muscle Dysmorphia" in the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE) via PUBMED, Cochrane Central Register of Controlled Trials (CENTRAL); *Literatura Latino-americana e do Caribe em Ciências da Saúde* (LILACS) via *Biblioteca Virtual em Saúde*, and Scopus via Elsevier. Besides, the reference lists of the included studies were checked in order to track additional studies that could be

accepted for the screening process. No restrictions regarding language or year of publication were applied.

The inclusion criteria for studies was citing at least one questionnaire used to assess people with MD. Articles encompassing animal-based studies and unpublished manuscripts were excluded.

After these studies were selected for full-text reading, the questionnaires were identified and then included if they were specifically designed and validated for people with MD. Exclusion criteria were questionnaires identified in unpublished manuscripts only (i.e. thesis and dissertation materials), as well as questionnaires measuring other constructs related to MD rather than the specific disorder itself (i.e. drive for muscularity, general body dysmorphia, mirror checking, etc.).

After selecting the eligible questionnaires, a Microsoft Excel spreadsheet was created containing each questionnaire title, items, year of publication, and first author's last name.

ICF-linking process

The second stage of this study comprised the process of linking the questionnaires' items to the ICF (WHO, 2001), as proposed by the guidelines of Cieza et al. (2019). This methodology has two updates (Cieza et al., 2005, 2019), and it has been widely used to analyse several instruments' content regarding the ICF framework (Castro & Grande, 2018; Dantas et al., 2019; de Moraes et al., 2021; Prodinge et al., 2019).

The ICF is divided into two components: Part 1 – Functioning and Disability, which encompasses several domains addressing body functions and structures, activities, and participation; and Part 2 – Contextual Factors, made up of environmental and personal factors. Each component contains hierarchically arranged domains. Furthermore, each domain is made up of several categories (WHO, 2001), which are the classification units used in the ICF-linking process (Cieza et al., 2019).

Regarding the ICF-linking rules, the most recent guidelines present ten rules for linking the instruments' items to the ICF. According to the main one, each instrument item encompasses a construct, also called “meaningful concept”, which may describe health conditions, personal factors, functional activity, or environmental factors. Once the meaningful concept of each item is identified, it must be linked to the most precise ICF category that matches it (Cieza et al., 2019). As an example, the item “I am muscular enough” contains the construct “body image”, which can be linked to the ICF category “b1801 – Body image”. When a meaningful concept is not addressed in the ICF, it is assigned to “not covered” (nc). Moreover, when the construct is not addressed by the ICF either, though it is truly a personal factor, it is labelled as “personal factor” (pf) (Cieza et al., 2019).

Thus, the linking process was carried out by two independent researchers (AAO and HGFS), who displayed substantial experience in using ICF in health practical contexts, as well as in ICF-linking studies. After conducting the independent linking process, the answers were crosschecked in a consensus meeting. A senior researcher (DOA), with robust experience in ICF application, resolved the discordances that emerged in the process.

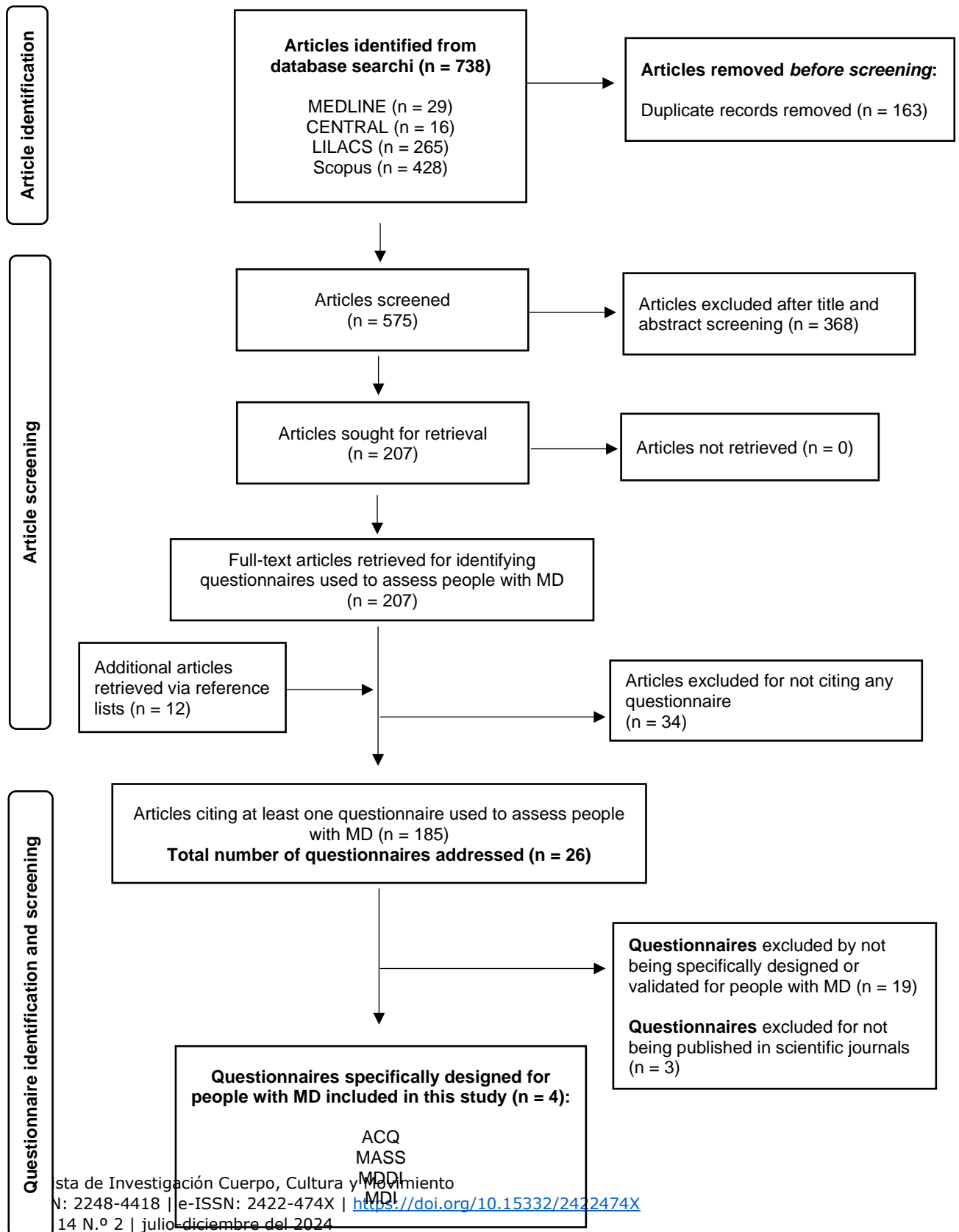
Data analysis

Each ICF category was expressed in absolute and relative frequencies. Cohen's Kappa coefficient (k) was calculated in order to check inter-rater reliability in the ICF-linking phase. The coefficient values range from 0 to 1, where 0 represents no agreement between evaluators, 0.01-0.2 none to slight, 0.21-0.40 fair, 0.41-0.60 moderate, 0.61-0.80 substantial, 0.81-1.0 almost perfect, and 1 means a perfect inter-rater agreement (McHugh, 2012). Data were analysed using the Statistical Package for Social Sciences (SPSS) software, version 21.0 (IBM Corp, USA).

Results

The database search resulted in 738 studies, out of which 185 articles mentioned at least one questionnaire to assess people with MD. From these studies, 26 instruments were identified and checked for being specifically designed or validated for people with MD, as well as being published in scientific journals. Considering the eligibility criteria, four questionnaires were included in the present analysis: the Adonis Complex Questionnaire (ACQ) (Pope et al., 2000), Muscle Appearance Satisfaction Scale (MASS) (Mayville et al., 2002), Muscle Dysmorphic Disorder Inventory (MDDI) (Hildebrandt et al., 2004), and the 27-item version of Muscle Dysmorphia Inventory (MDI) (Rhea et al., 2005). Figure 1 presents a flow diagram with the literature search results.

Figure 1. Flow diagram of questionnaires in the study. Abbreviations: ACQ - Adonis Complex Questionnaire; MASS - Muscle Appearance Satisfaction Scale; MD - Muscle dysmorphia; MDDI - Muscle Dysmorphic Disorder Inventory; MDI - Muscle Dysmorphia Inventory.



The ACQ is a 13-item questionnaire originally developed in the English language, aimed at assessing male subjects regarding dissatisfaction and concerns about their physical appearance. Its assertions range from 0 (“rarely or not at all”) to 3 (“frequently”). The overall score is rated from 0 to 39, where higher scores suggest higher levels of MD (Pope et al., 2002). Although this instrument has been widely used in several investigations, its original version has not been analysed in terms of measurement properties (Rubio-Aparicio et al., 2020). Nevertheless, the ACQ was translated and cross-culturally adapted for the Spanish (Latorre-Román et al., 2015) and Italian (Riccobono et al., 2020) languages. Both instruments demonstrated high internal consistency (Cronbach’s alpha = 0.88 (Latorre-Román et al., 2015) and 0.812 (Riccobono et al., 2020), respectively), and the Spanish version demonstrated acceptable test-retest reliability ($r = 0.71$), and good concurrent validity when compared to other instruments that measure MD symptoms (Latorre-Román et al., 2015).

The MASS was developed for assessing cognitive, affective, and behavioral dimensions of MD. It comprises 19 items rated on a 7-point Likert scale, where overall scores higher than 52 points are suggestive of MD. Besides, the items are divided into five subscales: Bodybuilding Dependence (5 items), Muscle Checking (4 items), Substance Use (4 items), Injury (3 items), and Muscle Satisfaction (3 items). The acceptable reliability and test-retest reliability of MASS are displayed by both alpha and correlation coefficients greater than 0.70 respectively (Mayville et al., 2002). This questionnaire has been widely used among clinicians to diagnose MD, being translated and adapted to several countries, for instance: Spain (González-Martí et al., 2012), China (Jin et al., 2015), Brazil (Silva Júnior et al., 2008), Peru (Cook-del Aguila et al., 2016), Mexico (López Cuautle et al., 2013), Hungary (Babusa et al., 2012), United Kingdom and Ireland (Ryan & Morrison, 2010).

The MDDI was created based on MD criteria, and its 13 items are structured around three domains: Drive for Size (5 items), Appearance Intolerance (4 items), and Functional Impairment (4 items). This instrument was validated in a study comprising 237 male weightlifters, and demonstrated good internal consistency (Cronbach’s alpha equal or higher than 0.80 in all subscales and total score), good convergent validity and 1-week test-retest reliability ($r = 0.87$) (Compte et al., 2019; Hildebrandt et al., 2004). The MDDI has been validated for several countries, e.g. Italy (Santarnecki & Dèttore, 2012) and Brazil (Nagata et al., 2022).

Five different versions of the MDI were identified in the literature review. Three of them were found in unpublished manuscripts, and were therefore excluded from this study. The other two instruments were developed by the same research group, where the first one was a 40-item version (Lantz et al., 2002), being later refined into a final and

shorter 27-item version (Rhea et al., 2005), which will be considered for the ICF-linking analysis. The final MDI encompassed six domains: body size/symmetry (five items), physique protection (six items), exercise dependence (four items), supplement use (four items), dietary behavior (five items), and pharmacological use (three items). All these subscales attained acceptable internal reliability (Cronbach's alpha = 0.72 – 0.94). This instrument was also assessed for construct validity, exploratory and confirmatory factor analysis, as well as structural equation modeling, with a sample composed of 151 male and female weightlifters and bodybuilders, demonstrating it to be a valid multi-dimensional measure for assessing MD (Rhea et al., 2005).

With regards to the ICF-linking results, an almost perfect inter-rater reliability was achieved ($k = 0.86$). Overall, 44 different meaningful concepts were identified from the 72 questionnaire items. Out of these, one concept (self-worth) could not be linked to the ICF, as it represented a personal factor. Thus, the 43 concepts left matched 26 different ICF categories, where 11 were second-level and 15 third-level categories. A detailed description of each item, meaningful concept, and its corresponding ICF category can be verified in Table 1. The majority of categories belonged to body functions (b) component (42,4%, $n = 11$), followed by activities and participation (d) (34,6%, $n = 9$), environmental factors (e) (19,2%, $n = 5$), and body structures (s) (3,8%, $n = 1$). Table 2 describes both absolute and relative frequencies of ICF categories linked in each questionnaire. Additionally, Figure 2 shows the coverage of the ICF domains in each instrument.

Table 1. Questionnaires' items linked to the International Classification of Functioning, Disability and Health.

Adonis Complex Questionnaire						
Questionnaire's items	Meaningful concept(s)	b	d	e	s	Other
1. "How much time do you spend each day worrying about some aspect of your appearance (not just thinking about it, but actually worrying about it)?"	Body image; Thought management	b1801; b1603				
2. "How often are you distressed by concerns with your appearance (that is, feeling upset, anxious or depressed)?"	Body image; Emotional distress	b1801; b1520				
3. "How often do you avoid having all or part of your body seen by others? For example, how often do you avoid locker rooms, swimming pools, or situations where you have to take your clothes off? Alternatively, how often do you wear certain clothes to alter or disguise your body appearance- such as a hat to hide your hair, or baggy clothes to hide your body?"	Body appearance judgement; Socialization; Body image	b1801	d9205	e425		
4. "How much time in total do you spend each day involved in grooming activities to improve your appearance?"	Grooming activities		d520			
5. "How much time in total do you spend each day on physical activities to improve your body appearance, such as lifting weights, doing sit-ups, or running on a treadmill?"	Body image; Exercise	b1801	d5701			
6. "How often do you engage in dieting, eating special foods (for example high protein or low-fat foods), or taking Supplements specially to improve your appearance?"	Diet; Supplements; Body appearance	b1801	d5701	e110		
7. "How much of your income do you spend on items designed to improve your appearance (for example diet food, Supplements, hair products, cosmetics and cosmetic procedures, workout equipment, or gym memberships)?"	Spending money; Body appearance	b1801	d6200			
8. "How much have your appearance-related activities undermined your social relationships? For example, have your workout activities, dietary practices, or other appearance-related behaviors compromised your relationships with other people?"	Social relationships; Body appearance	b1801	d750			
9. "How often has your sex life been compromised by your appearance concerns?"	Sexual life; Body appearance	b1801	d7702			
10. "How often have appearance-related concerns or activities compromised your job or career (or academic performance if you are a student)? For example, have you been late, missed work or school, worked below your potential, or lost opportunities for advancement because of your appearance-related needs or self-consciousness?"	Job; Academic life; Body image	b1801	d820; d850			
11. "How often have you avoided being seen by other people because of your appearance concerns (for example, not going to school, work, social events, or out in public)?"	Socialization		d9205			
12. "Have you ever taken any type of drug- legal or illegal- to increase muscle mass, lose weight, or otherwise improve your appearance?"	Drugs; Body appearance	b1801		e1101		

13. "How often have you used more extreme measures (other than drug use) to change your appearance, such as excessive exercising; working out even when injured; fasting or other unhealthy dietary activities; vomiting, use of laxatives or other 'purging' methods; or unconventional techniques for muscle development, hair growth, penile enlargement, etc..?"

Extreme measures; Body image

b1801;
b130

Muscle Appearance Satisfaction Scale

Questionnaire's items	Meaningful concept(s)	b	d	e	s	Other
1. When I look at my muscles in the mirror, I often feel satisfied with my current muscle size.	Visual perception; Body image; Muscles	b1561; b1801				s7702
2. If my schedule forces me to miss a day of working out with weights, I feel very upset.	Emotional response; Exercise	b152	d5701			
3. I often ask friends and/or relatives if I look big.	Body appearance judgement; Friends and relatives; Body image	b1801		e315; e320; e425		
4. I am satisfied with the size of my muscles.	Emotional response; Muscles	b152				s7702
5. I often spend money on muscle-building supplements.	Spending money; Muscle-building supplements		d6200	e110		
6. It is OK to use steroids to increase muscle mass.	Judgement; Steroids	b1645		e110		
7. I often feel like I am addicted to working out with weights.	Impulse control	b130				
8. If I have a bad workout, it is likely to have a negative effect on the rest of my day.	Emotional adjustment	b1520				
9. I would try anything to get my muscles to grow.	Impulse control	b1304				
10. I often keep working out even when my muscles or joints are sore from previous workouts.	Impulse control	b1304				
11. I often spend a lot of time looking at my muscles in the mirror.	Body image	b1801				
12. I spend more time in the gym working out than most others who work out.	Body image satisfaction; Exercise; Time management	b1522; b1642	d5701			
13. To get big, one must be able to ignore a lot of pain.	Pain; Motivation	b130; b280				
14. I am satisfied with my muscle tone/definition.	Body image; Satisfaction; Muscles	b152; b1801				s7702

15. My self-worth is very focused on how my muscles look.	Self-worth; Body image; Emotional adjustment	b1520; b1801					pf
16. I often ignore a lot of physical pain while I am weight lifting to get bigger.	Pain; Motivation; Emotional adjustment	b1520; b280;					
17. I must get bigger muscles by any means necessary.	Emotional adjustment	b1520					
18. I often seek reassurance from others that my muscles are big enough.	Body appearance judgment; Body image; Muscles	b1801	e425			s7702	
19. I often find it difficult to resist checking the size of my muscles.	Emotional control; Body image	b1520; b1801					

Muscle Dysmorphic Disorder Inventory

Questionnaire's items	Meaningful concept(s)	b	d	e	s	Other
1. I think my body is too skinny/slender.	Body image	b1801				
2. I wear loose clothing so that people can't see my body.	Body appearance judgement			e425		
3. I hate my body.	Body image; Hate	b1520; b1801				
4. I wish I could be heavier.	Body image; Lamentation	b1520; b1801				
5. I find my chest to be too small.	Body image	b1801				
6. I think my legs are too thin.	Body image	b1801				
7. I feel like I have too much body fat.	Body image	b1801				
8. I wish my arms were stronger.	Body image; Lamentation	b1520; b1801				
9. I am embarrassed to let people see me without a shirt or t-shirt.	Body appearance judgement; Body image; Insecurity	b1520; b1801		e425		
10. I feel anxious when I miss one or more days of exercise.	Anxiety; Exercise	b152	d5701			
11. I cancel social activities with friends (e.g., watching football, invitations to dinner, going to the movie theater, etc.) because of my workout/exercise schedule.	Socialization; Exercise		d5701; d9205			
12. I feel depressed when I miss one or more days of exercise.	Sadness; Exercise	b152	d5701			

13. I miss opportunities to meet new people because of my workout schedule.	Meeting new people; Socialization; Exercise		d5701; d7200; d9205		
1. I think my body is too skinny/slender.	Body image	b1801			
2. I wear loose clothing so that people can't see my body.	Body appearance judgement			e425	
3. I hate my body.	Body image; Hate	b1520; b1801			
4. I wish I could be heavier.	Body image; Lamentation	b1520; b1801			
5. I find my chest to be too small.	Body image	b1801			
6. I think my legs are too thin.	Body image	b1801			
7. I feel like I have too much body fat.	Body image	b1801			
8. I wish my arms were stronger.	Body image; Lamentation	b1520; b1801			
9. I am embarrassed to let people see me without a shirt or t-shirt.	Body appearance judgement; Body image; Insecurity	b1520; b1801		e425	
10. I feel anxious when I miss one or more days of exercise.	Anxiety; Exercise	b152	d5701		
11. I cancel social activities with friends (e.g., watching football, invitations to dinner, going to the movie theater, etc.) because of my workout/exercise schedule.	Socialization; Exercise		d5701; d9205		

Muscle Dysmorphia Inventory

Questionnaire's items	Meaningful concept(s)	b	d	e	s	Other
1. I regulate my caloric intake to maximize muscle development.	Drive for muscle development; Diet	b130	d5701			
2. Before a workout, I consume energy supplements.	Supplements; Diet		d5701	e110		
3. I maintain a strict workout schedule.	Drive for muscle development	b130				
4. I monitor my diet closely to limit my fat intake.	Drive for muscle development; Diet; Food	b130	d5701	e110		
5. I wear bulky clothing to hide my muscular physique from others.	Body image; Body appearance judgement; Body shame	b1801; b1522		e425		
6. I am concerned with losing muscle mass.	Body image; Thought management	b1801; b1603				

7. I use supplements to help me recuperate from strenuous workouts.	Supplements; Workout		d5701	e110
8. I control the intake of proteins, carbohydrates, and fats to maximize my muscular development.	Drive for muscle development; Diet	b130	d5701	
9. I use supplements to increase my weight lifting performance.	Drive for muscle development; Supplements	b130		e110
10. My workouts are designed to develop the maximum amount of muscle mass.	Drive for muscle development	b130		
11. I am preoccupied that I look small.	Body image; Preoccupation	b1801; b152		
12. I use supplements to help me train through injuries.	Supplements			e110
13. It bothers me to miss a scheduled workout.	Drive for muscle development; Emotion management	b130; b1520		
14. I prefer to work out when no one else can see me.	Body image; Socialization	b1801	d9205	
15. Developing large muscle mass is important to me.	Drive for muscle development; Body image; Motivation	b1801; b130; b1520		
16. My diet is regimented to the point that I eat the same foods several days in a row.	Drive for muscle development; Diet	b130	d5701	
17. I will benefit from having large muscles.	Body image; Emotion management	b1801; b1520		
18. I have a hard time taking a scheduled day off from training.	Drive for muscle development; Emotion management	b130; b1520		
19. I avoid foods high in sodium.	Drive for muscle development; Diet	b130	d5701	
20. I am preoccupied with a desire to be larger.	Body image; Emotion management	b1801; b1520		
21. I avoid situations where other weightlifters may see my muscle development.	Body image; Body appearance judgement; Body shame; Socialization	b1801; b1520	d9205	e425
22. I wear clothes that help conceal the size of my physique.	Body image; Emotion management	b1801; b1520		
23. It is important that other weight trainers see how muscular I am.	Body image; Body appearance judgement; Socialization	b1801	d9205	e425
24. I would rather keep others from seeing my level of muscle development.	Body image; Body appearance judgement; Body shame; Socialization	b1801; b1520	d9205	e425
25. I use steroids.	Drug use			e110

26. I use laxatives.	Drug use			e110
27. I use diuretics.	Drug use			e110
1. I regulate my caloric intake to maximize muscle development.	Drive for muscle development; Diet	b130	d5701	
2. Before a workout, I consume energy supplements.	Supplements; Diet		d5701	e110
3. I maintain a strict workout schedule.	Drive for muscle development	b130		
4. I monitor my diet closely to limit my fat intake.	Drive for muscle development; Diet; Food	b130	d5701	e110
5. I wear bulky clothing to hide my muscular physique from others.	Body image; Body appearance judgement; Body shame	b1801; b1522		e425
6. I am concerned with losing muscle mass.	Body image; Thought management	b1801; b1603		
7. I use supplements to help me recuperate from strenuous workouts.	Supplements; Workout		d5701	e110
8. I control the intake of proteins, carbohydrates, and fats to maximize my muscular development.	Drive for muscle development; Diet	b130	d5701	
9. I use supplements to increase my weight lifting performance.	Drive for muscle development; Supplements	b130		e110
10. My workouts are designed to develop the maximum amount of muscle mass.	Drive for muscle development	b130		
11. I am preoccupied that I look small.	Body image; Preoccupation	b1801; b152		
12. I use supplements to help me train through injuries.	Supplements			e110
13. It bothers me to miss a scheduled workout.	Drive for muscle development; Emotion management	b130; b1520		
14. I prefer to work out when no one else can see me.	Body image; Socialization	b1801	d9205	
15. Developing large muscle mass is important to me.	Drive for muscle development; Body image; Motivation	b1801; b130; b1520		
16. My diet is regimented to the point that I eat the same foods several days in a row.	Drive for muscle development; Diet	b130	d5701	
17. I will benefit from having large muscles.	Body image; Emotion management	b1801; b1520		
18. I have a hard time taking a scheduled day off from training.	Drive for muscle development; Emotion management	b130; b1520		

19. I avoid foods high in sodium.	Drive for muscle development; Diet	b130	d5701	
20. I am preoccupied with a desire to be larger.	Body image; Emotion management	b1801; b1520		
21. I avoid situations where other weightlifters may see my muscle development.	Body image; Body appearance judgement; Body shame; Socialization	b1801; b1520	d9205	e425
22. I wear clothes that help conceal the size of my physique.	Body image; Emotion management	b1801; b1520		
23. It is important that other weight trainers see how muscular I am.	Body image; Body appearance judgement; Socialization	b1801	d9205	e425
24. I would rather keep others from seeing my level of muscle development.	Body image; Body appearance judgement; Body shame; Socialization	b1801; b1520	d9205	e425
25. I use steroids.	Drug use			e110
26. I use laxatives.	Drug use			e110
27. I use diuretics.	Drug use			e110
1. I regulate my caloric intake to maximize muscle development.	Drive for muscle development; Diet	b130	d5701	

Key: b = body functions categories; d = activities and participation categories; e = environmental factors categories; s = body structures categories; pf = personal factor.

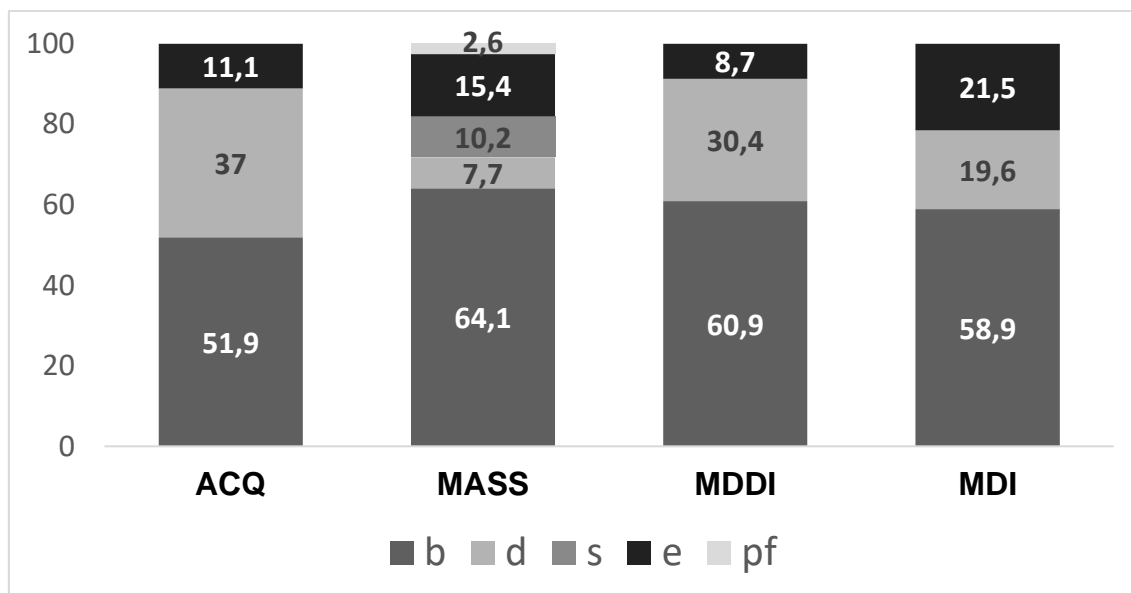
Table 2. Absolute and relative frequencies of the International Classification of Functioning, Disability and Health domains linked to the meaningful concepts of the questionnaire items.

Chapters by components	ACQ		MASS		MDDI		MDI					
	n	%	Linked categories	n	%	Linked categories	n	%	Linked categories			
b: Body functions												
(b1) Mental functions	4	26,7	b130 – Energy and drive functions [1] b1520 – Appropriateness of emotion [1] b1603 – Control of thought [1] b1801 – Body image [11]	9	52,8	b130 – Energy and drive functions [3] b1304 – Impulse control [2] b152 – Emotional functions [3] b1520 - Appropriateness of emotion [4] b1522 – Range of emotion [1] b1561 – Visual perception [1] b1642 – Time management [1] b1645 – Judgement [1] b1801 – Body image [7]	3	42,8	b152 – Emotional functions [2] b1520 - Appropriateness of emotion [4] b1801 – Body image [8]	6	60	b130 – Energy and drive functions [11] b152 – Emotional functions [1] b1520 - Appropriateness of emotion [8] b1522 – Range of emotion [1] b1603 – Control of thought [1] b1801 – Body image [11]
(b2) Sensory functions and pain	-	-	-	1	5,9	b280 – Sensation of pain [2]	-	-	-	-	-	-
d: Activities and participation												
(d2) General tasks and demands	-	-	-	-	-	-	-	-	-	-	-	-
(d5) Self-care	2	13,3	d520 – Caring for body parts [1] d5701 – Managing diet and fitness [2]	1	5,9	d5701 – Managing diet and fitness [2]	1	14,3	d5701 – Managing diet and fitness [4]	1	10	d5701 – Managing diet and fitness [7]
(d6) Domestic life	1	6,7	d6200 – Shopping [1]	1	5,9	d6200 – Shopping [1]	-	-	-	-	-	-
(d7) Interpersonal interactions and relationships	2	13,3	d750 – Informal social relationships [1]	-	-	-	1	14,3	d7200 – Forming relationships [1]	-	-	-

(d8) Major life areas	2	13,3	d7702 – Sexual relationships [1] d820 – School education [1] d850 – Remunerative employment [1]	-	-	-	-	-	-	-	-	-
(d9) Community, social and civic life	1	6,7	d9205 – Socializing [2]	-	-	-	1	14,3	d9205 – Socializing [2]	1	10	d9205 – Socializing [4]
s: Body structures												
(s7) Structures related to movement	-	-	-	1	5,9	s7702 – Muscles [4]	-	-	-	-	-	-
e: Environmental factors												
(e1) Products and technology	2	13,3	e110 – Products or substances for personal consumption [1] e1101 – Drugs [1]	1	5,9	e110 – Products or substances for personal consumption [2]	-	-	-	1	10	e110 – Products or substances for personal consumption [8]
(e3) Support and relationships	-	-	-	2	11,8	e315 – Extended family [1] e320 – Friends [1]	-	-	-	-	-	-
(e4) Attitudes	1	6,7	e425 – Individual attitudes of acquaintances, peers, colleagues, neighbors, and community members [1]	1	5,9	e425 – Individual attitudes of acquaintances, peers, colleagues, neighbors, and community members [2]	1	14,3	e425 – Individual attitudes of acquaintances, peers, colleagues, neighbors, and community members [2]	1	10	e425 – Individual attitudes of acquaintances, peers, colleagues, neighbors, and community members [4]

[] – Absolute frequency of linking between a category and a meaningful concept; ACQ - Adonis Complex Questionnaire; MASS - Muscle Appearance Satisfaction Scale; MDDI - Muscle Dysmorphic Disorder Inventory; MDSQ - Muscle Dysmorphia Symptom Questionnaire; MDI - Muscle Dysmorphia Inventory.

Figure 2. Relative frequency (%) of meaningful concepts of questionnaires by ICF components. b = body functions; d = activities and participation; s = body structures; e = environmental factors; pf = personal factors; ACQ = Adonis Complex Questionnaire; MASS = Muscle Appearance Satisfaction Scale; MDDI = Muscle Dysmorphic Disorder Inventory; MDI = Muscle Dysmorphia Inventory.



Source: own elaboration

The MAAS was the only questionnaire that addressed all ICF domains, as the other instruments did not encompass items involving body structures. Additionally, its items were linked to the largest number of categories (18 ICF categories) when compared to the other questionnaires. Nevertheless, an imbalanced distribution was observed, as the body functions component accounts for 64,1% of meaningful concepts identified. Furthermore, as opposed to the other questionnaires, which focused only on chapter “(b1) – Mental functions” out of eight body functions components, it also displayed questions regarding “(b2) – Sensory functions and pain”. Moreover, although the environmental factors component did not present the largest coverage proportion (15,4% of items, when compared to 21,5% observed in MDI), the items were better distributed into three chapters out of five, while the other questionnaires covered up to two environmental factors’ chapters.

The ACQ displayed the broadest coverage of the activities and participation component (37%) compared to the other instruments, encompassing five out of eight chapters, although each chapter was represented by up to two categories. In spite of this, the 13 items of this instrument were mostly linked to the body functions component (51,9%), but they were all restricted to chapter “(b1) – Mental functions” out of the eight chapters that compose this component. Thus, b1801 (Body image) was the most frequent category addressed in this questionnaire, which was also the most frequent one in all the questionnaires.

The 13 items of MDDI were linked to 7 categories only, this being the least broad ICF coverage among the instruments selected for this analysis. The questions were mostly linked to body functions categories (60,9%), being followed by activities and participation and environmental factors components.

Finally, the MDI also focused on body functions categories (58,9%). This coverage was followed by environmental factors (21,5%) and activities and participation (19,6%), where the latter two components were represented by two categories only.

Discussion

The present study presents an overview of functional aspects addressed by instruments specifically developed for MD clinical assessment. To our knowledge, this is the first research to examine these measures through an ICF-based perspective, which is useful for researchers and health professionals to select the questionnaire that best fits the assessment needs of individuals with MD.

Although mental health disorders such as MD usually display a wide range of clinical symptoms, several professionals have been questioning whether such disorders should be assessed exclusively in terms of psychiatric symptoms, rather than considering other indicators, e.g. daily life functioning (Guilera et al., 2020). To illustrate this, two individuals with identical diagnoses may display completely different illness consequences, thus affecting their quality of life and functional levels, besides leading to different health needs that could be easily tracked through adequate instruments. Considering this, investigating the extent to which mental health disorders' questionnaires encompass functionality aspects is valuable to understand a patient's health condition more precisely, as well as to set realistic goals for treatment.

The complexity of MD was highlighted by a model proposed by Grieve et al. (Grieve, 2007), who identified cognitive, behavioral, socioenvironmental (media influence and sports participation), physiological (body mass), emotional, and psychological (body dissatisfaction, ideal body internalization, self-esteem, body distortion, perfectionism) factors that interact with each other in a complex manner and influence MD etiology and expression. As a result, people with MD may face different functional impairments, such as job and academic losses, eating and sleeping disorders, relationship breakdowns, social avoidance, camouflaging behaviors, financial damages, among others (Tod et al., 2016). In view of this, clinical professionals are expected to identify health needs that deserve greater attention in order to propose the best treatment approach for the MD population, and the use of patient-reported outcome measures is fundamental for such research.

The literature review shed a light on the fact that, in some studies, the assessment instrument selected was not an MD measure per se or did not examine the condition's main features. As an example, some researchers employed drive for muscularity or even

body checking questionnaires, despite the fact that these measures do not assess MD, as they are distinct constructs. Based on this, the present study has carefully screened the eligible instruments, resulting in four measures specifically developed and validated for people with MD (Hildebrandt et al., 2004; Mayville et al., 2002; Pope et al., 2000; Rhea et al., 2005). These displayed good psychometric properties aimed at evaluating MD symptoms and providing a comprehensive assessment of patients with this disorder.

With regards to the ICF-linking stage, all questionnaires had a major focus on the body functions domain, and the category “b1801 – Body image” was explored in several items. As the MD etiology model is essentially a body image disorder, this content was expected to be frequently observed in the analysis. In addition, it is important to note that almost all items that contemplated the body appearance construct associated it with other meaningful concepts, and therefore other facets related to the disease’s central characteristic could be explored. For instance, the ACQ’s (Pope et al., 2000) ninth item “How often has your sex life been compromised by your appearance concerns?” assesses to what extent body image preoccupation affects an individual’s sexual life. In another example, the MDDI’s (Hildebrandt et al., 2004) ninth item postulates “I am embarrassed to let people see me without a shirt or t-shirt.”, thus investigating the extent to which body appearance concerns trigger self-deprecation feelings and modulate social interactions.

A comparison of all the questionnaires reveals that MASS (Mayville et al., 2002) displayed the broader coverage of ICF categories, in spite of its imbalanced distribution – which is mainly concentrated on the body functions component. This is explained by the proposed objective for this instrument, i.e. to assess cognitive, affective, and behavioral dimensions of MD. All these aspects are directly related to the ICF chapter “b1 – Mental functions”, which contemplates general and specific mental functions, such as consciousness, energy, and drive (WHO, 2001).

On the other hand, the least diverse ICF coverage was observed in MDDI (Hildebrandt et al., 2004), which contemplated only seven categories in its thirteen items. Curiously, the MDDI is the only instrument that comprises a Functional Impairment section in its structure, leading researchers to choose it as an outcome measure to assess functionality in MD patients (Zeeck et al., 2018), even though it poorly addresses the ICF domains. This divergence is related to a common belief that functionality is restricted to the capacity for carrying out daily living activities rather than considering all aspects involved in this concept – i.e., body functions and structures, environmental factors, and activities and participation domains.

In terms of activities and participation coverage, MDI (Rhea et al., 2005) had the highest number of items linked to categories from that domain. However, only two categories were addressed: “d5701 – Managing diet and fitness” and “d9205 – Socializing”. This functional domain had a more diversified coverage in the ACQ (Pope et al., 2000), with eight different activities and participation categories, regardless of the fact that it displayed a smaller number of items. The investigation of this aspect is particularly important, as some researchers state that mental disorders are stratified

according to the extent to which they affect activities and participation. Thus, this domain is able to complement illness definitions and symptoms, helping to better describe treatment targets (Baron & Linden, 2008).

Overall, the instruments analyzed lacked items regarding body structures, except for the MASS. As MD is a mental disorder that displays a symptom algorithm mostly based on behaviors, body structure alterations or even lesions are usually secondary to that set of attitudes. For instance, this population tend to present attitudes towards gaining muscle mass, reflected in overtraining, diet restriction, drugs usage, and social withdrawal (Grieve, 2007; Tod et al., 2016). As a consequence of these conducts, the appearance of lesions may become evident, such as musculoskeletal, liver, and renal injuries. Nevertheless, as the main purpose of the questionnaires is to examine the expression of central behavioral symptoms, alterations in body structures were not the main focus.

Environmental factors were addressed by all the questionnaires. Proportionally, MDI had the highest number of items linked to this domain. However, only two categories were contemplated: “e110 – Products or substances for personal consumption” and “e425 – Individual attitudes of acquaintances, peers, colleagues, neighbors, and community members”. These categories were also linked to MASS items, which had less topics associated with environmental factors, but the meaningful concepts could be linked to another two categories: “e315 – Extended family” and “e320 – Friends”.

Although environmental factors play an important role in the development and maintenance of MD, research into causal and contributory factors is still limited. However, the literature suggests that factors such as perceived childhood maltreatment, bullying, abuse episodes, and sociocultural pressures to achieve physical perfection may significantly contribute to the disorder (Neziroglu & Barile, 2017). In view of this, future research is needed to better explore the external influence on people with MD, as well as to develop instruments that could carefully examine this aspect.

Conclusions

In conclusion, four questionnaires specifically designed and validated for assessing individuals with MD were identified: ACQ (Pope et al., 2000), MASS (Mayville et al., 2002), MDDI (Hildebrandt et al., 2004), and MDI (Rhea et al., 2005). All the instruments covered biopsychosocial factors described by the ICF, with a major focus on the body functions component, but they poorly or did not cover body structures and environmental factors. Thus, other instruments could be considered in a complementary way for clinical assessment. Finally, MASS and ACQ presented the most diverse coverage of categories, enabling a wide and comprehensive assessment of health status.

Funding sources

Revista de Investigación Cuerpo, Cultura y Movimiento
ISSN: 2248-4418 | e-ISSN: 2422-474X | <https://doi.org/10.15332/2422474X>
Vol. 14 N.º 2 | julio-diciembre del 2024

The first and fourth authors received a PhD scholarship from the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brazil (CAPES).

References

- Araujo, E. S., & Buchalla, C. M. (2015). The use of the International Classification of Functioning, Disability and Health in health surveys: a reflexion on its limits and possibilities. *Revista Brasileira de Epidemiologia*, 18(3), 720–724. <https://doi.org/10.1590/1980-5497201500030017>
- Babusa, B., Urbán, R., Czeglédi, E., & Túry, F. (2012). Psychometric properties and construct validity of the Muscle Appearance Satisfaction Scale among Hungarian men. *Body Image*, 9(1), 155–162. <https://doi.org/10.1016/j.bodyim.2011.08.005>
- Baron, S., & Linden, M. (2008). The role of the “International Classification of Functioning, Disability and Health, ICF” in the description and classification of mental disorders. *European Archives of Psychiatry and Clinical Neuroscience*, 258(S5), 81–85. <https://doi.org/10.1007/s00406-008-5013-3>
- Castro, S., & Grande, C. (2018). Linking the early development instrument with the ICF-CY. *International Journal of Developmental Disabilities*, 64(1), 3–15. <https://doi.org/10.1080/20473869.2016.1199112>
- Cieza, A., Fayed, N., Bickenbach, J., & Prodinger, B. (2019). Refinements of the ICF Linking Rules to strengthen their potential for establishing comparability of health information. *Disability and Rehabilitation*, 41(5), 574–583. <https://doi.org/10.3109/09638288.2016.1145258>
- Cieza, A., Geyh, S., Chatterji, S., Kostanjsek, N., Üstün, B., & Stucki, G. (2005). ICF linking rules: an update based on lessons learned. *Journal of Rehabilitation Medicine*, 37(4), 212–218. <https://doi.org/10.1080/16501970510040263>
- Compte, E. J., Nagata, J. M., Sepúlveda, A. R., Rivas, A., Sbdar, L. S., Menga, S., Rica, R., Torrente, F., & Murray, S. B. (2019). Assessment and validation of a Spanish version of the Muscle Dysmorphia Disorder Inventory in Argentinian men who exercise: Inventario de Dismorfia Muscular. *Body Image*, 31, 24–34. <https://doi.org/10.1016/j.bodyim.2019.08.002>
- Cook-del Aguila, L., Sanchez-Castro, A. E., Yacila, G. A., Reyes Bossio, M. A., & Mayta-Tristán, P. (2016). Adaptación cultural de la versión peruana de la Muscle Appearance Satisfaction Scale (MASS) para dismorfia muscular. *Revista Colombiana de Psiquiatría*, 45(4), 268–269. <https://doi.org/10.1016/j.rcp.2016.04.003>
- Dantas, T. H. de M., Castaneda, L., Magalhães, A. G., & Dantas, D. de S. (2019). Linking of assessment scales for women with urinary incontinence and the International Classification of Functioning, Disability and Health. *Disability and Rehabilitation*, 41(12), 1443–1449. <https://doi.org/10.1080/09638288.2018.1431695>
- Davidson, M., & Keating, J. (2014). Patient-reported outcome measures (PROMs): how should I interpret reports of measurement properties? A practical guide for clinicians and researchers who are not biostatisticians. *British Journal of Sports Medicine*, 48(9), 792–796. <https://doi.org/10.1136/bjsports-2012-091704>
- de Moraes, A. A., Dantas, D. de S., Chagas, A. C. de S., de Melo, P. H., & de Oliveira, D. A. (2021). Linking assessment instruments for brachial plexus injury to the international classification of functioning, disability and health. *Journal of Hand Therapy*. <https://doi.org/10.1016/j.jht.2021.04.009>
- Duijnisveld, B. J., Saraç, Ç., Malessy, M. J. A., Brachial Plexus Advisory Board, T. I., Vliet Vlieland, T. P. M., & Nelissen, R. G. H. H. (2013). Developing core sets for patients with obstetric brachial plexus injury based on the International Classification of Functioning, Disability and Health. *Bone & Joint Research*, 2(6), 116–121. <https://doi.org/10.1302/2046-3758.26.2000153>
- Fabris, M. A., Longobardi, C., Prino, L. E., & Settanni, M. (2018). Attachment style and risk of muscle dysmorphia in a sample of male bodybuilders. *Psychology of Men & Masculinity*, 19(2), 273–281. <https://doi.org/10.1037/men0000096>

- González-Martí, I., Bustos, J. G. F., Jordán, O. R. C., & Mayville, S. B. (2012). Validation of a Spanish version of the Muscle Appearance Satisfaction Scale: Escala de Satisfacción Muscular. *Body Image*, 9(4), 517–523. <https://doi.org/10.1016/j.bodyim.2012.05.002>
- Grieve, F. G. (2007). A Conceptual Model of Factors Contributing to the Development of Muscle Dysmorphia. *Eating Disorders*, 15(1), 63–80. <https://doi.org/10.1080/10640260601044535>
- Guilera, G., Pino, O., Barrios, M., Rojo, E., Vieta, E., & Gómez-Benito, J. (2020). Towards an ICF Core Set for functioning assessment in severe mental disorders: Commonalities in bipolar disorder, depression and schizophrenia. *Psicothema*, 32(1), 7–14. <https://doi.org/10.7334/psicothema2019.186>
- Hildebrandt, T., Langenbucher, J., & Schlundt, D. G. (2004). Muscularity concerns among men: development of attitudinal and perceptual measures. *Body Image*, 1(2), 169–181. <https://doi.org/10.1016/j.bodyim.2004.01.001>
- Jin, X., Jin, Y., Zhou, S., Li, X., Yang, S., Yang, D., Nieuwoudt, J. E., & Yao, J. (2015). The Muscle Appearance Satisfaction Scale: A factorial analysis of validity and reliability for its use on adult Chinese male weightlifters. *Body Image*, 14, 94–101. <https://doi.org/10.1016/j.bodyim.2015.04.004>
- Lantz, C. D., Rhea, D. J., Cornelius, A. E., Lantz, C. D., Rhea, D. J., & Cor, A. E. (2002). Muscle Dysmorphia in Elite-Level Power Lifters and Bodybuilders: A Test of Differences Within a Conceptual Model. In *National Strength & Conditioning Association J. Strength Cond. Res*, 16 (4), 649–655. URL: https://journals.lww.com/nscajscr/abstract/2002/11000/muscle_dysmorphia_in_elite_level_power_lifters_and.26.aspx
- Latorre-Román, P. Á., Garrido-Ruiz, A., & García-Pinillos, F. (2015). Versión Española del cuestionario del complejo de Adonis; un cuestionario para el análisis del dimorfismo muscular o vigorexia. *Nutrición Hospitalaria*, 31(3), 1246–1253. <https://doi.org/10.3305/nh.2015.31.3.8292>
- López Cuautle, C., Vázquez Arévalo, R., Ruíz Martínez, A. O., & Mancilla Díaz, J. M. (2013). Psychometric properties of the Muscle Appearance Satisfaction Scale (MASS) in Mexican men. *Revista Mexicana de Trastornos Alimentarios*, 4(2), 79–88. [https://doi.org/10.1016/S2007-1523\(13\)71995-5](https://doi.org/10.1016/S2007-1523(13)71995-5)
- Mayville, S. B., Williamson, D. A., White, M. A., Netemeyer, R. G., & Drab, D. L. (2002). Development of the Muscle Appearance Satisfaction Scale. *Assessment*, 9(4), 351–360. <https://doi.org/10.1177/1073191102238156>
- McHugh, M. L. (2012). Interrater reliability: the kappa statistic. *Biochemia Medica*, 22(3), 276–282. URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3900052/>
- Nagata, J. M., Junqueira, A. C. P., Cattle, C. J., Carvalho, P. H. B. de Bagolin, V., Murray, S. B., Compte, E. J., Braga Costa, T. M., Almeida, S. de S., & Laus, M. F. (2022). Validation of the Muscle Dysmorphic Disorder Inventory (MDDI) in Brazilian Women. *Body Image*, 41, 58–66. <https://doi.org/10.1016/j.bodyim.2022.02.003>
- Neziroglu, F., & Barile, N. (2017). *Environmental Factors in Body Dysmorphic Disorder* (K. A. Phillips, Ed.; Vol. 1). Oxford University Press. <https://doi.org/10.1093/med/9780190254131.003.0021>
- Olivardia, R., Pope, H. G., & Hudson, J. I. (2000). Muscle Dysmorphia in Male Weightlifters: A Case-Control Study. *American Journal of Psychiatry*, 157(8), 1291–1296. <https://doi.org/10.1176/appi.ajp.157.8.1291>
- Pope, H. G., Gruber, A. J., Choi, P., Olivardia, R., & Phillips, K. A. (1997). Muscle dysmorphia: An underrecognized form of body dysmorphic disorder. *Psychosomatics*, 38(6), 548–557. [https://doi.org/10.1016/S0033-3182\(97\)71400-2](https://doi.org/10.1016/S0033-3182(97)71400-2)
- Pope, H. G., Olivardia, R., & Phillips, K. A. (2002). *The Adonis Complex: How to Identify, Treat and Prevent Body Obsession in Men and Boys*. Free Press.
- Pope, H., Phillips, K., & Olivardia, R. (2000). *The Adonis Complex: The Secret Crisis of Male Body Obsession*. Simon and Schuster.
- Prodinger, B., Stucki, G., Coenen, M., & Tennant, A. (2019). The measurement of functioning using the International Classification of Functioning, Disability and Health: comparing qualifier ratings with

- existing health status instruments. *Disability and Rehabilitation*, 41(5), 541–548. <https://doi.org/10.1080/09638288.2017.1381186>
- Quick, T. J., & Brown, H. (2020). Evaluation of functional outcomes after brachial plexus injury. *Journal of Hand Surgery (European Volume)*, 45(1), 28–33. <https://doi.org/10.1177/1753193419879645>
- Rhea, D. J., Lantz, C. D., & Cornelius, A. E. (2005). *Development of the Muscle Dysmorphia Inventory (MDI)*. <https://www.researchgate.net/publication/7975263>
- Riccobono, G., Pompili, A., Iorio, C., Carducci, G., Parnanzone, S., Pizziconi, G., Iannitelli, A., & Pacitti, F. (2020). An instrument for the evaluation of muscle dysmorphia: The Italian validation of the Adonis complex questionnaire. *Brain and Behavior*, 10(7), e01666. <https://doi.org/10.1002/brb3.1666>
- Rubio-Aparicio, M., Badenes-Ribera, L., Sánchez-Meca, J., Fabris, M. A., & Longobardi, C. (2020). A reliability generalization meta-analysis of self-report measures of muscle dysmorphia. *Clinical Psychology: Science and Practice*, 27(1), 120. <https://doi.org/10.1111/cpsp.12303>
- Ryan, T. A., & Morrison, T. G. (2010). Psychometric properties of the Muscle Appearance Satisfaction Scale among Irish and British men. *Body Image*, 7(3), 246–250. <https://doi.org/10.1016/j.bodyim.2010.02.008>
- Santarnecci, E., & Dèttore, D. (2012). Muscle dysmorphia in different degrees of bodybuilding activities: Validation of the Italian version of Muscle Dysmorphia Disorder Inventory and Bodybuilder Image Grid. *Body Image*, 9(3), 396–403. <https://doi.org/10.1016/j.bodyim.2012.03.006>
- Silva Júnior, S. H. A., Souza, M. A., & Silva, J. H. A. (2008). Tradução, adaptação e validação da escala de satisfação com a aparência muscular (MASS). Translation, adaptation, and validation of the Muscle Appearance Satisfaction Scale (MASS). *Revista Digital - Buenos Aires*, 13(120), 1. URL: <https://www.efdeportes.com/efd120/traducao-adaptacao-e-validacao-da-escala-de-satisfacao-com-a-aparencia-muscular.htm>
- Tod, D., Edwards, C., & Cranswick, I. (2016). Muscle dysmorphia: Current insights. In *Psychology Research and Behavior Management* 9, 179–188. Dove Medical Press Ltd. <https://doi.org/10.2147/PRBM.S97404>
- WHO. (2001). *International Classification of Functioning, Disability and Health (ICF)* (World Health Organization, Ed.).
- Zeeck, A., Welter, V., Alatas, H., Hildebrandt, T., Lahmann, C., & Hartmann, A. (2018). Muscle Dysmorphic Disorder Inventory (MDDI): Validation of a German version with a focus on gender. *PLOS ONE*, 13(11), e0207535. <https://doi.org/10.1371/journal.pone.0207535>