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Psychometric validation of the Muscle Dysmorphic Disorder Inventory (MDDI) among U.S. transgender men

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ABSTRACT

Muscle dysmorphia (MD) is characterized by a pervasive belief or fear of insufficient muscularity and an elevated drive for muscularity, representing the pathological and extreme pursuit of muscularity. Psychometric properties of one of the most widely used measures of MD symptoms—the Muscle Dysmorphic Disorder Inventory (MDDI)—have yet to be evaluated in transgender men despite emerging evidence suggesting differential risk for MD symptoms in this population. In this study, we assessed the psychometric properties of the MDDI in a sample of 330 transgender men ages 18–67 years who participated in a large-scale national longitudinal cohort study of sexual and gender minority adults in the U.S. Using a two-step, split-sample approach, an initial exploratory factor analysis supported a three-factor structure and a subsequent confirmatory factor analysis of a re-specified three-factor model demonstrated good overall fit (χ^2/df = 1.84, CFI =0.94, TLI =0.92, RMSEA =0.07 [90% CI =0.05,.09], SRMR =0.08). Moreover, results supported the internal consistency and convergent validity of the MDDI subscales in transgender men. Findings inform the use of the MDDI among transgender men and provide a foundation to support further work on the MDDI and MD symptoms among gender minority populations.

1. Introduction

In the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), muscle dysmorphia (MD) is classified as a specifier for body dysmorphic disorder in which there is a preoccupation with the idea that one's body is too small or insufficiently muscular (American Psychiatric Association, 2013). Individuals with MD often experience impairments in psychosocial functioning and decreased quality of life due to repetitive and time-consuming behaviors (e.g., excessive exercise, mirror checking) as well as avoiding social situations due to body shame (Cafri, Olivardia, & Thompson, 2008; Pope et al. 2005; Pope, Gruber, Choi, Olivardia, & Phillips, 1997). Elevated MD symptoms are associated with a range of adverse health-related behaviors and conditions including suicidal ideation

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and attempts (Ortiz, Forrest, & Smith, 2021), anabolic-androgenic steroid use (Piacentino et al., 2014), mood and anxiety disorders (Cafri et al., 2008; Mitchell et al., 2017), and eating disorders (Badenes-Ribera, Rubio-Aparicio, Sánchez-Meca, Fabris, & Longobardi, 2019).

Sociocultural body ideals for men typically center on muscularity and leanness (Lavender, Brown, & Murray, 2017), and prior studies exploring MD have overwhelmingly relied on samples of cisgender men (i.e., individuals who identify as men and were assigned male at birth) (Badenes-Ribera et al., 2019; Santos Filho, dos, Tirico, Stefano, Touyz & Claudino, 2016). However, there are several conceptual and clinical considerations that suggest the potential salience of MD symptoms in other populations, particularly gender minority people. For example, the gender minority stress framework posits that gender minority individuals exhibit increased risk for adverse mental health outcomes resulting from exposure to a range of stressors (e.g., interpersonal violence, discrimination, internalized transphobia) related to their identity and social position, including those associated with physical appearance and gender presentation (Hendricks & Testa, 2012; Testa, Habarth, Peta, Balsam, & Bockting, 2015). Further, certain gender minority populations who are more likely to ascribe to the traditionally masculine muscular body ideal, such as transgender men (i.e., individuals who identify as men or on the masculine spectrum and were assigned female at birth), may be more prone to developing excess behaviors in pursuit of that muscular ideal. Preliminary empirical evidence also supports the relevance of MD symptoms among gender minority groups; transgender men reported symptoms of comparable severity to cisgender men and greater severity relative to other gender minority groups (Amodeo, Esposito, Antuoni, Saracco, & Bacchini, 2022; Nagata et al., 2021). However, the literature in this area remains scarce, and to facilitate future research, there is a need to evaluate existing MD symptom measures to determine what psychometric properties they exhibit in gender minority samples.

The Muscle Dysmorphic Disorder Inventory (MDDI) is one of the most widely used MD symptom measures and consists of 13 items comprising three subscales focused on unique aspects of MD, including drive for size, appearance intolerance, and functional impairment (Hildebrandt, Langenbucher, & Schlundt, 2004). Notably, functional impairment is a key diagnostic feature of MD that other MD symptom questionnaires fail to assess (Mitchell et al., 2017). In addition, the MDDI has been psychometrically validated primarily in samples of college-aged and/or physically active cisgender men (Compte et al., 2019; Gomes et al., 2020; Sepúlveda, Rica, Moreno, Román, & Compte, 2019) as well as in a population-based sample of cisgender gay men and lesbian women (Compte et al., 2021). However, the psychometric properties of the MDDI have yet to be evaluated in gender minority samples. As such, the aim of this study was to examine the factor structure, internal consistency, and convergent validity of the MDDI in a large, U.S. community-based sample of transgender men. It was hypothesized that the original three-factor structure of the MDDI (Drive for Size, Appearance Intolerance, and Functional Impairment) would be supported in this sample and that results would support the internal consistency and convergent validity of the MDDI subscales.

2. Methods

2.1. Participants and procedure

The Population Research in Identity and Disparities for Equality (PRIDE) Study is a large-scale, national (U.S.), longitudinal, cohort study of sexual and/or gender minority (SGM) adults, including individuals who identify as lesbian, gay, bisexual, transgender, and/or queer (LGBTQ). Specific inclusion criteria include: identification as a sexual and/or gender minority person, living in the U.S. or its territories, age ≥ 18 years, and the ability to read and respond to a questionnaire written in English. Data are collected on a cloud-based, web-responsive, secure platform accessible from any smartphone, tablet, or computer. Participants in The PRIDE Study are recruited through PRIDEnet (a national network of organizations and individuals to engage SGM communities), digital communications (blog posts and newsletters), distribution of The PRIDE Study-branded promotional items, in-person outreach at conferences and events, social media advertising, and word-of-mouth. Additional details about The PRIDE Study research platform, recruitment, and design have been previously described (Lunn, Capriotti, et al., 2019; Lunn, Lubensky, et al., 2019).

Data were drawn from a subset of the 4285 participants included in The PRIDE Study who completed the 'Eating and Body Image' survey. Transgender men were defined as persons who responded "transgender man (female-to-male)" and/or "man" and/or "trans-masculine" (write-in) for gender identity and "female" for sex assigned at birth. A total of 352 participants were classified as transgender men. Missing values represented 0.05% of the data and were consistent with missing completely at random according to the non-parametric test of homoscedasticity (p = .100); consequently, data imputation was performed using multivariate imputation by chained equations. Participants had a mean age of 30.9 years (SD = 9.8, range = 18–67) and a mean body mass index (BMI) of 28.8 kg/m^2 (SD = 7.4, range = 16.1–58.5); 79.0% identified as White, 0.3% as Asian, 2.6% as Black, 0.3% as Native American or American Indian, 0.4% as multiracial, 6.0% as another race, and 11.4% did not report their race. A total of 3.1% of participants identified as Hispanic. Additionally, 56.8% of participants reported having a college degree or higher.

2.2. Measures

In addition to data on gender identity and sex assigned at birth, participants self-reported sociodemographic information including age, race/ethnicity, educational status, height, and weight (the latter two of which were used to calculate BMI [kg/m^2]).

The **Muscle Dysmorphic Disorder Inventory** (MDDI) (Hildebrandt et al., 2004) is a 13-item self-report questionnaire that assesses symptoms of MD. Responses are on a five-point Likert-type scale (1 = *never*; 5 = *always*), and higher scores are indicative of greater MD symptom severity. The MDDI comprises 3 subscales: Drive for Size (DFS; items 1, 4, 5, 6, and 8), Appearance Intolerance (AI; items 2, 3, 7, and 9), and Functional Impairment (FI; items 10, 11, 12, and 13). For participants in this study, item five *("I think my chest is too small")* was modified to specify "chest (muscle)", so as to not confuse "chest" with breast size (Compte et al., 2021). The original three-factor structure has been replicated in multiple samples (Compte et al., 2019; Gomes et al., 2020; Sepúlveda et al., 2019), including cisgender gay men and lesbian women (Compte et al., 2021).

The **Eating Disorder Examination – Questionnaire** (EDE-Q) (Fairburn & Beglin, 2008) is a self-report questionnaire widely used to assess eating disorder attitudes and behaviors (e.g., objective binge eating, compensatory behaviors) experienced over the past 28 days. The EDE-Q provides four subscale scores: Restraint (R; five items), Eating Concern (EC; five items), Weight Concern (EC; five items), and Shape Concern (SC; eight items). The Global score is calculated as the average of the four subscales. Attitudinal items are rated based on a seven-point scale with higher scores reflecting greater severity. EDE-Q norms have been published for many populations (Nagata et al., 2020), including transgender men (Nagata et al., 2020). The EDE-Q was used to evaluate the convergent validity of the MDDI given the conceptual associations between MD symptoms and eating disorder symptoms (Compte et al., 2021). It was expected that MDDI AI would be positively correlated with EDE-Q

Table 1
Factor loading for the Exploratory Factor Analysis in first split-half of transgender men (n = 176) participants.

Item/Factor	1	2	3	h2
Drive for Size				
1	.03	-0.07	**.81**	.69
4	.04	-0.08	**.81**	.71
5	.05	.33	**.54**	.35
6	-0.08	-0.03	**.58**	.32
8	.01	.09	**.66**	.42
Appearance Intolerance				
2	-0.12	**.72**	-0.08	.54
3	.09	**.78**	.03	.63
7	.13	**.62**	-0.24	.53
9	-0.08	**.61**	.14	.35
Functional Impairment				
10	**.79**	.14	.63	.67
11	**.86**	-0.07	.94	.73
12	**.79**	.09	.74	.66
13	**.85**	-0.03	.85	.69
Eigenvalue	3.67	1.89	3.00	–
Explained variance	21.38	15.81	18.95	–

WC and SC given the overlapping nature of these subscales (e.g., in relation to body dissatisfaction), and MDDI FI would be positively correlated with EDE-Q Global score given the impairment-relevant item content across several of the subscales (e.g., concentration difficulties, social avoidance). In contrast, it was expected that MDDI DFS would negatively correlate with EDE-Q Restraint and WC given desires to be larger reflected in the former versus desires for a lower weight reflected in the latter. Internal consistency for the EDE-Q is presented in Table 2.

2.3. Data analyses

Continuous variables were reported as mean ± SD and categorical variables were reported as percentages. Following guidelines for scale validation (Boateng, Neilands, Frongillo, Melgar-Quiñonez, & Young, 2018; Swami & Barron, 2019), participants were randomly divided in a 1:1 ratio into two split-half subsamples, each comprising 176 participants. An exploratory factor analysis (EFA) was conducted to determine the underlying factor structure of the MDDI in the first split-half subsample of transgender men. Subsequently, confirmatory factor analyses (CFAs) were conducted to evaluate the retained model in the second split-half subsample. For the EFA, guidelines to utilize as large a sample as possible were followed, given that sample adequacy is best determined after data analyses (communalities ≥0.50) (Swami & Barron, 2019); however, a minimum sample size of 130 participants was considered adequate, reflecting a 10:1 ratio of participants per item (Hair, Black, Babin, & Anderson, 2014). Given that sample size requirements for CFA are partially based on the degrees of freedom for a model, sample size adequacy was determined *a posteriori* and was based on a power analysis for a RMSEA value consistent with a good model fit (MacCallum, Browne, & Sugawara, 1996). For this study and following Hair et al. (2014), we have considered a minimum sample size that reflects a 10:1 ratio of participants per items.

For the EFA, the principal-axis factoring estimation method (Fabrigar, MacCallum, Wegener, & Strahan, 1999) was utilized given that the assumption of multivariate normality was not fulfilled (Mardia's Skewness 1311.70, p < .001). Factors were assumed to be correlated, thus the oblique Oblimin rotation was used. Values > 0.60 for the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and a significant Bartlett's test of sphericity were used in determining if the data met assumptions for an EFA (Worthington & Whittaker, 2006). To provide empirical guidelines for the number of factors to retain, a parallel analysis (Horn, 1965) also was conducted. Parallel analysis creates a random dataset, and factors are recommended to be retained if eigenvalues (λ) from the actual data are greater than those from the randomly generated data (Hayton, Allen, & Scarpello, 2004). In addition, extracted components in the EFA were judged to be adequate when their eigenvalues exceeded 1.0 (Kaiser's criterion) and after visual examination of scree plot. Items with factor loadings > 0.50 and no cross-loadings > 0.40 were retained, as they are considered practically significant (Hair et al., 2014).

A CFA was subsequently conducted using the second split-half sample employing the factor structure identified in the EFA from the first split-half sample. Given that the assumption of multivariate normality was not fulfilled (Mardia's test kurtosis = 8.60, p < .001), the CFA was based on a robust maximum likelihood estimation method with the Satorra-Bentler χ^2 scaled correction (Satorra & Bentler, 1994). Items were set to load freely except for one item per factor, which was set to 1, to ensure an identified model. Model fit was assessed using the following robust indices: comparative fit index (CFI), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), and RMSEA with its 90% confidence interval (CI). The following values were indicative of adequate fit: χ^2/df < 3.00, CFI and TLI (close to 0.95), SRMR (close to 0.08), and RMSEA (close to 0.06). Additionally, modification indices (MI) were considered for model improvement (Swami & Barron, 2019). A conservative convention suggests that MI values ≥ 5.00 have a statistically significant effect on the model's χ^2 (Byrne, Shavelson, & Muthén, 1989).

Table 2
Descriptive statistics, internal consistency, and correlations among variables in split-half samples of transgender men (N = 352).

		First split-half sample (n = 176)		*Second split-half sample (n = 176)*									
		M (SD)	Omega (CI 95%)	*M (SD)*	Omega (CI 95%)	1	2	3	4	5	6	7	8
1	**MDDI DFS**	10.44 (4.46)	.79 (0.72,.84)	10.98 (4.60)	.83 (0.78,.87)	–	-0.13*	.21**	-0.01	-0.07	-0.10	.01	-0.03
2	**MDDI AI**	13.14 (4.12)	.78 (0.72,.83)	13.28 (3.88)	.75 (0.68,.80)	-0.02	–	.11	.30**	.54**	.73**	.78**	.72**
3	**MDDI FI**	6.67 (3.71)	.87 (0.77,.91)	6.53 (3.11)	.85 (0.73,.90)	.26**	.17*	–	.33**	.30**	.24**	.31**	.33**
4	**EDE-Q R**	1.39 (1.50)	.83 (0.78,.87)	1.26 (1.36)	.81 (0.71,.85)	.01	.39**	.26**	–	.52**	.55**	.51**	.69**
5	**EDE-Q EC**	0.97 (1.27)	.85 (0.80,.89)	0.77 (1.07)	.83 (0.76,.89)	-0.08	.61**	.21**	.53**	–	.79**	.73**	.82**
6	**EDE-Q WC**	2.18 (1.62)	.86 (0.83,.89)	1.87 (1.54)	.87 (0.83,.89)	-0.11	.72**	.15 *	.56**	.77**	–	.89**	.94**
7	**EDE-Q SC**	2.78 (1.66)	.90 (0.86,.91)	2.53 (1.53)	.89 (0.86,.91)	.01	.79**	.29**	.54**	.72**	.84**	–	.95**
8	**EDE-Q GS**	2.00 (1.36)	.95 (0.94,.96)	1.78 (1.25)	.94 (0.93,.95)	-0.03	.76**	.28**	.72**	.81**	.92**	.94**	–

Note: Correlations for the first split-half sample are presented above the diagonal, and those for the second split-half subsample are presented below the diagonal. MDDI DFS = MDDI Drive for Size subscale; MDDI AI = MDDI Appearance Intolerance subscale; MDDI-FI = MDDI Functional Impairment subscale; EDE-Q R = EDE-Q Restraint subscale; EDE-Q EC = EDE-Q Eating Concern subscale; EDE-Q WC = EDE-Q Weight Concern subscale; EDE-Q SC = EDE-Q Shape Concern subscale; EDE-Q GS = EDE-Q Global Score.
* p < .05
** p < .01

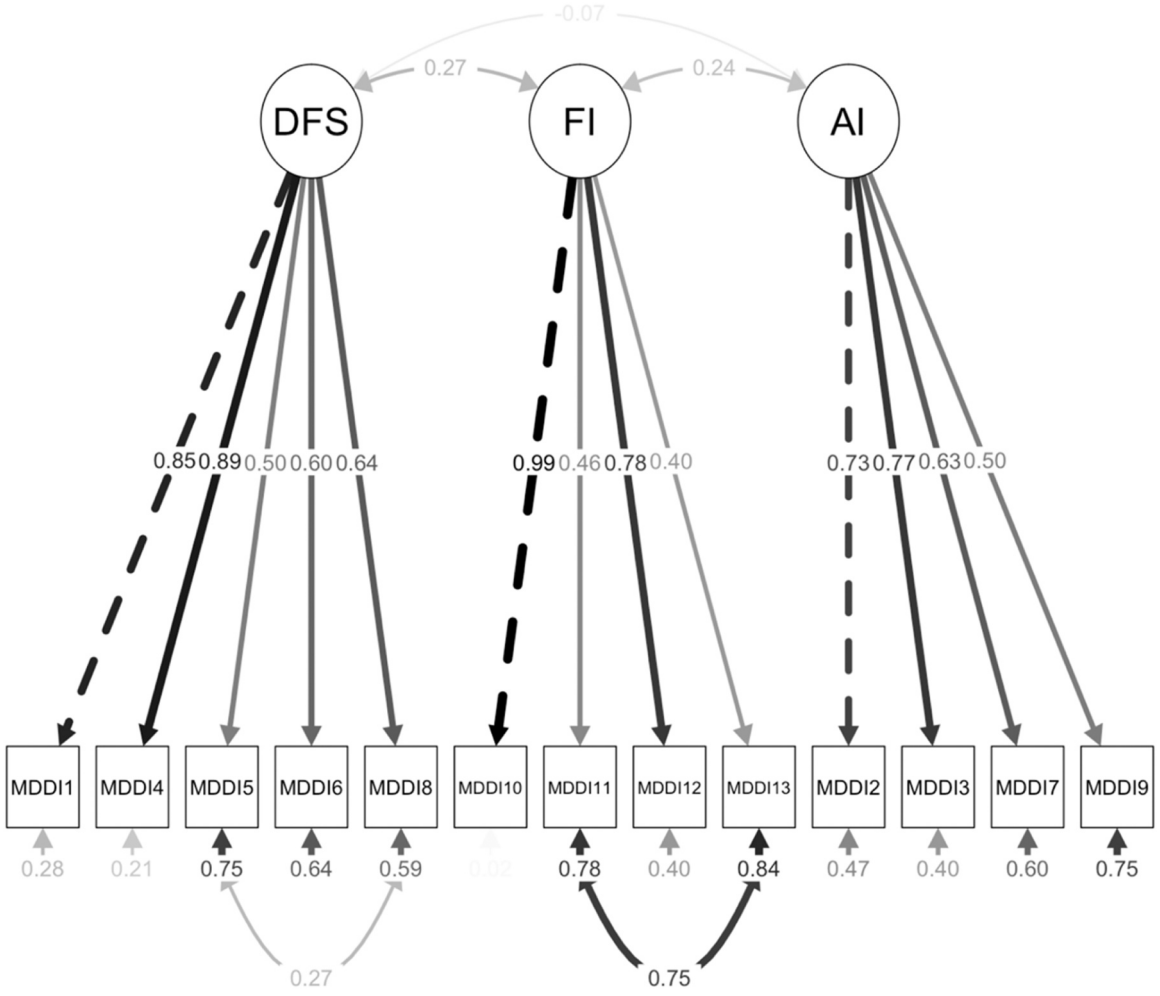

Fig. 1. Confirmatory factor analysis of the re-specified retained 3-factor model for the Muscle Dysmorphic Disorder Inventory (MDDI) in the second split-half sample of U.S. transgender men (N = 176) in The PRIDE Study. *Note.* DFS = Drive for Size factor, AI = Appearance Intolerance factor, FI = Functional Impairment factor.

A scaled Chi-square difference test ($\Delta\chi^2$) was used to compare the original and re-specified models (Satorra & Bentler, 2001). The omega coefficient and 95% CI (Dunn, Baguley, & Brunsden, 2014) were calculated to determine internal consistency; values > 0.70 were considered acceptable (Nunnally, 1978). Due to the lack of multivariate normality, the Spearman correlation coefficient was used for associations related to evaluation of convergent validity. Following Cohen (1988), values of r_s > 0.10–0.29 were considered small correlations, r_s > 0.30–0.49 were considered moderate correlations, and r_s > 0.50 were considered large correlations. All items were subjected to item analysis, and no values r_s < 0.20 were expected between latent variables and each of their corresponding items (Nunnally, 1978). Mann-Whitney *U* Rank tests for group comparisons were conducted to assess differences between randomly generated split-half first and second subset samples on key demographics. The coefficient r (r = z/square root of N) was used to report effect size for continuous variables with 0.10–0.29 being considered small, 0.30–0.49 being considered medium, and ≥ 0.50 being considered large (Cohen, 1988). A two-tailed p < .05 was considered statistically significant for all analyses.

R software (version 3.4.4) and the following packages were used: *WebPower* (Zhang & Yuan, 2018); *MissMech* (Jamshidian, Jalal, & Jansen, 2014); *Mice* (van Buuren & Groothuis-Oudshoorn, 2011); *MVN* (Korkmaz, Goksuluk, & Zararsiz, 2014); *Lavaan* (Rosseel, 2012); *MBESS* (Kelley, 2022); *Psych* (Revelle, 2022); and *Hmisc* (Harrell, 2006).

3. Results

3.1. Demographics

In the first split-half subsample of transgender men, the mean age was 30.31 years of age (*SD* = 9.40) and the mean BMI was 29.23 (7.69 kg/m^2, *SD* = 6.71); in the second split-half sample, the mean age was 31.35 years (*SD* = 10.16) and the mean BMI was 28.30 kg/m^2 (*SD* = 7.14). There were no significant differences in age (Mann-Whitney *U* test: z = −0.47, p = .320, Cohen's r = 0.03) or BMI (Mann-Whitney *U* test: z = −0.75, p = .228, Cohen's r = 0.04) between the split-half subsamples.

3.2. Exploratory Factor Analysis

In the first split-half subsample of transgender men (n = 176), the KMO index of 0.72 and a significant Bartlett's test of sphericity ($\chi^2(78)$ = 1173.73, p < .001), together with a mean item communality of 0.56, suggested that data and sample size were adequate to perform EFA. Results from the parallel analysis suggested the presence of three factors, as the first three eigenvalues from the observed data were higher than the randomly generated data (λ_1: 3.08 > 0.61, λ_2: 2.15 > 0.37, λ_3: 1.07 > 0.28, λ_4: 0.15 < 0.22). Consequently, an EFA with a three-factor solution was conducted, which accounted for the 56.14% of the variance. Table 1 shows factor loadings, eigenvalues, and explained variance. All items showed a

factor loading > 0.50 in their corresponding factor. Factor loadings ranged between 0.54 and 0.81 for the DFS factor, between 0.61 and 0.78 for the AI factor, and between 0.79 and 0.86 for the FI factor. Item communalities ranged between 0.32 and 0.73. The DFS, AI, and FI factors explained 18.95%, 15.81%, and 21.38% of the variance, respectively.

3.3. Confirmatory factor analysis

Robust fit indices indicated poor fit for the initial three-factor model (χ^2/df = 3.51, CFI = 0.79, TLI = 0.73, RMSEA = 0.14 [95% CI = 0.12,.16], SRMR = 0.10). However, an inspection of the modification indices revealed a large correlation between items 11 ("*I pass up social activities with friends because of my workout schedule*") and 13 ("*I pass up chances to meet new people because of my workout schedule*") from the FI subscale (MI = 105.02), and between items 5 ("*I think my chest is too small*") and 8 ("*I wish my arms were bigger*") from the DFS subscale (MI = 11.10). Consequently, based on theoretical and substantive meaning, the model was respecified to allow for covariance between the residual values in the aforementioned pairs of items. The respecified three-factor model showed overall good fit (χ^2/df = 1.84, CFI = 0.94, TLI = 0.92, RMSEA =0.07 [95% CI = 0.05, 0.09], SRMR = 0.08); results from the scaled Chi-square difference test suggested that the respecified three-factor model significantly improved the model fit ($\Delta\chi 2$ (2) = 30.21, p = .001). All factor loadings were statistically significant (p < .001) and > 0.30 (standardized parameters) (Fig. 1).

A post hoc power analysis was conducted given the final sample size (n = 176), and RMSEA value of 0.07, 60 degrees of freedom in the retained model, and an alpha level of 0.05. Results indicated that power for the current CFA was 0.97.

3.4. Descriptive statistics, internal consistency, and convergent validity

Table 2 shows descriptive statistics, Omega values and corresponding 95% CIs, and correlations among variables for both split-half subsamples. Across the subsamples, internal consistency reliability for the MDDI subscales was adequate, with Omega values ranging between 0.75 and 0.87. Internal consistency for the EDE-Q scales also was adequate, with Omega values ranging from 0.81 to 0.95 across the subsamples. Consistent with expectations regarding convergent validity, the MDDI AI subscale showed large, positive correlations with EDE-Q WC (r_s = 0.73 and 0.72, ps < 0.01) and EDE-Q SC (r_s = 0.78 and 0.79, ps < 0.01) in both subsamples. MDDI FI also showed small-to-moderate positive correlations with the EDE-Q Global score in both subsamples (r_s = 0.33 and 0.28, ps < 0.01). However, MDDI DFS showed no significant correlations with EDE-Q WC or SC in either subsample (ps > 0.05). Finally, in terms of item analysis, all items showed strong significant positive correlations with their corresponding latent variable in the two subsamples (DFS: r_s =0.61 to 0.81, ps < 0.001; AI: r_s = 0.69 to.81, ps < 0.001; FI: r_s = 0.55 to 0.92, ps < 0.001); all item-factor correlations were > 0.20 in both subsamples.

4. Discussion

Preliminary evidence suggests that MD symptoms may be prevalent among gender minority populations, particularly among transgender men, yet the lack of psychometric validation for measures of MD symptoms in transgender populations has been an impediment to empirical efforts to understand MD risk and burden. In this study, we provide the first psychometric evaluation of the MDDI in a sample of U.S. transgender men, which provides a critical foundation to support further work. Broadly, our findings support the three-factor structure of the MDDI in the current sample of transgender men. This same three-factor model has been supported in cisgender populations across distinct cultural settings (Compte et al., 2019; Sepúlveda et al., 2019; Zeeck *et al.* 2018) and in cisgender sexual minority populations (Compte et al., 2021). Our findings attest to the robustness of the latent factors assessed by the three subscales of the MDDI and indicate acceptable to good internal consistency reliability. The empirically-derived respecified MDDI model – allowing for error covariance between items 11 and 13 (FI subscale) and items 5 and 8 (DFS subscale) – is a replication of the respecified model in our previous validation of the MDDI in cisgender gay men and lesbian women (Compte et al., 2021), and likely reflects item content overlap (Bryne, 2016).

Consistent with our hypotheses, positive relationships were found between the MDDI AI and EDE-Q WC and SC subscales as well as between the MDDI FI subscale and the EDE-Q Global score. Taken together, these findings lend preliminary support to the convergent validity of these MDDI subscales in transgender men. Further, the broader pattern of associations between the MDDI and EDE-Q subscales generally mirrors those reported in a previous psychometric evaluation study of the MDDI in sexual minority populations (Compte et al., 2021), underscoring the robustness of the MDDI across sexual and gender minority groups. Notably, compared to MDDI data from other populations, transgender men in the current sample scored higher on MDDI AI than samples of cisgender men and cisgender women; however, scores were similar for MDDI FI (Amodeo et al., 2022). Moreover, compared to previously published MDDI data, transgender men in the current sample scored higher on the MDDI DFS scale than samples of cisgender women, transgender women, and gender-expansive people, but they were similar compared to cisgender men (Amodeo, Esposito, Antuoni, Saracco, & Bacchini, 2022; Nagata et al., 2021).

Certain limitations of the current investigation should be noted. Our sample was predominantly White, and the extent to which these findings extend to more racially and ethnically diverse samples of transgender men remains unclear. Given the online recruitment approach of the study, how the current findings would generalize to the broader population transgender men is unclear, including to those outside of the U.S. Additionally, data from measures of constructs that were conceptually distinct from MD were unavailable, and measures were administered at only one timepoint, thus precluding evaluation of discriminant validity and test-retest reliability, respectively. Future studies should also include other muscularity-oriented eating and body image measures to further evaluate the convergent validity of the MDDI in transgender men.

Notwithstanding these limitations, these data provide preliminary support for the factor structure and psychometric properties of the MDDI in transgender men. The availability of this measure of MD symptoms for use with transgender men may facilitate screening in clinical settings for MD symptoms. Further systematic research on the MDDI in other gender minority populations (e.g., gender-expansive people, transgender women) is critical given the currently limited literature on muscularity-oriented concerns in gender minority groups.

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Conflicts of Interest

Dr. Obedin-Maliver has consulted for Sage Therapeutics (5/2017) in a one-day advisory board, Ibis Reproductive Health (a non-for-profit research group; 3/2017–5/2018, 2020-present), Folx, Inc. (2020 - present), and Hims Inc. (2019 - present). Dr. Lunn has consulted for Hims Inc. (2019 - present) and Folx, Inc. (2020). Dr. Flentje has consulted for Hopelab (2020). None of these roles present a conflict of interest with this work as described here. The other authors have no conflicts of interest to report.

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