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Body Image Disturbance in 1000 Male Appearance and Performance Enhancing Drug Users

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Abstract

Body image disturbance (BID) among men has only recently become a phenomenon of clinical significance with noted heterogeneity in the behavioral consequences of these disturbances. The degree of heterogeneity among appearance and performance enhancing drug (APED) users is unknown and an empirically derived framework for studying BID is necessary. 1000 APED users were recruited via the Internet and they completed a comprehensive online assessment APED use patterns, motivations, consequences, and BID. Data were evaluated using latent trait, latent class, and factor mixture models. Model results were validated using a range of covariates including cycle characteristics, age, APED history, and APED risk. A 1-Factor, 4-Class model provided the best fit to the data with Class 1 scoring the highest on all measures of BID and Class 4 the lowest on all measures. Class 2 differed in their preference for being lean over muscular and Class 3 preferred adding mass and size. Each class was associated with unique risks, APED history, and training identity. Not all APED users suffer from significant BID and there are unique profiles for those with elevated BID. Future research on male BID should account for this structure in order to better define relevant diagnostic categories and evaluate the clinical significance of BID.

Keywords

Men; Eating Disorders; Muscle Dysmorphia; Anabolic-Androgenic Steroids; Body Image; Diagnosis

Introduction

Investigations of gender-specific body image disturbance largely suggest that men experience and evaluate their bodies differently than women and experience different types of psychopathology as a result (Hildebrandt & Alfano, 2009; McCabe & Ricciardelli, 2004). Stereotypically female body image concerns (typified by a “drive for thinness”) are implicated in the development and maintenance of eating disorders (Stice, Shaw, Becker, & Rohde, 2008), where large but shrinking gender disparities exist (Hudson, Hiripi, Pope, & Kessler, 2007), and problematic behaviors are aimed at weight loss and a thin physique. Conversely,

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stereotypically male body image disturbance is anchored in a “drive for muscularity” (Bergeron & Tylka, 2007; Phillips & Diaz, 1997). The extreme consequences of this pursuit is found among men with muscle dysmorphia (MD), a subtype of body dysmorphic disorder (BDD) characterized by obsessionality and compulsivity directed toward achieving a lean and muscular physique (Pope, Gruber, Choi, Olivardia, & Phillips, 1997). For instance, muscle dysmorphia is associated with anabolic-androgenic steroid and associated drug use, eating to gain muscle mass or cut fat, and excessive weight lifting (Olivardia, Pope, & Hudson, 2000; Pope et al., 2005).

However, the case of body image in men may be more complex and heterogeneous than initially conceptualized as men do not pursue muscularity exclusively but they are additionally concerned with achieving leanness (Cafri et al., 2005; Mangweth et al., 2001). For instance, male haute couture models may seek extreme leanness, while film actors may aim for moderate lean muscularity, fitness models for greater musculature, and bodybuilders/weightlifters for excessive muscularity. Thus, while the ideal physiques of these groups of men may be characterized by drives for both leanness and muscularity, their ideal body image and types of behavior aimed at achieving this ideal may vary significantly, yielding unique body image phenotypes that pose certain diagnostic dilemmas (e.g., eating disorder vs. MD).

Men experience sociocultural pressures for both leanness and the development of defined musculature early in their development (Pope, Olivardia, Borowiecki, & Cohane, 2001; Ricciardelli et al., 2007; Stanford & McCabe, 2005), and while the majority of men do not develop clinically significant body image disturbances, an increasing number of them are engaging in problematic behaviors including use of appearance and performance enhancing drugs (APEDs) such as anabolic-androgenic steroids (AASs) (Hildebrandt, Langenbucher, Carr, & Sanjuan, 2007; Kanayama, Barry, Hudson, & Pope, 2006). The pathological extension of this pressure for lean muscularity has been termed MD (Pope et al., 1997). Though the classification and proposed criteria for MD are still debated (Chung, 2001), these criteria offer an appropriate foundation for examining the consequences of stereotypically male body image disturbance. Men suffering from MD are susceptible to increased psychopathology, including eating disorder symptomatology, sexual dysfunction, suicidality, and depression (Cafri, Olivardia, & Thompson, 2008; Leone, Sedory, & Gray, 2005; Mangweth et al., 2001; Olivardia et al., 2000). These men may spend hours obsessing about their physiques, exercising excessively, and are more likely to use APEDs such as AASs, prohormones such as androstenedione, human growth hormone (HGH), or illegal “cutting” agents like the thyroid medications Synthroid and Cytomel (Hildebrandt et al., 2007; Hildebrandt, Schlundt, Langenbucher, & Chung, 2006; Pope et al., 1997). The propensity to use APEDs, the choice of APEDs used, as well as the pattern of APED may be influenced by the demands of a particular athletic identity such as bodybuilding (Goldfield, Blouin, & Woodside, 2006; Hildebrandt et al., 2007; Mosely, 2008) as well as one’s degree of body dissatisfaction and drive for muscularity. This heterogeneity potentially has diagnostic, clinical, and etiological significance. One such issue is whether MD serves as the pathological endpoint to a continuum of body image disturbance or whether there are multiple pathological endpoints related to different groups with functionally different clinical risks, associated psychopathology, and etiologies.

Consistent with the subgroup model of male body image disturbance, Hildebrandt, Schlundt, Langenbucher, and Chung (2006) surveyed a community sample of male weightlifters and identified five unique subgroups based on desired bodily changes and relevant patterns of extreme body controlling behavior. A group of respondents indicated that they were more concerned with decreasing fat and were more likely to use weight loss strategies, while others were more concerned with building muscle, and still others showed no abnormal body image concerns. A group with a desire for significant changes in both leanness and muscularity

reported the most MD symptoms and highest rates of APED use. As such, different training identities may map onto different profiles of body image disturbance. In another study, Pickett, Lewis, and Cash (2005) found that competitive bodybuilders and professional athletic trainers, while more satisfied in their overall appearance than athletically active controls, displayed higher levels of psychological investment in their physical appearance, and the bodybuilders tended to have a higher rate of disordered eating. Although weightlifting men may be at greater risk for developing MD symptomatology or even progressing to APED use, several studies have demonstrated that bodybuilding does not inevitably lead to such disturbances. For example, Pope et al. (1997) noted that many weightlifters they observed did not have symptoms of MD. In addition, Olivardia, Pope, and Hudson (2000) observed increased psychopathology among bodybuilders with MD, but not among those who did not meet criteria for MD, while Kanayama and colleagues (2006) observed that weightlifters' pre-lifting confidence in their physical appearance, the breadth of their views of masculinity, and current muscle dysmorphia predicted APED use. Thus, even high risk or pathological variants of body image disturbance are relatively heterogeneous in these groups and are clouded by different identities and bodily ideals.

The most commonly cited behavior associated with body image disturbance in men is illegal APED use although a range of weight and appearance controlling strategies have been observed. The focus on APED use concerns the potential for abuse and dependence of these substances. For example, in a survey of 100 illicit anabolic-androgenic steroid (AAS) users (94% male), Copeland, Peters, and Dillon (2000) found evidence for drug abuse or dependence in a full 78% of users. Another such study (Parkinson & Evans, 2006) surveyed 500 AAS users and observed several different "types" of users, whose pattern of APED use was directly related to their specific concerns (e.g. improvement of physical appearance vs. athletic performance). Using factor mixture modeling, a statistical approach that allows for simultaneous dimensional and categorical classification of participants, Hildebrandt et al. (2007) found four unique patterns of APED use that reflect different priorities (lean hypermuscularity, primarily leanness, primarily mass building, or a common nonspecific muscularity pattern). The 10% of the sample using heavy polypharmacy with drug use patterns reflecting both mass building and fat burning priorities were at the highest risk for side effects and future APED use.

In this present study, we analyzed data from an ongoing Internet survey of APED users (Hildebrandt et al., 2007; Hildebrandt et al., 2006) and sought to determine if there were different types of body image disturbance among APED users or if a simpler dimensional severity model anchored in the lean muscularity ideal often cited in the MD literature best reflects the body image disturbance experienced by these men. Such clarification will help sort out the clinical and possibly etiological role of body image disturbance in emerging psychiatric diagnoses such as MD or pre-existing diagnoses such as eating disorders.

Methods

Data Collection

A total of 1000 male APED users were recruited from Internet discussion boards between November, 2003 and November, 2007. Links posted to both moderated, unrestricted public message boards and selected membership boards devoted to performance-enhancing drugs, body building, power lifting, and physical fitness directed interested respondents to a Rutgers University Web server where the data collection instrument resides. The instrument totaled 445 items and took an average of 20 to 30 minutes to complete. The measure may be viewed at <http://websurvey.rutgers.edu/steroids/> and detailed information about its creation and content can be found elsewhere (Hildebrandt et al., 2007; Hildebrandt et al., 2006). To ensure data quality, a number of checks were in place. The initial sample contained 1493 subject, 1207 of these participants were APED users. Of the APED users 207 were eliminated due to duplicate

IP addresses (78 participants), bogus or conflicting item endorsement (12 participants), or were female (117 participants). Thus, the final sample consisted of 1000 unique APED using men. These validity and reliability checks provide a conservative approach to data collection and were used to reduce the sampling bias possible via internet data collection.

Participants

The race and ethnicity of the sample indicated that most identified themselves as White/Caucasian (89.0%, $n = 890$), Asian/Pacific Islander 6.0% ($n = 60$), Black/African-American (3.2%, $n = 32$), and Hispanic/Latino (2.8%, $n = 28$). A total of 86.0% of participants were North American. Participants were $M = 28.32$ ($SD = 8.54$; range = 18–77) years old with a self-reported body mass index (BMI) of $M = 29.54$ ($SD = 4.87$) and a standardized measure of self-reported body mass corrected for body fat percentage, fat free mass index (FFMI), of $M = 27.89$ ($SD = 5.12$). The majority of participants identified as heterosexual (94.8%, $n = 948$), with few identifying as homosexual (3.6%, $n = 36$) or bisexual (1.6%, $n = 16$).

Measures

Muscle Dysmorphic Disorder Inventory (MDDI)—The MDDI (Hildebrandt, Langenbucher, & Schlundt, 2004), is a 13-item measure of muscle dysmorphia (MD) symptoms that utilizes a 5-point Likert scale from 0 = *never* to 4 = *always*. The three subscales are designed to map onto the proposed MD criteria (Pope et al., 1997): desire for size (DFS; sample $\alpha = .89$), appearance intolerance (AI; sample $\alpha = .93$), and functional impairment (FI; sample $\alpha = .91$). The MDDI has shown good and convergent and divergent validity in community weightlifting samples (Hildebrandt et al., 2006).

SIBID-short form—Situational Inventory of Body Image Dysphoria-Short Form (Cash, 2002) is a psychometrically sound 20-item measure adapted from the original SIBID questionnaire (Cash, 2000). The SIBID measures the incidence of negative body-image emotions across a variety of specific contexts and is validated in both clinical and non-clinical populations (Cash, 2000; Cash, 2002). The internal consistency for the SIBID-SF was $\alpha = .90$ in the current sample. Like the original SIBID, the SIBID-short form has demonstrated stability, and convergent, discriminant, and construct validity (Cash, 2002).

MBSRQ—Multidimensional Body-Self Relations Questionnaire (Cash, 1994) is a 69-item questionnaire with 10 subscales for use in both sexes for ages 15 and older. The MBSRQ is designed to measure one's attitude towards the physical self (e.g. one's body image). The MBSRQ demonstrates strong convergent, discriminant, and construct validity (Cash, 1994). Two subscales, the Appearance Orientation (AO) and Appearance Evaluation (AE), were utilized in the current study. Internal consistency for the study sample was $\alpha = .89$ for AO and $\alpha = .94$ for AE. The AO measures the importance of appearance to an individual, while the AE assesses the values one places on appearance across several domains.

Design and Analyses

Categorical models—Estimation of body image subtypes were conducted via latent class analysis (LCA) (Vermunt & Magidson, 2002). This methodology uses the specification of a nominal latent variable (i.e., body image subtype) to explain the variability in a set of observed variables (body image disturbance measures). This methodology assumes local independence, or the absence of significant relationships between observed variables within each subtype, and we utilized a maximum likelihood estimation procedure in order to provide a range of traditional goodness of fit indicators. This assumption was evaluated by estimating standardized bivariate residuals for pairwise combinations of the indicators in each model. For the best fitting models, the local independence assumption held with none of these estimates

reaching statistical significance. Fit statistics can then be used to compare different LCA models to determine the most appropriate model. *Mplus* Version 5.10 (Muthen & Muthen, 2008) was used to fit two- to five-class models to the data, and covariates were entered into the mixture model to improve the fit and estimate the effects of background variables on class membership. Each latent class represents a distinct profile of body image disturbance mean scale scores that is theoretically the same for all members in the class. Participants can also be classified into subgroups on the basis of their posterior class probability. The Bayesian information criterion (BIC), an index that favors parsimony, with lower numbers indicating a better fit (Schwartz, 1978), and the Akaike information criterion (Akaike, 1987) (AIC) were used to measure goodness of fit as well as sample size adjusted versions (adjusted BIC and consistent AIC). The best fitting model was chosen on the basis of consideration of AICs, BICs, classification quality (e.g., entropy value), and likelihood ratio chi-square. The adjusted Lo–Mendell–Rubin log-likelihood ratio test (Lo, Mendell, & Rubin, 2001) was used to compare successive models, with a significant log-likelihood ratio indicating that the model with a larger number of classes provides a better fit to the data.

Dimensional models—As with existing dimensional modeling approaches, we estimated a series of two parameter item response theory (2PL-IRT) latent trait models. A number of IRT models exist and we chose the two-parameter IRT model because of its use in previous studies (Hildebrandt et al., 2007). This dimensional approach assumes a continuous latent severity variable underlies the observed body image disturbance patterns.

Factor Mixture Models—Recent methodological work has combined latent class models with latent trait models to create hybrid models (Lubke & Muthen, 2005; Muthen, 2006) in which both a continuous latent variable (e.g., severity) and a nominal latent variable (e.g., subtype of APED user) are estimated. Such hybrid models have been shown to be superior to LCA or two-parameter logistic item response theory models of substance abuse (Lubke et al., 2005). In these models, the continuous severity dimension is assumed to account for the variability between users within a specific group. As with the LCA and IRT models, these models were compared with BICs and AICs, with the lowest value indicating the best fitting model. We tested for measurement invariance of the factors for the final model but were unable to establish differences in the measurement properties of each indicator between classes, so measurement invariance was assumed.¹ When the relationships between each indicator (i.e. body image disturbance) and latent severity are the same across latent classes (i.e., beta weights and intercepts are the same for each subtype), they are assumed to be measuring the same construct in each group and the measure is assumed to have measurement invariance.

Missing data—Missing data were replaced via a missing-at-random function (Muthen et al., 2008) that uses maximum likelihood expectation maximization estimation. This method allows for missing data to vary as a function of covariates but does not allow for covariates to have any missing data. There was very little missing data for the covariates under investigation and pairwise deletion was used for these cases. There were no missing data for age, APED risk, training identity, or cycle length. A total of 37 cases of were missing data between FFMI and weeks between cycles.

Results

Among the APED users, 94.0% ($n=940$) reported regularly using at least one AAS with testosterone (90.3%, $n=903$) being the most commonly used drug. Over-the-counter stimulants and fat burning drugs (e.g., ephedrine, caffeine, mau huang were most common ingredients)

¹Results of measurement invariance tests available from the first author upon request.

were also commonly used with 85.3% reporting regular use. Illicit thermogenics such as thyroid hormones or clenbuterol were also typically used as part of an APED cycle by 27.9% of the sample. Users varied in experience levels with the median number of cycles completed being 2 ($SD = 4.11$), with the median weekly dose of AAS being 1000–1250 mg/week. Of those reporting insulin use (3.1%, $n = 31$), average doses were 8.22 ($SD = 4.51$) IUs. Of the 6.1% ($n = 61$) using human growth hormone (HGH) or insulin like growth factor-1 (IGF-1), average use was 4.40 ($SD = 3.91$) IUs per day. APED users reported exercising for a median of 2–5 hrs/day and 5 days per week. On average, they had been exercising for 8.97 ($SD = 7.59$) yrs.

Model estimation

Table 1 summarizes the goodness of fit statistics for each type of model. The fit of the one-dimensional latent trait models indicated that a single factor adequately fit the data. There was little improvement by adding a second dimension so factor mixture models were estimated using only a single dimension. Fit statistics and LMR chi square tests suggested a four class model provided the best fit to the data. However, when comparing both categorical and dimensional models to hybrid models, a single factor-four class model provided the best fit to the data. This pattern of results suggests that individual difference in body image disturbance occurs because of both unique group membership and latent severity within that unique group.

Model Interpretation

Table 2 reports the model estimated means and standard errors of each class for the model indicators (i.e., body image disturbance measures). Class 1 has the highest overall disturbance across measures and includes about 10% of APED users. Class 2's pattern of disturbance suggests an overall high degree dissatisfaction, but with only marginal desire to get bigger. In contrast, Class 3 has a comparatively greater desire to be bigger and more muscular, is similarly invested in their appearance as Classes 1 and 2, but experiences less impairment and negative affect related to their appearance. Finally, the majority of APED users report comparatively low levels of body image disturbance across measures.

The relationship between the model estimated latent dimension and exercise level, cycle length, APED risk, and weeks between cycles suggests it measures severity of APED use (see Table 3). Greater duration and shorter length between cycles are markers of increased exposure to APEDs and the greater risks suggests those higher on this latent dimension are more invested in continuing to use APEDs for a greater proportion of their lives.

Table 3 also summarizes the effects of covariates on both latent severity and latent class. The addition of covariates significantly improved the fit of the model. Including all the covariates listed in Table 3, the overall model fit was ($AIC = 16250.40$; $BIC = 16623.84$; $Entropy = .845$). All parameter estimates were significant although only means by class are reported in Table 3 to ease interpretation. The pattern of covariate effects suggests that Class 1 members are primarily bodybuilders who are equivalent in their primary desired change in body composition (leanness over size). In addition, they are committed to longer-term use of APEDs, use for longer periods of time, and have shorter durations between cycles. Overall, this suggests class 1 has a higher risk profile with more body image disturbance. Classes 2–3 differ in the direction of their disturbances with class 2 preferring to be lean and being primarily bodybuilders. Class 3 is primarily comprised of powerlifters and appears to have less overall risk in terms of time between cycles and intention for future use, but has comparatively long cycles. Again, Class 4 demonstrated the least overall pathology.

Discussion

The present study explored the heterogeneity in body image disturbance among APED using men, who as a group are traditionally considered to be engaged in pathological and extreme weight and shape controlling behaviors. The results suggest that body image disturbance is more than a simple trait, but rather a mixture of subgroups that are more or less pathological (i.e., highly invested and distressed about appearance) and vary within their subgroup by level of severity. What distinguishes the groups appears to be a combination of specific bodily changes (leanness vs. size) and associated training identity, which is consistent with previous research on community gym samples (Hildebrandt et al., 2006). In terms of defining pathology, this study raises an interesting diagnostic dilemma. Does severity of body image disturbance provide an appropriate dimensional construct that can be clinically useful in defining psychopathology or predicting course and outcome? Or, are existing categorical frameworks (e.g., eating disorder vs. muscle dysmorphia) appropriately capturing body image pathology of clinical importance? As the diagnostic framework for APED use evolves (Kanayama, Brower, Wood, Hudson, & Pope, 2009), body image disturbance may prove to be an important diagnostic feature. The results of the current study suggest that both subtype and severity dimension must be considered as a diagnostic framework sensitive to male specific body image concerns evolves.

There continues to be an absence of longitudinal data on either APED users or any subgroup of males with clinically significant body image disturbance. Given the age differences between these groups, one interesting possibility emerges. As APED users age, their investment in different bodily changes and approaches to modifying their appearance evolve such that those in Class 4 may transition between classes over time. Initial descriptions of MD support this possibility as many with MD appear to have had a prior eating disorder diagnosis (Pope et al., 1997). Thus, it is possible that some transition from desiring primarily leanness to an extreme lean muscularity ideal found in MD. Whether these transitions would coincide with increased drug related pathology, increased investment in appearance, or increased severity of disturbance is unclear. However, it is likely that a number of factors change over time and contribute to escalating severity as well as transitions between groups. For instance, investment in appearance alone does not suggest pathology (Pickett et al., 2005), but the combination of heightened investment and evaluation appear to co-occur in more body image disturbed groups. APED use is also likely to independently contribute to pathology as different substances have different side effect profiles and impact on the severity of APED use (Hildebrandt et al., 2007). Furthermore, different drugs have different psychoactive effects and the timing of use of these drugs may have important implications for their impact on psychopathology. Prevailing animal models of adolescent AAS use suggest adolescent exposure can have lasting changes in brain function and aggression (DeLeon, Grimes, & Melloni, 2002). Perhaps there are lasting perceptual disturbances in appearance that occur in a similar fashion.

There are limitations to the current study. First, internet based studies are subject to selection bias and could have led to oversampling of certain types of APED users. For instance, our sample is largely white, heterosexual, and educated. This bias appears consistent with samples recruited through other sampling strategies (Copeland et al., 2000; Kanayama et al., 2006) and suggests that this form of drug use may be more present in this population. Carefully conducted epidemiological studies are needed to confirm this pattern in the literature. Of note, there is evidence of agreement between internet and computer samples of drug users suggesting comparability on anonymous drug use self-report (McCabe, 2004). As with prior internet studies, we used a conservative approach to selecting cases to limit this bias (Hildebrandt et al., 2007; Hildebrandt et al., 2006). However, the sampling of APED users will be an important methodological issue as the field expands. It remains unclear whether those APED users recruited over the internet are comparable to the limited numbers surveyed in person, or which

group best reflects the true population of APED users. Secondly, the self-report nature of the study prevented the provision of clinical diagnosis. However, this is a more global issue for men with body image pathology as there is general lack of nosological work and the parameters that define pathology are still under consideration for eating disorders (Hildebrandt et al., 2009) and muscle dysmorphia (Cafri et al., 2008; Pope et al., 1997).

Continued research in this population is a priority and the results from this study can provide a framework for future diagnostic and classification research on men who use APEDs as well as those with significant body image problems. There are noted barriers to treatment for APED users (Pope, Kanayama, Ionescu-Pioggia, & Hudson, 2004) and likely for men with eating disorders as well. Although these obstacles remain understudied, the heterogeneity in body image problems has probably obscured clinical needs and concurrently limited research in this area. Considering the effects of subtypes as well as severity will undoubtedly benefit research on pathological expressions of male body image disturbance in future research.

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Table 1
Comparison of Dimensional, Categorical, and Hybrid Models of Body Image Disturbance

Model	# Parameters	AIC	cAIC	BIC	aBIC	Entropy
Dimensional						
LTA-1 factor	18	18846.20	18685.84	18934.37	18877.20	--
LTA-2 factor	25	18842.67	18619.95	18942.54	18837.02	--
Categorical						
LCA-2 class	19	18977.20	18807.93	19070.28	19006.20	0.861
LCA-3 class	26	18762.12	18592.85	18889.49*	18777.06	0.752
LCA-4 class	33	18644.33	18350.34	18805.98*	18578.02	0.770
LCA-5 class	40	18594.83	18238.43	18790.78	18581.64	0.790
Hybrid						
FMA-1 F, 2-C	25	18644.48	18421.66	18766.95	18661.43	0.858
FMA-1 F, 3-C	32	18556.35	18271.27	18713.11	18559.23	0.899
FMA-1 F, 4-C	39	18470.21	18122.77	18661.26	18459.03	0.755
FMA-1 F, 5-C	46	18594.83	18185.03	18790.78	18540.19	0.790

Note. LTA = latent trait analysis. LCA = latent class analysis. FMA = Factor mixture analysis. F = factor. C = class. AIC = Akaike Information Criterion. cAIC = consistent AIC. BIC = Bayesian Information Criterion. aBIC = sample size adjusted BIC.

* indicates significant improvement in model fit by Lo-Mendel-Rubin Chi square test.

Bold = best fitting model.

Table 2

Summary of Body Image Disturbance Measures by Latent Class

Indicator	Class 1 (10.20%)	Class 2 (19.10%)	Class 3 (22.90%)	Class 4 (47.80%)
Appearance Intolerance	13.77 (3.98)	14.02 (4.24)	5.23 (3.89)	3.34 (3.94)
Drive For Size	14.88 (4.77)	5.11 (4.98)	13.98 (5.01)	4.18 (4.12)
Functional Impairment	15.49 (5.32)	13.78 (4.54)	8.56 (3.76)	2.07 (3.45)
SIBID	2.11 (.64)	2.01 (.71)	1.33 (.70)	0.88 (.69)
Appearance Evaluation	4.51 (.65)	4.34 (.66)	2.19 (.69)	2.15 (.81)
Appearance Orientation	4.32 (.87)	3.39 (.88)	3.98 (.78)	2.01 (.91)

Note. Appearance Intolerance, Desire for Size, and Functional Impairment are subscales of the MDDI. SIBID = Situational Inventory for Body Image Disturbance. Appearance Evaluation and Appearance Orientation are subscales of the Multidimensional Body—Self Relational Questionnaire. Model estimated mean and standard error reported.

Table 3

Summary of Covariate Effects on Latent Class and Latent Severity

Covariate	Class 1 (10.20%)	Class 2 (19.10%)	Class 3 (22.90%)	Class 4 (47.80%)	Severity β (SE)
Age *	31.23(7.45) _{3,4}	30.19(8.01) _{3,4}	27.48 (7.39)	26.49 (8.79)	.89 (.55)
Exercise	732.3 (127.5) ₂₋₄	502.5 (102.4) _{3,4}	432.44 (127.5) ₄	318.98 (194.5)	1.12 (.33)
APED Risk	1.29 (.32) ₂₋₄	0.99 (.33) ₃₋₄	.04 (.43) ₄	-1.44 (.35)	3.8(.45)
FFMI	30.26 (3.31) ₂₋₄	27.34 (3.95) ₄	28.98 (4.78) ₂	25.88 (3.78)	.99 (.34)
Training Identity [†]					
Bodybuilder	72% ₂₋₄	55% ₃₋₄	18% ₄	6%	2.01 (.67)
Recreational	12%	39% _{1,3}	24%	84% ₁₋₃	-.45 (.23)
Weightlifter					
Powerlifter	8%	3%	58% _{1,2,4}	8%	.81 (.66)
+ Leanness	53% ₃	89% _{1,3,4}	12%	43% ₃	1.23 (.61)
Cycle Length	22.43 (7.84) _{2,4}	18.94 (9.23) ₄	22.56 (6.45) _{2,4}	12.34 (4.86)	2.15 (.71)
Weeks Between cycles	8.45 (13.78)	13.45 (11.88)	14.76 (14.46)	26.90 (16.62) ₁₋₃	-1.19 (.39)

Note. Model estimated means and standard errors reported in each cell. APED risk = Appearance and performance enhancing drug use risk calculated on a 1–5 scale with 5 being the most severe. FFMI = fat free mass index. Exercise calculated in minutes of exercise per week. + Leanness = the preference for achieving leanness over achieving mass or size.

[†] Training identity was dummy coded with recreational weightlifter as the reference class.

* significant at $p < .05$ Number listed for each cell indicates the latent classes that the value is significantly greater than at $p < .05$ by post hoc comparison.