



Eating Disorders

The Journal of Treatment & Prevention

ISSN: (Print) (Online) Journal homepage: <https://www.tandfonline.com/loi/uedi20>

The independent contribution of muscularity-oriented disordered eating to functional impairment and emotional distress in adult men and women

Mariel Messer, Siahn Duxson, Paige Diluvio, Zoe McClure & Jake Linardon

To cite this article: Mariel Messer, Siahn Duxson, Paige Diluvio, Zoe McClure & Jake Linardon (2022): The independent contribution of muscularity-oriented disordered eating to functional impairment and emotional distress in adult men and women, *Eating Disorders*, DOI: [10.1080/10640266.2022.2086728](https://doi.org/10.1080/10640266.2022.2086728)

To link to this article: <https://doi.org/10.1080/10640266.2022.2086728>



Published online: 07 Jun 2022.



Submit your article to this journal [↗](#)



Article views: 121



View related articles [↗](#)



View Crossmark data [↗](#)



The independent contribution of muscularity-oriented disordered eating to functional impairment and emotional distress in adult men and women

Mariel Messer, Siahn Duxson, Paige Diluvio, Zoe McClure, and Jake Linardon 

School of Psychology, Deakin University, Geelong, Vic, Australia

ABSTRACT

Muscularity-oriented disordered eating (MODE) refers to a broad cluster of pathological eating patterns driven by the pursuit of muscularity and leanness. Although increasing attention has been devoted towards understanding these symptoms in men, little work has been conducted to understand MODE in women. It is also unclear whether MODE contributes unique variance to functional impairment and emotional distress beyond thinness-oriented disordered eating symptoms. We addressed these gaps in a sample of 1,321 community-based adult women ($n = 1136$) and men ($n = 185$). Hierarchical multiple regressions revealed that MODE explained a significant proportion of unique variance in functional impairment in both men and women, even after controlling for traditional thinness-oriented disordered eating symptoms. MODE also contributed unique variance in symptoms of depression and anxiety in women, but not for men. Findings highlight the possible significance of these unique symptoms patterns geared towards the pursuit of muscularity and leanness. MODE symptoms may be a viable target in eating disorder intervention or prevention programs, although further longitudinal research is needed.

Clinical implications

- Muscularity-oriented disordered eating (MODE) may represent a unique pattern of eating pathology that drives psychosocial impairment and distress
- Assessing the nature and severity of MODE may provide important information about the functioning of an individual
- Developing novel intervention strategies designed to target MODE may be necessary for some individuals

Introduction

The pursuit of muscularity among males is common, with recent epidemiological data indicating that up to 30% of adolescent boys are actively trying to gain weight (Nagata, Bibbins-Domingo et al., 2019). Alongside this pursuit has been an increase in concerns related to both muscularity and leanness. Up to 10% of young men express significant muscularity and leanness concerns, which is important given that such concerns may have an adverse impact on mental health (Field et al., 2014). Concerns revolving around the desire for muscularity and leanness have also given rise to a unique pattern of disordered eating symptoms, coined muscularity-oriented disordered eating (MODE; Murray et al., 2016).

Muscularity-oriented disordered eating (MODE) refers to a broad cluster of pathological eating patterns driven by the pursuit of muscularity and leanness (Murray et al., 2016). As the ideal body type in this context is geared towards gaining lean muscle rather than losing weight, it naturally follows that the dietary strategies employed to attain this ideal differ from those that are used to achieve the thin ideal. It has been suggested that the symptoms that characterize MODE include overconsumption of protein-based foods, frequent eating (every 2 to 3 hours, sometimes during the middle of the night), elimination of fats and/or carbohydrate-based foods, liquefying ingredients to increase caloric intake, periodically engaging in “cheat” meals to boost metabolic rate, and maintaining continual access to pre-planned foods (Murray et al., 2016).

Emerging research shows that MODE symptoms may be associated with numerous adverse psychological outcomes. Evidence indicates that nearly one-quarter of men engage in MODE symptoms, with potentially important risk factors for future MODE onset including self-perceived underweight, a lower body mass index (BMI), depressive symptomatology, and substance use (Nagata, Nagata, Murray et al., 2019). Earlier data also show that the strength of the relationship between MODE symptoms and disability in men with muscle dysmorphia is comparable to the strength of the relationship between weight-control behaviors and disability in women with eating disorders (Murray et al., 2012). Moreover, engagement in specific MODE symptoms, including cheat meals and the use of performance-enhancing substances, has been linked to various adverse outcomes, including eating disorder psychopathology, body image problems, dating violence, and criminal offending (Ganson & Cadet, 2019; Ganson et al., 2022, 2021; Murray et al., 2016).

Existing research on MODE has mostly been conducted in men, despite growing recognition that muscularity concerns are increasingly common in women. Whereas the muscular ideal for men is characterized by a lean and muscular mesomorphic shape with a well-defined chest and arms (Cafri et al., 2005), the ideal for women is characterized by a thin, toned and athletic body with smooth muscles (Bozsik et al., 2018). In fact, prior evidence has shown

that men and women engage in a similar frequency of muscle-related social comparisons, and an internalization of the athletic-ideal in young women prospectively predicted increases in compulsive exercise (Homan, 2010). Several cross-sectional studies of women have also documented consistent associations between a drive for muscularity and multiple indices of mental health problems (e.g., Rodgers et al., 2018). Overall, these findings support suggestions that concerns related to muscularity may also be a prominent feature in women.

Important gaps in research exist with respect to MODE symptoms. There has been little effort to understand MODE symptoms in women, despite evidence suggesting that around 5% of young adult women (aged 18–24 years) engage in them (Nagata, Nagata, Murray et al., 2019). Furthermore, the clinical significance of MODE is poorly understood, which refers to the association of a symptom or set of symptoms with either marked distress or impairment in functioning (American Psychiatric Association, 2013). Clarifying these literature gaps is needed to better understand the importance of MODE.

This study examined the relations between MODE symptoms, functional impairment and emotional distress in women and men. Specifically, we tested whether MODE symptoms contribute unique variance to functional impairment and emotional distress beyond traditional thinness-oriented disordered eating symptoms. Despite most research on MODE being conducted in men, we also included men because we had an *a priori* aim to test whether the strength of associations between MODE and these criterion variables differs significantly between men and women. Based on prior research, we hypothesized that MODE would contribute a significant amount of unique variance in functional impairment and emotional distress in both men and women. No formal hypotheses on moderation effects were derived.

Method

Participants and procedure

A total of 1,321 adults (1136 women and 185 men) were recruited in this study. The vast majority of participants identified as Caucasian (88.0%). Other races and ethnicities reported were Asian (4.4%), Hispanic (2.6%), Pacific Islander (0.4%), African American (0.3%), and “other” (4.4%). The mean age was 29.59 ($SD = 12.43$, min = 18, max = 69) for women and 35.61 ($SD = 18.37$, min = 18, max = 76) for men. The mean self-reported body mass index (BMI) was 26.06 ($SD = 6.28$, min = 14.04, max = 50.06) for women and 26.50 ($SD = 5.26$, min = 16.01, max = 51.04) for men. The required sample size was powered under the following assumptions: a small ($f^2 = .04$) degree of proportion of variance increased; power set to .80; and alpha set to .05 (two-tailed); and

seven “predictor” variables. Under these assumptions, 199 men and women were each required. This slightly exceeded the number of men recruited in this study.

Participants were recruited primarily through online sources, including social media pages and online forums. Given the focus of the research, recruitment was geared towards various health and wellness platforms and forums. This included Facebook and Instagram pages, and advertisements posted in threads (e.g., about exercising, weight loss diets, weight training etc.) on Reddit and Quora. Study advertisements outlined that the researchers were interested in understanding factors associated with problematic eating and body image patterns. Respondents to study advertisements clicked on a link to access the online survey presented through Qualtrics. Participants could complete the survey at a time and place of convenience. The survey took approximately 20 minutes. We ensured that participants only took the survey once by checking for any duplicate IP addresses. No reimbursement was provided to participants. All participants provided informed consent. Ethical clearance was granted by Deakin University.

Study variables

Covariates

Background variables. Background variables included participant age, ethnicity, and BMI.

Disordered eating variables. To ensure that any relationship between MODE and criterion variables was not explained by traditional thinness-oriented disordered eating symptoms, we adjusted for three key thinness-oriented disordered eating symptoms, each of which were assessed via the Eating Disorder Examination Questionnaire subscales (Fairburn & Beglin, 1994). The first was the dietary restraint subscale, which consists of five items (e.g., “*have you gone for long periods of time without eating in order to influence your weight or shape*”) rated along a 7-point scale. Scores are averaged to create a subscale score, with higher scores reflecting higher intentions to restrict. The second variable was purging frequency, defined as the average number of self-induced vomiting or laxative use episodes of the past 28 days. The third variable was fear of weight gain, assessed via a single item (“*have you had a definite fear that you might gain weight*”) rated along a 7-point scale (from 0 [no days] to 6 [everyday]). Using a single item to assess fear of weight gain has been employed in several prior studies (e.g., Levinson et al., 2020; Linardon et al., 2018; Messer et al., 2021).

Independent variable

Muscularity-oriented disordered eating

The Muscularity-Oriented Eating Test (MOET) was used to assess the broad spectrum of MODE symptoms experienced over the past 28 days (Murray et al., 2019). The MOET contains 15 items (e.g., “*I have continued to eat despite feeling full, in attempting to influence my muscularity*”, “*I have used meal replacement supplements when I felt full*”.) that are rated along a 5-point scale, ranging from 0 (*never true*) to 4 (*always true*). Items are averaged to produce a total score, with higher scores reflecting a higher severity of MODE.

Criterion variables

Functional impairment

The 16-item Clinical Impairment Assessment was used to assess impaired psychosocial functioning secondary to eating behaviors over the past 28 days (Bohn et al., 2008). Items (e.g., “*to what extent have your eating habits, exercising, or feelings about your eating, shape, or weight interfered with your relationships with others*”) are rated on a 4-point scale, ranging from 0 (*not at all*) to 3 (*a lot*). Items are summed to produce a total score, with higher scores reflecting greater impairment in psychosocial functioning.

Depressive and anxiety symptoms

The 4-item Patient Health Questionnaire was used to assess symptoms of depression and anxiety experienced over the past two weeks (Kroenke et al., 2009). Two items each make up the depression (“*how often have you been bothered by feeling down, depressed, or hopeless*”) and anxiety (“*how often have you been feeling nervous, anxious, or on edge*”) subscale. Items are rated along a 4-point scale, ranging from 0 (*not at all*) to 3 (*nearly every day*). Items are summed to produce a subscale score, with higher scores reflecting more severe depression and anxiety symptoms.

Results

Preliminary analyses

A small amount of missing data (2%) was observed for participant BMI. These data were missing completely at random and were thus estimated using expectation maximization techniques. Multivariate outliers were detected, but given these cases comprised less than 1% of the total sample, they were retained in the final analyses. Skewness and kurtosis values for study variables were lower than the critical limits that may cause problems in

regression analyses (skew values > 3 and kurtosis values > 10; Kline, 2010). Residuals in each regression model were also normally distributed, centering on zero.

Descriptive statistics

Descriptive statistics and correlations between study variables are presented in Table 1. Internal consistency estimates for study measures are also presented in Table 1. For women, MODE was significantly and positively correlated with each of the study variables ($r_s = 0.19$ – 0.74). For men, MODE was also significantly and positively correlated with each of the study variables ($r_s = -0.36$ – 0.72), except purging frequency.

Hierarchical multiple regressions

Three hierarchical multiple regressions were performed to examine the independent contribution of MODE to functional impairment, depressive symptoms, and anxiety symptoms. In Step 1, covariates included were age, BMI, ethnicity (Caucasian vs other), dietary restraint, purging frequency, and fear of weight gain. In Step 2, MODE was added to evaluate its unique contribution. Although we had an *a priori* aim to test whether associations between MODE and criterion variables are moderated by gender, a post-hoc decision was made to omit such tests of moderation due to the small number of men recruited (and subsequent issues with statistical power). Instead, analyses are stratified by gender and results are presented separately for women (Table 2) and men

Table 1. Pearson correlations between study variables.

Variable	1	2	3	4	5	6	7
1. Muscularity oriented disordered eating		.72***	.06	.47***	.70***	.36***	.40***
2. Dietary restraint	.74***		.14*	.54***	.55***	.35***	.38***
3. Purging	.19***	.25***		.03	.08	.05	.05
4. Fear of weight gain	.54***	.49***	.17***		.55***	.39***	.36***
5. Functional impairment	.73***	.61***	.26***	.65***		.61***	.65***
6. Depressive symptoms	.41***	.31***	.15***	.42***	.60***		.69***
7. Anxiety symptoms	.47***	.39***	.21***	.42***	.67***	.70***	
<i>M (SD) women</i>	16.97 (12.10)	2.45 (1.80)	1.26 (5.82)	3.51 (2.49)	16.65 (12.24)	2.62 (1.98)	2.29 (1.94)
<i>Range</i>	0–59	0–6	0–50	0–6	0–48	0–6	0–6
<i>α</i>	.89	.83	–	–	.96	.90	.89
<i>M (SD) men</i>	12.25 (11.40)	1.72 (1.60)	0.64 (4.31)	1.71 (2.28)	8.19 (10.53)	1.51 (1.70)	1.55 (1.81)
<i>Range</i>	0–51	0–6	0–50	0–6	0–48	0–6	0–6
<i>α</i>	.90	.77	–	–	.96	.87	.85

Above the diagonal line are the values for men ($n = 185$) and below the diagonal line are the values for women ($n = 1136$).

*** $p < .001$

** $p < .01$

* $p < .05$

Table 2. Results from the hierarchical multiple regressions for women ($n = 1136$).

	Impairment			Depressive symptoms			Anxiety symptoms		
Independent variable	β	sr ²	ηp^2	β	sr ²	ηp^2	β	sr ²	ηp^2
Step 1									
Age	−.15***	.02	.04	−.14***	.02	.02	−.15***	.02	.02
Caucasian (coded 1)	−.03	.00	.00	.00	.00	.00	.03	.00	.00
BMI	.08***	.01	.01	.02	.00	.02	.01	.00	.00
Restraint	.35***	.08	.16	.21***	.02	.00	.10**	.01	.01
Purging	.09***	.01	.02	.09***	.01	.01	.05	.00	.01
Fear of weight gain	.43***	.13	.23	.28***	.06	.07	.34***	.09	.09
	$R^2 = .57***$			$R^2 = .25***$			$R^2 = .21***$		
Step 2									
Age	−.09***	.01	.02	−.10***	.01	.01	−.12***	.01	.01
Caucasian (coded 1)	−.02	.00	.00	.00	.00	.00	.03	.00	.00
BMI	.08***	.00	.02	.02	.00	.00	.01	.00	.00
Restraint	.08**	.00	.01	.03	.00	.00	−.05	.00	.00
Purging	.09***	.01	.01	.09***	.01	.01	.05	.00	.00
Fear of weight gain	.32***	.07	.17	.22***	.03	.04	.28***	.05	.06
MOET scores	.45***	.08	.17	.27***	.03	.04	.25***	.03	.03
	$R^2 \text{ change} = .08***$			$R^2 \text{ change} = .03***$			$R^2 \text{ change} = .02***$		

Ethnicity was operationalized as Caucasian (coded as 1) and non-Caucasian (coded as 0) given the small number of individuals identifying as non-Caucasian; β = *standardized regression coefficients*; sr^2 = semi = partial correlation.

ηp^2 = **partial eta squared**

* $P < .05$

** $P < .01$

*** $P < .001$

(Table 3). Given the number of tests performed, the threshold for statistical significance was adjusted to .008 (.05/6 tests). Analyses were performed for men and women separately.

Functional impairment

For both women and men, the overall regression model explained a significant proportion of variance in functional impairment. Inclusion of MODE in Step 2 significantly increased the proportion of variance in functional impairment accounted for by the two regression models. MODE explained 8% of unique variance in functional impairment scores for women ($\beta = .45$), and 10% for men ($\beta = .51$).

Depressive symptoms

The overall regression models explained a significant proportion of variance in depressive symptoms for men and women. Inclusion of MODE in Step 2 significantly increased the proportion of variance in depressive symptoms accounted for by the regression model for women, explaining 3% of unique variance in depressive symptoms ($\beta = .27$). MODE did not contribute unique variance in depressive symptom scores for men ($\beta = .10$).

Table 3. Results from the hierarchical multiple regressions for men ($n = 185$).

	Impairment			Depressive symptoms			Anxiety symptoms		
Independent variable	β	sr^2	ηp^2	β	sr^2	ηp^2	β	sr^2	ηp^2
Step 1									
Age	−.24***	.05	.08	−.20**	.04	.04	−.17*	.02	.03
Caucasian (coded 1)	−.00	.00	.00	−.02	.00	.00	.06	.00	.01
BMI	−.04	.00	.00	−.08	.00	.01	−.16*	.02	.03
Restraint	.30***	.06	.08	.19*	.02	.02	.15	.01	.01
Purging	.03	.00	.02	.02	.00	.01	.03	.01	.00
Fear of weight gain	.35***	.09	.14	.23**	.04	.05	.29***	.06	.07
	$R^2 = .46***$			$R^2 = .23***$			$R^2 = .25***$		
Step 2									
Age	−.10	.01	.02	−.18*	.02	.03	−.16*	.02	.02
Caucasian (coded 1)	.02	.00	.00	−.01	.00	.00	.06	.00	.00
BMI	.00	.00	.00	−.07	.00	.01	−.15*	.02	.03
Restraint	−.00	.00	.00	.13	.01	.01	.12	.01	.01
Purging	.04	.00	.00	.02	.00	.00	.03	.00	.00
Fear of weight gain	.29***	.05	.12	.21**	.03	.04	.29***	.05	.07
MOET scores	.51***	.10	.17	.10	.00	.00	.05	.00	.00
	$R^2 \text{ change} = .10***$			$R^2 \text{ change} = 00$			$R^2 \text{ change} = 01$		

Ethnicity was operationalized as Caucasian (coded as 1) and non-Caucasian (coded as 0) given the small number of individuals identifying as non-Caucasian; β = standardized regression coefficients; sr^2 = semi = partial correlation.

ηp^2 = partial eta squared

* $P < .05$

** $P < .01$

*** $P < .001$

Anxiety symptoms

The overall regression models explained a significant proportion of variance in anxiety symptoms for men and women. Inclusion of MODE in Step 2 significantly increased the proportion of variance in anxiety symptoms accounted for by the regression model for women, explaining 3% of unique variance in anxiety symptoms ($\beta = .25$). MODE did not contribute unique variance in anxiety symptom scores for men ($\beta = .05$).

Discussion

This study investigated whether MODE symptoms in men and women contribute unique variance to functional impairment and emotional distress. Two main findings emerged. The first was that MODE contributed unique variance to functional impairment in both men and women even after controlling for thinness-oriented disordered eating symptoms. The second was that MODE contributed unique variance to symptoms of depression and anxiety in women, but not in men. Importantly, the proportion of additional variance accounted for by MODE was mostly small in regression models (0–10%), suggesting that these symptoms may not explain as much variation in impairment and distress indices than other markers of disordered eating.

Results suggest that MODE could signify a unique and key pathway through which psychopathology manifests. Certain features that characterize MODE, such as meticulous macro-nutrient tracking, obsessions with protein-rich

food, and the importance placed on dietary regimes, may begin to take precedence over, and negatively affect other, important areas of life (e.g., work performance, interpersonal relationships etc.), potentially explaining its unique contribution to functional impairment in these domains.

It was interesting to see that MODE contributed variance to emotional distress in women but not men. This might be explained in a couple of ways. In regards to women, it may be that women who engage in MODE may also experience heightened psychological distress because of an outside perception that these symptoms are, relative to thinness-oriented disordered eating, atypical among women in the general population. With respect to men, perhaps the mean age ($M = 35.6$ years) of men in this study accounted for the null associations. It could be that MODE symptoms are less important in explaining variability in general emotional distress than other factors known to contribute to mental health problems in middle adulthood, such as perceptions of handling the transition to fatherhood, satisfaction with career performance, or financial security (Rochlen et al., 2008). Alternatively, sample size could have been a problem; it could be that the small number of men we sampled prevented us from detecting any smaller, but significant contributions of MODE to emotional distress.

Unexpectedly, the relative contribution of the three thinness-oriented disordered eating symptoms to criterion variables was similar across genders. For instance, fear of weight gain explained just as much variance in impairment and distress measures in men compared to women. It is likely that there are subgroups of men for whom thinness is a major concern and a subgroup for whom muscularity is the primary concern. Being able to predict this with accuracy is a necessary future direction. Taking into account the small sample size, findings further demonstrate that the experience of eating and body image disturbances in men is complex and warrants additional investigation.

On a practical level, present findings suggest that health care professionals may benefit from enquiring about, or screening for, the presence and severity of MODE among men and women who are at risk for eating and body image disturbances. Doing so may provide a more comprehensive case formulation of the precipitating factors contributing to a client's current psychological and interpersonal functioning, potentially leading to more targeted forms of care. Furthermore, pending replication in rigorous prospective studies, consideration of incorporating strategies designed to specifically target MODE in established eating disorder prevention and early intervention programs may be warranted. If these symptom patterns emerge as strong determinants of functional impairment and emotional distress, finding novel ways to address them is necessary for improving the mental health of those affected. Overall, the present findings will ideally generate additional prospective or experience sampling studies designed to investigate the prognostic importance of MODE.

Strengths and limitations

There are a number of strengths associated with this study, including the recruitment of a large sample from the general population, a focus on understudied populations (men), and an investigation of a novel class of disordered eating symptom that have received limited research attention. However, there are also limitations. First, we recruited mainly from health and wellness social media and online forums, which introduces potential selection biases. It is important to examine the role of MODE in cohorts that are representative of the wider population, or in populations for whom MODE is a significant problem (bodybuilders). Second, the assessment of key covariates is a limitation. The replicability of the EDE-Q restraint subscale has been called into question (Rand-Giovannetti et al., 2020), while a single item measure of fear of weight gain may not fully capture the complexity of this construct. Additionally, concerns have been raised about the construct validity of the MOET (Cooper et al., 2020), as it may tap into some restrictive eating patterns that are characteristic of thinness-oriented disordered eating. Although the MOET total score contributed unique variance to criterion variables beyond dietary restraint, replicating these findings with a different measure of MODE may be necessary (Cooper et al., 2020). Third, other than checking for duplicate IP addresses and unusual response patterns, no attention check items were administered. Fifth, the number of men recruited was much smaller than the number of women recruited, preventing us from formally testing for gender differences as originally planned due to issues with statistical power.

In sum, the present study examined the associations between MODE, functional impairment, and emotional distress. MODE was shown to contribute unique variance to functional impairment and emotional distress in adult women beyond traditional thinness oriented disordered eating symptoms. MODE also contributed unique variance to functional impairment in men. Pending replication in a larger sample with more diverse measures, practitioners may benefit from enquiring about the degree of MODE in certain individuals.

Data availability statement

De-identified data can be made available upon request

Disclosure statement

The authors have no relevant financial or non-financial interests to disclose

Funding

JL receives funding from the National Health and Medical Research Council (APP1196948).

ORCID

Jake Linardon  <http://orcid.org/0000-0003-4475-7139>

Ethics approval

This study has received ethical clearance from Deakin University

Consent to participate

All participants provided informed consent.

References

- American Psychiatric Association. (2013). *The diagnostic and statistical manual of mental disorders. Fifth Edition. DSM 5*. Virginia: American Psychiatric Association.
- Bohn, K., Doll, H. A., Cooper, Z., O'Connor, M., Palmer, R. L., & Fairburn, C. G. (2008). The measurement of impairment due to eating disorder psychopathology. *Behaviour Research and Therapy*, 46(10), 1105–1110. <https://doi.org/10.1016/j.brat.2008.06.012>
- Bozsik, F., Whisenhunt, B. L., Hudson, D. L., Bennett, B., & Lundgren, J. D. (2018). Thin is in? Think again: The rising importance of muscularity in the thin ideal female body. *Sex Roles*, 79(9–10), 609–615. <https://doi.org/10.1007/s11199-017-0886-0>
- Cafri, G., Thompson, J. K., Ricciardelli, L., McCabe, M., Smolak, L., & Yesalis, C. (2005). Pursuit of the muscular ideal: Physical and psychological consequences and putative risk factors. *Clinical Psychology Review*, 25(2), 215–239. <https://doi.org/10.1016/j.cpr.2004.09.003>
- Cooper, M., Griffiths, K. M., & Burns, R. (2020). Getting shredded: Development and validation of a measure of muscularity-oriented disordered eating. *Psychological Assessment*, 32(5), 451–460. <https://doi.org/10.1037/pas0000804>
- Fairburn, C. G., & Beglin, S. (1994). Assessment of eating disorders: Interview or self-report questionnaire? *International Journal of Eating Disorders*, 16(4), 363–370. <https://doi.org/10.1002/1098-108X>
- Field, A. E., Sonnevile, K. R., Crosby, R. D., Swanson, S. A., Eddy, K. T., Camargo, C. A., Horton, N. J., & Micali, N. (2014). Prospective associations of concerns about physique and the development of obesity, binge drinking, and drug use among adolescent boys and young adult men. *JAMA Pediatrics*, 168(1), 34–39. <https://doi.org/10.1001/jamapediatrics.2013.2915>
- Ganson, K. T., & Cadet, T. J. (2019). Exploring anabolic-androgenic steroid use and teen dating violence among adolescent males. *Substance Use & Misuse*, 54(5), 779–786. <https://doi.org/10.1080/10826084.2018.1536723>
- Ganson, K. T., Testa, A., Jackson, D. B., & Nagata, J. M. (2021). Performance-enhancing substance use and criminal offending: A 15-year prospective cohort study. *Drug and Alcohol Dependence*, 226, 108832. <https://doi.org/10.1016/j.drugalcdep.2021.108832>
- Ganson, K. T., Cunningham, M. L., Murray, S. B., & Nagata, J. M. (2022). Use of appearance and performance-enhancing drugs and substances is associated with eating disorder symptomatology among US college students. *Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity*, 1–6. <https://doi.org/10.1007/s40519-022-01364-z>
- Homan, K. (2010). Athletic-ideal and thin-ideal internalization as prospective predictors of body dissatisfaction, dieting, and compulsive exercise. *Body Image*, 7(3), 240–245. <https://doi.org/10.1016/j.bodyim.2010.02.004>

- Kline, R. (2010). *Principles and practices of structural equation modeling*. Guilford Press.
- Kroenke, K., Spitzer, R. L., Williams, J. B., & Löwe, B. (2009). An ultra-brief screening scale for anxiety and depression: The PHQ-4. *Psychosomatics*, 50(6), 613–621. [https://doi.org/10.1016/S0033-3182\(09\)70864-3](https://doi.org/10.1016/S0033-3182(09)70864-3)
- Levinson, C. A., Williams, B. M., & Christian, C. (2020). What are the emotions underlying feeling fat and fear of weight gain? *Journal of Affective Disorders*, 277(1), 146–152. <https://doi.org/10.1016/j.jad.2020.08.012>
- Linardon, J., Phillipou, A., Castle, D., Newton, R., Harrison, P., Cistullo, L. L., , and Brennan, L. (2018). The relative associations of shape and weight over-evaluation, preoccupation, dissatisfaction, and fear of weight gain with measures of psychopathology: An extension study in individuals with anorexia nervosa. *Eating Behaviors*, 29(1), 54–58. <https://doi.org/10.1016/j.eatbeh.2018.03.002>
- Messer, M., McClure, Z., Lee, S., & Linardon, J. (2021). Bidirectional relationships between intuitive eating and shape and weight overvaluation, dissatisfaction, preoccupation, and fear of weight gain: A prospective study. *Body Image*, 39, 227–231. <https://doi.org/10.1016/j.bodyim.2021.09.001>
- Murray, S. B., Rieger, E., Hildebrandt, T., Karlov, L., Russell, J., Boon, E., Dawson, R. T., & Touyz, S. W. (2012). A comparison of eating, exercise, shape, and weight related symptomatology in males with muscle dysmorphia and anorexia nervosa. *Body Image*, 9(2), 193–200. <https://doi.org/10.1016/j.bodyim.2012.01.008>
- Murray, S. B., Griffiths, S., & Mond, J. M. (2016). Evolving eating disorder psychopathology: Conceptualising muscularity-oriented disordered eating. *The British Journal of Psychiatry*, 208(5), 414–415. <https://doi.org/10.1192/bjp.bp.115.168427>
- Murray, S. B., Brown, T. A., Blashill, A. J., Compte, E. J., Lavender, J. M., Mitchison, D., . . . Nagata, J. M. (2019). The development and validation of the muscularity-oriented eating test: A novel measure of muscularity-oriented disordered eating. *International Journal of Eating Disorders*, 52(12), 1389–1398. doi: 1680-1688. <https://doi.org/10.1002/eat.23144>
- Nagata, J. M., Bibbins-Domingo, K., Garber, A. K., Griffiths, S., Vittinghoff, E., & Murray, S. B. (2019). Boys, bulk, and body ideals: Sex differences in weight-gain attempts among adolescents in the United States. *Journal of Adolescent Health*, 64(4), 450–453. <https://doi.org/10.1016/j.jadohealth.2018.09.002>
- Nagata, J. M., Murray, S. B., Bibbins-Domingo, K., Garber, A. K., Mitchison, D., & Griffiths, S. (2019). Predictors of muscularity-oriented disordered eating behaviors in US young adults: A prospective cohort study. *International Journal of Eating Disorders*, 52(12), 1380–1388. <https://doi.org/10.1002/eat.23094>
- Rand-Giovannetti, D., Cicero, D. C., Mond, J. M., & Latner, J. D. (2020). Psychometric properties of the Eating Disorder Examination–Questionnaire (EDE-Q): A confirmatory factor analysis and assessment of measurement invariance by sex. *Assessment*, 27(1), 164–177. <https://doi.org/10.1002/eat.20373>
- Rochlen, A. B., McKelley, R. A., Suizzo, M.-A., & Scaringi, V. (2008). Predictors of relationship satisfaction, psychological well-being, and life satisfaction among stay-at-home fathers. *Psychology of Men & Masculinity*, 9(1), 17–28. <https://doi.org/10.1037/1524-9220.9.1.17>
- Rodgers, R. F., Franko, D. L., Lovering, M. E., Luk, S., Pernal, W., & Matsumoto, A. (2018). Development and validation of the female muscularity scale. *Sex Roles*, 78(1–2), 18–26. <https://doi.org/10.1007/s11199-017-0775-6>