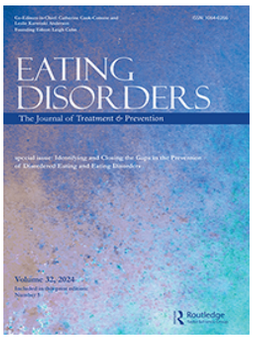
Author/s:
Dang, AB;Kiropoulos, L;Castle, D;Jenkins, Z;Phillipou, A;Rossell, S;Krug, I

Title:
Psychiatric comorbidity and severity in anorexia nervosa: a comparative study of the DSM-5, the ICD-11, and overvaluation of Weight/Shape severity ratings

Date:
2024-01-01

Citation:
Dang, A. B., Kiropoulos, L., Castle, D., Jenkins, Z., Phillipou, A., Rossell, S. & Krug, I. (2024). Psychiatric comorbidity and severity in anorexia nervosa: a comparative study of the DSM-5, the ICD-11, and overvaluation of Weight/Shape severity ratings. Eating Disorders, 32 (5), pp.546-562. https://doi.org/10.1080/10640266.2024.2346001.

Persistent Link:
https://hdl.handle.net/11343/352302



Routledge
Taylor & Francis Group

Eating Disorders
The Journal of Treatment & Prevention

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/uedi20

Psychiatric comorbidity and severity in anorexia nervosa: a comparative study of the DSM-5, the ICD-11, and overvaluation of Weight/Shape severity ratings

An Binh Dang, Litza Kiropoulos, David Castle, Zoe Jenkins, Andrea Phillipou, Susan Rossell & Isabel Krug

To cite this article: An Binh Dang, Litza Kiropoulos, David Castle, Zoe Jenkins, Andrea Phillipou, Susan Rossell & Isabel Krug (2024) Psychiatric comorbidity and severity in anorexia nervosa: a comparative study of the DSM-5, the ICD-11, and overvaluation of Weight/Shape severity ratings, Eating Disorders, 32:5, 546-562, DOI: 10.1080/10640266.2024.2346001

To link to this article: https://doi.org/10.1080/10640266.2024.2346001

Published online: 06 May 2024.

EATING DISORDERS
2024, VOL. 32, NO. 5, 546–562
https://doi.org/10.1080/10640266.2024.2346001

Routledge
Taylor & Francis Group

Psychiatric comorbidity and severity in anorexia nervosa: a comparative study of the DSM-5, the ICD-11, and overvaluation of Weight/Shape severity ratings

An Binh Dang[a], Litza Kiropoulos[a], David Castle[b,c], Zoe Jenkins[d,e,f], Andrea Phillipou[g,h,i,j], Susan Rossell[d,k], and Isabel Krug[a]

[a]Melbourne School of Psychological Sciences, The University of Melbourne, Melbourne, VIC, Australia; [b]Department of health, Tasmanian Centre for Mental Health Service Innovation Hobart, Tasmania, Australia; [c]Department of Psychiatry, University of Tasmania, Hobart, Tasmania, Australia; [d]Department of Mental Health, St Vincent's Hospital, Melbourne, Australia; [e]Iverson Institute, Swinburne University of Technology, Melbourne, Australia; [f]Department of Psychiatry, The University of Melbourne, Melbourne, Australia; [g]Centre for Youth Mental Health, Orygen, Melbourne, Australia; [h]Centre for Youth Mental Health, The University of Melbourne, Melbourne, Australia; [i]Department of Psychological Sciences, Swinburne University of Technology, Melbourne, Australia; [j]Department of Mental Health, Austin Health, Melbourne, Australia; [k]Centre for Mental Health, Swinburne University of Technology, Melbourne, Australia

ABSTRACT

This study assessed the rate of a.) the total and b.) specific psychiatric comorbidities among the three severity ratings for Anorexia Nervosa (AN): DSM-5, ICD-11 and overvaluation of weight and shape (OWS). The sample comprised 312 treatment-seeking patients with AN (mean age = 26.9). Weight and height were taken at intake to calculate BMI, the foundation for the DSM-5 and ICD-11 severity indices. The EDE-Q was used to assess OWS, and the Mini International Neuropsychiatric Interview was conducted to assess psychiatric comorbidities. For the DSM-5, the mild severity group showed a higher total number of psychiatric comorbidities, especially for panic, social anxiety, generalised anxiety, and post-traumatic stress disorders compared to the severe and extremely severe groups. ICD-11 and OWS severity groups did not significantly differ in total comorbidities, except for major depressive disorder and obsessive-compulsive disorders being more prevalent in the "significantly low BMI" ICD-11 group. The high OWS group displayed a notably higher rate of major depressive disorder than the low OWS group. The study underscores inconsistent patterns across the three severity systems, emphasising the need to recognise the current limitations of the assessed severity classification systems in AN assessment and guiding treatment.

CONTACT An Binh Dang dangb1@student.unimelb.edu.au Melbourne School of Psychological Sciences, The University of Melbourne, Redmond Barry, Level 7, Melbourne, VIC 3051, Australia

Clinical Implications

- Existing severity classifications for Anorexia Nervosa do not effectively gauge psychiatric comorbidity in treatment-seeking individuals.
- Both BMI-based severity ratings, DSM-5 and ICD-11, show that less severe groups (higher BMI) have a higher prevalence of psychiatric comorbidities.
- The high OWS group exhibits a notably higher rate of major depressive disorder compared to the low OWS group.
- Findings from the study do not advocate for the usage of the DSM-5, ICD-11, and OWS severity ratings in indexing psychiatric comorbidity in clinical settings.

Introduction

Anorexia Nervosa (AN) is currently diagnosed according to the fifth edition of the Diagnostic Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association [APA], 2013) and its text-revised version (DSM-5-TR; APA, 2013) or the 11th edition of the International Classification of Diseases (ICD-11; World Health Organisation [WHO], 2019). Both the DSM-5 and ICD-11 introduced Body Mass Index (BMI) specifiers to index AN severity. DSM-5 has four severity groups: mild (≥17.0 kg/m2), moderate (16–16.99 kg/m2), severe (15–15.99 kg/m2), and extreme (<15 kg/m2), while ICD-11 has two groups: significantly low BMI (≥14 kg/m2) and dangerously low BMI (<14 kg/m2). As outlined in the DSM-5 (APA, 2013), severity specifiers are intended to assist clinicians in evaluating the degree of intensity, frequency, duration, symptom count, or other disorder-specific indicators of severity, rather than specifiers related to the course or descriptive features of the disorder.

AN commonly co-occurs with psychiatric comorbidities, including major depressive disorder (MDD; up to 85.6%; Carrot et al., 2017) and post-traumatic stress disorder (PTSD; 17.5%; Ferrell et al., 2022). Compared to those without psychiatric comorbidities, individuals with AN and psychiatric comorbidity tend to exhibit increased eating disorder (ED) symptom severity, maintenance of ED behaviours (e.g., restriction, purging), poorer functioning, and treatment outcomes (Blinder et al., 2006; Bulik et al., 2003; Hambleton et al., 2022; Spindler & Milos, 2007). As such, the presence of psychiatric comorbidities consistently indicates a more complex and severe illness presentation in AN and is indicative of a poorer prognosis. Despite the link between ED severity and psychiatric comorbidity, only a few studies have assessed the clinical utility of DSM-5 AN severity ratings in indexing comorbidity (Dakanalis et al., 2018), and no study to date has examined the clinical utility of the ICD-11 severity index for this purpose. Additionally, while overvaluation of weight/shape (OWS) has been proposed as a potential alternative

severity indicator for AN (e.g., Gianini et al., 2017), its ability to index psychiatric comorbidity is not well understood. Therefore, this study aimed to investigate whether, BMI and OWS, a stand-alone severity indicator can effectively gauge the rate of psychiatric comorbidity, a crucial marker of AN severity, in a sample seeking treatment

DSM-5 severity rating for AN

Although prior research (e.g., Brand-Gothelf et al., 2014) has suggested an increased number of psychiatric comorbidities to higher severity in AN (assessed via ED psychopathology measured through the Eating Disorders Inventory–2 (Garner & Olmsted, 1991)), a recent meta-analysis conducted by Dang et al. (2022) contradicts these findings. Dang et al.'s meta-analysis, involving 19 studies assessing DSM-5 ED severity ratings, with five studies specifically examining the DSM-5 severity index for AN (e.g., Dakanalis et al., 2018; Krug et al., 2021), found no significant differences in ED psychopathology and comorbidity rates across the four DSM-5 AN severity categories. The studies included in Dang et al.'s meta-analysis, however, used self-report measures (e.g., Krug et al., 2021). Only Dakanalis et al. used the Structured Clinical Interview for DSM-5 Disorders ([SCID]; First et al., 2015), but the assessed comorbidities were limited to mood, anxiety, and substance use disorders. Furthermore, no study to date has explored the total number of psychiatric comorbidities across each DSM-5 AN severity group. This leaves the relationship between the DSM-5 AN severity groups and the rate of total psychiatric comorbidity as well as the prevalence of specific psychiatric comorbidities (e.g., PTSD), unexplored.

ICD-11 severity rating for AN

Acknowledging that many individuals meeting the AN prototype narrowly miss the BMI <17.5 kg/m^2 criterion, the ICD-11 omitted the BMI <17.5 kg/m^2 criterion for AN. However, recognising the significance of severe underweight as a predictor of poor prognosis, the ICD-11 proposes severe underweight (e.g., BMI < 14.0 kg/m^2) as a severity qualifier, termed "dangerously low body weight" (Button et al., 2010; Rosling et al., 2011). This adjustment aims to improve diagnostic accuracy and consider the importance of severely underweight in assessing AN prognosis and treatment intensity (Uher & Rutter, 2012). Despite this, the BMI cut-off values for both the DSM-5 and ICD-11 AN severity categories lack a solid research foundation, as noted by Dang et al. (2022). The rationale behind the ICD-11 binary severity classification remains unclear, and to date, no study has evaluated the clinical utility of the two ICD-11 severity ratings for AN.

Overvaluation of weight/shape severity rating

Amidst uncertainty about the clinical utility of the DSM-5 and ICD-11 AN severity ratings, researchers have explored alternative classifications, focusing on cognitive factors such as overvaluation of weight and shape ([OWS], e.g., Dang et al., 2023). Research has found support for OWS as a transdiagnostic severity indicator for AN, bulimia nervosa, and binge eating disorder (e.g., Dang et al., 2022, 2023). For instance, high OWS in AN has been found to be linked to an increase in self-reported depression, anxiety, and stress symptoms (Dang et al., 2023). However, studies that used clinician-administered interviews to assess psychiatric comorbidity rates across the OWS severity groups are lacking.

The current study

This study aimed to address the gaps in the literature articulated above, by determining psychiatric comorbidity rates across the DSM-5, ICD-11, and OWS AN severity groups in a treatment-seeking AN population. Specifically, our aims included assessing: 1) whether there was an association between the DSM-5, ICD-11, and OWS-defined AN severity groups and the total number of psychiatric comorbidity and 2) whether there were differences in the rate of specific psychiatric comorbidities (e.g., PTSD, MDD) across these three severity indices.

Method

Participants

This study included treatment-seeking patients with AN ($N = 312$, mean age: 26.9 years, mean BMI: 16.8 kg/m^2) from an outpatient ED treatment unit in Melbourne, Australia. Our clinicians used the DSM-5 criteria to assess participants' diagnoses of AN at the time of assessment. All patients with AN from the treatment unit were included in the study, with no exclusions, provided they consented. Sixty-six participants (21%) reported having at least one episode of binge eating and inappropriate compensatory behaviours over the past 3 months (see Dang et al., 2023; Phillipou & Beilharz, 2019 for more details).

Measures

Sociodemographic and clinical information

The study gathered key demographic data at intake. Participants also self-reported their age of AN onset, from which illness duration was calculated. Measurements of height and weight were taken with individuals wearing

indoor clothing and without shoes. Height was determined using a stadiometer, while weight was evaluated using the Tanita scale (Jebb et al., 2000), which employs bioelectrical impedance technology to calculate BMI.

Psychiatric comorbidity

To screen for adult psychiatric disorders based on the DSM-5 criteria, trained senior mental health clinicians relied on clinical judgment to select relevant modules from the Mini International Neuropsychiatric Interview [MINI] version 7.0.2 (Sheehan et al., 1998). Their judgment was based on gathered information from the participants' medical and psychiatric history, clinical observations, and intake interviews. Specific psychiatric diagnoses included in the MINI comprise MDD, persistent depressive disorder (PDD), agoraphobia, panic disorder (PD), social anxiety disorder (SAD), obsessive-compulsive disorder (OCD), generalised anxiety disorder (GAD), PTSD, alcohol use disorder (AUD), and substance use disorder (SUD).

AN severity categories

Severity groups based on DSM-5 and ICD-11 severity specifiers

Using the DSM-5 severity definitions based on BMI, with a total of 136 (43.6%) participants being classified as mild (≥17.0 BMI kg/m^2), 64 (20.5%) as moderate (16–16.99 BMI kg/m^2), 49 (15.7%) as severe (15–15.99 BMI kg/m^2) and 63 (20.2%) extreme (<15 BM kg/m^2). Based on the ICD-11 BMI severity cutoff, 284 (91%) and 28 (9%) participants were categorised into the "significantly low" and "dangerously low," respectively.

Subgroups based on overvaluation of shape/weight

Guided by previous studies (e.g., Gianini et al., 2017), OWS was measured using two items from the Eating Disorder Examination-Questionnaire (Fairburn & Beglin, 1994): "Over the past 4 weeks, has your shape influenced how you feel about (judge, think, evaluate) yourself as a person?" and "Over the past 4 weeks has your weight influenced how you feel about (judge, think, evaluate) yourself as a person?" A score of 5 or 6 on either item classified individuals with AN into low and high levels of OWS (Gianini et al., 2017) (see Dang et al., 2023 for more details). Due to missing data, out of 312 participants, we were only able to categorise 240 participants into low (n = 50; 20.8%) and high (n = 190; 79.2%) OWS AN groups.

Statistical planning

Differences in all study variables between AN severity groups were assessed using ANOVA for continuous variables and chi-square tests (Pearson's or

Fisher's exact test, as appropriate) for categorical variables. Post-hoc pairwise comparisons with Bonferroni correction were conducted to identify where the differences lied, and effect sizes (partial η^2 for continuous variables and Cramer's φ for categorical variables) were calculated. The partial η^2 with values of 0.06, 0.10, and 0.25 were interpreted as indicating low-poor, moderate-medium, and large-high effect sizes, respectively (Levine & Hullett, 2002). Additionally, Cramer's φ coefficient with values of 0.06, 0.15, and 0.30 was interpreted as indicating low-poor, moderate-medium, and large-high effect sizes, respectively (Cohen, 1988).

The distribution of the data was based on counts and had an excess of zero responses indicating most participants did not have a psychiatric comorbidity (58%). As such, the DSM-5, ICD-11 and OWS AN group differences in psychiatric comorbidities were examined using zero-inflated Poisson regression. The zero-inflated model expands on the Poisson distribution to allow for the analysis of data with excess zeros. This model produces two sets of results, one related to whether there was a psychiatric comorbidity and one related to the number of psychiatric comorbidities (Cameron & Trivedi, 2001; Coxe et al., 2009; Karazsia & van Dulmen, 2008; Lambert, 1992). For the DSM-5 AN severity groups, the severity groups were entered into the equation as dummy variables to compare the mild, moderate, severe, and extremely severe in the number of psychiatric comorbidities. Furthermore, Pairwise Exclusion of Missing Values was employed to manage missing data.

Results

Demographic information

Table 1 summarises the demographic characteristics of the entire sample and each severity index. Most participants with AN were single (76.2%), Caucasian (84.6%), and female (94.6%). The mean age of AN onset was 17.61 years (SD = 5.83), with an illness duration of 8.79 years (SD = 8.83).

From the MINI, 131 participants (42%) were found to have at least one additional psychiatric disorder. The DSM-5 and ICD-11 AN severity groups exhibited no significant differences in any demographic and clinical-related information. Individuals in the low OWS severity group had a higher BMI at assessment than the high OWS group ($p < .001$). The distribution of each severity group for the three assessed severity indices is presented in Table 1.

Total number of psychiatric comorbidities across an severity indices and groups

Table 2 presents results from the zero-inflated Poisson regressions with AN severity per DSM-5, ICD-11, and OWS as predictors of the total number of psychiatric comorbidities. The zero model showed no significant differences

Table 1. Demographic information for each severity groups within the DSM-5, ICD-11 and overvaluation of weight/shape severity ratings for AN.

			DSM-5 AN severity classification								ICD AN severity classification				Overvaluation of weight/shape (OWS) classification			
	Total		DSM-5 Mild		DSM-5 Moderate		DSM-5 Severe		DSM-5 Extreme		Significantly Low		Dangerously Low		OWS/Low		OWS/High	
	N = 312		*N = 136*		*N = 64*		*N = 49*		*N = 63*		*N = 284*		*N = 28*		*N = 50*		*N = 190*	
Gender																		
Male	17	5.4%	12	8.8%	2	3.1%	1	2.0%	2	3.2%	*16*	*5.6%*	*1*	*3.6%*	*6*	*12.0%*	6	3.2%
Female	295	94.6%	124	91.2%	62	96.9%	48	98.0%	61	96.8%	*268*	*94.4%*	*27*	*96.4%*	*44*	*88.0%*	184	96.8%
Marital status																		
Single	237	76.2%	107	78.7%	49	76.6%	36	73.5%	45	72.6%	214	75.6%	23	82.1%	35	70%	149	78.4%
Widowed	16	1.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	0.7%	0	0%	0	0%	1	0.5%
Divorced/Separated	16	5.2%	2	1.4%	2	3.1%	4	8.2%	8	12.9%	15	5.3%	1	3.6%	4	8.0%	8	4.3%
Married—in couple	35	11.3%	14	10.4%	11	17.2%	5	10.2%	5	8.1%	34	12.0%	1	3.6	6	12.0%	22	11.6%
Other/Unknown	21	6.8%	11	8.1%	2	3.1%	4	8.2%	4	6.5%	18	6.4%	3	10.7%	5	10.0%	10	5.3%
Education																		
Secondary/lower	87	28.2%	43	32.2%	18	28.6%	17	34.6%	9	14.5%	82	29.2%	5	18.5%	7	14.3%	54	28.7%
Vocational	7	2.3%	4	3.0%	1	1.6%	0	0%	2	3.2%	6	2.1%	1	3.7%	2	4.1%	5	2.7%
University Commenced	106	34.4%	45	33.6%	25	39.7%	13	26.5%	23	37.1%	96	34.2%	10	37.0%	20	40.8%	66	35.1%
University Completed	79	25.6%	27	20.1%	14	22.2%	15	30.6%	23	37.1%	70	24.9%	9	33.3%	12	24.5%	49	26.1%
Other/Unknown	29	9.4%	15	11.1%	5	7.9%	3	6.1%	3	4.8%	10	3.5%	2	7.4%	8	16.4%	14	7.5%
Ethnicity																		
Aboriginal	7	2.5%	3	2.3%	1	1.7%	3	6.7%	0	0%	7	2.7%	0	0%	2	4.0%	4	2.1%
Caucasian	241	84.6%	112	87.5%	51	87.9%	39	86.7%	39	72.2%	227	87.0%	14	58.3%	41	82.0%	162	85.3%
Asian	10	3.6%	3	2.4%	1	1.7%	1	2.2%	11	3.6%	9	3.5%	1	4.2%	2	4.0%	6	3.2%
Other/Unknown	27	9.5%	10	7.8%	5	8.6%	2	4.4%	10	18.5%	16	6.9%	9	37.5%	5	10.0%	19	10.0%
Employment																		
Unemployed.	29	9.7%	11	8.5%	4	6.3%	6	13.0%	8	13.3%	29	10.6%	0	0%	6	12.0%	15	7.9%
Student	101	33.8%	44	33.8%	19	30.2%	15	30.4%	24	40.0%	92	33.6%	9	36.0%	16	32.0%	62	32.6%
Employed	63	26.3%	34	28.6%	14	28.6%	6	19.4%	9	20.5%	76	27.8%	4	16.0%	16	32.0%	47	24.7%
Home Duties	10	3.3%	5	3.8%	1	1.6%	1	2.2%	3	5.0%	7	2.6%	3	12.0%	0	0%	8	4.2%
Unable to work/Other	79	26.5%	30	23.1%	20	31.7%	14	30.4%	15	25%	70	25.5%	9	36.0%	12	24.0%	58	30.5%

Table 2. Zero-inflated Poisson regression for severity groups contrasts predicting psychiatric comorbidity.

	B	*SE*	*z*	*p*	95% CI (*B*)
DV = Number of Psychiatric Comorbidity (Count model)					
Severity groups					
DSM-5 Mild to Moderate	**−0.36**	0.15	−2.95	**.005**	(−0.75; −0.15)
DSM-5 Mild to Severe	**−0.36**	0.15	−2.03	**.009**	(−0.61; −0.01)
DSM-5 Mild to Extreme	**−0.73**	0.14	−4.34	**<.001**	(−1.46; −0.55)
DSM-5 Moderate to Severe	0.14	0.19	0.77	.44	(−0.22; 0.51)
DSM-5 Moderate to Extreme	**−0.55**	0.26	−2.17	**.042**	(−1.05; −0.05)
DSM-5 Severe to Extreme	−0.70	0.26	−2.73	.006	(−1.20; −0.20)
Low BMI to Dangerously Low BMI	−0.40	0.23	1.71	.09	(−1.13; 0.03)
Low OWS to high OWS	0.32	0.16	1.95	.05	(−0.11; 0.60)
DV = No psychiatric comorbidity (Zero-inflated model)					
DSM-5 Mild to Moderate	−0.52	0.31	−1.64	.10	(−1.30; 0.04)
DSM-5 Mild to Severe	−0.72	0.35	−2.03	.34	(−1.36; 0.16)
DSM-5 Mild to Extreme	−0.47	0.43	−1.09	.27	(−1.33; 0.38)
DSM-5 Moderate to Severe	−0.13	0.43	−0.30	.77	(−0.98; 0.72)
DSM-5 Moderate to Extreme	0.15	0.49	0.31	.76	(−0.81; 1.12)
DSM-5 Severe to Extreme	0.28	0.51	0.55	.56	(−0.72; 1.28)
Low BMI to Dangerously Low BMI	−0.18	0.45	−0.41	.68	(0.70; 1.01)
Low OWS to high OWS	0.07	0.35	−0.19	.85	(−1.00;1.05)

among DSM-5 severity groups regarding the likelihood of having no psychiatric comorbidity. The count model showed that there were significant differences among the groups in the total number of psychiatric comorbidities. More specifically, those in the DSM-5 mild group were associated with a higher total number of psychiatric comorbidities in comparison to those in the DSM-5 moderate (OR = 1.43), severe (OR = 1.43) and extremely severe (OR = 2.08) AN groups. In addition, those in the DSM-5 moderate severity group were associated with a higher total number of psychiatric comorbidities compared to those in the extremely severe group (OR = 1.73).

The regression models found no significant differences between the ICD-11 "significantly low BMI" and "dangerously low BMI" groups and between the low OWS and high OWS groups in both the likelihood of not having a psychiatric comorbidity and the total number of psychiatric comorbidities.

Rate of specific psychiatric disorders across the AN severity indices and groups

Table 3 presents the comorbidity rates for the specific psychiatric disorders for individuals with AN, across the different severity groups for DSM-5, ICD-11, and OWS. The chi-square tests of independence revealed that there were significant associations between the DSM-5 AN severity groups and the rates of PD [χ^2 (3, n = 161) = 11.16, p = .011], SAD [χ^2 (3, n = 161) = 12.89, p = .005], GAD [χ^2 (3, n = 153) = 9.99, p = .019] and PTSD [χ^2 (3, n = 160) = 9.64, p = .022]. Post hoc comparisons showed that those in the mild DSM-5 AN severity group had significantly higher rates of PD (p = .004), SAD (p = .003), GAD (p = .005), and PTSD (p = .020) than those in the DSM-5 extremely severe group. In addition, those in the mild DSM-5 AN severity group had

Table 3. Psychiatric comorbidity rate between DSM-5, ICD-11, and OWS severity groups.

	DSM-5 Classification											ICD-11 Classification							Overvaluation of weight and shape						
	Mild		Moderate		Severe		Extreme					Significantly Low		Dangerously Low					Low OWS		High OWS				
Anorexia nervosa	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	*F*/	*P*	h^2/V	n	Mean (SD)	n	Mean (SD)	*F*	*p*	h^2/V	n	Mean (SD)	n	Mean (SD)	*F*	*p*	h^2/V
Age (yrs-old)	135	25.3 (7.6)	63	27.4 (10.5)	49	26.5 (8.6)	63	29.2 (10.3)	2.3	.140	.029†	282	*26.7 (9.1)*	28	28.5 (9.8)	0.96	.327	.003	50	27.5 (9.5)	188	26.3 (8.9)	0.7	.518	.000
Onset ED (yrs-old)	128	17.4 (6.1)	60	16.5 (4.5)	43	18.6 (5.8)	55	19.1 (7.1)	1.6	.290	.022	261	*17.5 (5.7)*	25	19.1 (6.9)	1.8	.176	.006	47	19.4 (5.5)	174	17.2 (6.0)	5.2	0.06	.004
Duration ED (yrs)	129	7.8 (7.4)	59	11.3 (11.2)	44	7.6 (7.0)	56	9.9 (9.4)	2.1	.170	.029	262	*8.8 (8.8)*	26	8.5 (8.9)	0.3	.862	.000	47	7.4 (7.1)	173	9.3 (9.0)	1.9	.266	.002
BMI at assessment (kg/m^2)	136	18.9 (2.2)	64	16.4 (0.3)	49	15.4 (0.3)	63	13.9 (0.9)	120.4	**<.001**	.605†	284	*17.1 (2.2)*	28	12.9 (0.7)	98.3	**<.001**	.241	50	16.0 (2.1)	190	17.3 (2.6)	10.5	**.001**	**.046**
	n	%	n	%	n	%	n	%	χ2	*P*	V	n	%	n	%	χ2	*p*	V	n	%	n	%	χ2	*p*	V
Presence of at least 1 psychiatric disorder	**51**		**31**		**26**		**23**																		
Depressive Disorder	39	39.8	23	23.5	20	20.4	16	16.3	3.4	.332	.146	92	93.9	6	6.1	*5.2*	***.034***	.180	9	14.1	55	85.9	5.5	**.019**	.299
Panic Disorder	26	53.1	9	18.4	10	20.4	4	8.2	*11.2*	***.011***	.263	47	95.9	2	4.1	*3.1*	*.097*	.139	6	15.4	33	84.6	1.5	.229	.117
Social Anxiety	21	60	5	14.3	7	20.0	2	5.7	*12.9*	***.005***	.283	34	97.1	1	2.9	*2.8*	*.124*	.132	3	12.5	21	87.5	1.5	.214	.121
Obsessive Compulsive Disorder	15	48.4	8	25.8	4	12.9	4	12.9	*3.0*	*.399*	.135	31	100	0	0	*4.5*	***.045***	.168	6	24	19	76	0.1	.749	.031
Generalized Anxiety Disorder	26	47.3	13	23.6	12	21.8	4	7.3	*9.9*	***.019***	.256	52	94.5	3	5.5	*2.3*	*.172*	.122	6	15.8	32	84.2	1.4	.241	.117
Post Traumatic Stress Disorder	17	60.7	4	14.3	5	17.9	2	7.1	*9.6*	***.022***	.245	27	96.4	1	3.6	*1.8*	*.311*	.105	3	12.5	21	87.5	1.6	.205	.124
Alcohol Use Disorder	7	36.9	2	15.4	2	15.4	2	15.4	*1.8*	*.610*	.107	11	84.6	2	15.4	*0.3*	*.632*	.046	3	33.3	6	66.7	0.8	.386	.085
Substance Use Disorder	5	55.6	1	11.1	3	33.3	0	0	*4.8*	*.189*	.173	9	100	0	0	*1.1*	*.599*	.084	2	25	6	75	0.1	.826	.021

a significantly higher rate of SAD than those in the moderate DSM-5 group ($p = .026$).

The ICD-11 "significantly low" BMI group had significantly higher rates of MDD ($p = .034$) and obsessive-compulsive disorder (OCD; $p = .045$) compared to the "dangerously low" group. Individuals in the high OWS alternative AN severity group had a higher rate of MDD ($p = .019$) than the low OWS group.

Discussion

The study investigated 1) the relationships between the DSM-5, ICD-11, and OWS-defined severity groups for AN and the total number of psychiatric comorbidities and 2) whether there were significant differences in specific psychiatric comorbidity rates among the three assessed severity ratings. Overall, although there were no differences in overall comorbidity counts within the ICD-11 and OWS AN severity groups, the DSM-5 mild severity group exhibited a significantly higher total number of psychiatric comorbidities compared to the DSM-5 moderate, severe, and extremely severe AN groups. Significant differences in the prevalence of specific psychiatric disorders (e.g., PD, SAD, GAD, and PTSD using the DSM-5 severity index; or OCD and MDD using the ICD-11 severity rating) were also found across the three assessed severity ratings, which will be discussed further below.

Distribution of AN severity groups for DSM-5, ICD-11, and OWS

Despite using a sample of treatment-seeking individuals with AN, both the DSM-5 and ICD-11 mainly categorised most individuals with AN into the milder (higher BMI) groups. Only about 15% and 8% of individuals with AN fell into the DSM-5 severe and ICD-11 "dangerously low body weight" severity groups, respectively, raising doubts about correctly identifying these two groups in AN. Conversely, up to 78% of AN participants were classified as having high OWS—the more severe end of the OWS severity spectrum. Such distribution is consistent with what was found in previous studies (e.g., Dang et al., 2023). Considering that the present sample consists of treatment-seeking participants with an average illness duration of 8.79 years, it seems that the OWS severity rating effectively mirrors the level of AN severity in this specific cohort in comparison to the DSM-5 and ICD-11 severity systems.

Comorbidity: BMI-based severity ratings per DSM-5 and ICD-11

Total number of psychiatric comorbidities

The DSM-5 and ICD-11 systems use BMI to index severity in AN, differing only in categorical cut-off scores, yet they did not yield a consistent pattern of

results in the total number of psychiatric comorbidities across the AN severity groups. Regarding the DSM-5 severity groups, the mild AN group was found to be associated with higher odds of having a greater number of psychiatric comorbidities compared to the moderate, severe, and extremely severe AN groups. The moderate DSM-5 group was also found to have a higher number of psychiatric comorbidities than the DSM-5 extremely severe groups. As for ICD-11, no significant differences were found between the two severity groups in the total number of psychiatric comorbidities.

While no study has examined the relationship between both the DSM-5 and ICD-11 AN severity groups and the total number of psychiatric comorbidities, our findings contradict prior research associating psychiatric comorbidity with increased AN severity, including factors such as suicidal ideations and ED symptomatology (Hambleton et al., 2022; Spindler & Milos, 2007). The discrepancy between our results and prior studies (e.g., Dang et al., 2023), coupled with the unexpected trend of higher comorbidity in the milder DSM-5 severity groups, suggests that the current DSM-5 and ICD-11 severity ratings for AN may need to be reconsidered.

Specific psychiatric comorbidities

The pattern of higher comorbidity in the milder DSM-5 AN severity groups extended to specific psychiatric diagnoses, with the mild DSM-5 AN group exhibiting significantly higher rates of PD, SAD, GAD, and PTSD compared to the extreme DSM-5 AN group. In addition, the mild DSM-5 AN severity group had significantly higher rates of SAD compared to the moderate DSM-5 AN severity group.

When examining individual psychiatric comorbidity rates across the ICD-11 severity groups, we observed that individuals in the 'significantly low BMI' ICD-11 group were more likely to have MDD and OCD than those in the 'dangerously low BMI' group. Despite these differences, both DSM-5 and ICD-11 BMI-based severity classification systems share a common pattern: individuals with a higher BMI tend to have a higher likelihood of experiencing additional psychiatric comorbidities. These disparities in the type of psychiatric comorbidities could stem from the arbitrary BMI cut-off scores in both the DSM-5 and ICD-11 systems.

Relating to the previous literature, no prior study has assessed psychiatric comorbidity rates among the two ICD-11 AN severity groups. However, in line with Dakanalis et al. (2018) findings regarding the DSM-5 severity ratings for AN, we also found no differences in the rates of MDD across the DSM-5 AN severity groups. In contrast to Dakanalis et al., the current study observed significant differences in the rates of PD, SAD, and GAD among the DSM-5 AN severity groups. These differences may stem from our separate assessment of the individual anxiety disorders (SAD versus GAD), unlike Dakanalis et al.

who grouped these disorders under an overall anxiety disorder group. Our findings also deviate somewhat from Krug et al. (2021), who observed no significant differences between the DSM-5 AN severity groups concerning self-reported depression, anxiety, and stress symptoms as measured by the Symptom Checklist-90-Revised (Derogatis, 1983). Discrepancies between our findings and Krug et al.'s could be attributed to their separate evaluation of DSM-5 severity ratings for AN-binge purge and AN-restricted subtypes, while we combined these subtypes for our analysis due to having a smaller sample size. This means that the DSM-5 severity classification for AN may operate differently depending on the specific AN subtypes, highlighting the importance of considering potential separate severity ratings for each AN subtype, such as the number of purging methods as an alternative severity rating for AN-binge purge subtypes (Dang et al., 2022; Gianini et al., 2017).

Comorbidity: overvaluation of weight and shape

No significant differences were found in the total number of psychiatric comorbidities between the low and high OWS AN groups. However, we found that those in the high OWS group had significantly higher rates of MDD than those in the low OWS group. Such findings are consistent with previous studies (Dang et al., 2023; Gianini et al., 2017) that showed increased self-reported symptoms of depression in those with AN in the high OWS group. Building on previous studies that found OWS to effectively capture ED and general psychopathology in AN (Dang et al., 2022, 2023), coupled with the current findings found OWS to be indicative of psychiatric comorbidity, OWS emerges as a more robust indicator of AN severity compared to BMI-based DSM-5 and ICD-11 indices. This is reflected in its ability to index general and ED psychopathology (Dang et al., 2023) and psychiatric comorbidity rates as observed in our study. Overall, there was no consistent pattern of psychiatric comorbidity emerging across the three tested severity systems for AN.

Implications

The current findings have implications for DSM-5, ICD-11, and OWS AN severity ratings. Although the OWS severity systems demonstrated a slight advantage over the BMI-based severity systems, associating higher OWS severity with higher rates of MDD and OCD, the current evidence falls short of substantiating their utility in clinical practice. Consequently, emphasising the importance of comprehensive clinical assessments remains crucial for informed treatment planning of individuals with AN.

Second, both this study and prior research (e.g., Dang et al., 2022; Krug et al., 2021) challenge the traditional assumption that lower BMI indicates more complex and severe AN, such as higher ED psychopathology and psychiatric

comorbidity. It highlights that BMI alone does not reliably correlate with psychiatric comorbidity in AN, as it is just one facet of a multifaceted psychiatric disorder involving fear of weight gain and body distortions (Gadsby, 2017). Using BMI as the primary gauge of AN severity perpetuates the idea that individuals without an extremely low BMI are "not unwell enough," despite experiencing similar disordered eating patterns and facing comparable physical and psychological risks, as shown in previous studies (e.g., Dang et al., 2023; Gianini et al., 2017). Therefore, BMI should not be the sole determinant for clinical decisions in individuals with AN (Phillipou & Beilharz, 2019).

Limitations and future directions

The current study has some limitations which should be acknowledged. First, the cross-sectional design prevents exploring the predictive validity of the DSM-5, ICD-11, and OWS AN severity ratings, including treatment outcomes and ED diagnoses crossover.

Second, senior clinicians used their clinical judgment to select relevant MINI modules to screen for ICD-11 psychiatric disorders. This approach, meant to ease burdens, could introduce clinician selection biases compared to administering the full MINI. Consequently, future research should employ a more standardised method for establishing psychiatric comorbidity rates.

Third, although the ICD-11 severity rating aims to serve as a prognostic indicator for physical complications and mortality risk (WHO, 2019), this study only assessed psychiatric comorbidity. Future studies should assess these severity ratings and further severity indicators (e.g., weight suppression, Berner et al., 2013) on a range of psychological (e.g., perfectionism, Buzzichelli et al., 2018; Drieberg et al., 2019), biological (e.g., potassium, Funayama et al., 2021) or physical indicators (amenorrhoea); using a longitudinal design. For example, there is a consensus that amenorrhoea should not be included as a diagnosis criterion for AN but should be recorded, since it may be an indicator of severity and may help distinguish between constitutional thinness and AN (Attia & Roberto, 2009).

Fourth, our categorisation of individuals with AN into multiple severity groups may have lacked the statistical power to detect significant links between psychiatric comorbidity and severity levels. Future research should consider larger sample sizes to further explore these relationships.

Finally, this was conducted in an Australian treatment facility, with predominantly participants being Caucasian females. Given the recognised variations in ED presentations among males and females (Murray et al., 2017), adolescents versus adults (Rajagopalan, et al., 2019), and individuals from diverse cultural backgrounds (Soh et al., 2008), the results may not be broadly applicable to other demographic groups, warranting further replications.

Conclusion

Our findings suggest that the currently existing severity indicators for AN (e.g. DSM-5 and ICD-11) cannot effectively index psychiatric comorbidity in individuals with AN. We did, however, find that the alternative OWS severity system was slightly more robust in indexing the prevalence of specific psychiatric comorbidities in AN compared to their BMI-based counterparts (i.e., DSM-5 and ICD-11). Specifically, we found a correlation between a high OWS severity and elevated rates of MDD and OCD. However, the existing evidence does not conclusively support the practical application of the OWS severity rating in clinical settings for AN. This means that as we navigate the complexities of AN severity classifications, integrating a holistic approach (e.g., in-depth assessment of both psychological and behavioural symptoms) remains pivotal for advancing the precision and effectiveness of clinical interventions.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

An Binh Dang http://orcid.org/0000-0001-7961-6913

References

American Psychiatric Association (APA). (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Attia, E., & Roberto, C. A. (2009). Should amenorrhea be a diagnostic criterion for anorexia nervosa? *International Journal of Eating Disorders*, *42*(7), 581–589. https://doi.org/10.1002/eat.20720

Berner, L. A., Shaw, J. A., Witt, A. A., & Lowe, M. R. (2013). The relation of weight suppression and body mass index to symptomatology and treatment response in anorexia nervosa. *Journal of Abnormal Psychology*, *122*(3), 694. https://doi.org/10.1037/a0033930

Blinder, B. J., Cumella, E. J., & Sanathara, V. A. (2006). Psychiatric comorbidities of female inpatients with eating disorders. *Psychosomatic Medicine*, *68*(3), 454–462. https://doi.org/10.1097/01.psy.0000221254.77675.f5

Brand-Gothelf, A., Leor, S., Apter, A., & Fennig, S. (2014). The impact of comorbid depressive and anxiety disorders on severity of anorexia nervosa in adolescent girls. *The Journal of*

Nervous and Mental Disease, *202*(10), 759–762. https://doi.org/10.1097/NMD.0000000000000194

Bulik, C. M., Tozzi, F., Anderson, C., Mazzeo, S. E., Aggen, S., & Sullivan, P. F. (2003). The relation between eating disorders and components of perfectionism. *American Journal of Psychiatry*, *160*(2), 366–368. https://doi.org/10.1176/appi.ajp.160.2.366

Button, E. J., Chadalavada, B., & Palmer, R. L. (2010). Mortality and predictors of death in a cohort of patients presenting to an eating disorders service. *International Journal of Eating Disorders*, *43*(5), 387–392. https://doi.org/10.1002/eat.20715

Buzzichelli, S., Marzola, E., Amianto, F., Fassino, S., & Abbate-Daga, G. (2018). Perfectionism and cognitive rigidity in anorexia nervosa: Is there an association? *European Eating Disorders Review*, *26*(4), 360–366. https://doi.org/10.1002/erv.2591

Cameron, A. C., & Trivedi, P. K. (2001). Essentials of count data regression. *A Companion to Theoretical Econometrics*, 331.

Carrot, B., Radon, L., Hubert, T., Vibert, S., Duclos, J., Curt, F., & Godart, N. (2017). Are lifetime affective disorders predictive of long-term outcome in severe adolescent anorexia nervosa? *European Child & Adolescent Psychiatry*, *26*(8), 969–978. https://doi.org/10.1007/s00787-017-0963-5

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*.

Coxe, S., West, S. G., & Aiken, L. S. (2009). The analysis of count data: A gentle introduction to Poisson regression and its alternatives. *Journal of Personality Assessment*, *91*(2), 121–136.

Dakanalis, A., Timko, C. A., Colmegna, F., Riva, G., & Clerici, M. (2018). Evaluation of the DSM-5 severity ratings for anorexia nervosa in a clinical sample. *Psychiatry Research*, *262*, 124–128. https://doi.org/10.1016/j.psychres.2018.02.009

Dang, A. B., Giles, S., Fuller-Tyszkiewicz, M., Kiropoulos, L., & Krug, I. (2022). A systematic review and meta-analysis on the DSM–5 severity ratings for eating disorders. *Clinical Psychology Science & Practice*, *29*(4), 325–344. https://doi.org/10.1037/cps0000078

Dang, A. B., Kiropoulos, L., Castle, D. J., Jenkins, Z., Phillipou, A., Rossell, S. L., & Krug, I. (2023). Assessing severity in anorexia nervosa: Do the DSM-5 and an alternative severity rating based on overvaluation of weight and shape severity differ in psychological and biological correlates? *European Eating Disorders Review*, *31*(4), 447–461. https://doi.org/10.1002/erv.2969

Derogatis, L. R. (1983). SCL-90-R: Administration, scoring and procedures. Manual II for the R (evised) version and other instruments of the psychopathology rating scale series.

Drieberg, H., McEvoy, P. M., Hoiles, K. J., Shu, C. Y., & Egan, S. J. (2019). An examination of direct, indirect and reciprocal relationships between perfectionism, eating disorder symptoms, anxiety, and depression in children and adolescents with eating disorders. *Eating Behaviors*, *32*, 53–59. https://doi.org/10.1016/j.eatbeh.2018.12.002

Fairburn, C. G., & Beglin, S. J. (1994). Assessment of eating disorders: Interview or self-report questionnaire? *International Journal of Eating Disorders*, *16*(4), 363–370.

Ferrell, E. L., Russin, S. E., & Flint, D. D. (2022). Prevalence estimates of comorbid eating disorders and posttraumatic stress disorder: A quantitative synthesis. *Journal of Aggression, Maltreatment & Trauma*, *31*(2), 264–282. https://doi.org/10.1080/10926771.2020.1832168

First, M., Williams, J., Karg, R., & Association, S. R. A. P. (2015). *Arlington*. VA, American Psychiatric Association.

Funayama, M., Mimura, Y., Takata, T., Koreki, A., Ogino, S., Kurose, S., & Shimizu, Y. (2021). Hypokalemia in patients with anorexia nervosa during refeeding is associated with binge–purge behavior, lower body mass index, and hypoalbuminemia. *Journal of Eating Disorders*, *9*(1), 1–10. https://doi.org/10.1186/s40337-020-00356-7

Gadsby, S. (2017). Distorted body representations in anorexia nervosa. *Consciousness and Cognition*, *51*, 17–33. https://doi.org/10.1016/j.concog.2017.02.015

Garner, D. M., & Olmsted, M. P. (1991). *Eating disorder inventory 2*. Psychological Assessment Resources Odessa.

Gianini, L., Roberto, C. A., Attia, E., Walsh, B. T., Thomas, J. J., Eddy, K. T., Grilo, C. M., Weigel, T., & Sysko, R. (2017). Mild, moderate, meaningful? Examining the psychological and functioning correlates of DSM-5 eating disorder severity specifiers. *International Journal of Eating Disorders*, *50*(8), 906–916. https://doi.org/10.1002/eat.22728

Hambleton, A., Pepin, G., Le, A., Maloney, D., Touyz, S., & Maguire, S. (2022). Psychiatric and medical comorbidities of eating disorders: Findings from a rapid review of the literature. *Journal of Eating Disorders*, *10*(1), 132. https://doi.org/10.1186/s40337-022-00654-2

Jebb, S. A., Cole, T. J., Doman, D., Murgatroyd, P. R., & Prentice, A. M. (2000). Evaluation of the novel Tanita body-fat analyser to measure body composition by comparison with a four-compartment model. *British Journal of Nutrition*, *83*(2), 115–122. https://doi.org/10.1017/S0007114500000155

Karazsia, B. T., & Van Dulmen, M. H. (2008). Regression models for count data: Illustrations using longitudinal predictors of childhood injury. *Journal of Pediatric Psychology*, *33*(10), 1076–1084.

Krug, I., Binh Dang, A., Granero, R., Agüera, Z., Sánchez, I., Riesco, N., Jimenez-Murcia, S., Menchón, J. M., & Fernandez-Aranda, F. (2021). Drive for thinness provides an alternative, more meaningful, severity indicator than the DSM-5 severity indices for eating disorders. *European Eating Disorders Review*, *29*(3), 482–498. https://doi.org/10.1002/erv.2776

Lambert, D. (1992). Zero-inflated Poisson regression, with an application to defects in manufacturing. *Technometrics*, *34*(1), 1–14.

Levine, T. R., & Hullett, C. R. (2002). Eta squared, partial eta squared, and misreporting of effect size in communication research. *Human Communication Research*, *28*(4), 612–625.

Murray, S. B., Nagata, J. M., Griffiths, S., Calzo, J. P., Brown, T. A., Mitchison, D., Blashill, A. J., & Mond, J. M. (2017). The enigma of male eating disorders: A critical review and synthesis. *Clinical Psychology Review*, *57*, 1–11. https://doi.org/10.1016/j.cpr.2017.08.001

Phillipou, A., & Beilharz, F. (2019). Should we shed the weight criterion for anorexia nervosa? *Australian & New Zealand Journal of Psychiatry*, *53*(6), 501–502. https://doi.org/10.1177/0004867418814958

Rajagopalan, A., Bhattacharya, A., Peebles, R., Dakanalis, A., & Timko, C. A. (2019, October). A literature review: Do DSM–5 severity indicators for eating disorders apply to children and adolescents? [Paper presentation]. American Academy of Children and Adolescent Psychiatry 66th Annual Meeting, Chicago, Illinois, United States.

Rosling, A. M., Sparén, P., Norring, C., & von Knorring, A. L. (2011). Mortality of eating disorders: A follow-up study of treatment in a specialist unit 1974–2000. *International Journal of Eating Disorders*, *44*(4), 304–310. https://doi.org/10.1002/eat.20827

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The mini-international neuropsychiatric interview (MINI): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry*, *59*(20), 22–33.

Soh, N. L. W., Touyz, S., Dobbins, T., Surgenor, L., Clarke, S., Kohn, M., Lee, E. L., Leow, V., Rieger, E., Ung, K. E. K., & Walter, G. (2008). Body image disturbance in young North European and East Asian women with and without eating disorders in Australia and in Singapore. *European Eating Disorders Review: The Professional Journal of the Eating Disorders Association*, *16*(4), 287–296.

Spindler, A., & Milos, G. (2007). Links between eating disorder symptom severity and psychiatric comorbidity. *Eating Behaviors*, *8*(3), 364–373. https://doi.org/10.1016/j.eatbeh.2006.11.012

Uher, R., & Rutter, M. (2012). Classification of feeding and eating disorders: Review of evidence and proposals for ICD-11. *World Psychiatry*, *11*(2), 80–92. https://doi.org/10.1016/j.wpsyc.2012.05.005

World Health Organization. (2019). *International statistical classification of diseases and related health problems* (11th ed.). https://icd.who.int/