

BMJ Open Cross-sectional comparison of health-related quality of life and other features in people with and without objective and subjective binge eating using a general population sample

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ABSTRACT

Objectives Evidence suggests that while objective binge eating (OBE) and subjective binge eating (SBE) differ in the amount of food consumed, both are associated with impairment in people with eating disorders. However, only OBE is accounted for in the diagnostic criteria of eating disorders. This study compared the sociodemographic profile and burden of OBE versus SBE at a population level.

Design Population-based survey.

Participants A representative sample of 3028 men and women. Participants were categorised into four groups based on their reporting of binge eating in the past 3 months: non-binge eating group (no OBE or SBE), OBE group, SBE group and OSBE group (both OBE and SBE).

Outcome measures Demographics (age, gender and body mass index, BMI), binge eating, distress, weight/shape overvaluation and health-related quality of life. Groups were compared on sociodemographic information, overvaluation and health-related quality of life. The OBE and SBE groups were also compared on the distress related to binge eating.

Results No differences were found between the SBE group and OBE group in age, gender, BMI, mental health-related quality of life and overvaluation (all $p > 0.05$). However, differences were found in the OSBE participants, namely that they were younger, had a higher mean BMI, lower mental health-related quality of life and higher overvaluation of weight/shape than the non-binge-eating participants (all $p < 0.001$). Proportions of participants who reported distress related to binge eating in the OBE and SBE groups also did not differ ($p = 0.678$).

Conclusion There is little difference in the demographic profile or burden of people who engage in OBE versus SBE, supporting the proposed inclusion of SBE in the diagnostic criteria for eating disorders in International Classification of Diseases-11. People who experience both OBE and SBE may experience a relatively higher eating disorder severity and impairment.

INTRODUCTION

Objective binge eating (OBEs) episodes are a core diagnostic criteria for both bulimia nervosa (BN) and binge eating disorder

Strengths and limitations of this study

- The study comprised a representative sample of the general population of adults, attenuating the gender bias towards young women that is frequently associated in eating disorder investigations.
- Study questionnaires were administered at interview by trained personnel, decreasing vulnerability to reporting bias.
- The cross-sectional nature of the study precludes longitudinal patient follow-up.
- All study participants were selected from the predominantly metropolitan state of South Australia, potentially reducing nationwide or international applicability.

(BED), and also often occur in patients with anorexia nervosa (AN).¹ An OBE is currently defined in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as being characterised by the sensation of a loss of control (LOC) over eating in a discrete time frame, during which the amount of food consumed is ‘definitely larger than what most people would eat’ under similar circumstances.¹ However, not only is the definition of a ‘definitely large’ amount of food subject to the practitioner’s clinical judgement,² this current criteria exclude the phenomenon of subjective binge eating (SBE). This is a form of binge eating closely related to an OBE which is also associated with LOC, and which many people with eating disorders and in the general population experience. In contrast to OBEs, SBEs involve the consumption of a small or moderate amount of food that is perceived by the individual as a binge.²

Studies comparing OBE and SBE have demonstrated considerable similarities between clinical features, outcomes and

impairment of people with these two closely related behaviours;²⁻⁴ however, there is still international dispute regarding SBEs' formal inclusion into the DSM criteria for eating disorders.

Results from recent studies have demonstrated no differences between SBE and OBE in regard to levels of associated depression, substance abuse, general psychological distress and interpersonal problems,^{3 4} and both have shown clinically significant psychological impacts of binge eating.⁵ Furthermore, studies conducted by Palavras *et al* examining the epidemiology of SBEs and OBEs have also found similar sociodemographic profiles, for example in regard to marital status and age.^{5 6} Several limitations are observed in these studies however, including a lack of samples that are representative of the general population, and frequent exclusion of men and of older individuals.^{5 6} Nonetheless, research to date suggests that when the criterion of size is removed from the definition of a binge episode, the common attribute of LOC between OBEs and SBEs becomes the remaining defining parameter.² The importance of LOC has also been suggested to be the key determinant of psychological problems, with a diminished relative importance of amount of food consumed.⁷ Ultimately, this has led researchers to question the clinical significance of size distinction in binge episodes.³

Furthermore, a 2008 study of undergraduate American women has found SBEs to be a more common experience than OBEs (16.7% and 6.4%, respectively),⁸ and could have potential clinical importance in regard to treatment of related eating disorders.⁹ A recent cohort study of 218 individuals with BN or BED by Castellini *et al* demonstrated that a higher frequency of SBEs predicted lower rates of recovery with cognitive behavioural therapy, suggesting that careful consideration of SBE as a treatment target may be important for achieving treatment goals.⁹ Previous studies have also showed that not only may SBEs be implicated in the treatment of other EDs, individuals with SBEs are less responsive to treatment than those with OBEs,^{4 7} and are more likely to experience persisting negative affect and psychopathology.¹⁰ As binge eating is a key symptom in the DSM diagnostic guidelines for BN, BED and AN binge eating/purge subtype (AN B/P),¹ the inclusion of SBEs into diagnostic criteria is therefore particularly relevant for treatment and service access.

The extent which eating disorders are associated with overvaluation is also important to consider particularly given that it is a central feature across eating disorders.¹¹ Overvaluation is the excessive importance of weight or shape on one's self-evaluation,¹¹ and is a core DSM-5 diagnostic criterion for AN and BN, but not for BED.¹² However, prior research has shown that patients with BED have reported similar levels of overvaluation as patients with BN,¹³ and subsequent studies have argued that overvaluation should be included as a BED diagnostic specifier.¹⁴ There is still some controversy regarding its inclusion however, as another study comparing OBEs

and SBEs demonstrated that neither were associated with significant difference in shape or weight concern.¹⁵ This discrepancy highlights a need for further research into this topic, particularly given that much of the existing data on overvaluation in BED has been limited by their sample bias towards women.^{11 16 17}

Currently, the WHO has recognised the potential clinical significance of SBEs, and has removed the essential requirement for the size of a binge to be large in the International Classification Diseases (ICD) for BEDs.¹⁸ In the proposed ICD-11 criteria, a binge eating episode is a 'distinct period of time during which the individual experiences a subjective loss of control over eating, eating notably more or differently than usual, and feels unable to stop eating or limit the type or amount of food eaten'. Multiple studies as described above support this revision to the WHO ICD-11 scheme.^{5 6} However, we cannot be confident of generalisation to the general population as these studies have often been conducted with clinical and community samples with restricted demographic representation. It is particularly important to include both males and older people in studies of binge eating, as disorders involving this behaviour have been demonstrated to exhibit less of a gender bias towards young females than other eating disorders.^{12 19}

The current study uses a representative community adult sample, and aims to determine whether there are differences in sociodemographic profiles (age, sex and educational attainment), levels of distress regarding binge eating episodes, overvaluation and health-related quality of life (HRQoL) between people with recurrent OBEs only, people with solely recurrent SBEs and people with combined OBEs and SBEs. Given previous research findings, we expect that based on current literature, there will be no differences in health outcomes between participants with OBE only and those with SBE only. However, we did hypothesise that those who experience combined OBEs and SBEs will have poorer health outcomes than people with solely OBEs or solely SBEs.

METHODS

Sampling procedures

This study analysed data collected in 2016 from the Health Omnibus Survey, which is a face-to-face interview survey conducted annually by Harrison Health Research. The Health Omnibus Survey has collated South Australian health data for government and non-government organisations since 1991, with individual organisations paying to include health questions that are relevant to their research.²⁰

Household samples included in the Health Omnibus Survey were randomly selected from metropolitan and rural areas in proportion to their population size as based on the Australian Bureau of Statistics collector districts. Ten households within each collector district were then selected, and the resident older than 15 years who most recently had their birthday was chosen to partake in the

interview. If the selected participant was not at home, a maximum of six repeat visits was made to the chosen household. The sample was non-replacement; meaning that if the selected individual could not be interviewed, no other persons from the household were interviewed in their place. Construct validity and interview feasibility was ensured through pilot testing of 50 members of the general public. Due to the pragmatic constraints of large household surveys, verbal consent was obtained from all interview participants and additional written parental consent from participants aged <18 years. In 2016, 5300 individuals were in the initial household sample, 80 houses were vacant, 1129 refused, 736 could not be contacted, remainder were ineligible. Total interviews were 3047, thus the overall response rate was 58.4% and participation rate 68% (initial eligible sample excluding those with non-contact after six attempts). The most cited reason for non-participation was refusal (32%).

Measures

Demographic information and body mass index

Four parameters were analysed as indicators of participant demographics. These included gender, age, highest level of educational attainment and participant body mass index (BMI; kg/m²) as calculated from their self-reported height and weight. Educational attainment was assessed through participant self-nomination from the following categories: still in school, left school before age 15, left school after age 15, left school after age 15 but still studying, trade qualification or apprenticeship, certificate or diploma (less than or equal to 1 year completed), certificate or diploma (more than 1 year completed), or bachelor degree or higher.

Objective and subjective binge eating

Endorsement of objective binge eating episodes (OBE) within the last 3 months was assessed by the following interview question: 'I would now like to ask you about episodes of overeating. By overeating, or binge eating, I mean eating an unusually large amount of food in one go and at the time feeling that your eating was out of control. Over the past three months how often have you overeaten (in this way)? Would you say...1. Not at all, 2. Less than weekly, 3. Once a week, or 4. Two or more times a week'. Similarly, the interviewer established the endorsement of SBE episodes with the following question: 'Over the past 3 months have you felt your eating was out of control when others might not agree the amount of food was unusually large (eg, 2–3 pieces of bread)? Would you say...1. Not at all, 2. Less than weekly, 3. Once a week, 4. Two or more times a week'. For both OBE and SBE episodes, the interviewer was instructed to observe that the respondent reported that they could not prevent themselves from overeating, or could not stop eating once they had started. For the purposes of this study, recurrent OBE and SBEs were defined as occurring weekly or more over the past 3 months. The OSBE group had both OBE and SBE occurring weekly for 3 months.

Distress related to binge eating

Participants who reported either recurrent OBEs or SBEs were asked two follow-up questions to establish the level of distress they experienced in relation to both their recurrent OBE and separately their recurrent SBE. Participants indicated either 'not at all', 'yes, a little' or 'yes, a lot'. In this study, marked distress was recorded when the respondent endorsed 'yes a lot'.

Health-related quality of life

Participants' HRQoL was established using the abridged 12-item Medical Outcomes Study Short Form (SF-12) questionnaire. This questionnaire measures physical function and mental health through the assessment of various domains including participants' occupational, social and emotional health.²¹ The questionnaire involves two subscales, a mental health component score (MCS) and physical health component score (PCS), which were then transformed into T-scores with a mean of 50 and SD of 10. The SF-12 has been shown to be a valid and reliable tool in assessing HRQoL in the Australian population,²² with higher scores indicating better HRQoL.²¹

Overvaluation

Overvaluation of weight and/or shape is the extent to which weight and shape influences one's self-evaluation, and was measured in this study using a question modelled from the Eating Disorder Examination²³: 'On a scale of 0–6, where 0 is Not at all important and 6 is Extremely or the most important issue, how important an issue has your weight and/or your shape been to how you think about (judge or view) yourself as a person in the past three months?' This item has been used previously in population studies to examine weight/shape concerns.²⁴

Data transformation and analysis

Data were inspected for normality and completeness. The rate of missing data was <0.5% for all variables with the exception of BMI where it was 8%. This was low and no imputation or adjustment was made. Data were weighted based on an individual's probability of selection, and then reweighted to the population distribution derived from the 2015 Estimated Resident Population, from the Australian Bureau of Statistics. The comparative frequency of OBE, SBE and both OBE and SBE in the past 3 months was tested using the X² test. Prevalence data are reported as percentages with 95% CI calculated using the Newcombe-Wilson method without continuity correction using an Excel syntax.²⁵

For the purposes of further data analysis, participants were grouped based on their endorsement of OBEs and SBEs: 1. Participants who reported neither OBE or SBE in the past 3 months (non-binge eating group), 2. Participants who reported only OBE in the past 3 months (OBE group), 3. Participants who reported only SBE in the past 3 months (SBE group) and 4. Participants who reported both OBE and SBE in the past 3 months (OSBE group). In regard to educational attainment, the collated

data were merged to form three major categories: 1. No tertiary qualifications, 2. Trade or certificate qualification and 3. Bachelor degree or higher. For the purposes of data analysis, these categories were then merged to form three major groups: no tertiary qualifications, trade or certificate qualification, or bachelor degree or higher. X^2 tests were used to compare distress related to binge eating between the OBE group and the SBE group, and to compare gender and educational attainment distribution between all four groups. Distress related to binge eating was only compared between OBE and SBE groups. We did not assess distress related to binge eating in the OSBE group as they were asked distress related to SBE and distress related to OBE, and thus included four groups of people with distress related to OBE, distress related to SBE, distress related to both OBE and SBE and no distress with either. Kruskal-Wallis tests were used to compare levels of overvaluation between the four binge eating groups, and Mann-Whitney U Test for posthoc analyses.

Two univariate analysis of variances (ANOVAs) with Tukey posthoc tests ($p < 0.05$) were performed to analyse differences in age and BMI between the four groups. HRQoL was compared between the four groups using two multivariate ANOVAs (MANCOVA), with mental health (MCS) and physical health composite scale (PCS) scores as dependent variables, and BMI, age, gender and education as covariates. Differences between groups were considered significant at $p < 0.05$. The Bonferroni correction was used for posthoc tests. All data analyses were performed using SPSS V.21.

Patient and public involvement

This was a general population study and patients were not involved in the design of the study.

RESULTS

Prevalence of OBE, SBE and OSBE

Overall, the sample consisted of $n = 3028$, including $n = 2578$ (85.1%; 95% CI 83.8% to 86.4%) who met criteria for the non-binge eating group (reported neither OBE or SBE), $n = 353$ (11.7%; 95% CI 10.6% to 12.9%) who met criteria for the OBE group (reported OBE only), $n = 20$ (0.7%; 95% CI 0.4% to 1.0%) who met criteria for the SBE group (reported SBE only) and $n = 77$ (2.5%; 95% CI 2.0% to 3.3%) who met criteria for the OSBE group (reported both OBE and SBE).

Demographic features and binge eating

As shown in [table 1](#), a significant main effect of group on age was observed, $F(3, 3023) = 27.11$, $p < 0.001$. Posthoc tests revealed that participants in the OBE ($p < 0.001$) and OSBE ($p < 0.001$) groups were on average significantly younger than participants in the non-binge eating group (medium effect sizes). There were also significant differences in BMI observed between groups, $F(3, 2746) = 16.01$, $p < 0.001$, with posthoc tests demonstrating

higher mean BMI in the OSBE group when compared with all other groups (medium to large effect sizes) and the OBE group also demonstrated a significantly higher mean BMI when compared with the non-binge eating group (small effect size). No differences in gender distribution or educational attainment were observed between groups (all $p > 0.05$).

Overvaluation

As shown in [table 1](#), a main effect of group on overvaluation was observed. Posthoc testing demonstrated significantly higher levels of overvaluation in the OBE group (median=4.0) and OSBE groups (median=4.0) when compared with the non-binge eating group (median=3.0), $U = 359\ 274.00$, $Z = -6.051$, $p < 0.001$, $r = -0.11$ and $U = 71\ 848.50$, $Z = -3.89$, $p < 0.001$, $r = 0.07$, respectively. The OSBE group also scored higher on overvaluation compared with the SBE group (median=2.9), $U = 495.50$, $Z = -2.14$, $p = 0.03$, $r = 0.22$. Effect sizes were small. No significant differences were revealed between the OBE and SBE groups, $p = 0.06$.

Distress related to binge eating

As shown in [table 1](#), no significant differences in distress related to binge eating were demonstrated between OBE and SBE groups (all $p > 0.05$).

Health-related quality of life

A main effect of group on MCS scores was observed, $F(3, 2714) = 7.8$, $p < 0.001$. On posthoc testing, the OSBE group demonstrated significantly lower MCS scores on average when compared with the OBE (small effect size) and non-binge eating (medium effect size) groups. No effect of group was observed for PCS scores (see [table 2](#)).

DISCUSSION

The present study investigated similarities and differences in four groups of people recruited from a community sample, namely people who did not binge eat (non-binge eating group), people who reported regular OBEs (OBE group), people who reported regular SBEs (SBE group) and people who reported both OBEs and SBEs (OSBE group). We found significant similarities between the OBE and SBE groups across all measures. This supports previous research indicating that subjective binge eating is associated with similar health-related consequences and eating-related psychopathology as DSM-5 recognised OBEs.^{3-7 18}

With regard to demographic profiles, participants of the SBE and OBE groups were of a similar age, which is consistent with prior research generally indicating a marked demographic similarity between SBE and OBE groups.^{4 5 26} Study results also showed that those in the non-binge eating group were on average 7 years and 10 years older than participants of the OBE and OSBE groups, respectively. This is in contrast to the results of Dalle Grave *et al* which found non-binge eating participants

Table 1 Descriptive statistics between groups for gender, age, body weight and educational attainment

	N	1. Non-binge eating (n=2578)	2. OBE (n=353)	3. SBE (n=20)	4. OSBE (n=77)	Statistic	P value	Posthoc	Effect size
Age, M (SD)	3026	47.1 (18.8)	40.0 (15.6)	46.4 (15.9)	37.4 (15.8)	F=27.11, df=3, 3023	<0.001	1>2 1>4	d=0.44 95% CI 0.33 to 0.55 d=0.57 95% CI 0.34 to 0.79
BMI kg/m ² ,* M (SD)	2749	26.7 (5.2)	28.0 (5.6)	26.0 (4.9)	30.5 (6.7)	F=16.01, df=3, 2746	<0.001	1<2 1<4 2<4 3<4	d=-0.26 95% CI -0.38 to -0.14 d=-0.71 95% CI -0.95 to 0.46 d=-0.41 95% CI -0.67 to -0.14 d=-0.60 95% CI -1.11 to -0.58
Gender, n (%)	3047					$\chi^2=4.17$, df=3	0.244	n.a.	n.a.
Male		1260 (48.9)	187 (53.0)	7 (35.0)	35 (45.5)				
Female		1318 (51.1)	166 (47.0)	13 (65.0)	42 (54.5)				
Education, n (%)	3045					$\chi^2=12.119$, df=6	0.059	n.a.	n.a.
No tertiary qualification		1014 (39.4)	130 (36.8)	5 (25.0)	33 (42.9)				
Trade or certificate		954 (37.0)	115 (32.6)	7 (35.0)	28 (36.4)				n.a.
Bachelor or higher		608 (23.6)	108 (30.6)	8 (40.0)	16 (20.8)				
Distress related to binge eating, n (%)	353		108 (30.6)	7 (35)		$\chi^2=0.172$, df=1	0.804*	n.a.	n.a.
Overvaluation, median (IQR)	2993	3.0 (1.0, 3.0, 4.0)	4.0 (2.0, 4.0, 5.0)	2.9 (1.0, 2.9, 4.6)	4.0 (3.0, 4.0, 5.0)	Kruskal-Wallis H=49.537, df=3	<0.001	1<2 1<4 3<4	r=0.11 r=0.07 r=0.22

*Distress was only compared between OBE only (353) and SBE only (20) groups, Fisher exact test used. BMI, body mass index; d, Cohen's d; OBE, recurrent objective binge eating alone; n.a., not applicable; OSBE, mixed objective and subjective recurrent binge eating episodes; r = Z/square root (n1 + n2); SBE, recurrent subjective binge eating alone.

were of similar age to those in the OBE and SBE groups.²⁷ A possible explanation for this difference is that the Dalle Grave study had a very small sample size (33–36 participants) in each binge-eating group and was less representative than the sample in the present study. It also suggests that binge eating may disproportionately affect younger people, although other evidence suggests that the age of

onset for BED is older than for other eating disorders (eg, AN and BN). We also found no effect of gender. Current literature is divided on this subject, with some research demonstrating a small female gender bias,²⁸ and other studies that report an equal prevalence of binge eating among men and women.²⁹ However, the overall trend of research to date does suggest that gender bias towards

Table 2 Effect of binge group on health-related quality of life

	1. Non-binge eating (n=2318)	2. OBE (n=319)	3. SBE (n=18)	4. OSBE (n=67)	MANCOVA	Posthoc	Cohen's d, 95% CI
MCS	53.0 (8.3)	51.6 (8.1)	51.1 (7.4)	47.4 (11.6)	F (3, 2714)=7.8, p<0.001	1<4 2<4	0.67, 0.42 to 0.91 0.38, -0.14 to 0.90
PCS	49.3 (9.8)	49.4 (9.7)	50.3 (5.9)	48.5 (9.7)	F (3, 2714)=1.2, p=0.293		n.a.

MANCOVA analyses include BMI, age, gender and education as covariates. ANOVA, analysis of variance; MANCOVA, multivariate ANOVA; MCS, mental health component score; OBE, recurrent objective binge eating alone; n.a., not applicable; OSBE, mixed objective and subjective recurrent binge eating episodes; PCS, physical health component score; SBE, recurrent subjective binge eating alone.

young women is less prevalent in BED than for other eating disorders.^{19 20} Likewise, there were no differences observed in our study based on educational attainment, similar to previous research with BED patients^{4 26} and where differences were found effect sizes were not large.

Regarding BMI, no significant differences were demonstrated between participants of the OBE and SBE groups, which might be surprising given that these behaviours differ based on the amount of food consumed. While a 2010 paper by Mond and colleagues indicated that regular endorsement of OBEs was associated with a significantly higher BMI than regular endorsement of SBEs,³⁰ the results of our study are generally consistent with prior data.^{4 5 29} On the other hand, as expected, participants who experienced both OBEs and SBEs were found to have a significantly higher average BMI than participants who only reported OBEs or SBEs, and participants who only reported OBEs had a significantly higher average BMI than participants who did not binge eat. However, effect sizes were not large.

Study results showed that participants of the OBE and SBE groups demonstrated remarkable similarity with regard to distress related to binge eating. This is consistent with current literature, which has found the size of the binge to be irrelevant to the extent of general psychological distress experienced.^{3 6} The reason for this finding has been postulated to be due to LOC over eating, which is a shared phenomenon between OBEs and SBEs that is thought to be more important than binge size in determining the degree of impairment experienced.^{6 7}

Similarly, there was also no difference between the OBE and SBE groups with respect to HRQoL, which is in concordance with prior research.²⁹ While we found poorer mental health among individuals with OSBE when compared with individuals of the OBE and non-binge eating groups, supporting our preliminary hypothesis that the OSBE group would likely have poorer health outcomes than other groups, the effect sizes were not large. Notably, a previous study of 214 women found that relative to non-binge eating patients, SBE and OBE participants showed markedly poorer health outcomes in the mental health domain³¹; however, our study did not specifically demonstrate poorer quality of life among participants who only endorsed recurrent (weekly) OBEs or SBEs when compared with the non-binge eating group. Previous research from our group in the South Australian population has found the impact of weekly OBEs on mental HRQoL appears to be reducing since 1998, but when OBEs occurred two times weekly there was significant impact on mental HRQoL.³²

With regard to overvaluation, this study showed results to be comparable between the OBE and SBE groups, which is in support of current literature describing a similar level of weight and shape concern between individuals who regularly engage in OBEs versus SBEs.^{4 30} Furthermore, and as would be expected based on prior findings, body shape overvaluation was higher among participants in our study who endorsed any type of binge eating than

in non-binge eating participants. While previous studies show that endorsement of both OBEs and SBEs does not appear to increase shape and weight concern,³⁰ our study did demonstrate significantly higher levels of overvaluation in the OSBE group when compared with the SBE and non-binge eating groups, which again supports our preliminary hypothesis.

While there is currently little research specifically examining the effect of engaging in both OBEs and SBEs, our results also showed that people who endorsed both types of binge eating (the OSBE group) generally demonstrated the poorest outcomes in health-related measures such as BMI, HRQoL and overvaluation. It is possible that participants who reported both OBEs and SBEs engage in more frequent binge eating, although as binge eating was assessed as a categorical variable, this cannot be ascertained. This is a group that warrants further investigation.

Finally, it is of note that endorsing only OBEs was far more prevalent (11.7%) than endorsing both OBEs and SBEs (2.5%) or SBEs alone (0.7%). These findings are in contrast to prior research demonstrating that SBEs were more commonly experienced than OBEs,^{8 30} with SBE versus OBE rates reported to be as high as 16.7% and 6.4%, respectively.⁸ Demographic and temporal differences in samples may explain this finding as well as the possibility that the size of binge eating episodes may be increasing with time. However, this speculation requires further research.

Strengths and limitations

One of the main strengths of this study is its large sample size and inclusion of a representative sample of the general population of adults, which is in contrast to many previous studies that have had a greater bias towards young women from treatment settings in their sample selection.^{5 6} This is particularly relevant in BEDs where prevalence in men has been shown to be approximately equal to those in women.^{19 20 29} Another study strength is its use of trained personnel to conduct the survey interviews, increasing the validity and reliability of study results. Furthermore, the specific analysis of OSBE endorsement is a novel aspect of this paper, as investigating a binge eating subpopulation is rarely exclusively studied despite its poorer health outcomes. However, several limitations of this study should also be noted. First, despite the large sample size, there were a relatively low number of participants who reported SBEs, which may have decreased the power to find significant differences between groups, and there were uneven group sizes. Second, the cross-sectional nature of the study means that there is no longitudinal follow-up, therefore precluding any causal inferences regarding the association between binge eating and the outcomes measured. Third, as mentioned previously, binge eating was not assessed as a continuous variable, which precluded our ability to compare and assess the effects of frequency of binge episodes on health outcomes. Fourth, OBE and SBE participants were characterised by recurrence in the last 3 months; however, the

SF-12 measures quality of life for the past 4 weeks; thus, there was only partial assessment of quality of life over the designated time period. Fifth, BMI was calculated from self-reported height and weight, and this lack of standardised measuring may have resulted in data inaccuracies. Finally, all study participants were from the largely metropolitan state of South Australia, so results may not generalise nationwide or internationally.

Study implications

Overall, our finding that SBE and OBE participants are comparable across all measured indices is consistent with prior research demonstrating that the size of the binge eating episode is a relatively less important factor in determining mental and physical health implications.^{3 6 7} This is supportive of the new ICD-11 revision proposal, which moves to discard the parameter of binge size in the classification of binge eating in an effort to improve rates of detection and treatment for all binge eating subpopulations.

Another implication of the current findings is that further investigation is required for the binge eating subpopulation that endorses both SBEs and OBEs. Results demonstrating that OSBE participants had the worst health outcomes indicate a need for greater awareness of this subpopulation among health researchers and clinicians, as this should lead to improvements in treatment.

Additionally, the finding that sex differences are negligible in the endorsement of BED has significant implications in challenging the historical view that eating disorders are endorsed by a predominantly young, female population. Currently, the vast majority of eating disorder prevention programmes are targeted towards young adolescent and adult women;³³ however, the current findings support the need for intervention programmes that are more relevant and targeted to men. There is thus a greater role for improvement of health literacy in the community and health professionals to increase awareness of BED in men and improve rates of male treatment seeking and referral.

Future research

In regard to future research, the results of this study open up several potential avenues for further exploration. In particular, there needs to be further studies in representative community samples using a longitudinal design to examine the clinical impacts of SBEs compared with OBEs on HRQoL and other outcomes. As well, further research into the characteristics and health implications of individuals with both OBEs and SBEs should be considered.

CONCLUSION

The current finding that there is a strong similarity in clinical features between individuals experiencing OBEs and individuals experiencing SBEs has a significant implication in the diagnosis and treatment of SBEs. Thus, in concordance with prior research, this paper supports the

inclusion of SBEs in the diagnostic criteria for eating disorders characterised by recurrent binge eating, as currently proposed by the ICD-11 Feeding and Eating Disorders Working Group. The findings also highlight the need for a more gender-equal approach to eating disorder prevention, as well as a more thorough and specific investigation into the health implications of OSBE endorsement.

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Competing interests PH receives/has received sessional fees and lecture fees from the Australian Medical Council, Therapeutic Guidelines publication and New South Wales Institute of Psychiatry and royalties/honoraria from Hogrefe and Huber, McGraw Hill Education and Blackwell Scientific Publications, Biomed Central and PlosMedicine and she has received research grants from the NHMRC and ARC. She is Deputy Chair of the National Eating Disorders Collaboration Steering Committee in Australia (2012–) and Member of the ICD-11 Working Group for Eating Disorders (2012–2018) and was Chair Clinical Practice Guidelines Project Working Group (Eating Disorders) of RANZCP (2012–2015). She has prepared a report under contract for Shire Pharmaceuticals in regard to Binge Eating Disorder (BED; July 2017) and received honoraria and travel support for teaching Psychiatrists from Shire Pharmaceuticals (2018). All views in this paper are her own. ST is the Chair of the Shire Australasian BED Advisory Committee. He has received both research grants and travel grants from Shire and has received consultancy fees for both commissioned reports and speaking engagements. He is also in receipt of royalties from McGraw Hill for contribution to text books.

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REFERENCES

1. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders: DSM-5*. 5th edn. Arlington: American Psychiatric Publishing Inc, 2013.
2. Wolfe BE, Baker CW, Smith AT, *et al*. Validity and utility of the current definition of binge eating. *Int J Eat Disord* 2009;42:674–86.
3. Niego SH, Pratt EM, Agras WS. Subjective or objective binge: is the distinction valid? *Int J Eat Disord* 1997;22:291–8.
4. Brownstone LM, Bardone-Cone AM, Fitzsimmons-Craft EE, *et al*. Subjective and objective binge eating in relation to eating disorder symptomatology, negative affect, and personality dimensions. *Int J Eat Disord* 2013;46:66–76.
5. Palavras MA, Morgan CM, Borges FM, *et al*. An investigation of objective and subjective types of binge eating episodes in a clinical sample of people with co-morbid obesity. *J Eat Disord* 2013;1:26.
6. Palavras MA, Hay PJ, Lujic S, *et al*. Comparing symptomatic and functional outcomes over 5 years in two nonclinical cohorts characterized by binge eating with and without objectively large episodes. *Int J Eat Disord* 2015;48:1158–65.

7. Latner JD, Clyne C. The diagnostic validity of the criteria for binge eating disorder. *Int J Eat Disord* 2008;41:1–14.
8. Luce KH, Crowther JH, Pole M. Eating Disorder Examination Questionnaire (EDE-Q): norms for undergraduate women. *Int J Eat Disord* 2008;41:273–6.
9. Castellini G, Mannucci E, Lo Sauro C, *et al*. Different moderators of cognitive-behavioral therapy on subjective and objective binge eating in bulimia nervosa and binge eating disorder: a three-year follow-up study. *Psychother Psychosom* 2012;81:11–20.
10. Goldschmidt AB, Accurso EC, Crosby RD, *et al*. Association between objective and subjective binge eating and psychopathology during a psychological treatment trial for bulimic symptoms. *Appetite* 2016;107:471–7.
11. Hrabosky JI, Masheb RM, White MA, *et al*. Overvaluation of shape and weight in binge eating disorder. *J Consult Clin Psychol* 2007;75:175–80.
12. Hay P, Girosi F, Mond J. Prevalence and sociodemographic correlates of DSM-5 eating disorders in the Australian population. *J Eat Disord* 2015;3:19.
13. Masheb RM, Grilo CM. Binge eating disorder: a need for additional diagnostic criteria. *Compr Psychiatry* 2000;41:159–62.
14. Mitchison D, Rieger E, Harrison C, *et al*. Indicators of clinical significance among women in the community with binge-eating disorder symptoms: Delineating the roles of binge frequency, body mass index, and overvaluation. *Int J Eat Disord* 2018;51:165–9.
15. Fitzsimmons-Craft EE, Ciao AC, Accurso EC, *et al*. Subjective and objective binge eating in relation to eating disorder symptomatology, depressive symptoms, and self-esteem among treatment-seeking adolescents with bulimia nervosa. *Eur Eat Disord Rev* 2014;22:230–6.
16. Grilo CM, Hrabosky JI, White MA, *et al*. Overvaluation of shape and weight in binge eating disorder and overweight controls: refinement of a diagnostic construct. *J Abnorm Psychol* 2008;117:414–9.
17. Harrison C, Mond J, Rieger E, *et al*. Correlates of binge eating with and without overvaluation of weight or shape: further evidence from a general population sample of women. *Adv Eat Disord* 2015;3:20–33.
18. World Health Organisation. The 11th Revision of the International Classification of Diseases (ICD-11). 2018 <http://www.who.int/classifications/icd/revision/en/> (Accessed 27 Aug 2018).
19. Mitchison D, Mond J. Epidemiology of eating disorders, eating disordered behaviour, and body image disturbance in males: a narrative review. *J Eat Disord* 2015;3:20.
20. Health GoSADo. Health omnibus survey 2008. 2008 <http://www.health.sa.gov.au/pros/Default.aspx?tabid> (Accessed 18 Mar 2011).
21. Ware J, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: construction of scales and preliminary tests of reliability and validity. *Med Care* 1996;34:220–33.
22. Lim LL, Fisher JD. Use of the 12-item short-form (SF-12) Health Survey in an Australian heart and stroke population. *Qual Life Res* 1999;8(1-2):1–8.
23. Cooper Z, Fairburn C. The eating disorder examination: a semi-structured interview for the assessment of the specific psychopathology of eating disorders. *Int J Eat Disord* 1987;6:1–8.
24. Hay P, Mitchison D, Collado AEL, *et al*. Burden and health-related quality of life of eating disorders, including Avoidant/Restrictive Food Intake Disorder (ARFID), in the Australian population. *J Eat Disord* 2017;5:21.
25. Newcombe RG. Interval estimation for the difference between independent proportions: comparison of eleven methods. *Stat Med* 1998;17:873–90.
26. Mulders-Jones B, Mitchison D, Girosi F, *et al*. Socioeconomic correlates of eating disorder symptoms in an Australian population-based sample. *PLoS One* 2017;12:e0170603.
27. Dalle Grave R, Calugi S, Marchesini G. Objective and subjective binge eating in underweight eating disorders: associated features and treatment outcome. *Int J Eat Disord* 2012;45:370–6.
28. Striegel-Moore RH, Rosselli F, Perrin N, *et al*. Gender difference in the prevalence of eating disorder symptoms. *Int J Eat Disord* 2009;42:471–4.
29. Hudson JI, Hiripi E, Pope HG, *et al*. The prevalence and correlates of eating disorders in the National Comorbidity Survey Replication. *Biol Psychiatry* 2007;61:348–58.
30. Mond JM, Latner JD, Hay PH, *et al*. Objective and subjective bulimic episodes in the classification of bulimic-type eating disorders: another nail in the coffin of a problematic distinction. *Behav Res Ther* 2010;48:661–9.
31. Vallance J. *The relationship between eating disorder psychopathology and quality of life within a non-clinical sample*. Christchurch: University of Canterbury, 2006.
32. Mitchison D, Touyz S, González-Chica DA, *et al*. How abnormal is binge eating? 18-Year time trends in population prevalence and burden. *Acta Psychiatr Scand* 2017;136:147–55.
33. Stice E, Becker CB, Yokum S. Eating disorder prevention: current evidence-base and future directions. *Int J Eat Disord* 2013;46:478–85.