Chew and spit (CHSP) in a large adolescent sample: prevalence, impact on health-related quality of life, and relation to other disordered eating features

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Chew and spit (CHSP) in a large adolescent sample: prevalence, impact on health-related quality of life, and relation to other disordered eating features

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ABSTRACT
A recent general population study of Chew and Spit (CHSP) behavior in adults found a 0.4% prevalence, predominantly in females. The current study explores this further by examining the same phenomenon in secondary-school aged adolescents. This study also explores the relationship between CHSP and other demographic and eating disorder (ED) features in 5111 adolescents (11-to-19 years of age) from 13 schools in New South Wales, Australia. Participants completed measures of ED symptoms and behaviors and change to impairment with two components: psychological distress (K-10) and health related quality of life (HRQoL; PedsQL). CHSP was found to have a 12.2% (95% CI 0.114, 0.132) point-prevalence rate. Participants who indicated engaging in CHSP reported significantly higher levels of psychological distress (K-10) and lower HRQoL scores (PedsQL) compared to those that did not report CHSP. There was a dose-response relationship between CHSP frequency, psychological distress and HRQoL physical scores but not for HRQoL emotional and HRQoL social scores. Participants who reported regular CHSP were more likely to be female, younger, and to engage in compensatory behaviors such as purging. The high frequency of CHSP behavior in adolescents with disordered eating could suggest that CHSP should be considered in routine ED screening practices. Future studies may examine how to treat CHSP or investigate more focused treatment approaches, in order to target the behavior of CHSP more directly.

Clinical Implications
- Raise clinical awareness of Chew and Spit
- Identify Chew and Spit associations with other eating disorders
- Identify potential risk factors (e.g. age) associated with Chew and Spit behavior

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Chew and Spit (CHSP) is the pathological chewing of food and spitting it out before swallowing, often as a weight management technique by individuals with disordered eating (Aouad, Hay, Soh, & Touyz, 2016). As of 2013, the CHSP symptom no longer appears in the American Psychiatric Association Diagnostic and Statistical Manual (DSM) of mental disorders (American Psychiatric Association, 2000, 2013; Aouad et al., 2016; Aouad, Hay, Soh, & Touyz, 2018). However, evidence from the 2016 South Australian Health Omnibus Survey (Dal Grande, 2017) demonstrates that there is a 0.4% point-prevalence in a large adult population-representative community sample (Aouad et al., 2018). Moreover, CHSP was associated with poorer mental and physical health related quality of life (HRQoL) and severe weight control behaviors (Aouad et al., 2018). This supports consideration of reintroducing CHSP as a symptom in future revisions of the DSM, as its prevalence is similar to other disordered eating behaviors such as purging in the absence of binging (Fear, Bulik, & Sullivan, 1996; Reba-Harrelson et al., 2009; Solmi, Hatch, Hotopf, Treasure, & Micali, 2014).

Currently, those who often engage in CHSP are thought to include individuals with eating disorders (ED), some medical patients, bariatric patients, and athletes (Aouad et al., 2016, 2018). However, there remains a paucity in knowledge into the prevalence and impact of CHSP in adolescents, and whether the clinical presentation of CHSP may differ amongst young people, aged 14 to 20 years, i.e. the typical age of onset of an ED (Killen et al., 1994; Stice, Killen, Hayward, & Taylor, 1998; Stice, Marti, & Rohde, 2013; Woodside & Garfinkel, 1992). In clinical samples, adolescents in ED inpatient treatment who engaged in CHSP have been found to be younger than those who did not CHSP, when matched by age and gender (Aouad et al., 2016).

The main aim of the current study was to estimate the CHSP point-prevalence in a large adolescent sample and describe the demographic features, ED features, and HRQoL in young people who engage in CHSP. Based on the research findings above (Aouad et al., 2018), it was predicted that: 1) The point prevalence of CHSP in adolescents will be higher than the prevalence in adults . 2) The likelihood of reporting other ED symptoms is expected to be higher among adolescents who report CHSP than those who do not report CHSP. 3) The prevalence of CHSP i.e. expected to be higher in girls than in boys. 4) Adolescents with CHSP will be younger than those who do not engage in CHSP behavior. 5) The mental and physical health related quality of life will be lower in those with CHSP compared to those without CHSP.

**Method**

**Materials and procedure**

The EveryBODY (Trompeter et al., 2018) study, which commenced in 2017, is an Australian longitudinal research inquiry into eating and body image
disturbances among adolescents. Data for this paper were drawn from the first wave of the study, with a final dataset of 5111 adolescents between the ages of 11 and 19 years (\(M = 14\) years, 11 months). Participants were eligible to take part in the study only if they were enrolled as a student at one of the participating secondary-schools in New South Wales, Australia, and were able to physically attend school on the day of testing.

Researchers initially approached principals and welfare staff of 50 secondary schools outside of Sydney, Australia and across the Newcastle and Hunter region of New South Wales, Australia. Of the 50 schools contacted, 18 schools (36%) initially agreed to take part in the study. Of these 18 schools, six withdrew their participation due to conflicting time commitments (\(n = 5\)) and concerns regarding controversial topics such as gender identity and dating (\(n = 1\)) prior to commencing the study. Other reasons for non-participation of schools included conflicting obligations and commitment to pre-existing research studies, time constraints, and insufficient staff numbers to oversee the administering of the study. To increase ethnic diversity among the sample, an additional seven Sydney-based schools were invited to participate: Two schools agreed to participate, with one withdrawing prior to the commencement of the study due to other commitments. Thus, a total of 13 schools participated in the research project. Independent (private) schools were slightly over-represented compared to the Australian general population (33.3% vs. 14.46%) compared to government (public) schools. Enrolment across all 13 participating schools ranged between 514 to 1305 students, with an average of 70% of enrolled students participating in the study.

Human research ethics approval was obtained from Macquarie University’s Human Research and Ethics Committee (HREC) and the NSW Department of Education. Unless stipulated by the school, all students were invited to participate in the study. Information letters to students and parents, as well as school-newsletter bulletin inserts, were distributed by participating schools prior to the study date. A passive parental consent procedure was used, where consent was assumed unless parents actively chose to have their children not take part in the survey, this required parents to notify the school that they did not wish their child to participate. Further to this, consent to participate was also obtained from young persons (assent) who were asked about their willingness to take part in the current study.

Under the supervision of their respective teachers, students completed an online questionnaire on the day of testing. Only students who provided assent (agreed on their own accord when asked by their teacher if they would like to participate in the current study), and who had obtained parental consent were provided with a copy of the survey to complete. The questionnaire consisted of questions covering demographic features, eating behaviors and pathology, body weight and shape concerns, general physical health, psychological distress, quality of life (QoL), social media usage, bullying, gender characteristics, sexuality, and relationships.
Participants

Of the participants who commenced the survey ($N = 5191$), 80 were excluded: 79 were identified as non-serious responders with potentially unreliable data, and 1 participant withdrew consent. Non-serious responders were identified by inappropriate or incomplete answers to text-based questions and further cross-checking of their responses indicated concerns over the legitimacy of their other responses. This left a total of 5111 participants in the current study sample. Of these, 2458 (48.1%) identified as female, 2154 (42.1%) as male, and 40 (0.8%) identified as other genders, 459 (9%) participants chose not to provide an answer. Regarding country of birth, 89.5% were born in Australia, 5.6% in Asia, 2.1% in Europe, 1.2% in the Oceania and Pacific region (not including Australia), 0.9% in Africa, 0.5% in North Africa, 0.1% in South America, and 0.1% did not specify their country of birth.

Measures

**Chew and spit (CHSP) frequency**

Chew and Spit (CHSP) frequency was assessed using one-item as part of the eating behaviors component of the questionnaire, which started with the stem: “... Over the past 4 weeks (28 days), how many times have you ... (give your best guess)”. Participants were then presented with a range of behaviors, including “... spat out food before swallowing it?”. Respondents were required to enter a numeric value, which was then categorized based on current DSM-5 (2013) BN frequency, as there are currently no-known clinical cut-off’s that have been defined for CHSP: no CHSP; CHSP once per week (1–3 times in the 28 days prior to participation), CHSP twice per week (4–7 times in the 28 days prior to participation), CHSP more than twice per week (8+ times in the 28 days prior to participation). There are no well validated measure of CHSP for use in large epidemiological surveys. The questions in this study were adapted from those asked in the larger adult survey which had demonstrated convergent validity with measures of mental health impairment and eating disorder symptoms. Moreover, the question relating to CHSP, in the current study, adapts the Eating Disorder Examination: Bariatric Surgery Version (EDE: BSV; Fairburn & Cooper, 2008) specifically, the first two questions of the EDE: BSV, which asks about the presence of CHSP and frequency as two separate questions.

**Psychological distress (K-10) and health related quality of life (HRQoL; PedsQL)**

*Psychological Distress—K-10:* Psychological Distress, was measured using the Kessler Psychological Distress Scale (K-10) (Andrews & Slade, 2001; Kessler et al., 2002). This scale was selected due to the brevity of administration time, simplicity of questions asked, and the ability of the K-10 to discriminate
between clinical and non-clinical cases of psychological distress (Kessler et al., 2002). Items used a 5-point Likert scale (ranging from 1. None of the Time to 5. All of the Time), and items were summed to provide a total score out of 50—where higher scores indicate greater psychological affliction. Validation studies of the K-10 indicate that it has adequate validity and reliability (Cronbach’s alpha (α) for current sample = 0.94) and has been widely used in epidemiological studies in adolescents (Smout, 2019).

Health Related Quality of Life (HRQoL)—PedsQL: Items from the Pediatric Quality of Life Inventory (PedsQL) were used to measure health-related quality of life (Varni, Seid, & Kurtin, 2001) across the domains of emotional, social, and physical functioning. The items center around the physical cues and wellbeing that impact each of the examined factors (Varni et al., 2001). The PedsQL was used given the excellent internal consistency (Cronbach’s α of 0.99), for the child-report, as well as being a well validated measure of HRQoL for this cohort (Varni et al., 2001). For the current study, participants completed items for the emotional, social and physical subscales. Cronbach’s α for this study was 0.92.

Eating pathology and control variables
In addition, data related to demographic features, eating behaviors and weight and shape concerns were also collected.

Weight/shape concerns and Eating Pathology (EDE-Q): Participants’ weight/shape concerns were assessed using the combined weight and shape concerns subscales of the EDEQ (Fairburn, Cooper, & O’connor, 2008; Mond et al., 2014). These scales require participants to rate the severity and frequency of weight and shape concerns using a 7-point Likert scale (0 = No days/Not at all to 6 = Everyday/Markedly). The weight and shape concerns subscale has shown good reliability among Australian adolescents (Australian Bureau of Statistics, 2016b; Centers for Disease Control and Prevention, 2017; Fairburn et al., 2008; Fairburn & Beglin, 1994; Mond et al., 2014; Mond, Hay, Rodgers, Owner, & Beumont, 2004). In the current study, the measure had excellent internal reliability (α = 0.96). Objective binge eating, subjective binge eating, purging (emesis), laxative use, fasting for 8 or more hours, strict dieting and compulsive exercise were also measured with the respective EDE-Q items for these behaviors. The EDE-Q is a very well validated measure having been used extensively to study pathological eating (Aardoom, Dingemans, Op’t Landt, & Van Furth, 2012; Mond et al., 2004).

Socioeconomic Status: Socio-Economic Status (SES) of cohorts was indirectly measured by determining the SES of the school, using the Index of Community Socio-Educational Advantage (ICSEA; NSW Department of Education, 2017). More specifically, it is a standardized (M = 1000, SD = 100) measure of educational advantage provided to schools and is based on parental education and occupation, location, and promotion of Indigenous (Aboriginal and Torres Strait Islander) enrolment numbers (Australian Bureau of Statistics, 2016a).
Scores for participating schools ranged from 909–1129, with a mean score of 1035 (SD = 60.91), which is within 1SD of the standardized mean; with lower scores indicating a lower socio-economic status.

Demographic variables: Age, SES, and migrant status (measured by “born in Australia” compared to “born overseas”) were used as control variables. Postal area index scores were used as the proxy indicator for SES—an index of relative socio-economic advantage and disadvantage assigned to each postcode (equivalent to ZIP codes) by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2016a). These indices are standardized (M = 1000; SD = 100), and provide an indirect measure of participants’ socio-economic status, with higher scores indicating residence in more socio-economically advantaged areas (Australian Bureau of Statistics, 2016a; Trompeter et al., 2018).

Data analysis

Frequencies were used to identify the point-prevalence of CHSP. Chi square analyses were used to determine the association between CHSP and other ED behaviors. Cut-off, or reference, scores for the presence of ED symptoms included: 0 for CHSP frequency: ≥ 4 for EDE-Q combined weight and shape subscales, and overeating, emesis (vomiting), laxatives, and fasting for ≥ 8 hours (other than sleep) episodes; and ≥ 12 times in the past 28 days for strict dieting and exercise (Fairburn & Beglin, 1994; Trompeter et al., 2018). As CHSP was previously mentioned in the DSM-IV (APA, 2000), cut-off’s for CHSP frequency groups were in-line with frequency categories of other behaviors. For example, according to the DSM-5 (2013), Bulimia Nervosa is categorized into mild: 1–3 episodes per week, moderate: 4–7 episodes per week, and severe/extreme: ≥8 episodes per week). A chi-square analysis was also used to compare gender differences in CHSP. A one-way analysis of variance (ANOVA) was used to determine age differences in CHSP prevalence. Lastly, mixed effects linear regression models were used to compare psychological distress and HRQoL outcomes between CHSP (one or more vs none) as well as CHSP frequency groups (0 episode, 1–3 episodes, 4–7 episodes, 8+ episodes) while controlling for the effects of potential confounding due to other ED psychopathology and demographics (age, gender, SES and migrant status). Measures of other ED psychopathology included in the models were the EDE-Q combined weight/shape concerns subscales, overeating, objective binge eating, subjective binge eating, purging (emesis), laxative use, fasting for 8 or more hours, strict dieting and compulsive exercise. Multiple imputation (MI) (25 imputations) was used, as it is a highly reliable and valid method to address missing data in statistical analysis (Rubin, 1996). Further, the regression results were pooled using Rubin’s rules (1987). A two-level linear mixed effects model was required to be used for each outcome variable as stated earlier, as it was found that there is clustering of participants within schools as evidenced by the following findings.
Estimated intraclass correlation coefficients (ICCs) were used to test effects of clustering by schools for each outcome variable. These were significantly different from zero, i.e. the likelihood ratio test was significant, when the outcomes were psychological distress (LR statistic = 47.1, df = 14 with \( p < .0001 \)), emotional HRQoL (LR statistic = 33.2, df = 14 with \( p < .01 \)), social HRQoL (LR statistic = 45.7, df = 14 with \( p < .0001 \)), and physical HRQoL (LR statistic = 32.2, df = 14 with \( p < .01 \)), respectively. Moreover, there was no clustering of the four outcome variables within the participants as the likelihood ratio test for assessing clustering of these variables within the participants is non-significant (LR statistic = 1.1, df = 20444, \( p = 1.0 \)). Hence, separate analysis for each of the outcome in the current study, was considered preferable.

Furthermore, parametric testing of weighted data, using weights based on the 2016 Census gender data for 10–19 year-old adolescents in Australia (Australian Bureau of Statistics, 2016b), was used to compare the demographics of participants who reported CHSP in our survey to those of the 2016 adolescent census population. This ensured that if there was any oversampling of males or females in our survey, its effect was removed from the demographics of study participants which were reported in this article. All data analyses were conducted with SPSS version 24 and SAS version 9.4 (SAS Institute, 2014).

**Results**

**Point prevalence of CHSP**

The point prevalence of at least one weekly CHSP episode in the 28-days prior to the study, among the entire sample, was 12.2% (95% CI 0.114, 0.132) (\( n_{CHSP} = 627 \); \( n_{No \ CHSP} = 4473 \)). Of these, 62.8% (\( n = 394 \)) reported engaging in the behavior at least once in the prior month, 19.9% (\( n = 125 \)) 4 to 7 times/month, and 17.2% (\( n = 104 \)) 8 or more times/month). Point-prevalence by CHSP frequency was noted at: 1–3 episodes of CHSP was 7.7% (\( n = 392 \)), 4–7 episodes was 2.5% (\( n = 125 \)), and 8 or more episodes of CHSP in the 28 days prior to participating in the study was 2.1% (\( n = 108 \)).

**Occurrence of CHSP with other ED behaviors and weight/shape concerns**

Significant relationships between CHSP frequency and disordered eating behaviors (subjective binge eating, laxative abuse, vomiting and fasting) and weight/shape concerns were observed (Table 1). The association was negative for overeating, LOC with objective overeating, LOC with subjective overeating, and fasting. Weight/shape concerns, laxative abuse and vomiting had a significant positive relationship with CHSP frequency. CHSP frequency was not significantly associated with either strict dieting or exercise.
Table 1. 2 × 2 Chi-square test results for association between CHSP frequency in the 28 days prior to the study and other eating disorders.

<table>
<thead>
<tr>
<th>Behavior</th>
<th>1-3 episodes</th>
<th></th>
<th>4-7 episodes*</th>
<th></th>
<th>8+ episodes*</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\chi^2$</td>
<td>df</td>
<td>N</td>
<td>Frequency^ (%)</td>
<td>$\chi^2$</td>
<td>df</td>
</tr>
<tr>
<td>Overeating</td>
<td>1.740</td>
<td>1</td>
<td>5111</td>
<td>73 (1.43%)</td>
<td>37.46</td>
<td>1</td>
</tr>
<tr>
<td>sLOC^+ (Objective Overeating)</td>
<td>7.48</td>
<td>1</td>
<td>5111</td>
<td>58 (1.13%)</td>
<td>123.25</td>
<td>1</td>
</tr>
<tr>
<td>sLOC^+ (Subjective Overeating)</td>
<td>11.66</td>
<td>1</td>
<td>5111</td>
<td>87 (1.70%)</td>
<td>153.32</td>
<td>1</td>
</tr>
<tr>
<td>Purgung (Emesis)</td>
<td>12.38</td>
<td>1</td>
<td>5111</td>
<td>25 (0.49%)</td>
<td>369.36</td>
<td>1</td>
</tr>
<tr>
<td>Laxatives</td>
<td>6.37*</td>
<td>1</td>
<td>5111</td>
<td>15 (0.29%)</td>
<td>262.06</td>
<td>1</td>
</tr>
<tr>
<td>Strict Dieting</td>
<td>0.636</td>
<td>1</td>
<td>5111</td>
<td>22 (0.43%)</td>
<td>35.82*</td>
<td>1</td>
</tr>
<tr>
<td>Compulsive Exercise</td>
<td>0.010</td>
<td>1</td>
<td>5111</td>
<td>35 (0.68%)</td>
<td>20.47*</td>
<td>1</td>
</tr>
<tr>
<td>Fasting &gt;8hr</td>
<td>20.47*</td>
<td>1</td>
<td>5111</td>
<td>64 (1.25%)</td>
<td>179.79*</td>
<td>1</td>
</tr>
<tr>
<td>EDE-Q Combined</td>
<td>17.88*</td>
<td>1</td>
<td>5111</td>
<td>286 (5.60%)</td>
<td>27.96*</td>
<td>1</td>
</tr>
</tbody>
</table>

All associations for CHSP episodes with the listed behavior are examined in reference to the 0-episode category. Cut-offs for the presence of disordered eating symptomology included: 4 for EDE-Q combined weight and shape subscales, overeating, emesis (vomiting), laxatives, and fasting for 8 or more hours (other than sleep); 12 for strict dieting and exercise [15, 16]. *Significant to the $p < .05$ level. ^Frequency of respondents who CHSP and engaged in the listed behavior. ^Subjective Loss of Control (sLOC).
**Gender differences in CHSP**

As indicted in Table 2, a significant relationship was found between gender and frequency level of CHSP.

**Age differences in CHSP**

A one-way between subjects ANOVA was conducted to compare the effect of CHSP Frequency on age. There was a significant effect of age on CHSP at the \( p < .001 \) level for different CHSP frequency levels \( [F(3, 20.36) = 8.35, p < .001] \). Post hoc comparisons using the Tukey HSD test indicated that the mean score for the No CHSP \( (M = 14.95, SD = .58) \) was significantly older than the individuals who engaged in 1–3 episodes of CHSP \( (M = 14.56, SD = 1.48) \). Table 2 highlights the differences between CHSP frequency groups and age.

**Psychological distress and HRQoL**

Mixed effects linear regression analyses were performed to investigate the impact of CHSP on wellbeing and functioning by examining both psychological distress and HRQoL among adolescents that CHSP versus adolescents who did not CHSP, based on their frequency of the behavior in the 28 days prior to the study. The results of the mixed effects linear regression models showed statistically significant differences between and the various CHSP frequency groups when results for the dependent variables were considered separately. Participants who engaged in CHSP reported significantly higher levels of psychological distress (K-10) and lower HRQoL scores (PedsQL) compared to those who did not report any CHSP. There was a dose-response relationship between CHSP frequency and psychological distress and physical HRQoL. On the other hand, the levels of emotional and social HRQoL

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**Table 2.** Associations between CHSP frequency in the 28 days prior to the study, age, and gender in the sample \( (n = 5111) \).

<table>
<thead>
<tr>
<th>Gender</th>
<th>CHSP Episode Frequency, n (%)</th>
<th>Statistic</th>
<th>Post-hoc</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No CHSP (^a)</td>
<td>1-3 episodes (^b)</td>
<td>4-7 episodes (^c)</td>
</tr>
<tr>
<td>Male</td>
<td>1866 (41.5)</td>
<td>143 (3.2)</td>
<td>31 (0.7)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2019 (45)</td>
<td>212 (4.7)</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>27 (0.6)</td>
<td>4 (0.1)</td>
</tr>
<tr>
<td>Age (years)</td>
<td>Mean (SD) [95% CI]</td>
<td>ANOVA F (df)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.95 (1.58)</td>
<td>14.56 (1.48)</td>
<td>14.73 (1.36)</td>
</tr>
</tbody>
</table>
decreased with an increase in CHSP frequency but not in a linear fashion indicating a lack of dose-response relationship (as shown in Table 3).

Discussion

The present study found a moderate point-prevalence of 12% of CHSP in an adolescent sample. The assumption that CHSP would have a point-prevalence greater than adults (0.4%) was thus met (Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011) but the high point prevalence rate was beyond expectation. As expected, the prevalence of more frequently (4 or more episodes in the past 28 days) occurring CHSP was lower. Engaging in CHSP was associated with adverse outcomes, including greater psychological distress, a higher frequency of objective and subjective binge, self-induced vomiting, laxative misuse, strict dieting, compulsive exercise, and fasting. This supported the hypothesis that CHSP would occur concurrently with other eating disorder features. Moreover, the current study identified that weight and shape concerns were common across all three CHSP frequency groups (1–3 episodes, 4–7 episodes, and 8+ episodes), and was positively associated with increasing CHSP occurrence.

The expectation that CHSP would be more prevalent in females was supported. However, CHSP occurred in older adolescents, which when compared to the findings reported in our adult prevalence study (Aouad et al., 2018) and earlier systematic review (using an adolescent clinical sample) (Aouad et al., 2016), was not expected. This may be due to the younger sample used for the current study which had a wider age ranges (11–19 years old), compared to the narrower age range for studies identified in the systematic review (14 years of age vs. 16 years of age) (Aouad et al., 2016; Guarda et al., 2004; Song, Lee, & Jung, 2015).

Table 3. Results of mixed effects linear regressions for the effects of CHSP (yes vs no) and CHSP frequency categories on psychological distress, HRQoL emotional, HRQoL social and HRQoL physical.

<table>
<thead>
<tr>
<th>Exposure variable</th>
<th>Psychological distress</th>
<th>HRQoL emotional</th>
<th>HRQoL social</th>
<th>HRQoL physical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
<td>Coefficient</td>
<td>SE</td>
</tr>
<tr>
<td>CHSP (vs no) yes</td>
<td>2.394*</td>
<td>0.415</td>
<td>−5.886*</td>
<td>1.146</td>
</tr>
<tr>
<td>Dose-response CHSP frequency (vs none)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1–3 episodes</td>
<td>2.008**</td>
<td>0.477</td>
<td>−5.750**</td>
<td>1.300</td>
</tr>
<tr>
<td>4–7 episodes</td>
<td>3.311**</td>
<td>0.863</td>
<td>−8.593***</td>
<td>2.322</td>
</tr>
<tr>
<td>8 or more episodes</td>
<td>4.950*</td>
<td>0.988</td>
<td>−7.092*****</td>
<td>2.638</td>
</tr>
</tbody>
</table>

The reference category is within parentheses; * indicates significant at $p < .0001$, ** significant at $p < .001$, *** significant at $p < .01$, **** significant at $p < .05$; all models are controlled for other EDs, namely, EDE-Q combined, overeating, LOC with objective overeating, LOC with subjective overeating, purging (emesis), laxatives, fasting for 8 or more hours, strict dieting, exercise and demographics, namely, age, SES and migration status.
Based on a similar prevalence study conducted in adults (Aouad et al., 2018), it may be concluded that most individuals, despite age and slight demographic variation, who engaged in CHSP also reported other concurrent ED symptoms. However, in the present study these associations were with shape and weight concerns and purging behaviors (vomiting/laxative misuse) and not with overeating, or loss of control with overeating behaviors (Aouad et al., 2018). This differs from the finding in adults where CHSP occur mainly in women with higher psychological distress and concurrent ED symptoms, that included Objective and Subjective Binge Eating (OBE/SBE), and weight/shape overvaluation (Aouad et al., 2018). Moreover, both the current study, and the prevalence study conducted in adults (Aouad et al., 2018), highlighted that those who CHSP reported poorer overall HRQoL than participants who did not CHSP or did so at a lower frequency.

The main strength of the current study was the statistical power from the large sample, giving confidence levels and reduced margin of error from the results obtained. Moreover, the methodological rigor of the study, and the well validated measures used, lent itself to the development of a repeatable study design, and as a result provided easier accessibility to the cohort for future follow-up longitudinal investigations. The findings of the current study may be generalizable to a wider adolescent sample, at least in Australia, as the schools sampled were for the most part representative (within 1SD of the standardized mean) of the population from which they were drawn. Nonetheless, the limitations of convenience sampling were still present and did not allow for a truly randomized selection of schools across the state of New South Wales, Australia. This may have introduced some level of sampling bias, which was controlled for during analyses, however may still have led to some systematic bias. Moreover, self-report measures, especially in adolescents, may have influences some of the findings. Relating to the findings of the systematic review (Aouad et al., 2016) future interactions of the current study in adolescents should assess medical problems, and athlete status in order to determine associations and relationships that might exist between these factors and CHSP. Further development of an instrument for assessing CHSP in epidemiology surveys is also needed.

The clinical significance of identifying associations with other behaviors (such as purging) and CHSP may provide insight into the treatment for CHSP, an otherwise under researched eating disordered behavior, and until the current study, one that was thought to not have been prevalent and consequently removed from the DSM-5 (American Psychiatric Association, 2013). The unexpected large point-prevalence rate of CHSP in an adolescent sample is cause for concern and warrants further investigation, predominately into future trends across several cohorts. Such a high prevalence rate is indicative of a disordered eating behavior that cannot be ignored. Without bring CHSP into clinical awareness, clinicians are unlikely to screen for the
behavior. Therefore it is important that clinicians are vigilant and aware to screen for CHSP in adolescents, especially in those with suspected eating pathology. Moreover. As the ramifications of the behavior are still not well understood, future studies should also be considered to ascertain if there are adverse impacts (whether physiological, psychological, or social) to individuals who engage in CHSP behavior, and reasons for engaging in CHSP behaviour.

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Declaration of Interest Statement

Competing interests: ST and PH receive royalties from Hogrefe, and Huber and McGraw-Hill publishers for contributions on eating disorders. ST has received travel grants, consulting fees and grant funding from Shire Pharmaceuticals. ST has chaired the Australian Advisory Board on Binge Eating Disorder and provided commissioned requests PH received royalties from Oxford University Press and receives sessional fees and lecture fees from the Australian Medical Council, Therapeutic Guidelines publication, and New South Wales Institute of Psychiatry. PH is an author of a paper cited in this Editorial. PH is a member of the World Health Organization Working Group on Feeding and Eating Disorders for the Revision of ICD-10 Mental and Behavioral Disorders and this paper represents personal views of the author. PH has received an honorarium from Shire Pharmaceuticals for a commissioned report.

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