



## Psychological characteristics and childhood adversity of adolescents with atypical anorexia nervosa versus anorexia nervosa

Ashley Pauls<sup>a</sup>, Gina Dimitropoulos<sup>b</sup>, Gisele Marcoux-Louie<sup>c</sup>, Manya Singh<sup>d</sup>, and Scott B. Patten<sup>a,e</sup>

<sup>a</sup>Departments of Psychiatry, University of Calgary, Calgary, Canada; <sup>b</sup>Faculty of Social Work, University of Calgary, Calgary, Canada; <sup>c</sup>Calgary Eating Disorder Program, Alberta Children's Hospital, Alberta Health Services; <sup>d</sup>Mathison Centre for Mental Health Research & Education, Department of Psychiatry, University of Calgary; <sup>e</sup>Departments of Psychiatry & Community Health Sciences, University of Calgary

### ABSTRACT

The assessment and diagnosis of atypical anorexia nervosa (AAN) is an ongoing challenge for clinicians. This study aims to examine psychological morbidity and exposure to childhood adversity in adolescents with AAN compared to adolescents with anorexia nervosa, restricting type (AN-R). This registry-based study compared 42 adolescents with AAN to 79 adolescents with AN-R on a variety of psychosocial measures at the time of presentation to a specialized eating disorder program. In contrast to AN-R, adolescents with AAN had more severe drive for thinness ( $p = .011$ ), body dissatisfaction ( $p = .038$ ), and lower quality of life ( $p = .047$ ), but had better global functioning ( $p = .032$ ). Adolescents who had high Adverse Childhood Experiences (ACE) Questionnaire scores (ACE score  $\geq 4$ ) had over 5 times higher odds of having AAN than those who did not have high ACE scores ( $p = .008$ ). There was no significant difference between groups on measures of low self-esteem and non-accidental self-injury. Adolescents with AAN presented with similar or more severe psychosocial distress compared to their peers with AN-R across a majority of the measures. The findings highlight the need to address trauma, body-related difficulties, and quality of life in the assessment and treatment of adolescents with AAN.

### Clinical Implications

- Adolescents with AAN present with similar or more severe psychosocial distress compared to their peers with AN-R across multiple psychological measures.
- Adolescents with AAN are more often exposed to a problematic number of adverse childhood experiences compared to their peers with AN-R; therefore, a trauma-informed approach to treatment should be considered.

- Adolescents who have lost a significant amount of weight should be screened for childhood adversity, body-related difficulties, and quality of life, regardless of their BMI at the time of presentation for eating disorder services.

Atypical Anorexia Nervosa (AAN) was introduced in the *Diagnostic and Statistical Manual of Mental Disorders—5th Edition* (DSM-5) to describe individuals who meet Anorexia Nervosa (AN) criteria, however, despite a significant amount of weight loss are still not considered underweight (American Psychiatric Association, 2013). The prevalence of adolescent AAN is 2.8% in a community sample (Stice et al., 2013) and 16.4% in a clinical sample of adolescents with eating disorders (Sawyer et al., 2016). Adolescents with AAN have higher rates of suicidality compared to peers without eating disorders (Stice et al., 2013), but similar rates of self-harm and suicidality compared to peers with AN (Sawyer et al., 2016).

Research shows that adolescents with AAN present with more severe eating disorder psychopathology (Garber et al., 2019; Sawyer et al., 2016) and similar poor self-esteem (Sawyer et al., 2016) compared to adolescents with AN. With regards to quality of life and global functioning, little is known about how these domains impact adolescents with AAN; however, research on adolescents with AN demonstrates impaired global (Davico et al., 2019) and social functioning (Stice et al., 2013) relative to healthy peers. Individuals with AN have poor health-related quality of life (Ágh et al., 2016), which has further been demonstrated in young people hospitalized with AN prior to the age of 14 at 4.5 to 11.5 year follow-up, showing poor long-term outcomes (Herpertz-Dahlmann et al., 2018). Health-related quality of life has not been shown to differ between AN subtypes or adolescents compared to adults in a mixed clinical sample with AN and AAN (Weigel et al., 2016).

In addition to impairments in global and social functioning, child maltreatment and adverse childhood experiences have been shown to be associated with AN. Individuals with AN have higher rates of childhood sexual, physical, and emotional maltreatment compared to healthy controls (Molendijk et al., 2017). These findings have been replicated in a large community sample of adults with AN, in addition to higher rates of childhood physical neglect and exposure to intimate partner violence (Afifi et al., 2017). However, to date, there is no empirical research examining child maltreatment and adverse childhood experiences in AAN.

This study aims to replicate earlier research investigating eating disorder psychopathology, self-esteem, and self-injury in adolescents with AAN compared to AN, restricting type (AN-R) in a clinical sample. Our study builds on previous research by examining exposure to early life adversities, global functioning, and quality of life in a clinical sample of adolescents with AAN compared to those with AN-R. Clarification of psychological characteristics of

adolescents with AAN will facilitate recognition of this disorder and may impact treatment considerations.

## **Methods**

### ***Setting***

The Calgary Eating Disorder Program (CEDP) at the Alberta Children's Hospital (Calgary, Canada) is a multidisciplinary clinic that provides inpatient and outpatient care to individuals with eating disorders. This is the only eating disorder program in the geographically defined Calgary Zone of Alberta Health Services (AHS). The clinic is a part of the publicly funded health system such that access from the population is not impeded by financial barriers. Adolescents referred to the clinic receive intake medical assessments by adolescent medicine pediatricians and nurses, nutrition assessments by dietitians, as well as intake family assessments by family counsellors. When it is clinically indicated, adolescents receive a mental health assessment by psychiatrists.

### ***Participants***

This study included 14- to 18-year-old adolescents who had intake assessments at the CEDP between July 2013 and June 2018. They received DSM-5 diagnoses of AAN or AN-R by adolescent medicine pediatricians following a medical work-up, history, and physical examination. All adolescents who met full diagnostic criteria for AAN ( $n = 42$ ) or AN-R ( $n = 79$ ) within this time period were included. Given the inconsistent reporting of expected body weight (%EBW) data in patient charts, and to ensure comparability of data points across the ages, we selected BMI as the primary weight-based metric across both diagnoses. No specific BMI cut-off was used when assigning the AAN diagnosis, as there is no clear BMI cut-point in the DSM-5 diagnostic criteria for AAN. All the charts reviewed in the Calgary Eating Disorder Program were closed prior to the start of this study. A waiver of consent was obtained, and the study was approved by the Conjoint Health Research Ethics Board at the University of Calgary.

We included adolescents with AN-R and not AN, binge-eating/purging type (AN-B/P) in this study. Adolescents with AN-R are an appropriate comparison for the AAN group given that diagnostically, adolescents with AAN do not have significant binge-eating and purging. If adolescents did demonstrate binge-eating or purging, they were classified as having Bulimia Nervosa, Other Specified Feeding or Eating Disorder (OSFED)- Bulimia Nervosa low frequency or limited duration, or OSFED-Purging Disorder, and were excluded in this study. By comparing adolescents with AAN to AN-R, we aimed to focus on the difference in BMI between these two groups, rather than the difference in binge-eating and purging behaviours.

### **Outcome measures**

AHS databases were accessed to obtain retrospective data for the Eating Disorder Inventory-3 (EDI-3) and Eating Disorder Quality of Life Scale (EDQLS), which were completed at the time of initial assessment, and the Adverse Childhood Experiences (ACE) Questionnaire and the Health of the Nation Outcome Scales for Children and Adolescents (HoNOSCA) were administered upon completion of the family assessment.

The EDI-3 (Garner, 2004) is a 91-item self-report outcome measure that evaluates eating disorder symptomatology. Each item is rated as “always”, “usually”, “often”, “sometimes”, “rarely”, or “never”. It generates 12 subscales, which include: Drive for Thinness (DT), Bulimia (B), Body Dissatisfaction (BD), Low Self-Esteem (LSE), Personal Alienation (PA), Interpersonal Insecurity (II), Interpersonal Alienation (IA), Interoceptive Deficits (ID), Emotional Dysregulation (ED), Perfectionism (P), Maturity Fears (MF), and Asceticism (A). Higher scores indicate more severe symptomatology. Subscales for the EDI-3 have shown to have adequate test–retest reliability for eating disorder populations; however, there are limited data on the construct validity for this measure (Merwin et al., 2010).

The ACE Questionnaire (Felitti et al., 2019) is a 10-item clinician-rated questionnaire which identifies exposure to adverse experiences prior to 18 years of age. Adverse experiences include abuse, domestic violence, parental separation/divorce, where a household member suffered a mental illness, substance abuse, and/or incarceration. Each item is scored as “yes” or “no”. The total ACE score is the sum of all “yes” responses. Thus, a higher total score indicates exposure to greater number of categories of adverse events. Despite limited evidence on its psychometric properties, the ACE has been shown to be correlated with several health-related outcomes in adults (Schirk et al., 2015).

The EDQLS (Adair et al., 2007) is a 40-item self-report outcome measure that assesses quality of life in 12 domains in individuals with eating disorders who are 14 years of age and older. The domains include Cognitive, Education/Vocation, Family & Close Relationships, Relationships with Others, Future/Outlook, Appearance, Leisure, Psychological, Emotional, Values & Beliefs, Physical, and Eating Disorder. A total score is made up of the 12 domain scores. A higher score indicates higher quality of life. This measure has been shown to have good internal consistency and construct validity (Adair et al., 2007).

The HoNOSCA (Gowers et al., 1999) is a 15-item clinician-rated outcome scale which measures the health and social functioning of individuals in mental health settings who are 5 to 18 years old. Clinicians rate the severity of each item within the previous 2 weeks as 0 (“no problem”), 1 (“minor problem-requiring no action”), 2 (“mild problem but definitely present”), 3 (“moderate problem”), or 4 (“severe problem”), or, when no information can be obtained, 9 (“unknown”). Section A includes items related to behaviour,

impairment, emotional and other mental health symptoms, and social functioning. The sum of Section A scores forms the total score, which ranges from 0 to 52. A higher score indicates greater severity of health and social function problems. Item 3 asks for a rating of “non-accidental self-injury,” which includes thoughts, intent, and acts of both self-harm and suicide. Section B includes items related to child, parent, or caregiver “lack of information or access to services.” The HoNOSCA has been shown to have adequate inter-rater reliability and validity (Garralda et al., 2000).

Primary outcome measures in this study included EDI-3 Drive for Thinness, EDI-3 Body Dissatisfaction, EDI-3 Low Self-Esteem, ACE total score, EDQLS total score, HoNOSCA total score, and HoNOSCA non-accidental self-injury item score.

### **Statistical analysis**

IBM SPSS Statistics Version 25 was used for statistical analyses. To avoid the risk of type 1 error, we selected variables to compare based on existing literature and clinical importance. We calculated descriptive statistics, including means and standard deviations for continuous variables evaluated by *t*-tests, medians for continuous variables evaluated by Mann–Whitney *U* tests, and percentages for categorical variables. Outcome measures for adolescents with AAN were compared to adolescents with AN-R by using independent *t*-tests for continuous variables which were normally distributed, Mann–Whitney *U* tests for continuous variables which were not normally distributed, and Fisher's exact tests for categorical variables. ACE total scores and non-accidental self-injury scores were recoded into binary categories since they had no observed central tendency and transformations were not successful. Severity categories for the ACE total scores were no adversity (ACE total score of 0), low ACE score (total score of 1–3), and high ACE score (total score  $\geq 4$ ). A cut-off of  $\geq 4$  was chosen to represent high ACE score given the study by Felitti et al. (2019), which found that people with exposure to  $\geq 4$  categories of childhood adversity had markedly increased adverse health and lifestyle risks. Categories for non-accidental self-injury scores were no problem (item score of 0) and problem (item score  $\geq 1$ ). Simple logistic regression was used to estimate odds ratios and associated confidence intervals. Diagnosis was modeled as a binary characteristic (AAN = 1, AN-R = 0). Statistical significance was considered to be  $p < .05$ .

## **Results**

### **Participant characteristics**

The study included 121 participants, of which 42 (34.7%) were diagnosed with AAN, and 79 (65.3%) were diagnosed with AN-R. The mean age for

participants was 15.63 years for AN-R and 15.93 years for AAN, while median age was 15 years for AN-R and 16 years for AAN. A Mann–Whitney  $U$  test revealed no significant difference in age between the diagnostic groups,  $p = .215$  (two-sided). Thirty-seven (88.1%) of the participants with AAN and 74 (93.7%) of the participants with AN-R were female. A Fisher's exact test indicated no significant association between sex and diagnosis,  $p = .314$  (two-sided). An independent samples  $t$ -test revealed significantly higher BMI in adolescents diagnosed with AAN ( $M = 20.738$ ,  $SD = 2.052$ ) compared to AN-R ( $M = 16.059$ ,  $SD = 1.480$ );  $t(117) = -14.326$ ,  $p < .001$  (two-tailed).

### **Results for primary outcome measure comparisons**

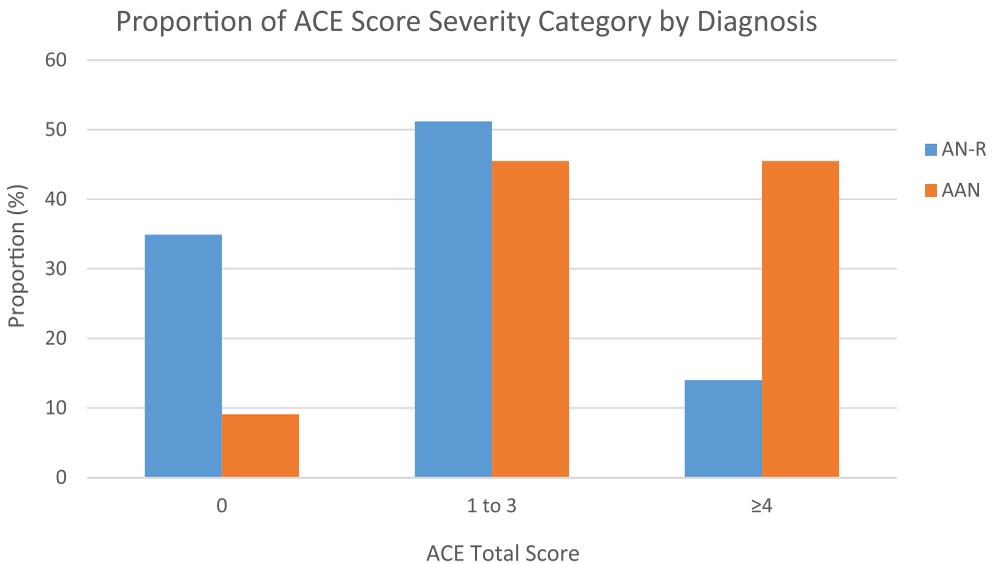
ACE score severities were associated with diagnosis (Figure 1). The AAN group had significantly higher scores than the AN-R group in EDI-3 Drive for Thinness and Body Dissatisfaction (Table 1). The AAN group had significantly lower EDQLS total scores, indicating lower quality of life, compared to the AN-R group. The AAN group had significantly lower HoNOSCA total scores, indicating better health and social functioning, compared to the AN-R group. There were no significant differences between groups in EDI-3 Low Self-Esteem and HoNOSCA non-accidental self-injury. Non-accidental self-injury was rated as problematic in 48.3% of the adolescents in the AAN group and 32.1% of the adolescents in the AN-R group.

### **Results for logistic regressions**

Simple logistic regressions were used to estimate odds ratios for each of the statistically significant primary outcomes. Odds ratios for high ACE scores, Drive for Thinness, Body Dissatisfaction, and the HoNOSCA total score were significant (Table 2). In contrast, the odds ratio for the EDQLS total score was not significant. A change in one unit on the EDI-3 Drive for Thinness subscale score resulted in a 7% elevation in the odds of a respondent being in the AAN group, whereas a one unit change on the EDI-3 Body Dissatisfaction scale was associated with a 4% greater odds of AAN. In contrast, higher HoNOSCA scores were associated with lower odds of AAN.

## **Discussion**

One of the aims of this study was to replicate and extend previous research in eating disorder psychopathology, self-esteem, and self-injury in a clinical sample of adolescents with AAN. We also aimed to examine and compare adverse childhood experiences, quality of life, and global functioning between adolescents with AAN compared to those with AN-R, as to our knowledge, these have not yet been investigated in this population. As hypothesized,



**Figure 1.** Proportion of ACE score severity category by diagnosis.

number of ACEs, drive for thinness, body dissatisfaction, and poor quality of life were more severe in adolescents with AAN compared to AN-R. Despite these findings, adolescents with AAN had better global functioning than their peers with AN-R. The groups had similar rates of poor self-esteem and non-accidental self-injury. We found that adolescents who had high ACE scores (ACE score  $\geq 4$ ) were more likely to have a diagnosis of AAN than those who did not have high ACE scores.

Child maltreatment is a type of trauma and childhood adversity and comprises 50% of the ACE Questionnaire (Felitti et al., 2019). Individuals with AN have significant rates of child maltreatment in numerous studies which have recently been included in a meta-analysis (Molendijk et al., 2017). The results of our study suggest that adolescents with AAN are, in contrast, more likely to have a high ACE score than those with AN-R. This finding is important, as child maltreatment and exposure to trauma have shown to have important clinical implications. For example, trauma is associated with more severe eating psychopathology among people with eating disorders (Molendijk et al., 2017; Scharff et al., 2019), and worse treatment outcomes (Castellini et al., 2018), as well as higher rates of suicidality, binge-purge episodes (Molendijk et al., 2017), comorbid psychiatric diagnoses, and earlier eating disorder age of onset (Castellini et al., 2018; Molendijk et al., 2017). Traumatic experiences are also associated with higher BMIs in adolescents presenting to an eating disorder program, relative to adolescents presenting without traumatic experiences (Hicks White et al., 2018). It is possible that child maltreatment and exposure to trauma further exacerbate eating disorder

**Table 1.** Primary outcome measure results.

Variable	Statistical Test	AAN		AN-R		Test Statistic	<i>p</i> (two-tailed)
		<i>M</i> or <i>Mdn</i>	<i>n</i>	<i>M</i> or <i>Mdn</i>	<i>n</i>		
ACE score severity	Fisher's exact test	—	22	—	43	—	0.009
EDI-3 Drive for Thinness	Mann-Whitney <i>U</i> test	23.00	39	16.00	62	1571.00	0.011
EDI-3 Body Dissatisfaction	Independent-samples <i>t</i> -test	25.21	39	20.40	62	-2.10	0.038
EDI-3 Low Self-Esteem	Mann-Whitney <i>U</i> test	15.00	39	11.00	62	1484.00	0.055
EDQLS total score	Independent-samples <i>t</i> -test (a)	101.24	33	112.95	56	2.02	0.047
HoNOSCA total score	Independent-samples <i>t</i> -test	11.76	29	15.21	53	2.18	0.032
Non-accidental self-injury	Fisher's exact test	—	29	—	53	—	0.162

a) Equal variances not assumed, as Levene's test for equality of variances was significant.

**Table 2.** Logistic regressions predicting likelihood of AAN.

	Wald	<i>p</i>	OR	95.0% C.I for OR
High ACE score	7.11	0.008	5.14	[1.54, 17.12]
EDI-3 Drive for Thinness	6.34	0.012	1.07	[1.02, 1.13]
EDI-3 Body Dissatisfaction	4.20	0.040	1.04	[1.00, 1.08]
EDQLS total score	3.40	0.065	0.98	[0.97, 1.00]
HoNOSCA total score	4.37	0.037	0.92	[0.86, 1.00]

psychopathology, treatment outcomes, comorbidities, and the onset of AAN in adolescents; however, further research is warranted in this area. To our knowledge, our study is the first to demonstrate higher ACE scores in adolescents with AAN compared to AN-R.

Our findings also suggest adolescents with AAN have a more severe drive for thinness and body dissatisfaction compared to adolescents with AN-R, which is consistent with previous reports of greater eating disorder psychopathology present in adolescents with AAN versus AN (Garber et al., 2019; Sawyer et al., 2016). Sawyer et al. (2016) suggest that greater eating disorder psychopathology observed in adolescents with AAN may reflect greater dissonance between current and ideal weight, compared to adolescents with AN who are underweight. They also suggest a possible role of fear of fatness exacerbated by the weight history of adolescents with AAN (Sawyer et al., 2016). Adolescents with AAN have significantly higher historical BMIs (Garber et al., 2019; Sawyer et al., 2016) and greater likelihood of being premorbid overweight or obese (Sawyer et al., 2016) compared to their peers with AN. Our finding of a greater drive for thinness in adolescents with AAN is supportive of a role for greater fear of fatness.

Our study further demonstrates poorer quality of life in adolescents with AAN compared to AN-R; however, given the paucity of research examining quality of life for adolescents with AAN, it is difficult to compare this finding to current research. To our knowledge, the only existing study assessing quality of life in individuals with AAN used two population-based surveys to

investigate eating disorder symptoms, as well as mental and physical health-related quality of life in individuals 15 years of age or older (Hay et al., 2017). Individuals with AAN were combined with Other Specified Feeding and Eating Disorders (OSFED) diagnostic subgroups, due to low sample size in the subgroups. Mental and physical health-related quality of life did not differ between individuals without an eating disorder and those with OSFED, the majority of whom had AAN, which is contrary to our findings. However, Hay et al. (2017) used different AAN inclusion criteria which did not include significant weight loss, and participants were older (43.5 years old) and had higher BMIs (27.8) than our AAN group. Given these differences, further investigations of quality of life in adolescents with AAN are warranted.

Given the higher eating disorder psychopathology and lower quality of life of adolescents with AAN in our study, it is surprising that the AAN group had better global functioning than the AN-R group. This contrasts with the literature which describes vast similarities between the two subtypes of the disorders, including eating disorder psychopathology and behaviours and similar medical and psychiatric complications (e.g., Moskowitz & Weiselberg, 2017). A possible explanation could be that adolescents with AAN have severe impact in functioning specifically related to their eating disorder rather than globally, whereas adolescents with AN may be more broadly impaired. The examination of the subscale constructs of our measure of global functioning (HoNOSCA) between the AAN and AN groups to justify these discrepancies was not feasible due to sample size restrictions. For example, some participants did not have HoNOSCA scores reported in their charts, and many adolescents over the age of 17 were administered an adult version of the HoNOSCA which is not directly comparable. This limited our ability to examine between-group differences across the HoNOSCA subscales. Further research examining global functioning in adolescents with AAN is certainly needed.

Our finding of similar self-esteem scores between diagnostic groups is consistent with the findings of Sawyer et al. (2016) in self-esteem of adolescents with AAN and AN. It is important to recognize this similarity in poor self-esteem in adolescents with AAN and AN, given that self-esteem is predictive of weight and remission outcomes for individuals with AN (Kästner et al., 2019), and has been postulated to be a maintaining process across eating disorder diagnoses (Fairburn et al., 2003). It is surprising that adolescents with AAN do not have poorer self-esteem than their peers with AN, given their higher BMIs and the disproportionate influence of weight and shape on their self-evaluation. Similarly, comparable rates of non-accidental self-injury were found for the two diagnostic groups, with a large proportion of the adolescents with AAN (48%) having problematic non-accidental self-injury. This finding is also consistent with the Sawyer et al. (2016), who found similar rates of self-harm or suicidal ideation in adolescents with AN and AAN. Other studies

have found significantly higher suicidality in adolescent females with AAN compared to those without eating disorders (Stice et al., 2013).

A strength of this study is the replication and extension of previous studies, using robust measures to investigate eating psychopathology, self-esteem, and self-injury in adolescents with AAN. To our knowledge, this is the first study investigating adverse childhood experiences in adolescents with AAN and comparing ACEs between AAN and AN. This is important, given the increased awareness of trauma-focused care and the need for mental health practitioners who treat adolescents with eating disorders to receive additional training in child maltreatment (Kimber et al., 2019). A limitation of this study is the small sample size, which impacts the power of our statistical analysis; however, our sample size is similar to the sample size of other studies which assess eating disorder psychopathology (Garber et al., 2019; Sawyer et al., 2016), self-esteem, and self-harm and suicidality (Sawyer et al., 2016) in adolescents with AN and AAN. In recognition of our sample size, we aimed to avoid the risk of type 1 error by carefully selecting variables to compare a priori. As we were using data originally collected for clinical purposes, we did not have access to a variety of demographic information which could have informed the generalizability of our study.

Another limitation is that this study relies on self-report measures to assess eating disorder psychopathology, self-esteem, and quality of life. Adding caregiver and clinician ratings of the above-mentioned constructs could have created more robust data. Further, adolescents and their families may underreport child maltreatment when assessed by interview versus self-report questionnaire (Molendijk et al., 2017), perhaps because they may be fearful of the consequences of mandatory practitioner reporting to child protective services or the possible impact on their working relationship with the practitioner in follow-up sessions. This type of underreporting may have impacted clinician ratings of ACE scores in both groups.

Given the high level of psychological distress and adverse childhood experiences of adolescents with AAN in this study, it is important to continue the investigation of effective methods of treating comorbid AAN and trauma-related symptoms. Recent studies have shown the efficacy of integrated Cognitive Behavior Therapy (CBT) sessions for co-occurring posttraumatic stress disorder (PTSD) and eating disorders following intensive eating disorder treatment. For example, Trottier et al. (2017) demonstrated improvements in symptoms of PTSD, anxiety, and depression, as well as sustained eating disorder behavioural symptom remission in the majority of patients at the end of integrated CBT treatment. Vrabel et al. (2019) published a protocol for a randomized trial of CBT and Compassion-Focused Therapy (CFT) for patients with eating disorders, with half of each treatment arm having concurrent eating disorder and childhood trauma. Further research could also explore specific types of adverse experiences and trauma-related symptoms in individuals with AAN, as well as integration of trauma-informed care principles into treatment of AAN.

## Conclusion

Despite normal or above average weight, adolescents with AAN have comparable or more severe psychosocial distress compared to their peers with AN-R in all measures in this study, with the exception of global functioning. In particular, adolescents with AAN have higher odds of significant adverse childhood experiences than adolescents with AN-R. This study suggests the need for clinicians to pay careful attention to the severity of psychological symptoms, childhood adverse experiences, quality of life, self-injury, and poor self-esteem when assessing adolescents who have lost a significant amount of weight. This may inform further treatment considerations and system-level planning for this vulnerable group of adolescents.

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## Conflicts of interest

The authors declare that they have no conflicts of interest. This study was funded by the psychiatry residency program at the University of Calgary.

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