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Examining simultaneous associations of four emotion regulation strategies with abnormal eating behaviors/attitudes in early adolescents

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ABSTRACT

Previous research has suggested that emotion regulation strategies (ERSs) are associated with abnormal eating behaviors and attitudes (AEBs). Available data have demonstrated that frequent rumination, a major maladaptive ERS, is associated with elevated AEBs, whereas adaptive ERSs, such as problem-solving and cognitive reappraisal, showed negative associations with AEBs. Most previous studies examined the association of a single ERS with AEBs. Therefore, any significant associations between an individual ERS and AEB reported in previous research might stem from spurious correlations. The current cross-sectional study sought to examine simultaneous associations of four ERSs (rumination, problem-solving, distraction, and cognitive reappraisal) with two categories of ED symptoms (i.e., drive for thinness and bulimic symptoms) in early adolescents in Japan (ages 10–15, $N = 5301$). Participants self-reported their use of the different ERSs and the ED symptoms. We found certain ERSs were uniquely associated with levels of drive for thinness and bulimic symptoms even after controlling for body mass index, depression, and socioeconomic status. Particularly, frequent rumination in both boys and girls was associated with a severe drive for thinness and bulimic symptoms. Regarding adaptive strategies, frequent uses of problem-solving was associated with decreased bulimic symptoms only in girls, with the effect size being small. In addition, contrary to our expectation, greater use of distraction was associated with elevated AEBs, except the association with drive for thinness in boys. Although this study extended findings of previous research, prospective studies are required to clarify the causal relationship between ERSs and eating pathology.

1. Introduction

Abnormal eating behaviors/attitudes (AEBs), symptoms of eating disorders (EDs), commonly develop during adolescence. One nationally representative study demonstrated that the median age of onset for EDs was around 12 years and that girls were at an increased risk for developing EDs (Swanson et al., 2011). Moreover, the prevalence of AEBs

during adolescence is also recognized in non-Western cultures. For example, one study in Japan revealed that 45% of girls experienced food restriction, and over 30% engage in frequent binge eating (Nakai et al., 2014). Also, research conducting in different cultures and societies has reported gender differences in AEBs, with girls being more likely to exhibit elevated AEBs than boys (Ito et al., 2016; Ivanova et al., 2017; Swanson et al., 2011). Elevated AEBs are associated with the

Abbreviations: ERS, Emotion regulation strategies; AEBs, Abnormal eating behaviors/attitudes; SES, Socioeconomic status; BMI, Body Mass Index; NIMSES, Non-intrusive Measure of SES.

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development of EDs, such that 32% of adolescent females with bulimic symptoms progressed to bulimia nervosa onset by the time of an 8-year follow-up (Stice et al., 2013). Therefore, a better understanding of AEBs maintenance during adolescence has the potential to promote mental health among adolescents.

Empirical research has suggested that the development and/or maintenance of AEBs is associated with maladaptive emotional regulation. One study among patients with bulimia nervosa showed that high negative affect contributed to the occurrence of bulimic symptoms (Goldschmidt et al., 2014). Furthermore, prospective studies among non-clinical adolescents found that an increased negative affect predicted the onset of EDs within subsequent years (Rohde et al., 2015). In addition, some researchers have considered binge eating and food restriction as maladaptive strategies in regulating an aversive affect (e.g., Smyth et al., 2007). In line with these findings, one prospective study in a sample of adolescents living in the same community has demonstrated that maladaptive emotion regulation contributes to the onset of multiple psychopathologies, including EDs (McLaughlin et al., 2011). Another prospective study of adolescent girls demonstrated that deficits in adaptive emotion regulation mediated the relationship between temperament, which is highly related to negative affect, and impulsiveness leading to binge eating (Goldschmidt et al., 2017). Thus, adaptive strategies that modulate negative affect could alleviate AEBs. Therefore, any strategies to promote or restrict adaptive emotion regulation seem to play a critical role in alleviating AEBs during adolescence.

Studies among early adolescents have indicated that major emotion regulation strategies (ERSs), which are broadly divided into adaptive and maladaptive, are the response styles (rumination, problem-solving, and distraction) and cognitive reappraisal (Abela et al., 2012; DeCicco et al., 2014). Rumination, a consistent pattern of thoughts and behaviors that focus attention on one's negative emotions (Nolen-Hoeksema & Morrow, 1991), is a major maladaptive strategy. One meta-analysis study revealed that rumination was positively associated with eating pathology (Smith et al., 2018). Aligning with this finding, cross-sectional studies have demonstrated that rumination is associated with food restriction, body dissatisfaction, or bulimic symptoms in adults with and without EDs (Dondzilo et al., 2016; Startup et al., 2012; Wang et al., 2017). Similarly, a prospective study found that elevated rumination predicted increased bulimic symptoms among middle-school girls in a metropolitan area (Nolen-Hoeksema et al., 2007).

While problem-solving and cognitive reappraisal are major adaptive ERSs (Naragon-Gainey et al., 2017), there has been a limited number of studies examining their associations with AEBs. In a meta-analysis, problem-solving (i.e., conscious attempts to change a stressful situation) was negatively associated with eating pathology (Aldao et al., 2010). Conversely, other cross-sectional studies in a sample of college students with and without EDs reported that problem-solving was not associated with a drive for thinness and binge eating (Koff & Sangani, 1997; Paxton & Diggins, 1997). Regarding reappraisal (i.e., a strategy to generate positive interpretations of a stressful situation to reduce distress; Gross, 1998), an experimental study in adults with EDs demonstrated that reappraisal resulted in a decrease in body dissatisfaction and bulimic symptoms (Fitzpatrick et al., 2019). Conversely, one meta-analytic study revealed that reappraisal was weakly associated with eating pathologies (Aldao et al., 2010).

Distraction, the purposeful act of shifting attention away from distressing thoughts toward more pleasant or neutral thoughts and activities (Nolen-Hoeksema & Morrow, 1991), is a controversial strategy. Some researchers have pointed to distraction as being counterproductive (Craske & Barlow, 2008), while others consider it a valid strategy for regulating aversive emotions (Linehan, 1993). Aligning with these differences in definition, previous studies reported inconsistent results regarding the association with AEBs. One study among patients with EDs indicated that the use of distraction behavior resulted in a decrease in body dissatisfaction and bulimic symptoms (Fitzpatrick et al., 2019), while another cross-sectional study of non-clinical female

undergraduates indicated frequent use of distraction was positively correlated with a drive for thinness and binge eating (Koff & Sangani, 1997).

In summary, previous studies of the associations between ERSs and AEBs during early adolescence have reported inconsistent findings, indicating that further research is required. In addition, several studies have indicated that individuals typically use multiple ERSs simultaneously (Aldao & Nolen-Hoeksema, 2013), and some ERSs are strongly correlated with each other (Seligowski & Orcutt, 2015). Based on this evidence, any significant association between an individual ERS and AEBs reported in prior studies might stem from spurious correlations via the effects of other ERSs. Although numerous studies have examined associations between multiple ERSs (i.e., response styles) and other psychological symptoms, such as depressive symptoms (e.g., Abela et al., 2012), few have examined simultaneous associations of multiple ERSs with AEBs. Furthermore, several studies have demonstrated that an individual's cultural background affects the function of ERSs (e.g., De Vaus et al., 2018); therefore, associations of ERSs with AEBs may differ across cultures. Despite this, only a small number of studies have examined the associations between ERSs and AEBs among early adolescents in Eastern countries.

Given these limitations, the current cross-sectional study sought to examine the simultaneous associations of the four ERSs (i.e., rumination, problem-solving, reappraisal, and distraction) with AEBs in a large sample of early adolescents in Japan, controlling for body mass index (BMI) and depressive symptoms; which have been found to be associated with development and maintenance of AEBs (e.g., Dondzilo et al., 2016). This study aims to provide insight into ERSs relationship to AEBs controlling for the effects of other ERSs during early adolescence, as well as cultural differences in associations between the major ERSs and AEBs. We hypothesized that higher levels of rumination and lower levels of problem-solving, reappraisal, and distraction would be associated with greater AEBs. This hypothesis was based on previous findings showing the associations of these ERSs with negative affect, especially depressive symptoms, which have been shown to be associated with AEBs. As such, adolescents who use problem-solving, distraction, or reappraisal more frequently would be more likely to exhibit fewer depressive symptoms (e.g., Abela et al., 2012; Murayama et al., 2017).

2. Methods

2.1. Participants and procedures

Students from the fourth through ninth grades (ages 9–15 years)¹ in all public elementary and junior high schools in a city in the Chūbu region of Japan participated in this study. The students' parents provided consent for their child's participation. Students with parental consent were allowed to answer self-reported questionnaires in the classroom. This study received approval from the Research Ethics Committee of the Hamamatsu University School of Medicine to which the last author belongs (E15-328-1). The response rate in the current study was 95.5%, and the final sample consisted of 5301 students (2726 boys and 2575 girls, 4th grade: $n = 884$, 5th grade: $n = 876$, 6th grade: $n = 923$, 7th grade: $n = 909$, 8th grade: $n = 898$, 9th grade: $n = 811$).

2.2. Measures

The students completed the following self-report questionnaires, except for the Non-Intrusive Measure of Socioeconomic Status (NIM-SES), which their parents completed. The reading levels of each item in

¹ In the Japanese school system, almost no students repeat a grade in elementary or junior high school. Therefore, students in each grade have a specific age range: students in fourth grade are aged 9 to 10 years, while students in the ninth grade are aged 14 to 15 years.

these scales are appropriate for the current sample.

2.2.1. Emotion regulation scale for elementary and middle school students

The Emotion Regulation Scale for Elementary and Middle School Students (ERS-MS; Murayama et al., 2017) was used to measure how frequently children and adolescents use the four ERSs in general. This scale contains 16 items grouped into four subscales: rumination (four items), problem-solving (four items), cognitive reappraisal (five items), and distraction (four items). Adolescents respond to each item using a four-point scale (1 = *almost never*, 4 = *almost always*), and higher scores indicate more frequent use of the ERSs. The ERS-MS has demonstrated good reliability and validity among Japanese adolescents (Murayama et al., 2017). In the current study, Cronbach's alphas were 0.804, 0.835, 0.798, and 0.694 for the rumination, problem-solving, appraisal, and distraction subscales, respectively.

2.2.2. Abnormal eating behavior questionnaire for elementary and junior high school students

The Abnormal Eating Behavior Questionnaire for Elementary and Junior High School Students (ABQ-EJ; Ito et al., 2016) was used to measure recently exhibited AEBs. This self-reported scale contains 14 items grouped into two subscales, drive for thinness, which relates to eating restrictions and body dissatisfaction (eight items), and bulimic symptoms, concerned with binge eating and purging (five items). Adolescents respond to the items using a four-point scale (1 = *almost never*, 4 = *almost always*), and higher scores indicate a higher level of AEBs. The ABQ-EJ has demonstrated good reliability and validity in a Japanese adolescent sample (Ito et al., 2016). In the current study, Cronbach's alphas were 0.854 and 0.762 for drive for thinness and bulimic symptoms, respectively.

2.2.3. NIMSES

The NIMSES (Ito et al., 2019) was used to measure socioeconomic status (SES). This tool comprises 14 items that indirectly assess SES, including household goods or lifestyles. A prior study in a sample of Japanese parents confirmed the NIMSES' reliability and validity (Ito et al., 2019). Possible total scores range from 0 to 100, with higher scores indicating greater SES, and internal consistency was acceptable in the current sample ($\alpha = 0.729$).

2.2.4. Body mass index

Participants' height (m) and body weight (kg) were measured to calculate their BMI (weight (kg) / height (m²)).

2.2.5. Birlson depression self-rating scale for children

Depressive symptoms were measured using the Japanese short version of the Birlson Depression Self-Rating Scale for Children, which has been validated in Japanese samples (DSRS-C; Birlson et al., 1987; Namikawa et al., 2011). The scale comprises nine items rated using a four-point scale (1 = *never*, 4 = *very often*), and higher scores indicate greater depressive symptoms in the past week. In the current study, Cronbach's alpha was 0.799.

2.3. Statistical analyses

To examine the associations of the ERSs with AEBs in concert, we performed a multiple regression analysis, entering gender, grade, BMI, and depressive symptoms as covariates. As BMI increases with age during adolescence (Rohde et al., 2015), in the analysis, we used standardized scores for BMI, which were calculated based on the national data reported by the government (Ministry of Education, Culture, Sports, Science and Technology, 2019). Additionally, because a previous study indicated gender differences in AEB levels and effects of ERSs on psychopathology (Murayama et al., 2017; Swanson et al., 2011), we stratified the results of the regression analyses by gender and examined the differences in estimates using Wald test statistics. Owing to the

Bonferroni correction, the *p*-value of each Wald test was 0.006 (0.05/8). The full information maximum likelihood estimation approach was applied to handle missing data. Mplus Version 7.31 (Muthen & Muthen, 2015) was used for the multiple regression analysis and PASW Statistics 18.0 (SPSS) for other analyses.

3. Results

3.1. Missing and descriptive data

Data for all variables except SES were missing for less than 5% of the sample ($n < 251$). Regarding SES, 30.3% ($n = 1608$) of the parents failed to answer completely. However, although there were no systematic differences between students with and without missing data regarding gender, more parents of 9th and 8th graders did not respond to the items measuring SES than parents of students in the other grades.

The means, standard deviations, and intercorrelations among the variables of interest are illustrated in Table 1. The coefficient of the skewness of each variable was under 3 (Skew = -0.41 – 0.06), and all the variables were normally distributed. Rumination was positively correlated with drive for thinness and bulimic symptoms in boys and girls ($r = 0.21$ – 0.31 , $ps < 0.001$). The correlation coefficients of the other ERSs with the AEBs were small, although some were significant.

3.2. Unique associations of ERSs with AEBs

Table 2 illustrates the results of a multiple regression analysis examining the associations of the ERSs with AEBs. Variance inflation factors in the analyses were under 2.33, and none of the data were affected by multicollinearity. Rumination demonstrated a significant association with drive for thinness (boys $\beta = 0.22$; girls $\beta = 0.25$, $ps < 0.001$). A Wald test indicated that the relationship was stronger for girls than boys. Also, in girls, elevated distraction was significantly related to the severity of the drive for thinness ($\beta = 0.12$, $p < .001$). The other strategies did not demonstrate such significant associations.

Regarding bulimic symptoms, rumination had significant associations for boys and girls ($\beta = 0.20$ and 0.16 , $ps < 0.001$, respectively). Additionally, elevated distraction was significantly related to severe bulimic symptoms in boys and girls ($\beta = 0.12$, $p < .001$; $\beta = 0.09$, $p = .007$, respectively), whereas problem-solving was negatively associated with bulimic symptoms only in girls ($\beta = -0.08$, $p = .022$).

4. Discussion

The present study examined the simultaneous associations between four ERSs and AEBs in a large sample of early adolescents. Consistent with prior research, greater rumination was related to elevated AEBs. Contrary to our expectation, however, distraction was positively associated with AEBs.

4.1. Association between rumination and eating pathology

As expected, the regression analyses showed that adolescents with higher rumination had a more severe drive for thinness and bulimic symptoms, although the observed effect sizes were small to medium.² These findings were consistent with previous studies among adolescents that examined the association of rumination with AEBs without removing the effects of other ERSs (e.g., Nolen-Hoeksema et al., 2007). Thus, this study provides evidence of the fact that regardless of the effects of other ERSs, rumination is a robust risk factor for maintenance of both drive for thinness and bulimic symptoms across cultures.

Regarding the association of rumination with the drive for thinness, a

² Acock (2014) has argued that an effect size is small when β is < 0.20 , moderate when β is 0.2 – 0.5 , and large when β is > 0.5 .

Table 1
Correlations, means, and standard deviations of all variables.

	Boys (n = 2726)										Girls (n = 2575)												
	1		2		3		4		5		6		7		8		9		10		M	SD	Skew
	B	SE	β	p	B	SE	β	p	B	SE	β	p	B	SE	β	p	B	SE	β	p			
1. Grade	-																						
2. SES	-0.03																						
3. BMI	0.43***	-0.01***																					
4. Depressive symptoms	0.11***	-0.11***	0.32***																				
5. Problem-solving	0.13***	0.07***	0.17***	0.08***																			
6. Rumination	0.22***	-0.07***	0.11***	-0.15***	0.43***																		
7. Distraction	0.11***	0.04*	0.00	-0.38***	0.57***	0.15***																	
8. Reappraisal	0.07***	0.09***	0.00	-0.25***	0.62***	0.23***	0.58***																
9. Drive for thinness	0.23***	-0.09***	0.43***	0.33***	0.08***	0.34***	-0.02	0.03															
10. Bulimic symptoms	0.22***	-0.10***	0.22***	0.22***	0.05***	0.23***	0.03	0.48***	0.03														

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Lower and upper diagonals represent the girls' and boys' samples, respectively. SES: socioeconomic status; BMI: body mass index.

Table 2
Associations of emotion regulation strategies with abnormal eating behaviors.

	Drive for thinness										Bulimic symptoms																
	Boys					Girls					Boys					Girls											
	B	SE	β	p	Wald	B	SE	β	p	Wald	B	SE	β	p	Wald	B	SE	β	p	Wald	B	SE	β	p			
Grade	0.02	0.04	0.01	0.598	0.38	0.06	0.12	<0.001	<0.001	0.03	0.04	0.02	0.492	0.24	0.04	0.16	<0.001	<0.001	<0.001	0.03	0.04	0.02	0.492	0.24	0.04	0.16	<0.001
SES	-0.09	0.10	-0.02	0.360	-0.05	0.13	-0.01	0.728	0.771	-0.05	0.08	-0.02	0.515	-0.16	0.08	-0.05	0.042	0.333	0.333	-0.05	0.08	-0.02	0.515	-0.16	0.08	-0.05	0.042
sBMI	0.54	0.04	0.36	<0.001	0.74	0.05	0.34	<0.001	0.001	0.22	0.03	0.21	<0.001	0.13	0.02	0.12	<0.001	0.007	0.007	0.22	0.03	0.21	<0.001	0.13	0.02	0.12	<0.001
Depression	0.24	0.03	0.18	<0.001	0.34	0.04	0.20	<0.001	0.055	0.03	0.02	0.03	0.183	0.14	0.02	0.16	<0.001	0.001	0.001	0.03	0.02	0.03	0.162	0.07	0.03	0.08	0.022
Problem-solving	0.00	0.03	0.00	0.988	-0.04	0.04	-0.03	0.325	0.425	-0.04	0.03	-0.05	0.20	-0.07	0.03	-0.08	0.022	0.546	0.546	-0.04	0.03	-0.05	0.20	-0.07	0.03	-0.08	0.022
Rumination	0.35	0.04	0.22	<0.001	0.51	0.05	0.25	<0.001	0.005	0.23	0.03	0.20	<0.001	0.16	0.03	0.16	<0.001	0.001	0.001	0.23	0.03	0.20	<0.001	0.16	0.03	0.16	<0.001
Distraction	0.02	0.04	0.02	0.552	0.10	0.05	0.05	0.048	0.205	0.13	0.03	0.12	<0.001	0.10	0.04	0.09	0.007	0.560	0.560	0.13	0.03	0.12	<0.001	0.10	0.04	0.09	0.007
Reappraisal	-0.04	0.03	-0.04	0.115	-0.04	0.04	-0.03	0.262	0.967	-0.01	0.02	-0.01	0.698	0.02	0.02	0.03	0.257	0.278	0.278	-0.01	0.02	-0.01	0.698	0.02	0.02	0.03	0.257
R ²			0.24	<0.001			0.31	<0.001				0.10	<0.001			0.13	<0.001						0.10	<0.001		0.13	<0.001

Note. p-value on each Wald test was 0.006. SES: socioeconomic status; sBMI: standardized scores for BMI.

significant gender difference was found; girls showed a stronger association. This is the first study to demonstrate a gender difference in the relationship between rumination and drive for thinness. This finding may relate to gender differences in body dissatisfaction, measured by the subscale “drive for thinness” of the ABQ-E and the function of rumination. Multiple studies have shown that girls/women are more likely to exhibit body dissatisfaction (e.g., [Chen et al., 2015](#)), which begins to emerge among girls aged 5–7 ([Perez et al., 2018](#)). Also, several studies across cultures have demonstrated that individuals feel body dissatisfaction by experiencing the gap between the thin-ideal body shape or weight prevalent in the modern society and their own actual ones ([Stice et al., 1994](#); [Uragami et al., 2013](#)). Regarding the function of rumination, some studies have suggested that rumination leads individuals to perseverate on negative information ([Joorman & Gotlib, 2008](#)). Considering this evidence together, girls with more frequent rumination may pay more attention to their body shape/weight, which they consider less desirable than what they view as an ideal body type, which leads to the perception that the association of rumination with drive for thinness is stronger in girls than boys.

4.2. Associations between adaptive strategies and eating pathology

Regarding the associations between adaptive strategies (i.e., problem-solving and reappraisal) and AEBs, the regression analyses demonstrated that the frequent use of the problem-solving strategy was associated with decreased bulimic symptoms only in girls. However, it is necessary not to overestimate this result. Despite this significant association in girls, the actual regression coefficient was small. Aligned with this finding, the Wald test did not show any gender differences in the association between problem-solving and bulimic symptoms. Considering these findings and the non-significant associations between reappraisal and drive for thinness/bulimic symptoms, the contributions of adaptive ERs to the maintenance of AEBs during early adolescence seem to be limited. In line with this view, a prior study suggested that adaptive ERs were less likely to relate to psychopathology than maladaptive ones ([Aldao et al., 2010](#)). Therefore, regardless of cultural differences, problem-solving and reappraisal could be less likely to play critical roles than maladaptive ones in the maintenance of AEBs during early adolescence.

4.3. Relationship of distraction with eating pathology

Contrary to our expectation, although the effect sizes were small, the regression analyses revealed that greater levels of emotional regulation by distraction were associated with elevated levels of drive for thinness and bulimic symptoms, except the association with drive for thinness in boys. To our knowledge, this is the first study to demonstrate the positive associations of distraction with AEBs during early adolescence. These findings could reflect the view that distraction may be a form of avoidance, which is characteristic of EDs ([Rawal et al., 2010](#)). One study among healthy adults showed that individuals are prone to emotional regulation by distraction when facing high-intensity emotions, as it provides short-term relief ([Sheppes et al., 2012](#)). Also, [Sheppes et al. \(2012\)](#) suggested that rigid uses of disengagement strategies in low emotional situations become maladaptive over the long-run, resulting in the development of psychopathology. Based on the evidence that children and early adolescents have not yet developed enough skills to self-regulate or even tolerance for aversive affect (e.g., [Fritz et al., 2019](#)), it is understandable that some early adolescents may intensively rely on distraction, which early adolescents easily channel, in order to regulate negative affect and then become habituated to use the strategy even in low emotional environments, which [Sheppes et al. \(2012\)](#) also have suggested. In line with this view, other researchers ([Hunt, 1998](#)) have pointed out that the chronic use of distraction prevents individuals from facing and coping with situations eliciting negative affect, suggesting that distraction functions as a form of avoidance. Considering these

findings, when compared to adults, early adolescents may be more likely to use distraction rigidly, which turns distraction into avoidance behavior. Therefore, it may be important to inform early adolescents about adaptive uses of distraction for short-term relief.

4.4. Clinical implications

Based on the findings of this study, which are consistent with previous findings across different cultures, amelioration of rumination based on treatments and preventive interventions should be emphasized to alleviate AEBs during early adolescence. Although research in the West has indicated a negative correlation between rumination and problem solving ([Nolen-Hoeksema et al., 2008](#)), this study of a sample of Japanese adolescents showed positive correlations between these variables, which was consistent with previous findings in the East ([Murayama et al., 2017](#)). Therefore, encouraging adolescents in Eastern countries to use problem-solving strategies, especially cognitive ones like reflection, a type of rumination involving an active inward focus on distress to solve a negative situation ([Trenor et al., 2003](#)), might ironically lead to more use of rumination, resulting in severe AEBs. Considering this perspective, clinical psychologists or school counselors should encourage early adolescents to use behavioral problem-solving strategies, such as utilizing social supports around them. Aligning with this view, one study suggested that social support is a critical factor for the treatment of patients with EDs ([Linville et al., 2012](#)). Therefore, encouraging early adolescents to use behavioral problem-solving strategies seems to play a critical role in reducing rumination use and alleviating levels of AEBs.

4.5. Limitations

The current findings should be considered in the context of certain limitations. First, owing to the cross-sectional study design, we cannot make causal inferences, and prospective studies are required to clarify these associations' temporal nature. If rumination and distraction do predict elevated AEBs, preventive interventions or psychoeducation for early adolescents should focus on reducing the frequencies of maladaptive ERs, especially rumination. Second, the study relied on self-report measures, which are vulnerable to inaccurate reporting. One study suggested that individuals are more likely to underestimate the frequency of AEBs in self-reporting than in interview-based assessments ([Mond et al., 2004](#)). Finally, the current study did not explore the associations between ERs and AEBs in adolescents diagnosed with EDs. It would be useful to replicate this study in such a population.

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CRediT authorship contribution statement

Yasuo Murayama: Conceptualization, Writing original draft, Writing review, Editing. **Hiroyuki Ito:** Data curation, Formal analysis. **Megumi Hamada:** Investigation. **Nobuya Takayanagi:** Investigation. **Mitsunori Myogan:** Investigation. **Katsuaki Suzuki:** Supervision. **Masatsugu Tsujii:** Funding acquisition, Project administration.

Declaration of competing interest

None.

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