Received: 15 February 2021 | Revised: 8 September 2021 | Accepted: 9 September 2021

DOI: 10.1002/eat.23608

BRIEF REPORT

International Journal of EATING DISORDERS WILEY

Emotion regulation in adolescents with anorexia and bulimia nervosa: Differential use of adaptive and maladaptive strategies compared to healthy adolescents

Karin Perthes MSc[1] | Inken Kirschbaum-Lesch MSc[2] | Tanja Legenbauer Dr.rer.nat.[2] | Martin Holtmann Dr.med.[2] | Florian Hammerle Dipl.-Psych.[1] | David R. Kolar Dr.rer.nat.[1,3]

[1]Department of Child and Adolescent Psychiatry and Psychotherapy, University Medicine of the Johannes Gutenberg-University, Mainz, Germany

[2]LWL University Hospital Hamm for Child and Adolescent Psychiatry, Psychotherapy and Psychosomatic, Ruhr University Bochum, Hamm, Germany

[3]Department of Psychiatry and Psychotherapy, University Hospital, Ludwig-Maximilians-University Munich, Munich, Germany

Correspondence
David R. Kolar, Department of Psychiatry and Psychotherapy, University Hospital, LMU Munich, Nussbaumstr. 7, 80336 Munich, Germany.
Email: david.kolar@med.uni-muenchen.de

Action Editor: Anja Hilbert

Abstract

Objective: Adolescents with anorexia (AN) and bulimia nervosa (BN) often struggle with emotion regulation (ER). These difficulties have predominantly been assessed across emotions, without considering adaptive and maladaptive ER separately. We compared adolescents with AN or BN to healthy adolescents (HCs) regarding the adaptive and maladaptive ER of three emotions.

Method: A treatment-seeking sample of 197 adolescents (atypical/full-threshold AN: $N = 118$, atypical/full-threshold BN: $N = 32$; HC: $N = 47$) reported emotion-specific ER with the FEEL-KJ questionnaire. Mixed models were calculated for adaptive and maladaptive ER to assess differences between emotions (anxiety, anger, and sadness) and groups (AN, BN, and HC).

Results: Main effects of emotion ($p < .001$) and group ($p < .001$) were found, but no interaction effects were found ($p > .05$). Post hoc tests showed lower maladaptive and higher adaptive ER for anxiety than anger or sadness ($p < .001$). AN and BN reported lower adaptive ($p < .001$) and higher maladaptive ER than HCs ($p < .001$). BN showed the highest levels of maladaptive ER ($p = .009$).

Discussion: The differences between AN and BN in adaptive and maladaptive ER should be considered. Furthermore, investigating differences in ER of other emotions in eating disorders might be promising.

KEYWORDS
anorexia nervosa, bulimia nervosa, eating disorders, emotion regulation

1 | INTRODUCTION

Anorexia (AN) and bulimia nervosa (BN) are serious eating disorders (EDs), associated with emotion regulation (ER) difficulties (Lavender et al., 2015). ER is the ability to regulate emotions regarding intensity, duration, and type by applying cognitive or behavioral strategies (Gross & Thompson, 2007). ER strategies can be categorized as adaptive (e.g., reappraisal) or maladaptive (e.g., rumination; Aldao, Nolen-

Hoeksema, & Schweizer, 2010). Maladaptive strategies are closely related to psychopathology across mental disorders (Aldao et al., 2010), including EDs (Prefit, Cândea, & Szentagotai-Tătar, 2019). Theoretical models of AN and BN conceptualize disordered eating behaviors (e.g., restriction, purging) as maladaptive behaviors to improve affect (Haynos & Fruzzetti, 2011; Stice, 2001). Cross-sectional and ecological momentary assessment studies underline these models showing that disordered eating is not only intended to regulate affect (Meule et al., 2019; Wang et al., 2020), but actually decreases negative and increases positive affect in daily life in AN (Engel et al., 2013; Kolar et al., 2020) and BN (Berg et al., 2013).

Most ER studies have assessed overall positive and negative affect, but individuals with EDs might experience distinct emotions differently. For example, fear of gaining weight is a core feature of AN and BN (Levinson et al., 2017; Murray et al., 2018), and childhood anxiety disorders predict EDs during adolescence (Schaumberg et al., 2019), indicating the centrality of anxiety for EDs. Fear of negative evaluation as a core feature of social anxiety is also associated with EDs (Levinson & Williams, 2020; Trompeter et al., 2019). Similar findings have been noted for depression, as studies acknowledge the impact of depressive symptoms on ED symptom trajectories (Allen, Crosby, Oddy, & Byrne, 2013; Herpertz-Dahlmann, Dempfle, Konrad, Klasen, & Ravens-Sieberer, 2015). Adolescent patients with comorbid depression show more ED symptoms compared to patients with comorbid anxiety disorders (Hughes et al., 2013). In summary, ED patients may struggle particularly with specific emotions associated with comorbid anxiety or depressive disorders. Sadness might be suppressed by restriction and purging (Espeset, Gulliksen, Nordbø, Skårderud, & Holte, 2012) and patients with AN restricted their eating further after sadness was induced (Naumann, Tuschen-Caffier, Voderholzer, & Svaldi, 2014). Other maladaptive ER strategies such as anger suppression also seem to be relevant in EDs (Fox & Power, 2009; Waller et al., 2003). However, there is a lack of studies examining whether adolescents with EDs apply adaptive and maladaptive ER differentially in response to specific emotions.

Adolescence is a phase of simultaneous emotional disturbance and adaptive ER development (Gullone, Hughes, King, & Tonge, 2010). Moreover, many mental disorders emerge during adolescence (Kessler & Wang, 2008), including AN and BN (Smink, van Hoeken, & Hoek, 2012). Consequently, higher difficulties in ER were found in adolescents with EDs compared to healthy adolescents (Segal & Golan, 2016), and greater dysfunctional ER for binge–purge compared to restrictive EDs in adolescents (Weinbach, Sher, & Bohon, 2018). To date, only one study has investigated age-specific differences of ER in EDs, finding no difference between adolescents and adults (Anderson et al., 2018). However, ER difficulties typically decrease when transitioning from adolescence into adulthood (Zimmermann & Iwanski, 2014), indicating that healthy adolescents continue developing adaptive ER, whereas this process is interrupted by EDs. Thus, investigating whether adolescents with EDs differ from healthy adolescents in adaptive and maladaptive ER might further increase insight into the relationship between ER and EDs.

Therefore, we hypothesize that adolescents with AN or BN differ from healthy adolescents (HCs) in using adaptive and maladaptive ER. Specifically, we assume that adolescents with EDs use less adaptive and more maladaptive ER strategies, with higher maladaptive ER levels reported among adolescents with BN. In addition, we hypothesize that strategies are differentially applied in response to anxiety, anger, and sadness in individuals with and without EDs.

2 | METHOD

The sample comprised 197 female adolescents aged 12–20 years, of those 118 with a clinical diagnosis of AN (atypical: $N = 35$), 32 with BN (atypical: $N = 12$), and 47 HCs. Diagnoses were classified as atypical when at least one DSM-5 symptom was not met, but a clinical impression of AN/BN was apparent (e. g. AN: higher body weight, atypically low fear of weight gain; BN: lower frequency of binge eating/purging). Patients were diagnosed by an experienced clinician after diagnostic assessment. Data were pooled from four sources (cf. Data S1). The research was reviewed and approved by an institutional review board from the medical faculty of the Ruhr-University Bochum (nos. 4359-12; 17-6140) and the State Medical Association at Mainz (no. 2020-15090).

2.1 | Measures

Weight and height were objectively measured for patients with AN and BN to calculate body mass index (BMI) (kg/m^2) and age- and gender-adjusted BMI standard deviation scores (BMI-SDS; Kromeyer-Hauschild et al., 2001).

2.1.1 | Eating disorder examination interview and questionnaire

Eating disorder examination interviews (EDE; child version: ChEDE) and questionnaire (EDE-Q) were used to compare symptom severity between patient groups and sample sites (Fairburn & Beglin, 1994). A thorough description of the EDE assessment in this study can be found in Data S2.

2.1.2 | Questionnaire to assess children's and adolescents' emotion regulation strategies (FEEL-KJ)

The FEEL-KJ (Grob & Smolenski, 2005) is a 90-item questionnaire assessing ER of children and adolescents in response to anxiety, anger, and sadness. For each emotion, mean scores of two second-order factor scales (adaptive and maladaptive ER strategies) were computed. Problem solving, forgetting, acceptance, distraction, humor, cognitive problem solving, and reappraisal were adaptive, and giving up, withdrawal, ruminating, self-evaluation, and aggressive behavior were maladaptive strategies. Participants indicated how much they apply each of the strategies (e.g., "I keep my feelings to myself") repeatedly for each emotion. The FEEL-KJ

was administered prior to or during early treatment phases. The FEEL-KJ is a reliable and valid measure for ER (Grob & Smolenski, 2005) and has been used in studies with ED patients (e.g., Czaja, Rief, & Hilbert, 2009). In our sample, the emotion-specific adaptive and maladaptive scales showed good internal consistency (.77 ≤ α ≤ .88).

2.2 | Analysis

Baseline differences were analyzed using analysis of variances (ANOVAs) and *t* tests. Two linear mixed models with random intercepts were calculated for adaptive and maladaptive ER, accounting for repeated assessments (i.e., answering the same items for three distinct emotions) within participants. They are comparable to repeated-measures ANOVAs, with the advantage of allowing partially missing data. Emotion (anger, sadness, and anxiety; within-factor), group (AN, BN, and HC; between-factor), and emotion × group interaction fixed effects were calculated. Two-tailed Alpha was set at $\alpha = .05$. Post hoc *t* tests were Tukey-adjusted. Data analysis was conducted with R 3.5.0 (Core Team, 2020) using the nlme package (Pinheiro, Bates, DebRoy, Sarkar, & Team, 2020). An a priori power analysis indicated 80% power to detect a small interaction effect with this sample size. The analysis plan and power analysis were preregistered (https://osf.io/s2w76).

3 | RESULTS

3.1 | Sample characteristics

Data S3 provides sample characteristics. AN, BN, and HC participants differed in age, $F(2, 194) = 3.12$, $p = .046$, $\eta^2 = 0.03$, indicating that patients with BN were older than patients with AN ($t[194] = 2.39$, $p = .047$, $d = 0.46$). Patients with atypical AN showed higher BMI (BMI-SDS) scores compared to patients with full-threshold AN, but no differences in questionnaire scores were observed. No differences between patients with atypical and full-threshold BN emerged, except for EDE eating concern (cf. Data S4). Thus, combining participants with full-threshold and atypical AN or BN seemed reasonable. Regarding site differences, patients with AN recruited at Mainz had a higher BMI, as only inpatients were recruited in Hamm. This difference disappeared using BMI-SDS. The HC groups differed in maladaptive ER for sadness between study sites (cf. Data S5).

TABLE 1 Model parameters of the linear mixed models and post hoc comparisons for adaptive and maladaptive emotion regulation strategies as assessed with the FEEL-KJ

A:	Adaptive emotion regulation strategies			Maladaptive emotion regulation strategies		
Fixed effects	***F***	***df***	***p***	***F***	***df***	***p***
Intercept	5,058.36	1; 385	<.001	4,963.46	1; 386	<.001
Emotion	25.53	2; 385	<.001	61.84	2; 386	<.001
Group	20.92	2; 193	<.001	27.68	2; 193	<.001
Emotion × group	1.98	4; 385	.098	0.95	4; 386	.437
Random effects	Variance			Variance		
Intercept	0.290			0.300		
Residual	0.134			0.124		
Model fit indices						
AIC	924			899		
BIC	972			947		
R^2 marginal	.17			.23		
R^2 conditional	.74			.77		

B:	Adaptive emotion regulation strategies						Maladaptive emotion regulation strategies					
Post hoc comparisons	M_1	M_2	***t***	***df***	***p***	***d***	M_1	M_2	***t***	***df***	***p***	***d***
Anger vs. anxiety	2.82	3.12	−7.01	385	<.001	0.46	3.02	2.70	7.95	386	<.001	0.50
Anger vs. sadness	2.82	2.92	−2.26	385	.063	0.14	3.02	3.10	−1.82	386	.165	0.11
Anxiety vs. sadness	3.12	2.92	4.74	385	<.001	0.31	2.70	3.10	−9.78	386	<.001	0.61
HC vs. AN	3.40	2.86	5.39	193	<.001	0.83	2.43	3.02	−5.87	193	<.001	0.92
HC vs. BN	3.40	2.61	5.93	193	<.001	1.21	2.43	3.37	−7.02	193	<.001	1.45
AN vs. BN	2.86	2.61	2.15	193	.083	0.38	3.02	3.37	−2.99	193	.009	0.53

Note: $N = 196$ participants, 587 observations (maladaptive: 588 observations). . R^2 indices are calculated with the formula proposed by Nakagawa, Johnson, and Schielzeth (2017). FEEL-KJ: Questionnaire for the assessment of children's and adolescents' emotion regulation strategies. . Means are estimated marginal means. *p*-Values of post hoc comparisons are Tukey-corrected for multiple comparisons.

Abbreviations: AN, anorexia nervosa; AIC, Akaike information criterion. BIC, Bayesian information criterion; BN, bulimia nervosa; HC: healthy control.

3.2 | Emotion-specific adaptive and maladaptive emotion regulation

Table 1 provides linear mixed model and post hoc comparison test statistics. For both adaptive and maladaptive ER, significant main effects of emotion and group were found, in line with our hypotheses. Significant post hoc comparisons revealed higher adaptive (Figure 1a) and lower maladaptive ER (Figure 1c) of anxiety compared to anger, but no difference between anger and sadness. Compared to HC, patients with AN and BN reported less adaptive (Figure 1b) and higher maladaptive ER (Figure 1d). Maladaptive (but not adaptive) ER in patients with BN was also higher than in patients with AN.

Contrary to our hypotheses, interaction effects of emotion × group were not found for either adaptive or maladaptive ER (Table 1). Thus, patients with AN or BN utilized ER strategies for all emotions similarly, compared to HC. Additional exploratory analyses, including

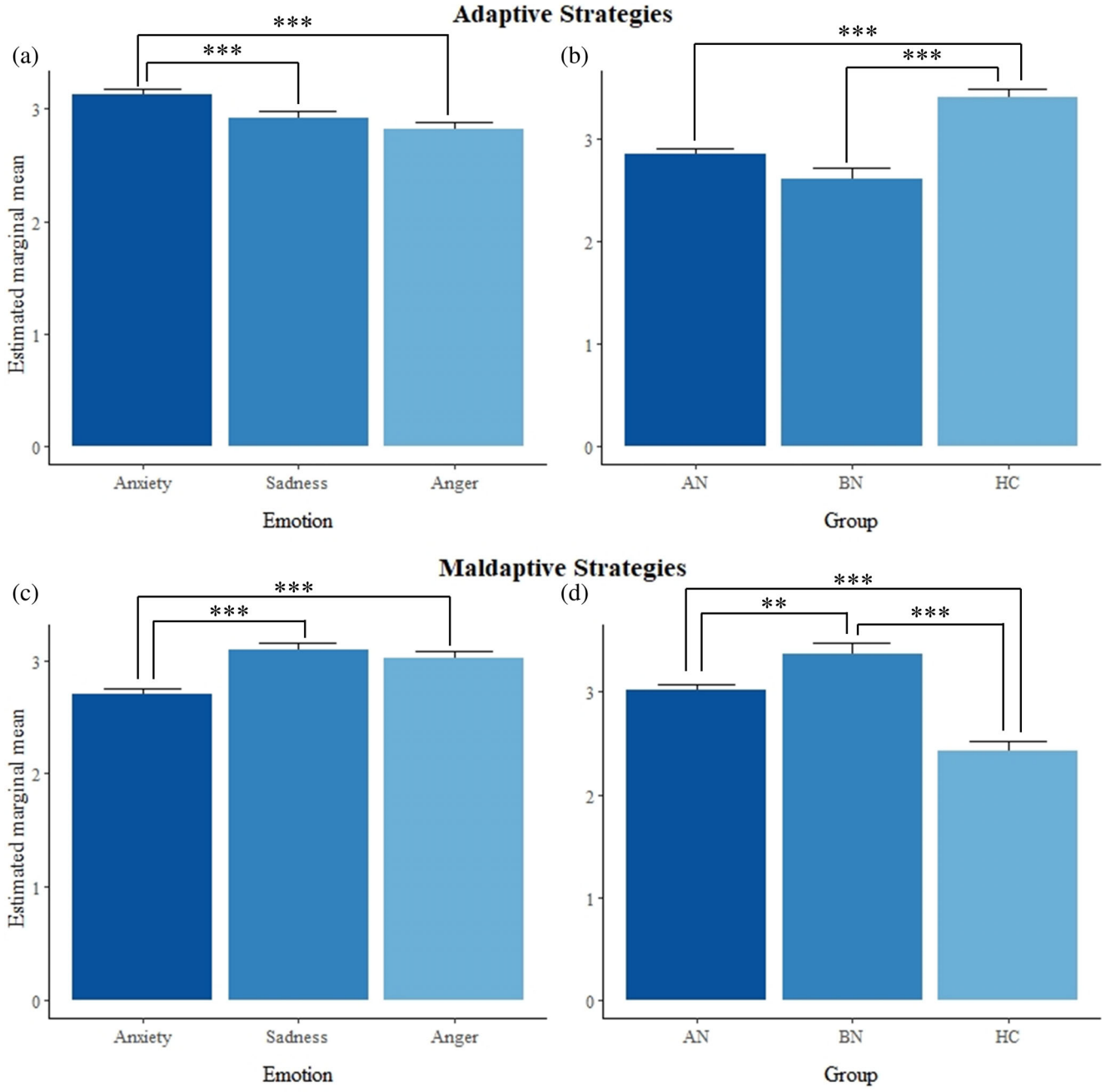

FIGURE 1 Estimated marginal means of adaptive and maladaptive emotion regulation scores by emotion and group. *Note*: Estimated marginal means (EMM) of the linear mixed models for adaptive and maladaptive emotion regulation. (a) EMM of adaptive emotion regulation by emotion. (b) EMM of adaptive emotion regulation by group. (c) EMM of maladaptive emotion regulation by emotion. (d) EMM of maladaptive emotion regulation by group. Error bars represent standard errors. Significance levels of main effects: * $p < .05$; ** $p < .01$; *** $p < .001$. AN, anorexia nervosa; BN, bulimia nervosa; HC, healthy controls

age or BMI-SDS as predictors were conducted. Results were mostly identical, however, post hoc differences in maladaptive strategies between AN and BN disappeared after controlling for BMI-SDS (cf. Data S6). Finally, exploratory analyses on differences between AN subtypes based on reported binge/purge frequencies in the last month revealed that the AN binge/purge subtype falls in between AN restrictive subtype and BN for adaptive and maladaptive strategies. However, it was not statistically significantly different from AN restrictive subtype or BN (see Data S7).

4 | DISCUSSION

We investigated adaptive and maladaptive ER in adolescents with AN and BN, compared to HCs. In line with our hypotheses, adolescents with AN and BN used more maladaptive and less adaptive strategies than HC, and adolescents with BN more maladaptive strategies than adolescents with AN. As expected, differences between emotions were observed: participants reported more adaptive and less maladaptive ER to regulate anxiety compared to anger and sadness. This indicates that even adolescents with AN or BN struggle less when regulating anxiety, compared to anger or sadness. AN binge/purge subtype reported less adaptive and more maladaptive strategies compared to AN restrictive subtype, and more adaptive and less maladaptive strategies compared to BN. Supporting Weinbach et al. (2018), ER difficulties seem to increase continuously from restrictive to binge/purge EDs. Altogether, both EDs and emotions explain a substantial part of the variance in using adaptive and maladaptive ER strategies.

Our results indicate that using adaptive strategies to regulate anger and sadness might be especially difficult for adolescents; therefore, more maladaptive strategies are used. Alternatively, adaptive ER for anxiety may be developed earlier during adolescence, compared to anger and sadness. However, because anxiety has been implicated as crucial during onset and maintenance of EDs (Levinson et al., 2017; Murray et al., 2018; Schaumberg et al., 2019), it is surprising that adolescents with EDs also reported fewer problems with ER of anxiety. An explanation might be that compared to ED-specific fears, dealing with anxiety, in general, may seem easier. A different explanation could be that fear of weight gain is more closely linked to sadness or depression, as a recent study has suggested (Levinson, Williams, & Christian, 2020).

Our results underline that ER difficulties constitute a transdiagnostic factor across EDs and support targeting ER in interventions for adolescents with EDs. Hence, future studies should investigate whether adolescents with EDs benefit from ER interventions, such as dialectical behavior therapy skills training (Reilly et al., 2020). Given that adolescents with BN exhibit higher levels of maladaptive ER than AN, they might specifically benefit from interventions aimed at increasing negative affect tolerance to decrease impulsive engagement in maladaptive ER.

Our data were pooled from four sources using different instruments. Therefore, diagnostic categories were partially based on clinical assessments instead of structured interviews, limiting their reliability. Our findings were based on self-reports, which may be biased as previous studies have found that adolescents with AN have difficulties identifying and describing emotions (Kolar et al., 2017). Sample sizes in the BN and HC groups were relatively small. Finally, we focused on anger, sadness, and anxiety, although emotions, such as disgust, shame, and guilt have also been linked to EDs (Fox & Power, 2009). Thus, future studies might investigate whether adolescents with EDs apply ER differentially for these emotions, given their importance in EDs (Berg et al., 2013; Haynos et al., 2017).

In conclusion, our study indicates that deficits in adaptive and excesses in maladaptive ER appear transdiagnostic and "trans-emotional," at least for anxiety, anger, and sadness in adolescents with AN and BN. Higher levels of maladaptive ER have been reported in adolescents with BN, warranting special attention. Future studies should corroborate our findings with measures other than self-reports and might investigate emotion-specific differences in the regulation of other emotions such as guilt or shame.

ACKNOWLEDGEMENTS

This study was presented at the Virtual XXVI Annual Meeting of the Eating Disorders Research Society. We are thankful to all adolescents that participated in this study. We thank Luisa Lüken for her support in data preparation. Open Access funding enabled and organized by Projekt DEAL.

CONFLICT OF INTEREST

Martin Holtmann served in an advisory role for Shire and Medice and received conference attendance support or was paid for public speaking by Medice and Shire. Martin Holtmann and Tanja Legenbauer receive research support from the German Research Foundation and the German Ministry of Education and Research. Martin Holtmann receives royalties as editor in chief of the German Journal for Child and Adolescent Psychiatry and for text books from Hogrefe. Tanja Legenbauer receives royalties for text books from Hogrefe, Springer, De Gruyter and Kohlhammer.

DATA AVAILABILITY STATEMENT

Due to restrictions of the ethics review board, data of adolescent patients are not publicly available and may be requested with reason by the corresponding author.

ORCID

Florian Hammerle https://orcid.org/0000-0002-2659-6266
David R. Kolar https://orcid.org/0000-0002-8649-5467

REFERENCES

Aldao, A., Nolen-Hoeksema, S., & Schweizer, S. (2010). Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*, *30*(2), 217–237. https://doi.org/10.1016/j.cpr.2009.11.004

Allen, K. L., Crosby, R. D., Oddy, W. H., & Byrne, S. M. (2013). Eating disorder symptom trajectories in adolescence: Effects of time, participant

sex, and early adolescent depressive symptoms. *Journal of Eating Disorders*, *1*(1), 1–14.

Anderson, L. K., Claudat, K., Cusack, A., Brown, T. A., Trim, J., Rockwell, R., … Kaye, W. H. (2018). Differences in emotion regulation difficulties among adults and adolescents across eating disorder diagnoses. *Journal of Clinical Psychology*, *74*(10), 1867–1873.

Berg, K. C., Crosby, R. D., Cao, L., Peterson, C. B., Engel, S. G., Mitchell, J. E., & Wonderlich, S. A. (2013). Facets of negative affect prior to and following binge-only, purge-only, and binge/purge events in women with bulimia nervosa. *Journal of Abnormal Psychology*, *122*(1), 111–118. https://doi.org/10.1037/a0029703

Core Team, R. (2020). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing.

Czaja, J., Rief, W., & Hilbert, A. (2009). Emotion regulation and binge eating in children. *International Journal of Eating Disorders*, *42*(4), 356–362.

Engel, S. G., Wonderlich, S. A., Crosby, R. D., Mitchell, J. E., Crow, S., Peterson, C. B., … Gordon, K. H. (2013). The role of affect in the maintenance of anorexia nervosa: Evidence from a naturalistic assessment of momentary behaviors and emotion. *Journal of Abnormal Psychology*, *122*(3), 709–719. https://doi.org/10.1037/a0034010

Espeset, E. M. S., Gulliksen, K. S., Nordbø, R. H. S., Skårderud, F., & Holte, A. (2012). The link between negative emotions and eating disorder behaviour in patients with anorexia nervosa. *European Eating Disorders Review*, *20*(6), 451–460. https://doi.org/10.1002/erv.2183

Fairburn, C. G., & Beglin, S. J. (1994). Assessment of eating disorders: Interview or self-report questionnaire? *International Journal of Eating Disorders*, *16*(4), 363–370. https://doi.org/10.1002/1098-108X(199412)16:4<363::AID-EAT2260160405>3.0.CO;2-%23

Fox, J. R., & Power, M. J. (2009). Eating disorders and multi-level models of emotion: An integrated model. *Clinical Psychology and Psychotherapy*, *16*(4), 240–267. https://doi.org/10.1002/cpp.626

Grob, A., & Smolenski, C. (2005). *Fragebogen zur Erhebung der Emotionsregulation bei Kindern und Jugendlichen (FEEL-KJ)*. Bern: Verlag Hans Huber.

Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: Conceptual foundations. In *Handbook of emotion regulation* (pp. 3–24). New York, NY, US: Guilford Press.

Gullone, E., Hughes, E. K., King, N. J., & Tonge, B. (2010). The normative development of emotion regulation strategy use in children and adolescents: A 2-year follow-up study. *Journal of Child Psychology and Psychiatry*, *51*(5), 567–574.

Haynos, A. F., Berg, K. C., Cao, L., Crosby, R. D., Lavender, J. M., Utzinger, L. M., … Crow, S. J. (2017). Trajectories of higher- and lower-order dimensions of negative and positive affect relative to restrictive eating in anorexia nervosa. *Journal of Abnormal Psychology*, *126*(5), 495–505. https://doi.org/10.1037/abn0000202

Haynos, A. F., & Fruzzetti, A. E. (2011). Anorexia nervosa as a disorder of emotion Dysregulation: Evidence and treatment implications. *Clinical Psychology: Science and Practice*, *18*(3), 183–202.

Herpertz-Dahlmann, B., Dempfle, A., Konrad, K., Klasen, F., & Ravens-Sieberer, U. (2015). Eating disorder symptoms do not just disappear: The implications of adolescent eating-disordered behaviour for body weight and mental health in young adulthood. *European Child and Adolescent Psychiatry*, *24*(6), 675–684.

Hughes, E. K., Goldschmidt, A. B., Labuschagne, Z., Loeb, K. L., Sawyer, S. M., & Grange, D. L. (2013). Eating disorders with and without comorbid depression and anxiety: Similarities and differences in a clinical sample of children and adolescents. *European Eating Disorders Review*, *21*(5), 386–394.

Kessler, R. C., & Wang, P. S. (2008). The descriptive epidemiology of commonly occurring mental disorders in the United States. *Annual Review of Public Health*, *29*, 115–129.

Kolar, D. R., Huss, M., Preuss, H. M., Jenetzky, E., Haynos, A. F., Burger, A., & Hammerle, F. (2017). Momentary emotion identification in female adolescents with and without anorexia nervosa. *Psychiatry Research*, *255*, 394–398. https://doi.org/10.1016/j.psychres.2017.06.075

Kolar, D. R., Neumayr, C., Roth, M., Voderholzer, U., Perthes, K., & Schlegl, S. (2020). Testing an emotion regulation model of physical activity in adolescents with anorexia nervosa: A pilot ecological momentary assessment. *European Eating Disorders Review*, *28*(2), 170–183. https://doi.org/10.1002/erv.2706

Kromeyer-Hauschild, K., Wabitsch, M., Kunze, D., Geller, F., Geiß, H. C., Hesse, V., … Hebebrand, J. (2001). Perzentile für den Body-mass-Index für das Kindes- und Jugendalter unter Heranziehung verschiedener deutscher Stichproben. *Monatsschrift Kinderheilkunde*, *149*(8), 807–818. https://doi.org/10.1007/s001120170107

Lavender, J. M., Wonderlich, S. A., Engel, S. G., Gordon, K. H., Kaye, W. H., & Mitchell, J. E. (2015). Dimensions of emotion dysregulation in anorexia nervosa and bulimia nervosa: A conceptual review of the empirical literature. *Clinical Psychology Review*, *40*, 111–122. https://doi.org/10.1016/j.cpr.2015.05.010

Levinson, C. A., & Williams, B. M. (2020). Eating disorder fear networks: Identification of central eating disorder fears. *International Journal of Eating Disorders*, *53*(12), 1960–1973. https://doi.org/10.1002/eat.23382

Levinson, C. A., Williams, B. M., & Christian, C. (2020). What are the emotions underlying feeling fat and fear of weight gain? *Journal of Affective Disorders*, *277*, 146–152. https://doi.org/10.1016/j.jad.2020.08.012

Levinson, C. A., Zerwas, S., Calebs, B., Forbush, K., Kordy, H., Watson, H., … Bulik, C. M. (2017). The core symptoms of bulimia nervosa, anxiety, and depression: A network analysis. *Journal of Abnormal Psychology*, *126*(3), 340–354. https://doi.org/10.1037/abn0000254

Meule, A., Richard, A., Schnepper, R., Reichenberger, J., Georgii, C., Naab, S., … Blechert, J. (2019). Emotion regulation and emotional eating in anorexia nervosa and bulimia nervosa. *Eating Disorders*, *29*, 1–17. https://doi.org/10.1080/10640266.2019.1642036

Murray, S. B., Strober, M., Craske, M. G., Griffiths, S., Levinson, C. A., & Strigo, I. A. (2018). Fear as a translational mechanism in the psychopathology of anorexia nervosa. *Neuroscience and Biobehavioral Reviews*, *95*, 383–395. https://doi.org/10.1016/j.neubiorev.2018.10.013

Nakagawa, S., Johnson, P. C., & Schielzeth, H. (2017). The coefficient of determination R 2 and intra-class correlation coefficient from generalized linear mixed-effects models revisited and expanded. *Journal of the Royal Society Interface*, *14*(134), 20170213. https://doi.org/10.1098/rsif.2017.0213

Naumann, E., Tuschen-Caffier, B., Voderholzer, U., & Svaldi, J. (2014). On the role of sadness in the psychopathology of anorexia nervosa. *Psychiatry Research*, *215*(3), 711–717.

Pinheiro, J., Bates, D., DebRoy, S., Sarkar, D., & Team, R. C. (2020). Nlme: Linear and nonlinear mixed effects models. *R Package Version*, *3*, 1–152. Retrieved from. https://CRAN.R-project.org/package=nlme

Prefit, A. B., Cândea, D. M., & Szentagotai-Tătar, A. (2019). Emotion regulation across eating pathology: A meta-analysis. *Appetite*, *143*, 104438. https://doi.org/10.1016/j.appet.2019.104438

Reilly, E. E., Orloff, N. C., Luo, T., Berner, L. A., Brown, T. A., Claudat, K., … Anderson, L. K. (2020). Dialectical behavioral therapy for the treatment of adolescent eating disorders: A review of existing work and proposed future directions. *Eating Disorders*, *28*(2), 122–141. https://doi.org/10.1080/10640266.2020.1743098

Schaumberg, K., Zerwas, S., Goodman, E., Yilmaz, Z., Bulik, C. M., & Micali, N. (2019). Anxiety disorder symptoms at age 10 predict eating disorder symptoms and diagnoses in adolescence. *Journal of Child Psychology and Psychiatry*, *60*(6), 686–696. https://doi.org/10.1111/jcpp.12984

Segal, A., & Golan, M. (2016). Differences in emotion regulation along the eating disorder spectrum: Cross sectional study in adolescents out patient care. *Journal of Psychology and Clinical Psychiatry*, *6*(1), 1–9.

Smink, F. R., van Hoeken, D., & Hoek, H. W. (2012). Epidemiology of eating disorders: Incidence, prevalence, and mortality rates. *Current Psychiatry Reports*, *14*(4), 406–414. https://doi.org/10.1007/s11920-012-0282-y

Stice, E. (2001). A prospective test of the dual-pathway model of bulimic pathology: Mediating effects of dieting and negative affect. *Journal of Abnormal Psychology*, *110*(1), 124–135.

Trompeter, N., Bussey, K., Hay, P., Griffiths, S., Murray, S. B., Mond, J., … Mitchison, D. (2019). Fear of negative evaluation among eating disorders: Examining the association with weight/shape concerns in adolescence. *International Journal of Eating Disorders*, *52*(3), 261–269.

Waller, G., Babbs, M., Milligan, R., Meyer, C., Ohanian, V., & Leung, N. (2003). Anger and core beliefs in the eating disorders. *International Journal of Eating Disorders*, *34*(1), 118–124. https://doi.org/10.1002/eat.10163

Wang, S., Fox, K., Boccagno, C., Hooley, J., Mair, P., Nock, M., & Haynos, A. (2020). Functional assessment of restrictive eating: A three-study transdiagnostic investigation. *PsyArxiv*, 1–45. https://doi.org/10.31234/osf.io/q2ezw

Weinbach, N., Sher, H., & Bohon, C. (2018). Differences in emotion regulation difficulties across types of eating disorders during adolescence. *Journal of Abnormal Child Psychology*, *46*(6), 1351–1358. https://doi.org/10.1007/s10802-017-0365-7

Zimmermann, P., & Iwanski, A. (2014). Emotion regulation from early adolescence to emerging adulthood and middle adulthood: Age differences, gender differences, and emotion-specific developmental variations. *International Journal of Behavioral Development*, *38*(2), 182–194. https://doi.org/10.1177/0165025413515405

SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

How to cite this article: Perthes, K., Kirschbaum-Lesch, I., Legenbauer, T., Holtmann, M., Hammerle, F., & Kolar, D. R. (2021). Emotion regulation in adolescents with anorexia and bulimia nervosa: Differential use of adaptive and maladaptive strategies compared to healthy adolescents. *International Journal of Eating Disorders*, *54*(12), 2206–2212. https://doi.org/10.1002/eat.23608