

Emotion Regulation and the Transdiagnostic Role of Repetitive Negative Thinking in Adolescents with Social Anxiety and Depression

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Abstract Social anxiety and depression are common mental health problems among adolescents and are frequently comorbid. Primary aims of this study were to (1) elucidate the nature of individual differences in specific emotion regulation deficits among adolescents with symptoms of social anxiety and depression, and (2) determine whether repetitive negative thinking (RNT) functions as a transdiagnostic factor. A diverse sample of adolescents ($N = 1065$) completed measures assessing emotion regulation and symptoms of social anxiety and depression. Results indicated that adolescents with high levels of social anxiety and depression symptoms reported decreased emotional awareness, dysregulated emotion expression, and reduced use of emotion management strategies. The hypothesized structural model in which RNT functions as a transdiagnostic factor exhibited a better fit than an alternative model in which worry and rumination function as separate predictors of symptomatology. Findings implicate emotion regulation deficits and RNT in the developmental psychopathology of youth anxiety and mood disorders.

Keywords Repetitive negative thinking · Emotion regulation · Depression · Social anxiety · Transdiagnostic · Research Domain Criteria

Introduction

Social anxiety is a common psychiatric disorder affecting roughly 9 % of adolescents during their lifetime (Burstein et al. 2011). Onset of the disorder typically occurs during late childhood or early adolescence (Beesdo et al. 2007; Kashdan and Herbert 2001) and follows an unremitting course that is likely to persist if not treated (Chartier et al. 1998; Beidel et al. 1996). Psychosocial impairment in numerous important domains of life is well documented in adolescent populations, including educational underachievement, poor management of relationships, and impaired social skills (c.f. Beidel et al. 2007; Wittchen et al. 1999). Social anxiety disorder in adolescents frequently collocates with other psychiatric disorders, particularly with depression and other anxiety disorders (Burstein et al. 2011; Chavira et al. 2004; Merikangas et al. 2010; Stein et al. 2001). Not only is social anxiety thought to be a possible risk factor for developing depression, but also it typically precedes its onset during adolescent development and is frequently associated with a more severe lifetime course of both disorders (Stein et al. 2001; Parker et al. 1999; Stein and Chavira 1998; Wittchen et al. 1999; Chavira et al. 2004).

Depression is also a common disorder in adolescents. It has an overall lifetime prevalence rate ranging from 3.7 % in mixed child and adolescent samples (aged 8–15; Merikangas et al. 2010) to 11.7 % in adolescent samples (aged 13–18; Merikangas et al. 2010), with varying rates by age and gender (i.e., lifetime prevalence rates are

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significantly higher for older adolescents and female adolescents). Longitudinal studies on community samples of adolescents estimate the average age of onset is between 11 and 14 years with an increasing incidence rate throughout adolescent development into young adulthood (Merikangas et al. 2009). The phenomenology and course of depression in adolescents generally parallels that of adults, but with notable developmental differences related to cognition, self- and social-awareness, behavior and stress, and emotion regulation (Blakemore 2008). Depression in adolescents tends to be chronic and is known to increase risk for interpersonal difficulties, academic troubles, legal problems, and suicidal ideation and attempts (e.g., Stice et al. 2009). Lifetime prevalence for those adolescents who experience severe impairment from depression is estimated at 8.7 % (Merikangas et al. 2010).

Potential explanations for the high comorbidity between social anxiety and depression during adolescence have been suggested (e.g., common genetic risk factors or common affective or cognitive vulnerabilities, such as a behaviorally inhibited temperament, c.f. Beesdo et al. 2007; or hypersensitivity to rejection, c.f. London et al. 2007), but none have received resounding support. An additional explanation may be that social anxiety disorder and depression are characterized by comparable deficits in emotion regulation (i.e., the range of activities, including intrinsic and extrinsic processes, that allow an individual to monitor, evaluate, and modify the nature and course of emotional responses in order to appropriately respond to environmental demands; Campbell-Sills and Barlow 2007; Gross and Thompson 2007; Cole et al. 2004; Eisenberg and Spinrad 2004; Gross 1998; Hofmann et al. 2012; Nolen-Hoeksema 2012; Thompson 1994; Campos et al. 1994). Indeed, developing awareness and understanding of one's emotions as well as the processes that influence their expression and regulation is a critical developmental task for adolescents. Nonetheless, there is considerable variability in both how and when adolescents acquire appropriate skills for managing their emotions (Zeman et al. 2006), which has important implications for individual differences in risk for psychopathology.

Research suggests that difficulties with emotion regulation may confer greater risk for internalizing psychopathology, such as anxiety and depressive disorders (Steinberg and Avenevoli 2000; Steinberg et al. 2006). Indeed, emotion regulation processes can augment or diminish emotional responding (c.f. Hofmann et al. 2012; Berking et al. 2013). Moreover, specific emotion regulation strategies (i.e., those that modify the magnitude and type of emotional experiences) may differ in their usefulness for reducing elevated negative affect and enhancing diminished positive affect, both of which are common to anxiety and depression (Campbell-Sills et al. 2006; D'Avanzato

et al. 2013; Kashdan 2007; Kashdan and Breen 2008). Specific difficulties, such as decreased awareness, poor understanding, inhibited or inappropriate expression, and difficulty managing emotions, have all been associated with anxiety and depression in samples of adolescents (c.f. McLaughlin et al. 2011; Zeman et al. 2002, 2006; Southam-Gerow and Kendall 2000).

Specific to anxiety, adolescent samples demonstrate decreased emotional understanding, increased suppression of emotions, difficulty managing negatively valenced emotions, and less self-assurance in their ability to manage emotions when compared to non-anxious peers (Kranzler et al. 2016; Southam-Gerow and Kendall 2000; Spokas et al. 2009; Suveg and Zeman 2004). In social anxiety, we are unaware of any work specifically examining deficits in clinical samples, but research with nonclinical samples has shown that adolescents low on social competence demonstrate decreased emotional awareness and control compared to adolescents high on social competence (Eisenberg et al. 1997, 2000). Relatedly, depression in adolescents has been frequently associated with difficulties in managing negative emotions (Silk et al. 2003). Adolescents with depression also have been found to experience poor emotional awareness, difficulty understanding their emotions, and exhibit dysregulated emotional expression (Kranzler et al. 2016). In particular, they tend to engage in rumination, a passive focus on their feelings and problems (Nolen-Hoeksema et al. 2007; Abela et al. 2002; also, see Nolen-Hoeksema 2000).

Prominent theories of rumination posit that ruminative processes initially suppress dysphoric emotions and, thereby, assume an avoidance function by becoming negatively reinforced (Nolen-Hoeksema et al. 2008). Continued use of rumination as a coping strategy, however, entails prolonged psychological distress and increases in depressive symptoms (Nolen-Hoeksema et al. 2007). In the past decade, a burgeoning corpus of literature has underscored the relevance of post-event rumination and worry to social anxiety disorder as possible mechanisms that engender emotional avoidance (Edwards et al. 2003; Abbott and Rapee 2004; Wells and Carter 2002; Rachman et al. 2000; Mellings and Alden 2000). Contemporary models of social anxiety disorder postulate that individuals deploy repetitive negatively-valenced cognitive processes, such as post-event rumination and anticipatory worry, with the intention of rehearsing safety-behaviors and increasing feelings of preparedness (Clark and Wells 1995; Kashdan and Roberts 2007). That notwithstanding, such processes fail to confer expected benefits and are thought to exacerbate avoidance of upcoming social interactions (Hofmann 2007).

Given that both social anxiety and depression in adolescents are associated with difficulties with emotion regulation and represent two of the most common forms of

internalizing psychopathology among adolescents (see Merikangas et al. 2010), it is important to explore how difficulties with emotion regulation may partially explain their high degree of comorbidity. Previous research, however, has not directly compared emotion regulation deficits in adolescents with social anxiety and depression. Accordingly, the aims of this study were to i) better understand differences in specific emotion regulation deficits among adolescents with symptoms of social anxiety, depression, and both disorders, and ii) determine whether rumination and worry, two types of cognitive emotion regulation, function as a single latent variable or separately as a transdiagnostic factors across social anxiety and depression in adolescents.

Certain cognitive emotion regulation strategies, such as rumination and worry, likely instantiate a superordinate process known as repetitive negative thinking (RNT; McEvoy et al. 2013; Fresco et al. 2002). Recent efforts undertaken to investigate RNT as a potential transdiagnostic factor yielded compelling results, substantiating RNT as a core process manifesting across various disorders (Watkins 2009; McEvoy et al. 2010). As such, researchers recommended that RNT receive acknowledgement from the NIMH Research Domain Criteria initiative as a core, transdiagnostic process to be addressed by future nosologies (e.g., Mennin and Fresco 2013). Extant research, however, has overlooked the contribution of RNT as a potential transdiagnostic factor in adolescent psychopathology. Given that forms of RNT are implicated in both social anxiety disorder and depression (i.e. anticipatory worry and rumination), it would prove profitable to determine whether this construct functions as a latent hierarchical factor underlying symptoms of social anxiety disorder and depression in adolescents. This hypothesis is motivated by prior work suggesting that social anxiety disorder and depression are associated with comparable levels of rumination and worry (McEvoy et al. 2013), which is consistent with the notion that these individual constructs represent different facets of a transdiagnostic RNT process.

In the current study, we compared emotion regulation deficits of adolescents with significant symptoms of social anxiety, depression, and both disorders. We hypothesized that adolescents who have symptoms of both social anxiety and depression would be more likely than those who have symptoms of social anxiety only and depression only to exhibit difficulties with a) emotional awareness, b) inhibited expression of emotions (i.e., reluctance to express emotions, dysregulated sadness and anger expression, and inhibited sadness and anger), and c) management of emotions. We also hypothesized that rumination and worry would be greater in the comorbid group than in the social anxiety and depression groups. Finally, two structural models were specified to reflect two competing hypotheses

about the nature of repetitive cognitive processes and symptoms of social anxiety and depression. We hypothesized that RNT, constructed using measures of worry and rumination as indicators (cf. Mahoney et al. 2012; McEvoy et al. 2013; Mennin and Fresco 2013), would represent a hierarchical latent variable underlying symptoms of social anxiety disorder and depression. This model was compared with an alternative model in which worry and rumination were represented as separate but correlated predictors of symptoms of social anxiety and depression. Identifying core transdiagnostic factors among adolescents would yield valuable insight into potential targets for treatment or prevention. Such a model might reveal differential relationships between these repetitive cognitive processes and symptoms of each disorder, attesting the utility of a disorder specific conceptualization of these processes. In line with a growing literature on transdiagnostic processes in internalizing psychopathology (e.g., Ehring and Watkins 2008; McLaughlin and Nolen-Hoeksema 2011; McLaughlin et al. 2014; and Aldao and Nolen-Hoeksema 2010), we expected that the former hypothesized model would yield a superior fit to the latter alternative model.

Method

Participants

Participants were recruited from the total enrollment (1480 students) of two middle schools from a school district in a small urban community in Connecticut. The schools were chosen for the study based on demographic characteristics of the district and the schools' willingness to participate in the study. Parents of all eligible children (i.e., all students except those in self-contained special education classrooms and students in technical programs who did not attend school for the majority of the school day) were requested to provide consent for their children to participate in the study. Parents who did not return written consent forms to the school were contacted by telephone to obtain consent. Approximately 22.2 % of parents did not return consent forms and could not be reached and another 5.8 % of parents declined to provide consent for their child to participate in the study. The overall participation rate in the study was approximately 72.0 %.

Participants were 1065 adolescents fairly evenly distributed by gender (51.2 % male, 48.8 % female) and across grade level (31.8 % sixth grade, 33.9 % seventh grade, and 34.3 eighth grade). Race/ethnicity composition of the sample was 13.2 % non-Hispanic White, 11.8 % non-Hispanic Black, 57.0 % Hispanic/Latino, 9.3 % Biracial/Multiracial, and 7.8 % reported other racial/ethnic backgrounds. A small percentage of participants 0.9 %

declined to provide information about racial/ethnic background. Participants comprising 27.5 % ($n = 293$) reported living in single-parent households.

Procedure

Following approval from an Institutional Review Board and after obtaining parental consent, participants completed study questionnaires during homeroom on two consecutive days. Homeroom teachers and one member of the research team were present in classrooms during administration of assessments. Participants were assured of the confidentiality of their responses and the voluntary nature of their participation.

Measures

Anxiety Symptoms

Social anxiety was assessed using the Social Phobia and Anxiety Inventory for Children (SPAI-C; Beidel et al. 1995). The SPAI-C is a 26-item self-report measure that assesses distress in social situations as manifested by cognitive, somatic, and behavioral symptoms of anxiety. Items are rated on a 3-point scale ranging from 0 (never) to 2 (most of the time or always). The SPAI-C assesses social anxiety features across three domains: assertiveness/general conversation, traditional social encounters and interactions, and public performance. The SPAI-C has excellent test–retest reliability, high internal consistency, and differentiates socially anxious children from those with other anxiety disorders, those with externalizing disorders, and those without any disorder (Beidel et al. 1995, 2000). The SPAI-C also demonstrates good convergent validity (Beidel et al. 1995) and has been found to be reliable and valid in an adolescent sample (Storch et al. 2004). The SPAI-C was reliable in this sample ($\alpha = 0.91$).

Depressive Symptoms

The Children’s Depression Inventory (CDI; Kovacs 1992) is a commonly used self-report measure of depressive symptoms in children and adolescents. The CDI contains 27 items consisting of three statements representing different levels of severity of a specific symptom of depression (e.g., I am sad once in a while; I am sad many times; and I am sad all the time). The CDI has respectable psychometric properties (e.g., internal consistency, test–retest reliability, and discriminant validity; Kovacs 1992; Reynolds 1994). Items were summed to create a total score ranging from 0 to 52. The CDI demonstrated good reliability in this sample ($\alpha = 0.82$).

To more clearly differentiate depression from social anxiety, the Anhedonia subscale of the CDI was used in place of the total CDI score (Kovacs 1992). The decision to use this subscale was based on a few important findings from past research. Primarily, the CDI includes items that may index anxiety more so than depression. Further, atypical depression, which is captured by total CDI score, is more closely related to rejection sensitivity, which also accounts for anxiety symptoms (Doerfler et al. 1988). Indeed, the CDI has shown to be strongly correlated with some anxiety measures, such as the Childhood Anxiety Sensitivity Index and Revised Children’s Manifest Anxiety Scale (Weems et al. 1997; Chorpita et al. 1998). In contrast, manifestations of anhedonia and low positive affect, both of which are aspects unique to the Anhedonia subscale of the CDI, have been found to be more specific to depression than anxiety (Watson et al. 1988, 1995). Thus, following the recommendation of Watson et al. (1995) and Kovacs (2009), using CDI items specific to anhedonic depression allowed us to better differentiate it from social anxiety. The CDI Anhedonia subscale demonstrated good reliability in this sample ($\alpha = 0.83$).

Emotion Regulation

The emotion regulation measures included in this study were selected because they comport well with the functionalist perspective on emotion, which emphasizes emotions as both communicative (in terms of social interactions) and self-regulating (for review, see Zeman et al. 2001 and Penza-Clyve and Zeman 2002). Accordingly, measures included in this study indexed emotional awareness, expression or inhibition of emotions, and management of emotion.

The Emotion Expression Scale for Children (EESC; Penza-Clyve and Zeman 2002) is comprised of two subscales, Poor Awareness (i.e., difficulty labeling and understanding emotions) and Expressive Reluctance (i.e., reluctance to express and communicate negative emotional states). Participants respond to 16 items on a 5-point Likert scale ranging from 1 (not at all true) to 5 (extremely true). Items for each scale are summed and yield a total score between 8 and 40; high scores indicate poor emotion awareness and greater reluctance to express emotion. The EESC has adequate psychometric properties, high internal consistency, and good test–retest reliability (Penza-Clyve and Zeman 2002); in this sample, the EESC was found to be reliable ($\alpha = 0.88$) as were the subscales (i.e., Poor Awareness = 0.83 and Expressive Reluctance = 0.76).

The Children’s Sadness Management Scale (CSMS) and the Children’s Anger Management Scale (CAMS; Zeman et al. 2001) assesses adaptive and maladaptive aspects of emotion expression and regulation of sadness and anger.

The CSMS and CAMS contain 12 and 11 items, respectively. Each item is scored on a 3-point Likert scale from 1 (hardly ever) to 3 (often). Each scale contains three subscales, including inhibition (i.e., turning emotion inward toward the self), dysregulated expression (i.e., expression of emotion in culturally inappropriate and nonconstructive ways), and emotion coping (i.e. strategic coping with sadness and anger by controlling specific emotion behaviors). Both the CSMS and CAMS have demonstrated adequate reliability and construct validity (Zeman et al. 2001) and have been used in prior research with early adolescents (Sim and Zeman 2005, 2006). Reliability for the CSMS and CAMS in this study were $\alpha = 0.68$ and $\alpha = 0.66$, respectively, and reliability for the subscales varied (i.e., CSMS: Inhibition = 0.72, Dysregulated Expression = 0.51, and Coping = 0.41; CAMS: Inhibition = 0.63, Dysregulated Expression = 0.55, and Coping = 0.67).

The Rumination subscale of the Children's Response Styles Questionnaire (CRSQ; Abela et al. 2002) is a 13-item scale that assesses the extent to which children respond to sad feelings with rumination (i.e., self-focused thought concerning the causes and consequences of depressed mood). For each item, participants are asked to rate how often they respond to sad feelings in a ruminative way on a 4-point Likert scale ranging from 1 (almost never) to 4 (almost always). Ratings are summed to produce a score ranging from 13 to 42. The reliability and validity of the CRSQ have been demonstrated in samples of early adolescents (Abela et al. 2002). The CRSQ Rumination subscale demonstrated good reliability in this study ($\alpha = 0.86$).

The Penn State Worry Questionnaire for Children (PSWQ-C; Chorpita et al. 1997) is a 14-item measure that assesses trait levels of pathological worry with regard to its frequency, severity, and controllability. Participants rate the extent to which they identify with various items on a 4-point scale ranging from 0 (*never true*) to 4 (*always true*). The PSWQ-C was adapted from the adult version of the PSWQ (Meyer et al. 1990) and it exhibits sound psychometric properties (cf. Chorpita et al. 1997). In the current study, the PSWQ-C demonstrated good reliability ($\alpha = 0.90$).

Data Analytic Plan

Cutoff scores were established for each of the symptom measures to determine clinical analogue groups for social anxiety, depression, and comorbid (i.e., social anxiety and depression) conditions. For the SPAI-C, a score of 18 or higher was used to establish analogue social anxiety (c.f. Beidel et al. 1995). For depression, raw data for the CDI Anhedonia subscale was converted to t-scores with 60 or

greater used to establish analogue depression.¹ Participants comprised four groups: 4.5 % ($n = 48$) of participants reported clinically significant social anxiety and depression (Comorbid group); 17.3 % ($n = 184$) of participants reported clinically significant social anxiety only (Social Anxiety group); 5.0 % ($n = 53$) of participants reported clinically significant depression only (Depression group); and 57.0 % ($n = 608$) of participants did not meet cut-off scores for either social anxiety or depression (Control group). Data was missing or not reported for 16.2 % ($n = 172$).

Demographic data were summarized according to participant groups and cross tabulated with ethnicity, grade, and gender using one-way analysis of variance (ANOVA) tests and Chi square analyses. Emotion regulation was examined using one-way ANOVA tests to assess for statistically significant mean differences among symptom groups and by grade. Significant group differences were followed up using post hoc Bonferroni tests.

The hypothesized model of RNT as an underlying latent variable accounting for variance in both symptoms of depression and social anxiety disorder was examined using structural equation modeling (SEM). Structural equation modeling analyses were conducted utilizing AMOS 22.0.0. Fit was assessed by invoking four different fit indices. The Chi square statistic (χ^2) can be construed such that smaller values correspond to better fit. This measure of fit can also be used for the Chi square difference test (χ^2 diff) to facilitate comparisons between hierarchical and non-hierarchical models. The non-normed fit index (NNFI) and the Comparative Fit Index (CFI) were utilized as they exact a penalty for adding parameters, which is not the case with the less restricting Normed Fit Index (NFI). Also, the Root Mean Square Error of Approximation (RMSEA) is a measure based on the non-centrality parameter. NNFI and CFI values greater than 0.95 and greater than 0.90 indicate good and acceptable model fit, respectively, and values less than 0.10 indicate adequate model fit for RMSEA, with values around .06 indicating good or excellent fit (Browne and Cudeck 1993; Hu and Bentler 1999). Furthermore, ratios of Chi square to degrees of freedom close to or less than 2 and values less than 5 suggest good and acceptable fit, respectively (Watkins 1989).

Indicators for all latent variables were constructed from the aforementioned measures. The latent variables representing depression and social anxiety incorporated the following indicators: (1) CDI, CSMS-Dysregulated Sadness Expression, and CSMS-Sadness Inhibition, and (2)

¹ The decision to use a t-score of 60 (instead of 65) was made to a) approximate the prevalence of depression in our sample to estimated population prevalence rates and b) prioritize statistical power to detect group differences.

SPAI-Fear of Assertiveness, SPAI-Fear of Social Interactions, and SPAI-Fear of Performance. The latent variable representing RNT was constructed using the following indicators: the CRSQ for rumination and the PSWQ for worry. We appraised the fit of the measurement model and two competing structural models to determine whether, by way of the Chi square difference test, one structural model yielded a better fit than another (for conceptual diagrams, please see Figs. 1, 2, 3).

Results

Demographic and Emotion Regulation Characteristics

With respect to demographic data, Pearson Chi square analyses revealed no significant differences among the groups for ethnicity, $\chi^2(12, n = 889) = 16.89, p > 0.05$ and grade, $\chi^2(6, n = 887) = 4.58, p > 0.05$; however, significant differences were found for gender, $\chi^2(3, n = 892) = 8.80, p < 0.05$, such that a greater number of females were classified in the clinical analogue groups (54 % depression only; 56 % social anxiety, and 67 % comorbid) and a greater number of males were classified as controls (52 %).

Group differences in emotion regulation deficits were examined using one-way ANOVAs. Results indicated significant group differences for Poor Emotional Awareness, Sadness and Anger Inhibition, Dysregulated Sadness Expression, Dysregulated Anger Expression, Expressive Reluctance, and Rumination (see Table 1). Significant group differences were not evident for Sadness and Anger

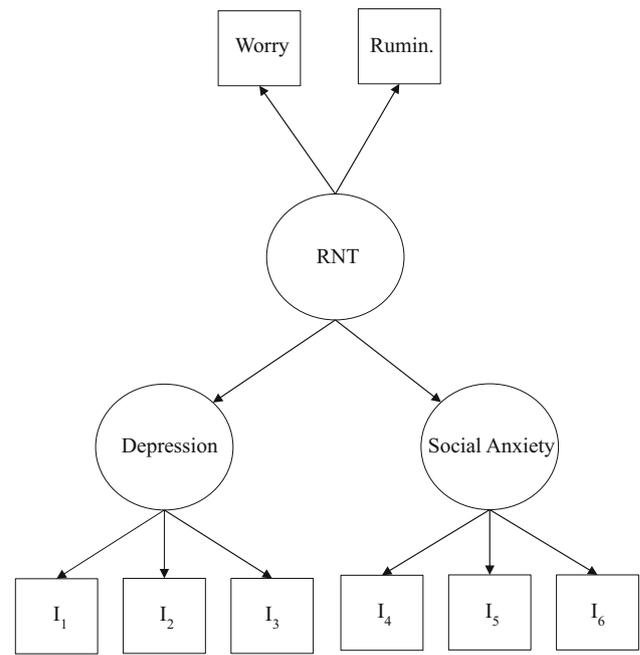


Fig. 2 Conceptual Structure of Hypothesized Model. *Note* Rumin rumination, RNT repetitive negative thinking. Error terms were omitted to facilitate presentation. *I*₁ dysregulated sadness expression; *I*₂ sadness inhibition; *I*₃ Children’s Depression Inventory; *I*₄ fear of assertiveness and conversation; *I*₅ fear of social interactions; *I*₆ fear of public performance

Coping. For those variables with significant omnibus group differences, post hoc Bonferroni tests revealed several pairwise group differences (see Table 1). On emotion regulation measures of Expressive Reluctance and Rumination, the comorbid group reported significantly greater mean scores than did the comparison groups. The social

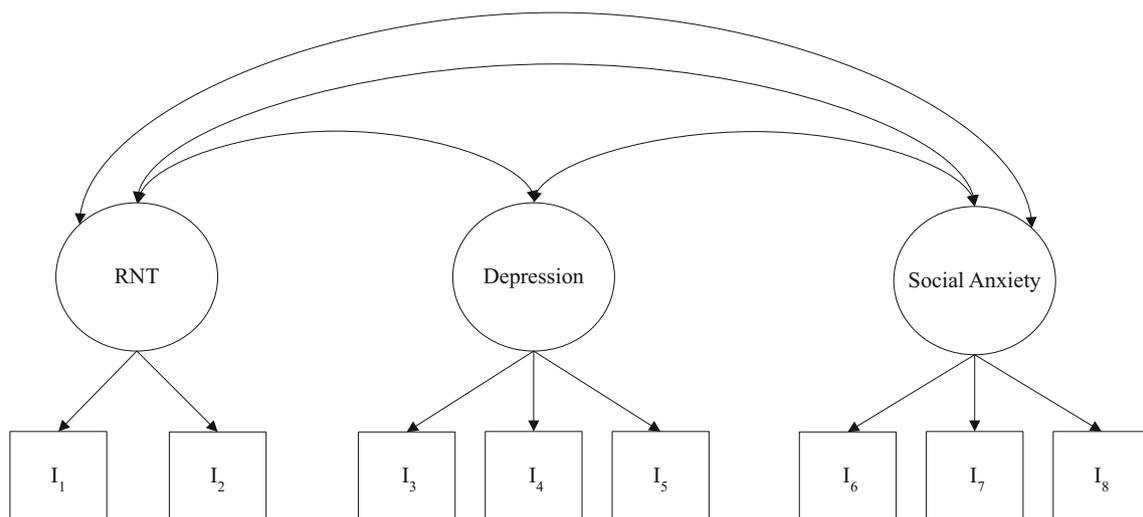


Fig. 1 Conceptual structure of the measurement model. *Note* RNT repetitive negative thinking. Error terms were omitted to facilitate presentation. *I*₁ rumination; *I*₂ worry; *I*₃ dysregulated sadness

expression; *I*₄ sadness inhibition; *I*₅ children’s depression Inventory; *I*₆ fear of assertiveness and conversation; *I*₇ fear of social interactions; *I*₈ fear of public performance

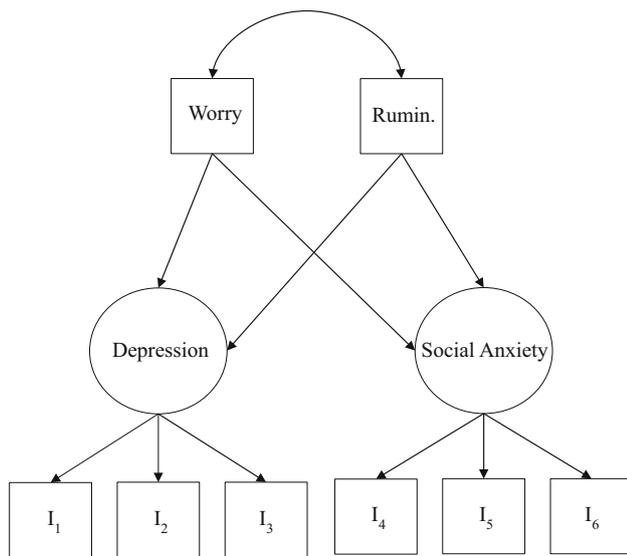


Fig. 3 Conceptual Structure of Alternative Model. *Note* Rumin rumination. Error terms were omitted to facilitate presentation. I₁ dysregulated sadness expression; I₂ sadness inhibition; I₃ Children’s Depression Inventory; I₄ fear of assertiveness and conversation; I₅ fear of social interactions; I₆ fear of public performance

anxiety and depression groups also reported significantly greater mean scores on these same measures than did the control group. For measures of Poor Emotional Awareness

and Dysregulated Sadness Expression, the comorbid, social anxiety, and depression groups reported significantly greater mean scores than did the control group. On a measure of Anger Inhibition, the comorbid and social anxiety groups reported significantly greater mean scores than did the control group, but the depression group did not. Finally, despite significant omnibus group differences, measures of Sadness Inhibition and Dysregulated Anger Expression did not reveal significant post hoc group differences.

Differences in symptom measures and emotion regulation deficits were also examined by grade using several one-way ANOVA tests. Results revealed that there were no significant differences by grade for any of the symptom measures and emotion regulation variables, except for Rumination (see Table 2). Specifically, participants in the sixth grade reported significantly more rumination than did those participants in the seventh grade.

Measurement Model

We first appraised the fit of the measurement model wherein rumination and worry loaded onto a latent variable representing RNT and disorder specific indicators loaded

Table 1 Group differences in symptom and emotion regulation measures

Variable	Group								F	p	d	Significant Grp. Comparisons
	Comorbid ^a (n = 48)		SAD ^b (n = 184)		Depression ^c (n = 51)		Controls ^d (n = 606)					
	M	SD	M	SD	M	SD	M	SD				
Symptom measures												
SPAI-C	25.77	5.61	24.19	4.89	10.23	5.56	7.32	5.24	613.59	0.00*	1.66	a, b > c > d
CDI anhedonia	69.97	6.94	49.31	7.90	67.46	5.05	46.69	7.19	268.47	0.00*	1.10	a, c > b, d
Emotional awareness												
Poor emotional awareness	24.72	6.29	22.34	6.26	21.94	7.23	16.95	6.35	53.71	0.00*	0.49	a, b, c > d
Emotional expression or suppression												
Expressive reluctance	25.42	6.14	22.38	6.06	21.88	6.25	18.52	6.08	35.44	0.00*	0.40	a > b, c, d a, b, c > d
Sadness inhibition	8.04	1.64	7.76	1.76	7.29	2.08	7.38	2.18	2.91	0.03*	0.11	–
Dysregulated sadness expression	5.21	1.20	5.37	1.55	5.10	1.60	4.47	1.40	21.56	0.00*	0.31	a, b, c > d
Anger inhibition	8.04	2.22	7.55	1.87	7.27	1.99	7.01	1.98	6.66	0.00*	0.17	a, b > d
Dysregulated anger expression	5.85	1.60	5.58	1.46	5.52	1.73	5.32	1.66	2.66	0.05*	0.11	–
Emotional management												
Sadness coping	10.02	1.72	9.88	1.94	9.43	1.88	10.12	2.30	1.92	0.13	0.09	–
Anger coping	8.17	1.75	7.98	1.80	7.79	1.92	8.22	2.08	1.31	0.27	0.07	–
Rumination	19.48	7.54	14.29	6.98	14.81	8.59	9.09	6.88	56.57	0.00*	0.50	a > b, c, d a, b, c > d
Worry	22.08	8.12	18.48	7.23	17.47	6.48	12.93	6.55	54.47	0.00*	0.50	a > b, c > d

Note. Significant group comparisons = Significant differences between groups based on pairwise comparisons

* p < 0.05

Table 2 Grade differences in symptom and emotion regulation measures

Variable	Group						F	p	d
	Grade 6 (n = 324)		Grade 7 (n = 337)		Grade 8 (n = 341)				
	M	SD	M	SD	M	SD			
Symptom measures									
SPAI-C	11.95	8.81	11.84	8.99	11.83	9.11	0.02	0.98	0.00
CDI anhedonia	25.29	3.38	24.82	3.06	25.01	2.82	1.65	0.19	0.00
Emotional awareness									
Poor emotional awareness	18.81	6.79	18.65	7.17	18.57	7.13	0.10	0.91	0.00
Emotional expression or suppression									
Expressive reluctance	19.89	6.53	19.89	6.52	19.67	6.65	0.13	0.88	0.00
Sadness inhibition	7.42	2.14	7.42	2.13	7.55	2.09	0.48	0.62	0.00
Dysregulated sadness expression	4.77	1.61	4.69	1.47	4.67	1.42	0.40	0.67	0.00
Anger inhibition	7.29	1.94	7.01	2.01	7.11	2.04	1.71	0.18	0.00
Dysregulated anger expression	5.37	1.63	5.53	1.69	5.40	1.57	0.85	0.43	0.00
Emotional management									
Sadness coping	10.04	2.11	9.92	2.18	10.00	2.43	0.26	0.77	0.00
Anger coping	8.23	2.07	8.05	2.08	7.90	1.95	2.21	0.11	0.00
Rumination	11.91	7.66	10.31	7.12	10.63	8.06	4.19	0.02*	0.01
Worry	14.58	7.22	14.39	7.31	14.59	7.38	0.28	0.76	0.00

* p < 0.05

onto the appropriate latent variables representing social anxiety and depression. The overall fit of the model was excellent, as evidenced by the values of the Chi square and fit indices: $\chi^2(17) = 22.06$, $p = n.s.$; $\chi^2/df = 1.29$; NNFI = 0.99; CFI = 0.99; and RMSEA = 0.01. Additionally, the measurement model coefficients for all pathways were significant (for descriptive statistics and regression coefficients, see Tables 3 and 4, respectively) and, the standardized values indicated strong magnitudes for all loadings except for two of the indicators of the latent variable representing depression. For the hypothesized structural model, we proceeded with the current measurement model.

Structural Models

We next appraised the fit of two competing models: (1) our hypothesized model, in which a latent factor representing RNT predicts symptoms of depression and social anxiety, and (2) an alternative model, in which worry and rumination are represented as separate but correlated predictors of symptomatology. Results of the alternative model suggested good overall fit, as evidenced by the values of the fit indices: $\chi^2/df = 2.54$; NNFI = 0.97; CFI = 0.99; and RMSEA = 0.04. The Chi square value, however, was significant ($\chi^2(17) = 43.16$, $p < 0.001$). Examination of the modification indices indicated factor loadings that were

Table 3 Descriptive statistics for models

Variable	Mean	S.D.	1	2	3	4	5	6	7
1. Worry	14.62	7.38							
2. Rumination	10.94	7.63	.58**						
3. FA	5.67	4.63	.44**	.41**					
4. FSI	3.52	3.28	.43**	.3**	.87**				
5. FPP	4.23	3.19	.37**	.35**	.69**	.63**			
6. DSE	4.71	1.49	.34**	.35**	.30**	.30**	.23**		
7. SI	7.47	2.11	.07*	.10**	.11**	.09**	.06*	.06	
8. CDI	9.67	6.44	.42*	.42**	.34**	.38**	.29**	.21**	.06

FA fear of assertiveness and conversation, FSI fear of social interactions, FPP fear of public performance, DSE dysregulated sadness expression, SI sadness inhibition, CDI Children’s Depression Inventory

* p < 0.05; ** p < 0.01 (two-tailed)

Table 4 Path coefficients for measurement model

Path	Parameter estimate	Standard error	Standardized estimate	<i>p</i> Value
RNT → Worry	1.02	0.06	0.78	<0.001
RNT → Rumination	1.00	–	0.74	–
SAD → FA	1.00	–	0.96	–
SAD → FSI	0.66	0.02	0.89	<0.001
SAD → FPP	0.517	0.02	0.72	<0.001
Dep → DSE	1.00	–	0.49	–
Dep → SI	0.37	0.11	0.13	<0.001
Dep → CDI	0.41	0.17	0.10	<0.05

→ Regression path, *RNT* repetitive negative thinking, *SAD* social anxiety, *Dep* depression, *FA* fear of assertiveness and conversation, *FSI* fear of social interactions, *FPP* fear of public performance, *DSE* dysregulated sadness expression, *SI* sadness inhibition, *CDI* Children's Depression Inventory

No *p* values are reported for those pathways with loadings fixed to 1

significant and generally moderate in magnitude (see Table 5). Results of the hypothesized model suggested excellent overall fit, as evidenced by a non-significant Chi square ($\chi^2 = 25.61$ (18), $p = \text{n.s.}$) and the values of the fit indices: $\chi^2/\text{df} = 1.42$; NNFI = 0.99; CFI = 0.99; and RMSEA = 0.02. Examination of its modification indices revealed factors loadings that were significant and moderate to large in magnitude (see Table 5). Moreover, the magnitudes of the relationships between the RNT latent variable and symptoms of social anxiety and depression were stronger than those between the individual cognitive processes, i.e. worry and rumination, and symptoms of social anxiety and depression. Comparison of these models by way of the Chi square difference statistic afforded evidence that the hypothesized model accomplished superior fit, given its significantly lower Chi square value (χ^2 difference (1) = 17.55, $p < 0.0001$).

Discussion

Several theorists have argued that emotion regulation deficits have an important role in the development of psychopathology in adolescents (Bradley 1990, 2000; Cicchetti et al. 1995; Bohnert et al. 2003; Suveg and Zeman 2004; Steinberg et al. 2009). Our current study further substantiates this notion and provides greater specificity about the relationship between particular types of difficulties with emotion regulation and social anxiety and depression (c.f. Hannesdottir and Ollendick 2007; Southam-Gerow and Kendall 2000; Suveg and Zeman 2004). Specifically, adolescents with both social anxiety and depression, and those with social anxiety only and depression only, generally reported greater difficulty with emotional awareness, inhibited expression of emotions, and emotional management of emotion than did controls. These results are in line with recently published work by Kranzler

et al. (2016) and accord well with Nolen-Hoeksema and Watkin's (2011) paper on a heuristic for developing transdiagnostic models of psychopathology. Moreover, adolescents who had concomitant social anxiety and depression symptoms tended to report greater levels of rumination and worry when compared to adolescents with social anxiety only or depression only. By describing the emotion regulation characteristics of this sample, we are better able to delineate which strategies have stronger associations to social anxiety and depression. Importantly, many of our findings also parallel the literature on emotion regulation in adults with anxiety and depressive disorders (Mennin et al. 2007, 2009; McLaughlin et al. 2007). Consistent with extant literature on adults (c.f. Mennin and Fresco 2013; Ehring and Watkins 2008), results corroborated a structural model in which RNT functions as a transdiagnostic process underlying symptoms of both social anxiety disorder and depression in adolescents. To our knowledge, this is the first study to examine the role of specific and common emotion regulation constructs and repetitive negative thinking in adolescents with symptoms of social anxiety and depression.

Emerging evidence supports cognitive emotion dysregulation (e.g. Aldao and Nolen-Hoeksema 2010) as a process that occasions increases in symptoms across mood and anxiety disorders. Repetitive negative thinking, a specific form of cognitive emotion dysregulation that comprises such processes as rumination and worry, has been postulated to be a transdiagnostic feature of psychopathology that manifests across disparate disorders (e.g. across the anxiety disorders and depression; c.f. Watkins 2009; Mennin and Fresco 2013). A paucity of research efforts has been undertaken to appraise the transdiagnostic status of RNT in adolescents, however. The relevant literature that bears reference to the dispositional use of RNT among adolescents with mood or anxiety disorders primarily includes studies that have investigated the association

Table 5 Path coefficients for alternative and hypothesized models

Models	Path	Parameter estimate	Standard error	Standardized estimate	<i>p</i> Value
Alternative	Worry → SAD	0.20	0.02	0.33	<0.001
	Worry → Dep	0.04	0.01	0.42	<0.001
	Rumination → SAD	0.13	0.02	0.23	<0.001
	Rumination → Dep	0.04	0.01	0.44	<0.001
	SAD → FA	1.00	–	0.96	–
	SAD → FSI	0.66	0.02	0.89	<0.001
	SAD → FPP	0.517	0.02	0.72	<0.001
	Dep → DSE	1.00	–	0.50	–
	Dep → SI	0.35	0.12	0.13	<0.001
	Dep → CDI	0.40	0.18	0.10	<0.05
	Worry ↔ Rumination	–	–	0.58	<0.001
Hypothesized	RNT → Worry	1.01	0.06	0.77	<0.001
	RNT → Rumination	1.00	–	0.74	–
	RNT → SAD	0.48	0.03	0.61	<0.001
	RNT → Dep	0.12	0.01	0.94	<0.001
	SAD → FA	1.00	–	0.96	–
	SAD → FSI	0.66	0.02	0.89	<0.001
	SAD → FPP	0.52	0.02	0.72	<0.001
	Dep → DSE	1.00	–	0.49	–
	Dep → SI	0.36	0.11	0.13	<0.01
	Dep → CDI	0.41	0.17	0.09	<0.05

→ Regression path, ↔ Correlation, *RNT* repetitive negative thinking, *SAD* social anxiety, *Dep* depression, *FA* fear of assertiveness and conversation, *FSI* fear of social interactions, *FPP* fear of public performance, *DSE* dysregulated sadness expression, *SI* sadness inhibition, *CDI*, Children's Depression Inventory

No *p* values are reported for those pathways with loadings fixed to 1

between a single disorder of interest and rumination or worry (e.g., rumination and depression: Abela et al. 2002; Broderick and Korteland 2004; worry and generalized anxiety disorder: Esbjørn et al. 2014). Considering the current state of research, the current study extends extant literature's ability to elucidate the transdiagnostic nature of RNT by modeling it as a latent variable that predicts symptoms of both social anxiety and depression in adolescents. Results of the fit indices indicated that the hypothesized model, representing RNT as a single latent variable predicting symptoms, proved superior to and more parsimonious than the alternative model, representing worry and rumination as distinct but related predictor variables. Such results attest the utility of targeting RNT as a treatment mechanism for complex manifestations of comorbid social anxiety and depression. The hypothesized model comports well with contemporary nosological approaches, such as the RDoC, by embracing a dimensional paradigm that emphasizes higher-order domains of psychopathology.

Identifying core, superordinate processes that contribute to the genesis and maintenance of several emotional disorders could be of great consequence to both explaining

comorbidities (cf., Nolen-Hoeksema and Watkins 2011) and therapeutic interventions for adolescent psychopathology. Given the proliferation of disorder-specific treatments for adolescents (c.f. Barrett and Ollendick 2004), the parsimony of a transdiagnostic framework might mitigate such burgeoning complexity and yield an efficacious intervention that can be applicable across several forms of psychopathology. Treatments such as the unified protocol (Barlow et al. 2010) or common elements (Chorpita et al. 2005) have been introduced to ameliorate symptomatology across emotional disorders by addressing principal transdiagnostic mechanisms. Indeed, adolescents who underwent a modified version of the Unified Protocol, for example, evidenced symptom reduction at post-treatment, with greater treatment gains found at the 6-month follow-up, suggesting that targeting transdiagnostic mechanisms confers prophylactic benefit to patients. (Ehrenreich et al. 2009). Importantly, however, neither of these treatments explicitly address RNT. Thus, based on our findings, including RNT as a common psychopathological component in transdiagnostic interventions for adolescents could improve upon prior disorder-specific treatment manuals and reduce the high degree of comorbidity between the two

disorders over and above focused cognitive behavioral treatments (e.g., Reinholt and Krogh 2014; Clark 2009). Such an approach, based, in part, on our findings might better address the exigencies of real world practice by encouraging researchers to develop, test, and implement a more compendious treatment protocol that explicitly targets RNT and thereby providing benefits to an array of emotional disorders.

Limitations

Our study had a number of strengths, including use of a relatively large sample of ethnically diverse adolescents and utilizing structural models as a first attempt to elucidate the transdiagnostic role of RNT in social anxiety and depression in adolescents. Nonetheless, limitations to our research warrant mention. First, we relied on self-report methodology as a means to classify participants into clinical analogue groups. Although the measures used in this study have been previously well established with adolescents (e.g., Beidel et al. 1995; Kovacs 1992; Southam-Gerow and Kendall 2000; Suveg and Zeman 2004), utilizing structured clinical interviews to establish DSM diagnoses would have been a significant methodological improvement. Additionally, self-report measures on emotion are constrained by their acontextual nature (i.e., instructing adolescents to imagine an emotional experience or asking them to identify a stressful or emotional experience for the past week or month). Second, the cross-sectional design of the study precludes causal construal of the structural models and directional associations among constructs. Future research should investigate the theoretical model delineated in the current study using a longitudinal framework to model possible causal and reciprocal pathways of RNT. Third, the power to detect group differences may have been affected by the relatively large size of the control group; however, the analogue groups still contained a sizeable number of participants and were deemed to have adequate power to detect true differences. Finally, this study may have been limited by measurement equivalence. Measures used in this study have been well established with predominantly White adolescents and it is not known whether these measures yield corresponding data for ethnically and racially diverse adolescents.

Overall, our findings are consistent with previous research that has documented emotion regulation deficits in adolescent anxiety and depression (Bradley 1990, 2000; Cicchetti et al. 1995; Bohnert et al. 2003; Suveg and Zeman 2004; Southam-Gerow and Kendall 2000). Extant literature, underscoring the transdiagnostic nature of RNT (e.g., Kranzler et al. 2016; Mennin and Fresco 2013), as well as emotion dysregulation (Aldao and Nolen-Hoeksema

2010), dovetails nicely with the current hypothesized model. Adolescent social anxiety, alone and in combination with depression, was associated with wide range of emotion regulation deficits, including poor emotional awareness, dysregulated sadness expression, expressive reluctance, and increased rumination. Our findings suggest that emotion regulation deficits associated with social anxiety are evident in earlier developmental stages; importantly, future research in prospective studies should aim to determine whether emotion dysregulation is a risk factor for social anxiety and subsequent or comorbid depression, as opposed to a concomitant or consequence of symptomatology. Further, prevention and intervention programs teaching strategies to promote adaptive emotion regulation skills and reduction in RNT may reduce both social anxiety and depression.

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Compliance with Ethical Standards

Conflict of Interest David Klemanski, Joshua Curtiss and Katie McLaughlin declare that they have no conflict of interest. Susan Nolen-Hoeksema (*deceased*) had no conflict of interest.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Animal Rights All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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