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Extreme Thinking in Clinically Depressed Adolescents: Results from the Treatment for Adolescents with Depression Study (TADS)

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Abstract

The purpose of this report is to examine relations between extreme thinking, as measured by the Dysfunctional Attitudes Scale, and the maintenance of gains among adolescents who participated in the Treatment for Adolescents with Depression Study (TADS). We examine extreme thinking among 327 adolescents (mean age = 14.56, 57% female, 75% White) who received cognitive behavior therapy (CBT), fluoxetine (FLX), or a combination of CBT and FLX (COMB). Among those who met remission status on the Children's Depression Rating Scale – Revised (CDRS-R $\leq$ 28; 56 at week 12, 79 at week 18) extreme thinking did not predict failure to maintain remission. This is in contrast to findings with depressed adults. Treatment influenced level of extreme thinking, and this appeared to be driven by greater endorsement of positively valenced beliefs as opposed to a decrease in negatively valenced beliefs. Developmental or investigation characteristics may account for the discrepancy in findings.

Keywords

major depressive disorder; adolescents; recovery; cognitive therapy

Cognitive models of depression (for a review see Clark and Beck, 1999) have generated a great deal of research. Recent work points to the *form*, as opposed to the *content*, of dysfunctional thinking (i.e., Segal, Williams, & Teasdale, 2002) as increasing an individual's susceptibility

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to depression. For example, higher levels of extreme thinking (defined as number of *totally agree* or *totally disagree* responses) pre- and post- treatment have been found to predict shorter time to relapse among adults (Teasdale et al., 2001). In fact, extreme responses represent substantial increased risk, as Teasdale and colleagues (2001) reported that relapse risk was more than 2.5 times greater for those who reported just one extreme response (regardless of response valence, i.e. totally disagreeing with a dysfunctional attitude) when compared to those with no extreme scores. Similar results were reported by Beevers and colleagues' (2003) study of relapse among hospitalized adults who received six months of outpatient treatment. In this study, poor cognitive change (defined as one standard deviation below the mean) during depression treatment predicted time to relapse of depressive symptoms. Again, both extreme responses to positive and negative DAS items on the Dysfunctional Attitudes Scale (Weissman & Beck, 1978) predicted a return of depressive symptoms.

Extreme thinking has not been explored among youth to date. The current investigation examines the effect of extreme thinking on depression outcome across 36 weeks of treatment within a large, representative sample of clinically depressed youth. We hypothesized that pre-treatment extreme thinking scores on the DAS would predict a return of clinically significant depressive symptoms after achieving remission, which we refer to as 'failure to maintain remission status' (Kennard et al, 2009). We examined this phenomenon across 36 weeks of treatment among adolescents who met criteria for remission. We hypothesized that all participants, regardless of remission status, would demonstrate a reduction in extreme thinking over the course of treatment.

Methods

Study participants

Four hundred and thirty nine clinically depressed adolescents were originally enrolled in the Treatment for Adolescents with Depression Study (TADS). Details of consent and assent, IRB approval, rationale, methods, and other aspects of the design are given in previous reports (TADS, 2003; 2005). The following analyses are conducted on the 327 youth randomized to an active treatment arm. Only those youth randomized to active treatment who were full or partial responders over Stage I (first 12 weeks of treatment) based on the treating clinician's rating on the Clinical Global Impression - Improvement score (CGI-I; Guy, 1976) continued in their randomized treatment arm (COMB, FLX, and CBT; $n = 242$) during the subsequent six-week consolidation phase (Stage II). This was followed by an 18 week maintenance phase (Stage III). To ensure compatibility with previous adult and pediatric studies, full response was defined as a CGI-I score of 1 (very much improved) or 2 (much improved) at the end of Stage I; whereas partial response was indicated by a CGI-I score of 3 (minimally improved). Fifty-seven percent of the sample was female and 87% were experiencing their first episode of major depressive disorder (MDD). The average age at the beginning of the trial was 14.56 ($SD = 1.5$). Seventy-five percent of participants classified their race/ethnicity status as White; 10% as African American; 8% as Hispanic white; 2% as Hispanic black; 1% as Asian; and 3% as Other. The modal family income was \$50,000 to \$74,000, with a range of less than \$5000 to more than \$200,000. The flow of participants for this study is outlined in Figure 1.

Analyses were conducted on those participants who continued in their assigned treatment arm through week 36 regardless of treatment compliance or adherence. Analyses were conducted on the participants who remitted from depression during the acute treatment phase ($n = 56$) and during the continuation treatment phase ($n = 79$).

Children's Depression Rating Scale – Revise

(CDRS-R; Poznanski & Mokros, 1996). The CDRS-R is a well validated 17-item clinician-rated depression severity measure that was completed by an Independent Evaluator (IE) blind to treatment arm. Scores on the CDRS-R are based on interviews with the adolescent and parent and could range from 17 to 113, with higher scores representing more severe depression. Interrater reliability on the CDRS-R at baseline (intraclass correlation coefficient of .95) and week 12 (intraclass correlation coefficient of .98) was high (TADS Team, 2005).

Extreme thinking

The DAS (Weissman & Beck, 1978) is a self-report rating scale that assesses beliefs associated with vulnerability for depression. The scale consists of 40 statements on a 7-point Likert scale. Although the DAS was originally developed within adult populations, it has been widely used with adolescent samples. Internal consistency is good and stability is excellent over among youth (Garber, Weiss, & Shanley, 1993). The extreme thinking variable was first computed as a sum of the number of extreme responses (i.e., “totally agree” or “totally disagree”) given on the DAS at baseline. This is the same as the computation methods used in two prior studies among adults (Beevers et al., 2003; Teasdale et al., 2001), which included strong endorsement of positive as well as negative beliefs (Teasdale et al., 2001). As these phenomena have not been explored among youth to date, we subsequently analyzed the positive and negative beliefs separately.

Definition of remission and return to clinically significant symptomatology

For the current analyses, remission was defined in line with Kennard and colleagues' (2009) definition as achievement of a CDRS-R ≤ 28 . This definition is consistent with previous definitions of remission in the child and adolescent psychiatry literature (e.g., Emslie et al., 1997). A return to clinically significant symptomatology, failure to maintain remission status, was defined as a CDRS-R score ≥ 29 at any one time point. We do not use the term relapse due to the constrained nature of the assessment schedule maintained in the TADS. IEs met with participants every six weeks, thus, the exact timing of relapse was not captured.

Statistical Analyses

Descriptive Statistics

General Linear Models (GLMs) with *a posteriori* *t*-tests were employed to compare the treatment arms on key baseline clinical characteristics. When the assumptions of this test were not met, non-parametric Kruskal-Wallis or Wilcoxon-Mann-Whitney tests were used.

Predictor analyses

As a first step, the remission rates reported by Kennard and colleagues (2006) were replicated. Generalized Estimating Equations (GEEs) were employed to compare between-treatment differences in remission rates among the 327 adolescents randomized to active treatment and to estimate the probabilities of remission over time for each treatment arm. Logistic regression analyses were used to assess the effects of baseline extreme thinking on failure to maintain remission at subsequent assessment points among two samples: acute phase (Stage I) remitters and continuation phase (Stage II) remitters.

Effect of treatment on extreme thinking

Random coefficients regression models (RRMs) were employed to test the effect of treatment on extreme thinking across the 36 week treatment period. The RRM for this analysis included both fixed (treatment, natural log of time, time-by-time, treatment-by-time, treatment-by-time-by-time, site) and random (patient, patient-by-time, patient-by-time-by-time) effects.

Trajectories of levels of extreme thinking across the entire 36 week treatment period were generated.

All analyses were conducted using SAS 9.1 using commands such as PROC LOGISTIC, PROC GENMOD, and PROC MIXED. The level of significance was set at 0.05 for each statistical test. *A posteriori* paired comparisons were conducted only if the omnibus test was significant at the 0.05 level for the treatment or treatment-by-time effect. As these analyses are considered exploratory, no adjustments were made for the number of statistical tests.

Results

Descriptive Statistics

At baseline, extreme thinking scores ranged from 0 to 40, with a median score of 6. The mean baseline extreme thinking score was 9.31 (SD = 9.19). Thirteen individuals were missing baseline extreme thinking scores and the median score was imputed in these instances. There were no significant differences on extreme thinking scores by gender ($\chi^2 = 1.52, p = 0.22$), age ($F = 0.31, p = .58$), family income ($\chi^2 = 9.71, p = 0.56$), baseline CDRS-R depression severity ($F = 0.74, p = .39$), CGAS functioning ($F = 0.39, p = 0.53$), or presence of comorbidities ($\chi^2 = 3.61, p = 0.46$).

Predictor analyses

At week 12 remission rates were as follows: 41% COMB; 26% FLX; 19% CBT. At week 18 the estimated rates for COMB, FLX, and CBT were 60%, 42%, and 24%, respectively, whereas at week 36 these rates were 64%, 60%, and 60%.

Seventeen out of 56 acute phase (Stage I) remitters failed to maintain their remission status across Stages II and III. Twenty-two out of 79 of the continuation phase (Stage II) remitters failed to maintain their remission status over Stage III. Baseline extreme thinking¹ did not predict failure to maintain remission among either acute phase or continuation phase remitters, as detailed in Tables 1 and 2.

Effect of treatment on extreme thinking

The treatment-by-time interaction significantly predicted levels of extreme thinking across the 36 weeks ($F = 4.95, df = 259, p < .01$), as did the quadratic treatment-by-time-by-time interaction ($F = 3.07, df = 253, p < .05$), and site ($F = 2.31, df = 312, p < .05$). All other effects were not significant. Table 3 details treatment contrasts and Cohen's d effect sizes. Figure 2 depicts change in extreme thinking over the course of treatment.

When analyzed separately, positive extreme thinking scores were also predicted by a treatment-by-time interaction ($F = 4.73, df = 324, p = .01$), a time-by-time-by-treatment interaction ($F = 4.20, df = 324, p = .02$), and site ($F = 3.21, df = 315, p < .01$). Negative extreme thinking scores were not predicted by a quadratic time-by-time-by-treatment interaction and this term was removed from subsequent models. Negative extreme thinking was predicted by time ($F = 62.66, df = 324, p < .01$) and the interaction of treatment-by-time ($F = 5.81, df = 324, p < .01$). These results suggest that the increase in extreme thinking across treatment was driven by increases in extreme endorsement of positive, as opposed to negative, beliefs as illustrated in Figure 3.

¹When negative and positive extreme thinking were analyzed separately, results were the same. We also examined baseline DAS total scores as potential predictors and these were not significant.

Discussion

The fact that extreme thinking did not predict failure to maintain remission among adolescents treated for depression is surprising given previous evidence that extreme thinking contributes to relapse for depression among adults (Teasdale et al., 2001; Beevers et al., 2003). Differences between the current and previous investigations may account for the different result. First, the studies reviewed focused on adults with chronic depression exclusively. For example, Beevers and colleagues' (2003) study evaluated adults who were hospitalized for depression and who had experienced an average of three previous episodes. They note that "reductions in dysfunctional thought content may thus have a more important role in mitigating depression susceptibility among severely depressed people compared to people with more mild forms of the disorder" (Beevers et al., 2003, p. 493). Similarly, Teasdale's investigation (2001) studied adults with residual depressive chronicity, wherein participants had completed a successful trial of antidepressant medication and were randomized to clinical management alone or with cognitive therapy. It is possible that individuals with chronic depression may demonstrate extreme thinking patterns more frequently. Moreover, evidence suggests that chronic depression differs from less chronic manifestations in clinical presentation and classification (e.g., Mondimore et al., 2007). Perhaps extreme thinking is a phenomenon that predicts relapse among individuals who have experienced a highly chronic and relentless form of depression.

Interestingly, extreme endorsement of negative DAS items decreased over the course of treatment, whereas extreme endorsement of positive DAS items increased within the COMB treatment arm. Negative and positive beliefs were not evaluated separately in previous studies. Thus it is difficult to determine whether developmental phenomena may be at play. Some researchers have noted that all-or-none thinking is normative in childhood (Harter, 1999). Further work is needed to determine whether increased endorsements of positively valenced extreme beliefs are adaptive or maladaptive among youth.

Our investigation is limited by the small number of adolescents who failed to maintain their remission status. Moreover, it is possible that the current investigation represents a manifestation of the differential sieve effect (Jacobson & Hollon, 1996); wherein, despite randomization, participants may have varied in respect to pre-existing characteristics. For example, if different types of patients are likely to complete or respond to a particular intervention, the acute treatment period may act as a differential sieve and produce systematic differences in the sets of patients from the different treatment groups who continue in the study. Despite many analyses examining such possibilities (e.g., Rohde et al., 2008), a differential sieve effect in the larger TADS study cannot be ruled out. In addition, the generalizability of our findings are uncertain as it has yet to be determined whether these findings are specific to depressotypic cognition or whether they would generalize to extreme thinking as assessed by any self-report measure. Last, we believe that these findings are too preliminary to guide clinical practice; however, following replication and extension of this line of work may support clinical application.

In sum, extreme thinking did not predict a return to clinically significant symptoms among a sample of adolescents who were treated for and remitted from depression. This is in contrast to reports with adult samples (Teasdale et al., 2001; Beevers et al., 2003; see Ching & Dobson, in press for a failure to replicate). Future research examining the effect of medication on cognition is especially warranted. For example, innovative work has examined how the administration of *d*-Fenfluramine impacts dysfunctional beliefs. A study of adults documented a decrease in DAS scores in response to *d*-Fenfluramine when compared to placebo (Meyer et al., 2003). Overall, a broad understanding of mechanisms of treatment response and how they may function across development will be critical in the adequate prevention and amelioration of depression that occurs among youth.

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References

- Beck, AT.; Rush, AJ.; Shaw, BF.; Emery, G. Cognitive therapy of depression. New York: Guilford Press; 1979.
- Beevers CG, Keitner GI, Ryan CE, Miller IW. Cognitive predictors of symptom return following depression treatment. *Journal of Abnormal Psychology* 2003;112:488–496. [PubMed: 12943027]
- Ching LE, Dobson KS. An investigation of extreme responding as a mediator of cognitive therapy for depression. *Behavior Research and Therapy*. in press.
- Clark, DA.; Beck, AT. Scientific foundations of cognitive theory of depression. New York: John Wiley; 1999.
- Emslie GJ, Rush JA, Weinberg WA, Gullion CM, Rintelmann J, et al. Recurrence of Major Depressive Disorder in hospitalized children and adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry* 1997;36:785–792. [PubMed: 9183133]
- Garber J, Weiss B, Shanley N. Cognition, depressive symptoms, and development in adolescents. *Journal of Abnormal Psychology* 1993;102:47–57. [PubMed: 8436699]
- Guy, W. ECDEU Assessment Manual for Psychopharmacology. 2nd. Washington DC: U.S. Government Printing Office; 1976.
- Harter, S. The construction of the self: A developmental perspective. New York: Guilford Press; 1999.
- Kennard BD, Silva SG, Tonev S, Rohde P, Hughes JL, Vitiello B, et al. Remission and recovery in the Treatment for Adolescents with Depression Study (TADS): Acute and long-term outcomes. *Journal of the American Academy of Child and Adolescent Psychiatry* 2009;48:186–195. [PubMed: 19127172]
- Meyer JH, McMain S, Kennedy SH, Korman L, Brown GM, et al. Dysfunctional attitudes and 5-HT₂ receptors during depression and self-harm. *American Journal of Psychiatry* 2003;160:90–99. [PubMed: 12505806]
- Mondimore FM, Zandi PP, MacKinnon DF, McInnis MG, Miller EB, Crowe RP, et al. Familial aggregation of illness chronicity in recurrent, early-onset major depression pedigrees. *American Journal of Psychiatry* 2007;163:1554–1560. [PubMed: 16946180]
- Petersen TJ, Feldman G, Harley R, Fresco DM, Graves L, et al. Extreme response style in recurrent and chronically depressed patients: Change with antidepressant administration and stability during continuation treatment. *Journal of Consulting and Clinical Psychology* 2007;75:145–153. [PubMed: 17295573]
- Poznanski, EO.; Mokros, HB. Children's Depression Rating Scale-Revised Manual. Los Angeles, CA: Western Psychological Services; 1995.

- Segal, ZF.; Williams, JMG.; Teasdale, JD. Mindfulness-based cognitive therapy for depression: A new approach to preventing relapse. New York: Guilford Press; 2002.
- TADS Team. Treatment for Adolescents with Depression Study (TADS): Rationale, design, and methods. *Journal of the American Academy of Child & Adolescent Psychiatry* 2003;42:531–542. [PubMed: 12707557]
- TADS Team. Fluoxetine, cognitive-behavioral therapy, and their combination for adolescents with depression: Treatment for Adolescents with Depression Study (TADS) randomized controlled trial. *Journal of the American Medical Association* 2004;292:807–820. [PubMed: 15315995]
- TADS Team. The Treatment for Adolescents with Depression Study (TADS): Demographic and clinical characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry* 2005;44:28–40. [PubMed: 15608541]
- Teasdale JD, Scott J, Moore RG, Hayhurst H, Pope M, et al. How does cognitive therapy prevent relapse in residual depression? Evidence from a controlled trial. *Journal of Consulting and Clinical Psychology* 2001;69:347–357. [PubMed: 11495165]
- Weissman, AN.; Beck, AT. Development and validation of the dysfunctional Attitude Scale: A preliminary investigation. Paper presented at the Association for the Advancement of Behavior Therapy; Chicago. 1978 Nov.

Figure 1.

Figure 1a. Sample size for acute phase analyses

Note. This sample consists of treatment completers. FTM = failure to maintain remission; M = maintained remission; COMB = fluoxetine and cognitive behavior therapy; CBT = cognitive behavior therapy; FLX = fluoxetine.

Figure 1b. Sample size for continuation phase analyses

Note. This sample consists of treatment completers. FTM = failure to maintain remission; M = maintained remission; COMB = fluoxetine and cognitive behavior therapy; CBT = cognitive behavior therapy; FLX = fluoxetine.

Figure 2.

Extreme thinking by treatment group across 36 weeks

Note. Predicted score trajectories generated from RRM model.

Figure 3.

Extreme endorsement of positive and negative items on the Dysfunctional Attitudes Scale

Note. Predicted score trajectories generated from RRM model.

Table 1

Type 3 Effects in Logistic Regression Models for Acute Phase Failure to Maintain Remission

Model	Wald χ^2	<i>p</i>	AIC
Treatment only	1.84	.40	72.63
Treatment and Extreme Thinking			
Treatment	2.20	.33	
Extreme Thinking	1.53	.22	
Extreme Thinking by Treatment	0.78	.68	75.97

Rsquare = 0.08

Table 2

Type 3 Effects in Logistic Regression Models for Continuation Phase Failure to Maintain Remission

Model	Wald χ^2	<i>p</i>	AIC
Treatment only	2.21	.33	96.75
Treatment and Extreme Thinking			
Treatment	3.42	.18	
Extreme Thinking	1.62	.20	
Extreme Thinking by Treatment	2.69	.26	99.55

Rsquare = 0.07

Table 3

Effect of Treatment on Extreme Thinking

Comparison	F	<i>p</i>	<i>d</i>
Wk12 COMB vs. CBT	19.56	<.01	.69
Wk12 COMB vs. FLX	6.94	<.01	.36
Wk12 FLX vs. CBT	3.41	0.07	.31
Wk24 COMB vs. CBT	15.88	<.01	.71
Wk24 COMB vs. FLX	8.13	<.01	.31
Wk24 FLX vs. CBT	1.30	0.25	.37
Wk36 COMB vs. CBT	8.38	<.01	.40
Wk36 COMB vs. FLX	6.09	0.01	.34
Wk36 FLX vs. CBT	0.17	0.68	.06

Note. COMB = combination of fluoxetine (FLX) and cognitive behavior therapy (CBT).