Efficacy of Interpretation Bias Modification in Depressed Adolescents

Jamie A. Micco, Ph.D.
Department of Psychiatry
Massachusetts General Hospital/
Harvard Medical School
Boston, Massachusetts, USA
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Collaborators
Dina R. Hirshfeld-Becker, PhD
Aude Henin, PhD

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Research Assistants
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Introduction

• 20% of adolescents meet criteria for lifetime major depression by age 18
• Approximately 30% do not respond to SSRI medication, CBT, or both types of treatment (March et al, 2004)
• Innovative or enhanced treatments for this population are needed
Cognitive Bias Modification (CBM)

• Mathews and Mackintosh (2000) developed a computerized paradigm for inducing positive or negative interpretations of ambiguous social situations in non-clinical subjects.

• Interpretation bias has been modified with CBM programs in adults who score highly on measures of social anxiety (Beard & Amir, 2008), specific phobia (Teachman & Addison, 2008), and GAD (Hirsch et al, 2009).

• Few studies of CBM with non-clinical or anxious children or adolescents (Vassilopoulos et al, 2009; Muris et al, 2008), which have shown promising results; no studies to date of CBM for depression.
CBM for Depressed Youth

• Depressed adolescents display negative interpretation biases (e.g., Timbremont et al., 2008; Dalgleish et al., 1997)
  - Negative interpretations of neutral and ambiguous information
  - Selective attention to negative information

• Interpretive biases associated with social phobia and depression are similar (e.g., Micco & Ehrenreich, 2009)

• Will a computerized interpretation bias modification program also be effective for depression, using scenarios relevant to potential loss, rejection, and failure, and developmentally tailored to adolescents?
Participants

- 48 adolescents and young adults, ages 14-21 years, recruited through fliers, Internet, and clinics at MGH
- 3 enrolled, but dropped after first visit (included in mixed-effects analyses)
- 3 not included in analyses (BDI score by first visit<14 [n=2], manic episode by post-tx [n=1])
- Inclusion/Exclusion Criteria:
  - BDI-II score = 14+ at phone screen
  - Working command of English
  - No medication/therapy changes within 2 weeks
  - No active psychosis or mania, previous diagnosis of Autism Disorder, mental retardation, or severe dyslexia
## Participants

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>23 (16 female)</td>
<td>22 (17 female)</td>
<td>NS</td>
</tr>
<tr>
<td>Age</td>
<td>17.70±1.94 years</td>
<td>18.86±1.81 years</td>
<td>t=2.09 p&lt;.05</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>74% Caucasian, 17% Biracial, 9% Other</td>
<td>68% Caucasian, 14% Biracial, 18% Other</td>
<td>NS</td>
</tr>
<tr>
<td>BDI-Pre</td>
<td>27.59±10.64</td>
<td>28.00±10.86</td>
<td>NS</td>
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## Depression Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
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<tbody>
<tr>
<td><strong>Current MDD</strong></td>
<td>Full: 65%</td>
<td>Full: 59%</td>
</tr>
<tr>
<td></td>
<td>Sub-threshold: 30%</td>
<td>Sub-threshold: 36%</td>
</tr>
<tr>
<td></td>
<td>None: 5%</td>
<td>None: 5%</td>
</tr>
<tr>
<td><strong>Severity</strong></td>
<td>Mild: 27%</td>
<td>Mild: 38%</td>
</tr>
<tr>
<td></td>
<td>Moderate: 55%</td>
<td>Moderate: 33%</td>
</tr>
<tr>
<td></td>
<td>Severe: 18%</td>
<td>Severe: 29%</td>
</tr>
<tr>
<td><strong>Treatment History</strong></td>
<td>None: 9%</td>
<td>None: 14%</td>
</tr>
<tr>
<td></td>
<td>Therapy only: 13%</td>
<td>Therapy only: 14%</td>
</tr>
<tr>
<td></td>
<td>meds only: 9%</td>
<td>Meds only: 10%</td>
</tr>
<tr>
<td></td>
<td>Therapy+Meds: 43%</td>
<td>Therapy+Meds: 38%</td>
</tr>
<tr>
<td></td>
<td>Hospital: 26%</td>
<td>Hospital: 24%</td>
</tr>
</tbody>
</table>
Design: Pilot RCT

Attention Control Group
- Baseline Assessment
- Four sessions over two weeks of exposure to neutral scenarios
- Post-Tx Assessment
- Two-week FU

Intervention Group
- Baseline Assessment
- Four sessions over two weeks of positive interpretation training
- Post-Tx Assessment
- Two-week FU
Modification Paradigm

• Intervention Group: 100 three-line scenarios per session (randomly drawn from a pool of 200)
  o 66 scenarios that are relevant to potential loss, rejection, or failure; ambiguous until the final word (which forces a positive interpretation of the scenario), followed by a comprehension question
  o 24 filler (neutral) scenarios

• Attention Control Group: also receive 100 scenarios a session, but all are filler scenarios
Modification Paradigm

Example Training Scenario:

You have to give an oral presentation in history class this morning. You stand up in front of your class with your notes in your hand. Partway through, people think your presentation is g-od.

Does the class like your presentation? Y/N
Modification Paradigm

Example Training Scenario:
Your older cousin has had trouble finishing school and cannot hold down a job. You wonder if you will end up like him. You realize that your life will turn out better.

Will things turn out badly for you? Y/N
Modification Paradigm

Example Filler Scenario:

You take your dog outside for a walk. While walking, he picks up a big stick and brings it to you. You throw the stick for him to go and f-tch.

Does your dog run after the stick?  Y/N
Hypotheses

Compared to adolescents in the attention control group, adolescents receiving the positive interpretation training will show:

1) Greater reduction in negative interpretation bias over time; and,
2) Greater reduction in scores on measures of depression, anxiety, and negative affect at post-tx and follow-up.
Outcome Measures

Primary Outcome: Interpretation Bias
1. Test of Interpretation Bias (Recognition Task)
2. Dysfunctional Attitudes Scale (DAS)
3. Affective Go/No Go Task (CANTAB)

Secondary Outcomes: Depression/Anxiety
1. SCID-IV or K-SAD, mood modules
2. BDI-II
3. STAI-Trait/State
4. PANAS
5. Subjective Units of Depression (SUDS)
Test of Interpretation Bias (TIB)

• 10 completely ambiguous scenarios

• Participants rate (1-4) how similar each of four interpretations is to what they read

• Example:
The Movies
You are on your way to meet a friend at the movie theater. You are supposed to meet him near the ticket booth. When you arrive, your friend is not waiting.
Test of Interpretation Bias

How similar is each statement below to the scenario you just read on a scale from 1 (not at all similar) to 4 (very similar)?

1. When you arrive, your friend is running late for the movie. [Positive Target]

2. When you arrive, your friend has stood you up. [Negative Target]

3. When you arrive, you realize you have money for popcorn. [Positive Foil]

4. When you arrive, you realize that the movie is sold out. [Negative Foil]
Test of Interpretation Bias

• Negative and Positive Target scores each range from 10-40

• Bias score = Positive Target/Negative Target, with higher ratios indicative of a more positive interpretation bias
Mixed Effects Model (REML): Main effect for time (at post-tx), $\beta = .214$, $p < .05$, no Group x Time Interaction
Bias Change: Negative BL Bias Only

Mixed Effects Model (REML): Main effect for time (at post-tx), $\beta=0.212$, $p<0.05$,
Group x Time Interaction (at mid-tx and post-tx), $\beta=0.330$, $p<0.05$
and $\beta=0.263$, $p=0.07$
Mixed Effects Model (REML): Group x Time Interaction (at post-tx and FU), $\beta=-15.37$, $p<.05$ and $\beta=-26.29$, $p=.001$
Mixed Effects Model (REML): Main effect for time: $\beta = -5.82$, $p < .01$ (mid-tx), $\beta = -5.73$, $p < .01$ (post-tx), $\beta = -7.35$, $p < .001$ (FU); no Group x Time interaction
Mixed Effects Model (REML): Main effect for time: $\beta = -4.14$, $p < .05$ (post-tx), $\beta = -7.86$, $p < .01$ (FU); no Group x Time interaction
Summary

• No significant differences between intervention and control groups in interpretation bias change.
• When restricting the sample to adolescents with initial negative bias, then the intervention group shows significantly greater improvement in interpretation bias at mid- and post-treatment.
• Greater change in dysfunctional cognitions (DAS) in the intervention versus the control group at post-treatment and follow-up.
• No differences between groups in depression or anxiety symptom improvement.
Future Considerations

- How much “dose” is enough?

- Must negative mood be induced before training?

- Should CBM for depression be considered an adjunct to CBT, or a stand-alone treatment?