Mechanisms of change in cognitive therapy and interpersonal therapy for depression: preliminary results from an ongoing trial

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Mechanisms in psychotherapy

Psychotherapy works, but how?

- Numerous trials demonstrating effectiveness

- The Great Debate on working mechanisms
  - The Dodo Bird Verdict ("all have won and must have prizes")
  - Common factors versus specific factors

- Mechanisms of change much discussed, but little hard evidence
CT and IPT for depression

Cognitive Therapy (CT) and Interpersonal Therapy (IPT) are effective interventions for depression

- CT and IPT (and several other short-term therapies) are equally effective (Cuijpers et al. 2008)

- CT most extensively studied
  - Cuijpers et al. review: 53 studies, 38 on CT, 6 on IPT

- CT seems to have a preventive effect on relapse (Vittengl et al. 2007)
Proposed mechanisms of change in CT and IPT

Central assumption of factors that drive change in therapy differs:

- CT works through changes in (negative) thinking or cognitions
- IPT works through changes in interpersonal functioning
- Both models emphasize importance of other therapy ‘ingredients’, such as therapeutic alliance and structure
Cognitive therapy for depression

It works, but how exactly?

*Cognitive specificity:*
Assumption that a change in thinking is the *central mechanism* that leads to symptomatic relief

*Cognitive therapy:*
Modifying dysfunctional thinking patterns that perpetuate depressive symptoms
Beck’s cognitive model

- **Events**
- **Automatic thoughts**
  - **Mood**
  - **Behavior**
- **Physiology**
- **Assumptions & Core beliefs**
  - **Coping strategies**

**Early maladaptive life events**
But how exactly does CT work then?

Possible models (DeRubeis, Brewin):

- CT leads to cognitive change on schema level, underlying vulnerability is “removed”
- CT only deactivates schemas temporarily, maladaptive schemas become active under stress
- Newly formed functional schemas have to compete with old maladaptive schemas under stress
- CT does not change schemas but teaches patients to use compensatory skills
Mediation model for treatment

- Therapy affects the mediator (a).
- The mediator affects the outcome (b).
- Therapy directly affects the outcome (c).

Variables:
- Therapy
- Mediator
- Outcome
Mediation model for CT vs IPT for depression
Requirements for mediators (to be mechanisms)

- **Statistical mediation**: mediator explains why and in what way a treatment has an effect on the outcome (and explains the difference in effects of two treatments).

- **Temporal relations**: Change in the mechanism precedes change in depressive symptoms

- **Specificity**: The mechanism is unique for the type of treatment
  - Interpretation issue, part of mediation analysis
Mediation studies in CT

Review of mediation studies in CT: Garratt & Ingram 2007

- 31 studies on cognitive change processes
- Mixed findings, at best
- Cognitive change seems to mediate therapeutic change statistically in CT
- Cognitive change is not (entirely) specific for CT
Methodological problems in mediation studies

What stands out is that most studies differ in design and analysis

- Mostly ‘simple’ models of statistical mediation
- Absence of repeated measures (temporality)
- Absence of appropriate controls groups (specificity)
Closer look at statistical mediation: Baron & Kenny

Diagram:
- Therapy
- Mediator
- Outcome

Equation:
\[ c_1 \]
Closer look at statistical mediation: Baron & Kenny

\[ \text{therapy} \rightarrow \text{mediator} \rightarrow \text{outcome} \]

- \[ a \]
- \[ 2 \]
Closer look at statistical mediation: Baron & Kenny

Diagram:
- Therapy
- Mediator
- Outcome

Path coefficients:
- b
- 3
Closer look at statistical mediation: Baron & Kenny

 therapy → mediator
  \[ a \]

 mediator → outcome
  \[ b \]

 \[ 2 \]

 \[ 3 \]

 \[ 4 \]

 \[ c' \]
Closer look at statistical mediation: McKinnon

Joint significance of $a$ and $b$ implies different direct effect than total effect (total = direct + $a*b$)
Mediators of cognitive therapy and interpersonal therapy for depression: preliminary findings
STEPd study

Treatment study (RCT)
180 depressed patients randomized to: cognitive therapy (20 sessions); interpersonal therapy (20 sessions); or 8-week waitlist condition

Main research questions:
• Effectiveness CT and IPT for depression in the acute phase
• CT and IPT in the long term (relapse prevention)
• Mechanisms of Change CT and IPT

In- & exclusion criteria

Inclusion:
• Age between 18 – 65 years old
• The presence of a depressive episode as indicated by the SCID-I
• BDI score > 10
• Internet access and an e-mail address

Exclusion:
• Chronic depression (>5 years)
• Current use of antidepressant mediation
• Severe psychiatric co-morbidity
• Drugs- and alcohol abuse/dependence
• Insufficient knowledge of the Dutch language
Procedure

Intake at Mental Health Care Centre (Check Eligibility)

Baseline Assessment eligible patients (N = 180)

CT (N = 75)
- Follow-up
  - 3 months
  - 7 months
  - 8 months
  - 9 months
  - 10 months
  - 11 months
  - 12 months
  - 24 months

IPT (N = 75)
- Follow-up
  - 3 months
  - 7 months
  - 8 months
  - 9 months
  - 10 months
  - 11 months
  - 12 months
  - 24 months

Waiting List (N = 30)
- Follow-up
  - 2 months
  - 9 months
  - 14 months
  - 26 months
Assessment points
## Participants at baseline

### Baseline characteristics of the total sample

<table>
<thead>
<tr>
<th></th>
<th>CT</th>
<th>IPT</th>
<th>Waiting-list</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$(n = 75)$</td>
<td>$(n = 75)$</td>
<td>$(n = 31)$</td>
</tr>
<tr>
<td><strong>Gender, female: $n$ (%)</strong></td>
<td>54 (72%)</td>
<td>46 (61.3%)</td>
<td>16 (52%)</td>
</tr>
<tr>
<td><strong>Age, year: mean (s.d.)</strong></td>
<td>41.0 (12.3)</td>
<td>41.3 (11.8)</td>
<td>37 (12.5)</td>
</tr>
<tr>
<td><strong>Education $^a$, $n$ (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Low</td>
<td>16 (21.6%)</td>
<td>13 (17.3%)</td>
<td>7 (22.6%)</td>
</tr>
<tr>
<td>- Medium</td>
<td>45 (61.0%)</td>
<td>41 (54.7%)</td>
<td>20 (64.5%)</td>
</tr>
<tr>
<td>- High</td>
<td>12 (16.2%)</td>
<td>20 (26.7%)</td>
<td>3 (9.7%)</td>
</tr>
<tr>
<td><strong>Partner $^b$, $n$ (%)</strong></td>
<td>42 (56%)</td>
<td>51 (68%)</td>
<td>18 (58%)</td>
</tr>
<tr>
<td><strong>BDI-II score, mean (s.d.)</strong></td>
<td>28.5 (9.0)</td>
<td>31.2 (8.9)</td>
<td>29.2 (10.6)</td>
</tr>
<tr>
<td><strong>Depression specifiers, $n$ (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Recurrent</td>
<td>38 (51%)</td>
<td>36 (48%)</td>
<td>15 (48%)</td>
</tr>
<tr>
<td>- Severe (BDI-II &gt; 32)</td>
<td>27 (36%)</td>
<td>35 (45%)</td>
<td>14 (45%)</td>
</tr>
</tbody>
</table>

$^a$: Education levels defined as low, medium, and high
$^b$: Partner status defined as presence or absence

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Faculty of Psychology and Neuroscience
Change in depressive symptoms

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>3</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CT (n = 68)</strong></td>
<td>27.91 (8.75)</td>
<td>22.27 (11.04)</td>
<td>13.69 (11.01)</td>
</tr>
<tr>
<td><strong>IPT (n = 69)</strong></td>
<td>30.62 (9.01)</td>
<td>23.79 (13.22)</td>
<td>16.02 (13.65)</td>
</tr>
</tbody>
</table>
Effect of waiting list

Mean (SD) BDI-II (change) scores at baseline and 8-week follow-up

<table>
<thead>
<tr>
<th>Condition</th>
<th>Baseline</th>
<th>8 weeks</th>
<th>Δ score</th>
<th>Paired Samples T-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>CT (n = 52)*</td>
<td>27.7 (9.1)</td>
<td>21.5 (10.1)</td>
<td>6.2 (9.8)</td>
<td>t = 4.54, p = 0.00</td>
</tr>
<tr>
<td>IPT (n = 59)*</td>
<td>30.4 (8.9)</td>
<td>24.3 (12.7)</td>
<td>6.1 (10.0)</td>
<td>t = 4.66, p = 0.00</td>
</tr>
<tr>
<td>Waiting-List (n = 28)*</td>
<td>28.8 (10.1)</td>
<td>28.6 (12.1)</td>
<td>0.2 (8.0)</td>
<td>t = 0.14, p = 0.89</td>
</tr>
</tbody>
</table>

No significant differences between the three groups at baseline. Significantly more improvement in the active treatment groups as compared to the waiting-list group. Significant improvement in the two active treatment groups after 8 weeks. No significant differences in change scores between CT and IPT. No improvement in the waiting-list control group.
Clinical Meaningful Change

<table>
<thead>
<tr>
<th>Category</th>
<th>3 months</th>
<th>7 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovered</td>
<td>17 (13%)</td>
<td>47 (34%)</td>
</tr>
<tr>
<td>Improved without recovery</td>
<td>49 (36%)</td>
<td>48 (35%)</td>
</tr>
<tr>
<td>Deteriorated</td>
<td>6 (4%)</td>
<td>3 (2%)</td>
</tr>
<tr>
<td>No change</td>
<td>62 (45%)</td>
<td>24 (18%)</td>
</tr>
<tr>
<td>Missing</td>
<td>3 (2%)</td>
<td>15 (11%)</td>
</tr>
</tbody>
</table>

Recovered = Δ > 9 + BDI < 9; Improved without recovery = Δ > 9 + BDI > 9; Deteriorated = Δ < -9; No change = Δ < 9.

Jacobson & Truax, 1991
## Outcome and process variables in this study

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI</td>
<td>Beck Depression Inventory</td>
<td>Depression Severity</td>
</tr>
<tr>
<td>DAS</td>
<td>Dysfunctional Attitude Scale</td>
<td>Cognitions</td>
</tr>
<tr>
<td>ASQ</td>
<td>Attributional Style Questionnaire</td>
<td>Attitudes</td>
</tr>
<tr>
<td>Sc-IAT</td>
<td>Single-category Implicit Association Test</td>
<td>Schemas</td>
</tr>
<tr>
<td>LEIDS</td>
<td>Leiden Index of Depression Sensitivity</td>
<td>Cognitive Reactivity</td>
</tr>
<tr>
<td>RRS</td>
<td>Ruminative Response Scale</td>
<td>Rumination</td>
</tr>
<tr>
<td>IIP</td>
<td>Inventory of Interpersonal Problems</td>
<td>Interpersonal Problems</td>
</tr>
<tr>
<td>SLSC</td>
<td>Self-liking and Self-competence Scale</td>
<td>Self-esteem</td>
</tr>
<tr>
<td>WSAS</td>
<td>Work and Social Adjustment Scale</td>
<td>General Functioning</td>
</tr>
<tr>
<td>BHS</td>
<td>Beck Hopelessness Scale</td>
<td>Hopelessness</td>
</tr>
</tbody>
</table>
Change during therapy

![Graph showing changes during therapy](image-url)
Mediation analysis plan

Multilevel analysis (n=137 therapy completers), McKinnon approach

- **Step 1**: univariate mediation analysis: cross-sectional
- **Step 2**: univariate mediation analysis: change scores
- **Step 3**: multiple mediator analysis
  - several mediators in one model, adjusting for each other
- **Step 4**: moderated mediation analysis
  - mediation in subgroups of patients
- **Step 5**: temporality analysis: time lagged effects and SEM
- **Step 6**: specificity analysis: interpretation earlier steps
Results of the mediation analysis

- Multilevel analysis (n=137), McKinnon approach

- **Step 1**: univariate mediation analysis: cross-sectional
  - Treatment not associated with any of the mediators

- **Step 2**: univariate mediation analysis: change scores
  - Treatment not associated with any of the mediators

No evidence for differential effects of CT and IPT on change processes
Concurrent relations between process change scores and depression change scores (Δ 0-7)

Regression analysis

<table>
<thead>
<tr>
<th>Variables</th>
<th>Std. β</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δ Sc-IAT 0 - 7</td>
<td>0.18</td>
<td>0.02</td>
</tr>
<tr>
<td>Δ LEIDS 0 – 7</td>
<td>0.17</td>
<td>0.04</td>
</tr>
<tr>
<td>Δ RRS 0 – 7</td>
<td>0.40</td>
<td>0.00</td>
</tr>
<tr>
<td>Δ BHS 0 – 7</td>
<td>0.50</td>
<td>0.00</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.63</td>
<td></td>
</tr>
</tbody>
</table>

No differences between CT and IPT
Temporal relations: from 0-3 to 3-7 months

No differences between CT and IPT
Preliminary main findings I

- CT and IPT seem equally effective

- Change in symptoms is larger than change in proposed mediators
  - Change in symptoms seems to drive change in proposed mediators, not the other way around

- No statistical mediation: no evidence for differential causal pathways of CT and IPT

- No evidence for cognitive, interpersonal functioning or common factor model of therapy
  - Role of therapeutic alliance analyzed in subsequent stage
Preliminary main findings II

Why was statistical mediation not found?

- Study design and instruments flawed?
- Essential working mechanisms not assessed?
- Poor execution of both therapies?
- Underlying theories of CT and IPT inaccurate?
Conclusion

- Mechanisms of change much discussed, but not backed up by empirical research

- Methodological and statistical issues in mechanism research are troublesome

- A methodological framework to study mediators and mechanisms is needed: evidence-based explanation (Kazdin)

- Our study aims to contribute to such a framework (but we were stopped before we were half-way ...)