Trajectories of Theorized Clinical Change Mechanisms in a Cognitive Behavioral Intervention for College Students with ADHD

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Abstract: Evidence for the efficacy of cognitive-behavioral treatment (CBT) for adults with ADHD continues to grow (Knouse et al., 2017). Although most CBT trials examine effects pre and post treatment, few assess clinical change *during* treatment. Hence, it is unknown whether trajectories of clinical change mechanisms follow a linear pattern (steadily increasing over time) or a non-linear pattern (reflecting an inconsistent change rate). Although one might expect improvement to be steady and linear in psychosocial interventions, this is often not the case (Hayes et al., 2007). The aim of the current study is to examine trajectories of change over time in three theorized clinical change mechanisms (knowledge of ADHD, behavioral strategy use, adaptive thinking) in a cognitive-behavioral treatment for college students with ADHD. **Method.** Participants were 119 college students with ADHD (*M* age = 19.58; *SD* = 2.81). The sample was 66.40% female and 66.39% Caucasian. Weekly surveys assessing knowledge (two items), behavioral strategies (five items), and adaptive thinking (five items) were administered via an online system. Participants had 72 hours to complete the survey. **Results.** Growth curve modeling was used to examine trajectories of knowledge, behavioral strategies and adaptive thinking during treatment. A random intercept-only model was examined first, and if indicated, a linear growth term was added to the model. Quadratic and cubic model terms were added when indicated (Bollen & Curran, 2006). Analyses were conducted in SPSS 25. In the final model for knowledge, there was a significant positive linear effect (β = .13, *SE* = .02, $p < .001$), suggesting a steady rate of increase in knowledge over time. In the final model for behavioral strategies, significant effects included a positive linear effect (β = 5.66, *SE* = 1.12, $p < .001$), a negative quadratic effect (β = - 1.06, *SE* = .24, $p < .001$), and a positive cubic effect (β = .07, *SE* = .02, $p < .001$). This suggests a "S" curve in behavioral strategy use over time. In the final model for adaptive thinking, significant effects included a positive linear effect (β = .85, *SE* = .22, $p < .001$) and a negative quadratic effect (β = - 0.49, *SE* = .02, $p < .05$). This indicates adaptive thinking increased, but the rate of change was not consistent. **Conclusions.** Knowledge of ADHD increased steadily in a linear trend, but trajectories of behavioral strategy use and adaptive thinking use were non-linear. It appears emerging adults with ADHD attending college do not show a steady increase in skill use through treatment. Behavioral strategy use showed a cubic trend, which is best represented by an S-shaped curvilinear pattern. This suggests an initial increase in behavioral strategy use, followed by a flattening or decrease before another rise. Adaptive thinking use demonstrated a quadratic pattern. Use of this skill rose slowly at first before rising more rapidly over time. The non-linear patterns demonstrated by behavioral strategy use and adaptive thinking use could reflect difficulties in implementing strategies, which is a notable concern in CBT for adults with ADHD (see Ramsay & Rostain, 2016). In contrast, knowledge increased in a linear trajectory, suggesting that increases in knowledge occur at a steady, predictable pace.

Introduction

- Evidence for the efficacy of cognitive-behavioral treatment (CBT) for adults with ADHD continues to grow (Knouse et al., 2017)
- Relatively fewer studies have focused on CBT for emerging adults with ADHD attending college (He & Antshel, 2017)
- Existing evidence suggests CBT reduces the impact of ADHD and improve general functioning (Anastopoulos et al., 2018; Eddy et al., 2015; Fleming et al., 2015).
- Most CBT trials examine effects pre and post treatment; far fewer assess clinical change *during* treatment
- Hence, it is unknown whether trajectories of clinical change mechanisms follow a linear pattern (steadily increasing over time) or a non-linear pattern (reflecting an inconsistent change rate)
- Some evidence indicates improvement is not generally linear and steady (Hayes et al., 2007).
- Aim of the current study is to examine trajectories of change over time in three theorized clinical change mechanisms of ACCESS, a cognitive-behavioral treatment for college students with ADHD
- Preliminary analyses of data from a randomized controlled trial show reductions in ADHD symptoms and improvements in functioning.
- Hypothesized clinical mechanisms include:
  - Knowledge of ADHD
  - Behavioral strategy use
  - Adaptive thinking strategy use

Method

Participants:

- *N* = 119

Table 1. Participant Demographics

	M (SD)	N (%)
Age	19.58 (2.81)	
Ethnicity		
Non-Hispanic		107 (93%)
Hispanic		8 (7%)
Sex		
Male		42 (35.3)
Female		77 (64.7)
Race		
White		78 (66.1)
Black		14 (11.9)
Asian		6 (5.1)
More than one		14 (11.9)
Other		6 (5.1)

- Participants emailed link to surveys
- Surveys completed within secure RedCap data management system
- Allowed 72 hours for response
- Intervention:
  - 8-week cognitive-behavioral intervention designed to improve academic and social-emotional functioning of college students with ADHD
- Treatment delivered via weekly groups accompanied by individual mentoring sessions
- Maintenance phase of treatment included 4 to 6 mentoring sessions and 1 group session

Method

Measures:

Knowledge:

- 2 items; 5-point Likert-style scale
- Assesses level of knowledge of ADHD
- Example item: *"How much new information about ADHD have you learned?"*
- α = .80

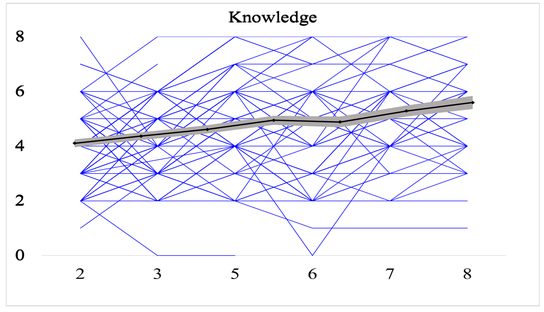
Behavioral strategies

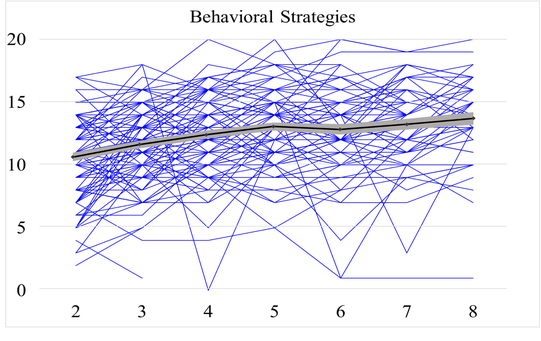
- 5 items; 5-point Likert-style scale
- Items assess use of organizing, prioritizing and planning strategies
- Example item: *"How often did you add items to, or review, your planning calendar?"*
- α = .69

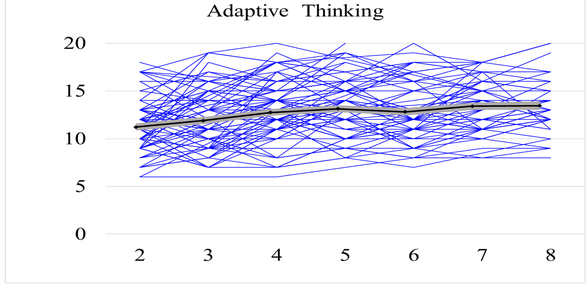
Adaptive thinking

- 5 items; 5-point Likert-style scale
- Assesses acquisition of adaptive thinking skills
- Example item: *"How often have you noticed your automatic thoughts?"*
- α = .73

Results







Results

Analyses:

- Growth curve modeling assessed trajectory of knowledge, behavioral strategies and adaptive thinking over course of treatment
- Growth curve modeling is robust to inequality in the number of data points measured per person and differences in measurement schedule across time; does not assume independence of data (Bollen & Curran, 2006).
- Stepped approach was used (Bollen & Curran, 2006)
  - Random intercept-only model examined initially to assess growth over time.
  - If indicated, linear growth model term was added; followed by quadratic and cubic model terms
- Analyses conducted in SPSS Version 25

Knowledge

- Significant positive linear effect (β = .13, *SE* = .02, $p < .001$)
- Suggests a steady rate of increase in knowledge over time

Behavioral Strategies

- Significant positive linear effect (β = 5.66, *SE* = 1.12, $p < .001$)
- Significant negative quadratic effect (β = - 1.06, *SE* = .24, $p < .001$)
- Significant positive cubic effect (β = .07, *SE* = .02, $p < .001$)
- Suggests a "S" curve in behavioral strategy use over time

Adaptive Thinking

- Significant positive linear effect (β = .85, *SE* = .22, $p < .001$)
- Significant negative quadratic effect (β = - 0.49, *SE* = .02, $p < .05$)
- Indicates adaptive thinking increased, but the rate of change was not consistent

Discussion

- Knowledge of ADHD increased steadily in a linear trend; whereas trajectories of behavioral strategy use and adaptive thinking use were non-linear.
  - The steady linear pattern of ADHD knowledge growth may indicate increasing knowledge of ADHD does not require implementation outside of session, in contrast to use of strategies.
- Emerging adults with ADHD attending college do not show a steady, linear increase in skill use through treatment
  - Behavioral strategy use showed a cubic trend, which is best represented by an S-shaped curvilinear pattern.
  - Suggests an initial increase in behavioral strategy use, followed by a flattening or decrease before another rise.
  - This may reflect initial increase in behavioral strategy use, followed by increased difficulty with implementing strategies outside of session.
  - Overall this pattern is still consistent with an increase in strategy use over time.
- Adaptive thinking use demonstrated a quadratic pattern, suggesting use of this skill rose slowly at first before rising more rapidly over time.
  - This may indicate that participants had more difficulty acquiring this particular skill
  - Results are consistent with verbal feedback from participants about the difficulty in noticing and challenging maladaptive thinking patterns.
- In sum, these results could reflect difficulties in implementing strategies, which is a notable concern in CBT for adults with ADHD (see Ramsay & Rostain, 2016 for a discussion of this topic).
- In clinical work with adults with ADHD, it may be helpful to provide ongoing support and attention to the implementation of previously learned strategies.

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Poster Abstract

Background. The evidence for the efficacy of cognitive-behavioral treatment (CBT) for adults with ADHD continues to grow (Knouse et al., 2017). Although most CBT trials examine effects pre and post treatment, few assess clinical change *during* treatment. Hence, it is unknown whether trajectories of clinical change mechanisms follow a linear pattern (steadily increasing over time) or a non-linear pattern (reflecting an inconsistent change rate). Although one might expect improvement to be steady and linear in psychosocial interventions, this is often not the case (Hayes et al., 2007). The aim of the current study is to examine trajectories of change over time in three theorized clinical change mechanisms of ACCESS, a cognitive-behavioral treatment for college students with ADHD. Currently, ACCESS is being tested in an IES-funded multi-site efficacy trial. Preliminary analyses show reductions in ADHD symptoms and improvements in functioning. The current study will examine the trajectories of knowledge of ADHD, behavioral strategy use, and adaptive thinking strategy use during the first eight sessions of ACCESS. **Methods.** Participants were 119 college students with ADHD (*M* age = 19.58; *SD* = 2.81). The sample was 66.40% female and 66.39% Caucasian. Weekly surveys assessing knowledge (two items), behavioral strategies (five items), and adaptive thinking (five items) were administered via email. Participants had 72 hours to complete the survey. **Results.** Growth curve modeling was used to examine trajectories of knowledge, behavioral strategies and adaptive thinking during treatment. A random intercept-only model was examined first, and if indicated, a linear growth term was added to the model. Quadratic and cubic model terms were added when indicated (Bollen & Curran, 2006). Analyses were conducted in SPSS 25. In the final model for knowledge, there was a significant positive linear effect (β = .13, *SE* = .02, p < .001), suggesting a steady rate of increase in knowledge over time. In the final model for behavioral strategies, significant effects included a positive linear effect (β = 5.66, *SE* = 1.12, p < .001), a negative quadratic effect (β = - 1.06, *SE* = .24, p < .001), and a positive cubic effect (β = .07, *SE* = .02, p < .001). This suggests a "S" curve in behavioral strategy use over time. In the final model for adaptive thinking, significant effects included a positive linear effect (β = .85, *SE* = .22, p < .001) and a negative quadratic effect (β = - 0.49, *SE* = .02, p < .05). This indicates adaptive thinking increased, but the rate of change was not consistent. **Conclusions.** Knowledge of ADHD increased steadily in a linear trend, but trajectories of behavioral strategy use and adaptive thinking use were non-linear. It appears emerging adults with ADHD attending college do not show a steady increase in skill use through treatment. Behavioral strategy use showed a cubic trend, which is best represented by an S-shaped curvilinear pattern. This suggests an initial increase in behavioral strategy use, followed by a flattening or decrease before another rise. Adaptive thinking use demonstrated a quadratic pattern. Use of this skill rose slowly at first before rising more rapidly over time. These results could reflect difficulties in implementing strategies, which is a notable concern in CBT for adults with ADHD (see Ramsay & Rostain, 2016). Finally, knowledge showed a linear pattern, suggesting a steady positive increase. This may indicate increasing knowledge of ADHD does not require implementation outside of session, in contrast to use of strategies.