

The Study of Therapeutic Mechanisms in Psychosocial Treatment of Chronic Pain: Methodological and Statistical Considerations

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To build the case for a mechanism, at least 5 conditions should be examined

✓ Changes in mechanism and outcomes are correlated

– Substantial change in mechanism precedes substantial change in outcome

- “cause” (e.g., decreased maladaptive cognitions) must precede “effect” (e.g. decreased pain severity).

– Early change in mechanism predicts later change in outcome (i.e., lagged correlation), but not vice versa

- “cause” predicts “effect,” but “effect” does not predict “cause”

– Change in mechanism is specific to the treatment approach

- cognitive restructuring as part of CBT invokes greater decreases in maladaptive cognitions than meditation does as part of MBSR

– Mechanism change has some degree of unique relationship with outcome changes beyond effects of general mechanisms (e.g., working alliance, patient expectations)

Use an RT with method enhancements to illustrate.

– Enhanced CBT (ECBT) vs standard CBT (SCBT)

(Robert Kerns, PI)

- ECBT enhanced with motivational interviewing (MI)
 - increase pt motivation to adopt coping and behavior skills consistent with a self-management approach
- *pre-, 4-wk, 8-wk and post assessments*
- N = 100
- 10 weekly sessions
- Mechanism
 - increased “Action” orientation: active engagement in attempts to improve self-management skills.
- Outcome
 - reduced Pain Interference (PI)

N= 48

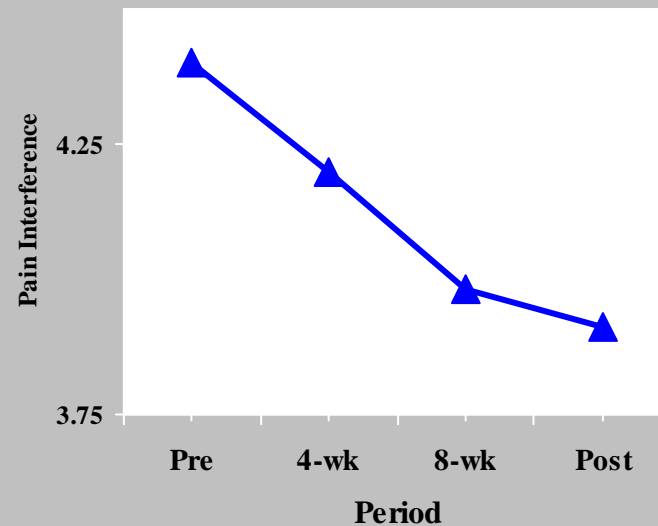
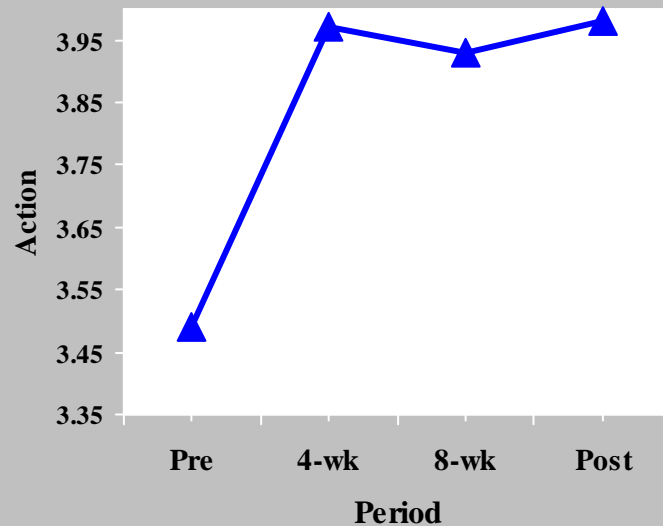
Pre-Tx

4-wk

8wk

Post-Tx

Action	3.49 (.7)	3.97 (.5)	3.93 (.6)	3.98 (.7)
PI	4.40 (1.1)	4.2 (1.1)	3.98 (1.1)	3.91 (1.2)



Pre- to 4-wk

4-wk to Post-Tx

Action

d = .71

99% of total

>

Action

d = .01

1% of total

V

PI

d = .18

42% of total

=

PI

d = .25

58% of total

- Radically different patterns of change between putative mechanism and outcome indexes
 - Not visible with pre-post only
 - Mechanism studies should use multiple assessments *DURING* Tx to reveal distinct change patterns
 - that may or may not support case for mechanism.
- Majority of change in Action subscale occurred early in Tx.
 - supports condition that “cause” precedes “effect.”
 - substantial early change in this factor potentially represents mechanism by which later changes in outcomes are wrought

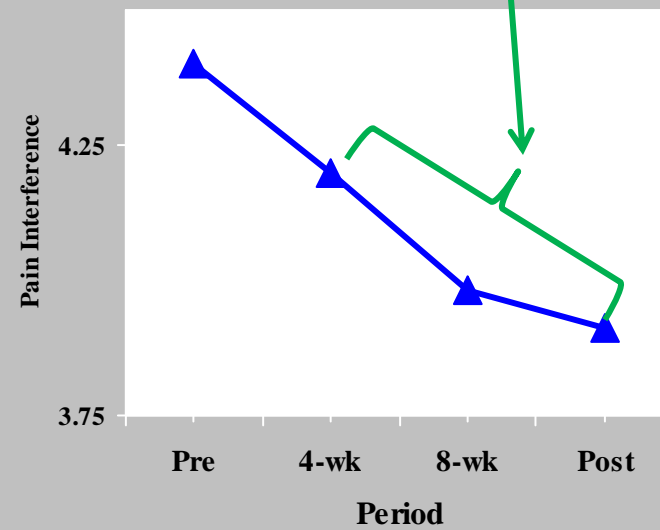
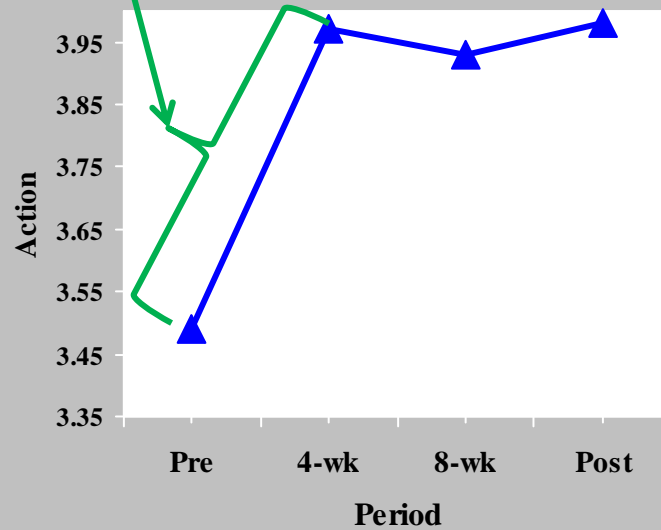
With multiple assessments during Tx, can examine lagged effects.

- Correlations among pre-post mechanism and outcome changes are first step, but not sufficient.
- Could be that reducing pain interference causes action attitudes to increase.
- Modeling cross-lagged associations allows tests of whether early-Tx changes in mechanism predict subsequent changes in outcomes (and not vice versa).

Pre to mid Action changes predict mid to post changes in PI.

Pre to mid PI changes ***DO NOT*** predict mid to post Action changes.

Compute residualized change scores



Early-Tx
Mech Change

Later-Tx
Mech Change

a

b

c

c

b

Early-Tx
Outcome Change

Later-Tx
Outcome Change

a

Early-Tx
Mech Change

Later-Tx
Mech Change

a

b

c

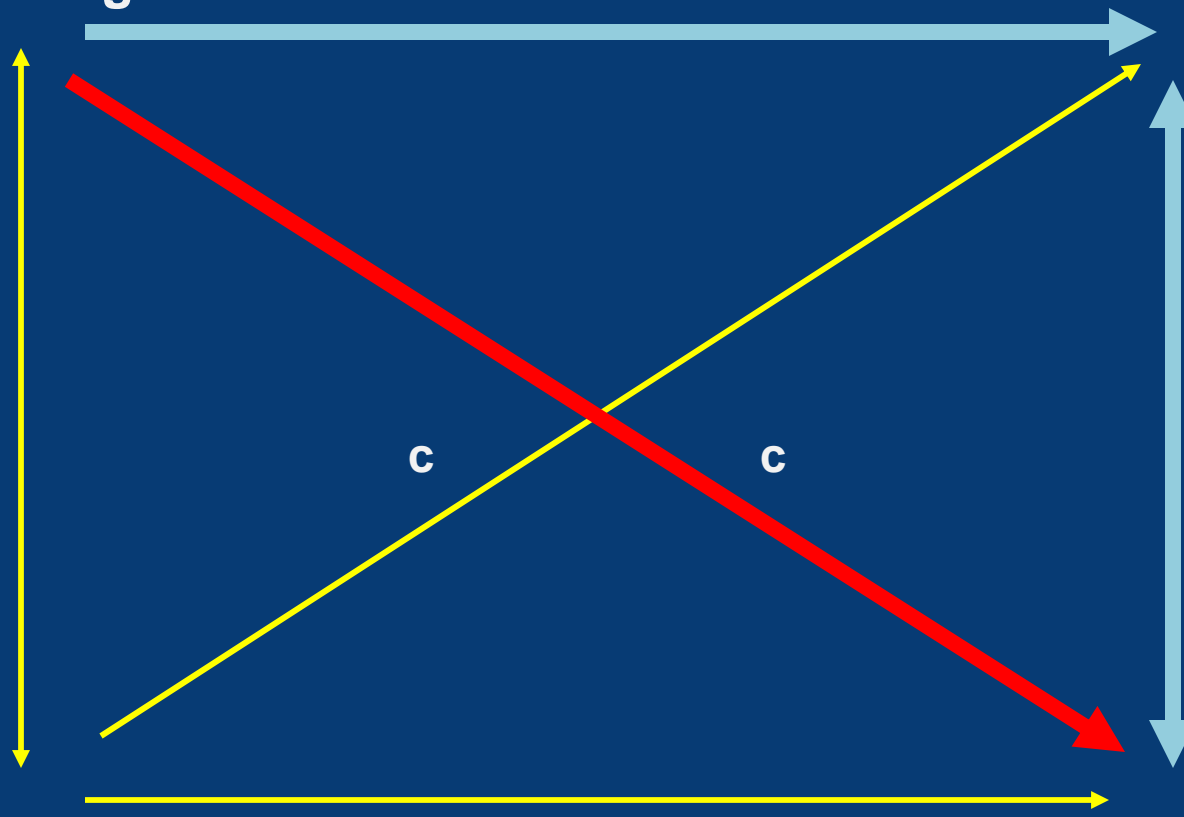
c

b

Early-Tx
Outcome Change

Later-Tx
Outcome Change

a



Early-Tx
Mech Change

Later-Tx
Mech Change

a

b

c

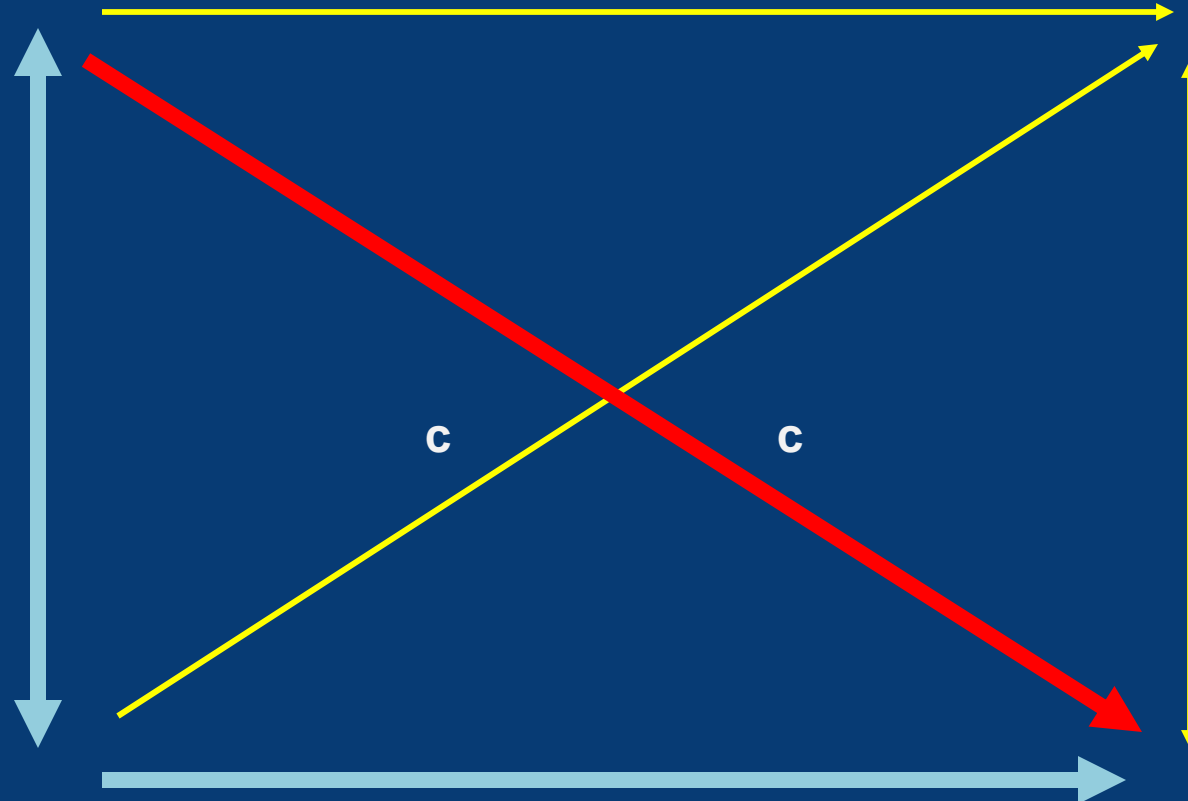
c

b

Early-Tx
Outcome Change

Later-Tx
Outcome Change

a



Early-Tx
Mech Change

Later-Tx
Mech Change

a

b

c

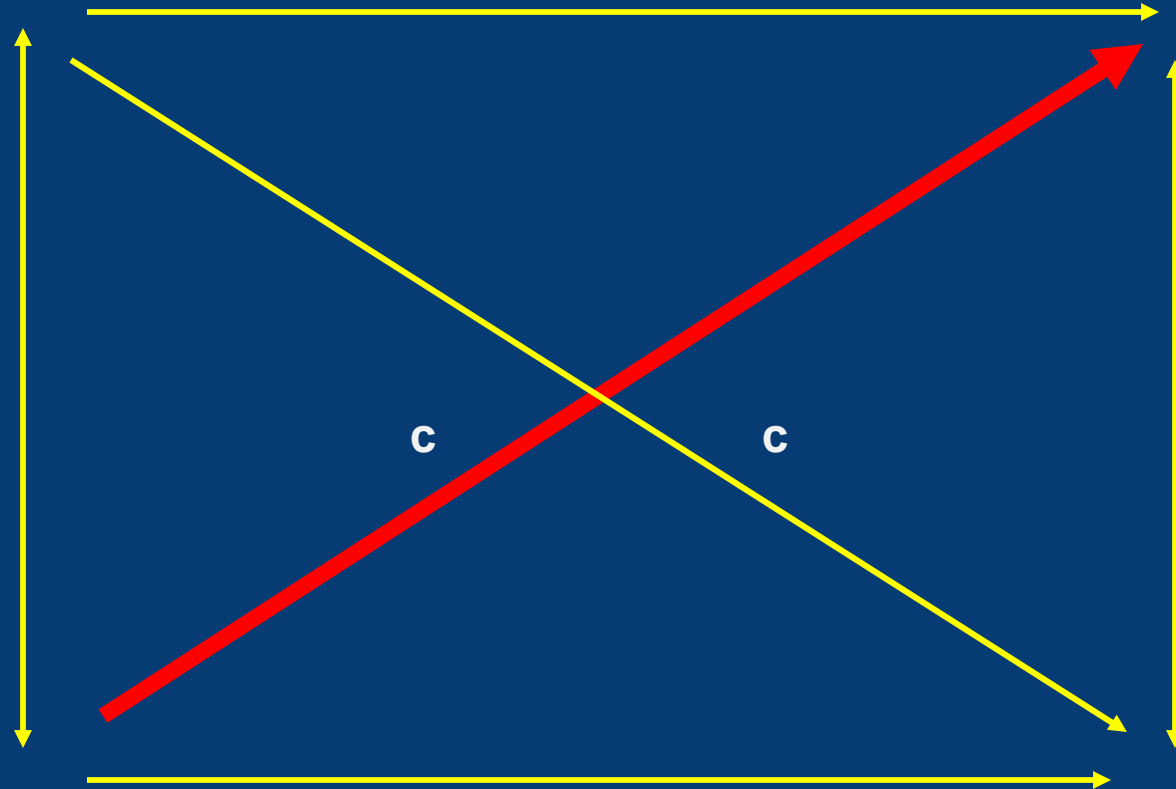
c

b

Early-Tx
Outcome Change

Later-Tx
Outcome Change

a



HMR: 4 wk to Post Interference (PI) Δ as Criterion

<u>Variables</u>	<u>beta</u>	<u>Total R²</u>	<u>step R² Increment</u>	<u>step signif.</u>
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Step 1:

Pre to 4 wk PI	-.25			
4 wk to Post AS	-.31	.15	.15	< .001

Step 2:

Pre to 4 wk AS	-.25	.21	.06	< .01
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HMR: 4 wk to Post Action (AS) Δ as Criterion

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Step 1:

Pre to 4 wk AS	-.14			
4 wk to Post PI	-.33	.08	.08	< .01

Step 2:

Pre to 4 wk PI	-.15	.09	.01	> .10
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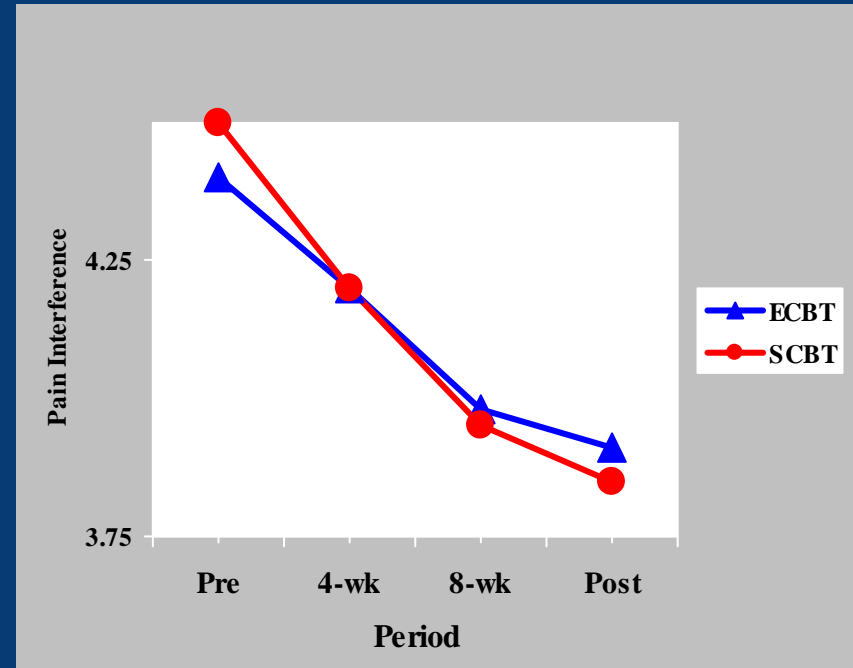
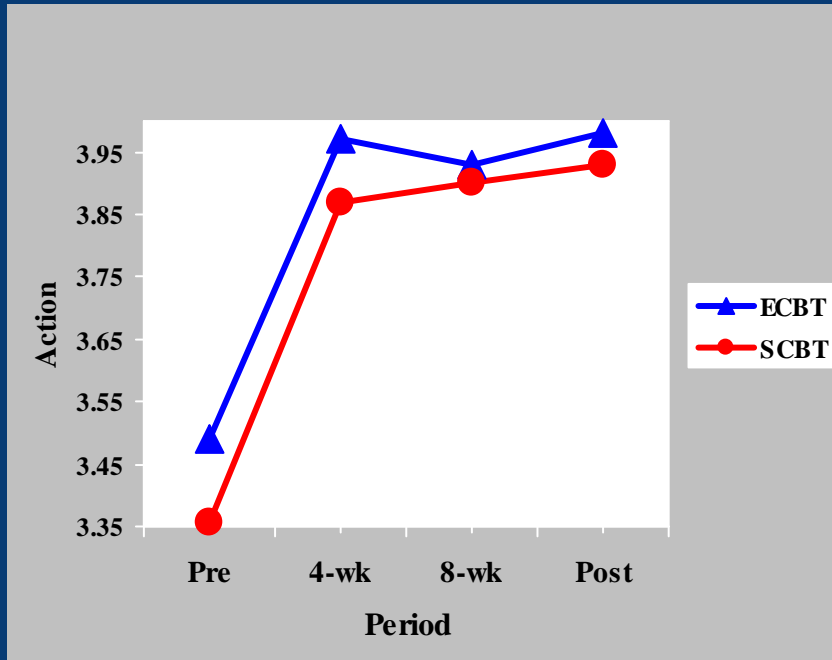
- Early-Tx Action changes predicted later-Tx PI changes, but not vice versa.
- Cross-lagged effects not testable with pre-post only
 - multiple assessments allow tests of relationships among lagged change scores, making stronger case for mechanism beyond correlations among concurrent change scores
- Support condition that “cause” predicts “effect,” whereas “effect” does not predict “cause.”

To build the case for a mechanism, at least 5 conditions should be examined

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 - ✓ “cause” (eg, decreased irrational cognition) must precede “effect” (eg decreased pain severity).
- ✓ early change in mechanism predicts later change in outcome (lagged) but not vice versa
 - ✓ “cause” predicts “effect,” but “effect” does not predict “cause”
- **change in mechanism is specific to the treatment approach**
 - Cognitive restructuring in CBT invokes more cognitive change than meditation in MBSR
- **mechanism change has some degree of unique relationship with outcome changes beyond effects of general mechanisms (eg, working alliance, pt expectations).**

N= 96

ECBT vs SCBT



ECBT/SCBT x Period interactions:

F's (3,288) < 1.33; p's > .10

ECBT – featuring MI techniques targeting attitude changes -- did NOT affect Action attitudes to a greater extent than SCBT

- Magnitude and patterns of Action attitude changes were identical across intervention conditions
- Pre- 4 wk Action changes predicted 4 wk- post-Tx Interference changes irrespective of condition (not shown).

Assumption that MI would magnify Action attitudes and thereby enhance outcomes called into question

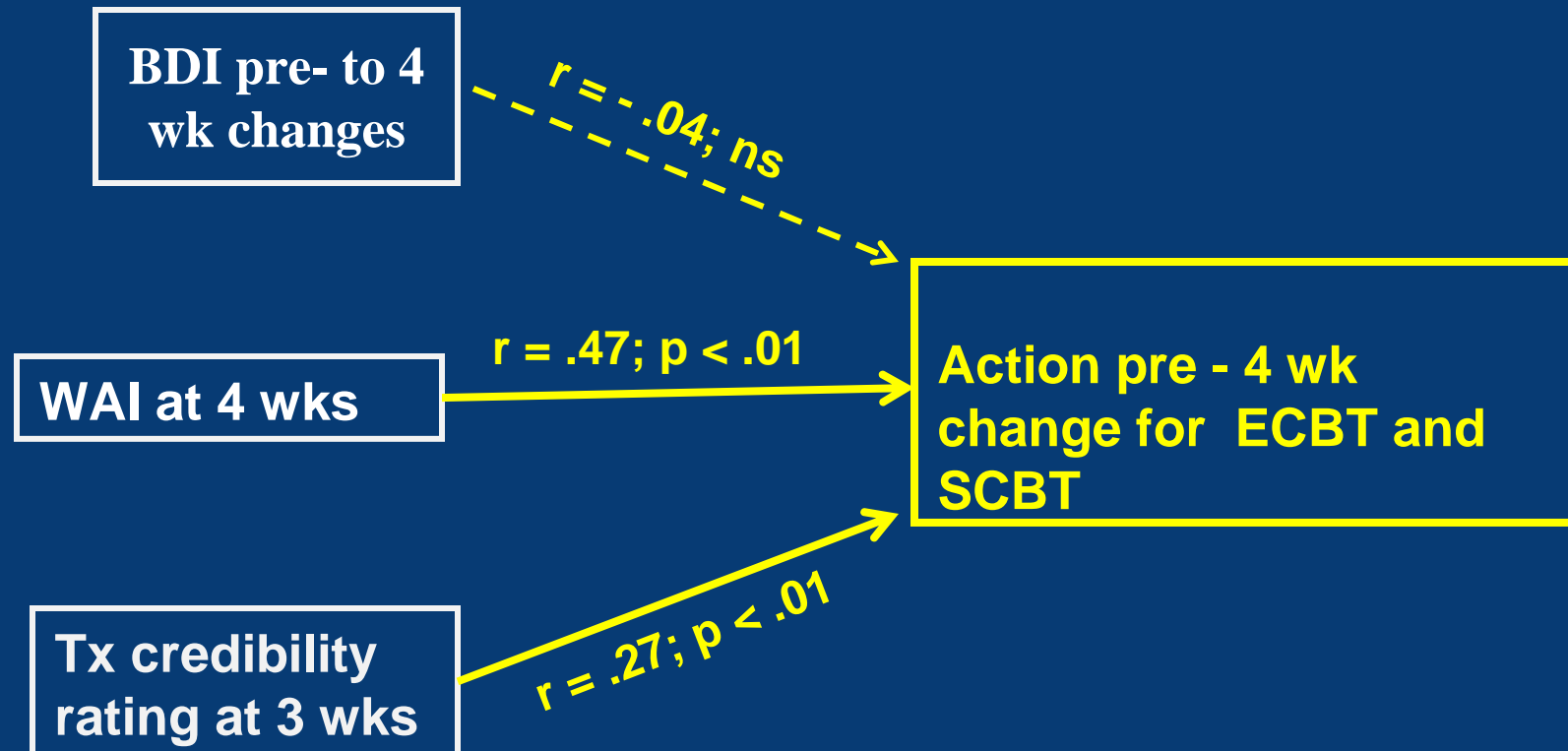
- Results do not support notion that Action changes are a mechanism *specific* to MI-enhanced CBT
- Action attitude changes may still be a mechanism, but MI techniques may not be necessary to invoke them.
- this last point would remain obscured, and use of MI+CBT perhaps unaltered without focus on mechanisms

Specific and General Mechanisms

So what might explain the gains in Action attitudes if not the specific MI techniques given in ECBT?

- General mechanisms, perhaps...
 - A “halo” effect that lifts mood and results in improved self-report?
 - Indexed by pre- to 4 wk changes in BDI
 - Quality of the working alliance?
 - Indexed by WAI at 4 wk
 - Pt beliefs that Tx is credible and potentially helpful?
 - Indexed by Tx credibility ratings at 3 wk

Specific and General Mechanisms



Specific and General Mechanisms

Gains in Action attitudes may be influenced by general mechanisms *common to both* ECBT and SCBT (and many other therapeutic approaches)

- Deliberate use of motivation interviewing techniques did not appear necessary to achieve changes in motivation
 - Instead, quality of working alliance between pt and therapists, and pt beliefs that the treatment is credible may have played a role.
- These influences would remain obscured without consideration of general mechanisms.

Examining effects of general mechanisms sheds light on some crucial phenomena that promote change.

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4 wk to Post AS	-.31			
Pre to 4 wk BDI	-.12			
WAI 4 wk	-.22			
Tx credibility 3 wk	-.07	.20	.20	< .001

Step 2:

Pre to 4 wk AS	-.14	.215	.015	ns
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Specific and General Mechanisms

Although early-Tx Action changes appeared to be mechanism affecting outcome across Tx conditions,

- quality of the working alliance at 4 wks partly accounts for effects of Action change on interference
- BUT it appears that working alliance and Action changes predict outcome in *COMMON* (ie, overlap).
- Raises issue of relative importance of “technique” vs “relationship” in psychosocial chronic pain Tx
- Again, these phenomena would have remained unappreciated without focus on mechanism

We have to open the Treatment Box

- Need to enhance RCTs to include methods and analytic tools that allow evaluation of mechanisms
- But *FIRST*, we need to be convinced that effort to delve into mechanisms is well worth it.

Holey moley!
Lookie here!



Early glimpses into the Treatment Box are encouraging but also puzzling and vexing

- Some evidence that Tx's may work (partly) because of mechanisms specified by theories.
- BUT, these mechanisms may be *broad* and *NOT* specific to a given Tx approach.
- Specific mechanisms *thought* to be rooted in specific techniques (eg cognitive restructuring provoking cognitive change) may emerge via processes we may not deliberately initiate (eg catastrophizing changing during pain education and physical exercise)
 - How does this happen? What forces are (actually) at work?
 - Issues regarding what phenomena in Tx are responsible for people changing for the better can only be settled by studying *mechanism*.