My journey from error messages to R packages

Building tools to increase reproducibility and productivity in clinical psychology

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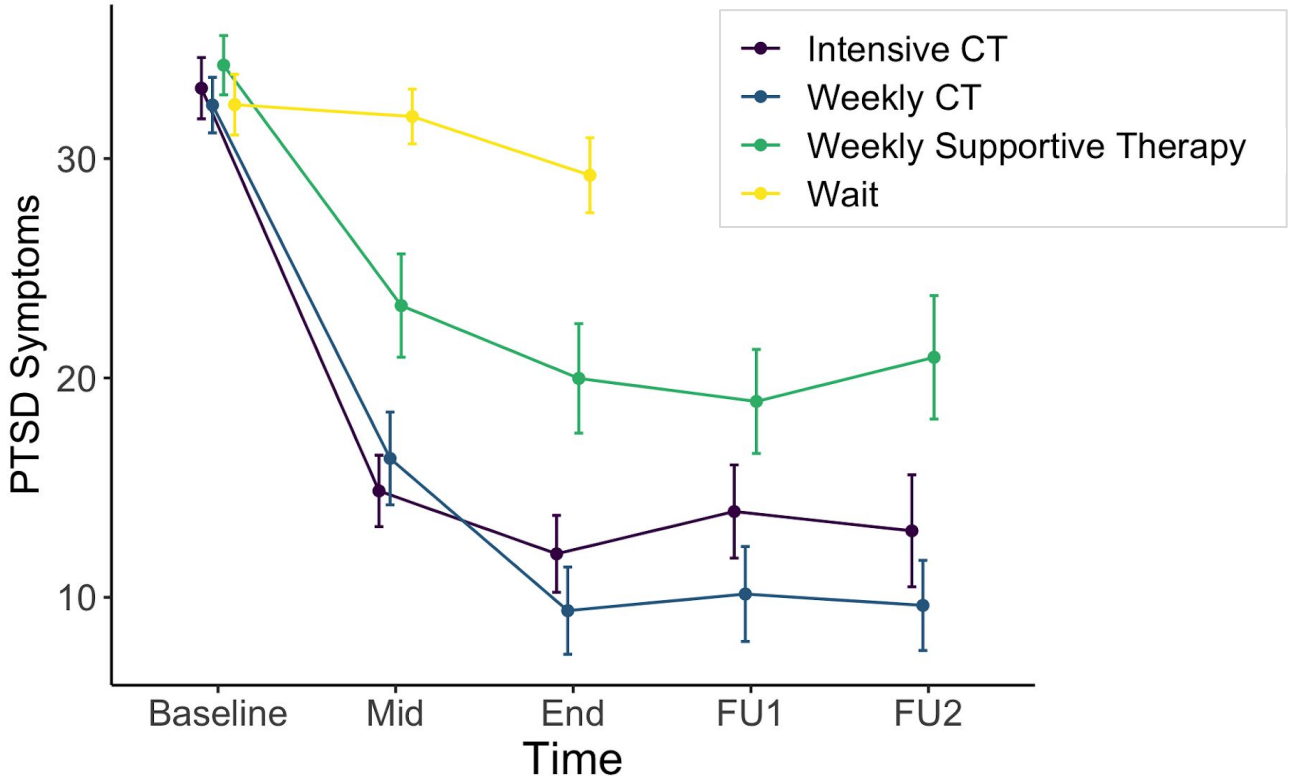
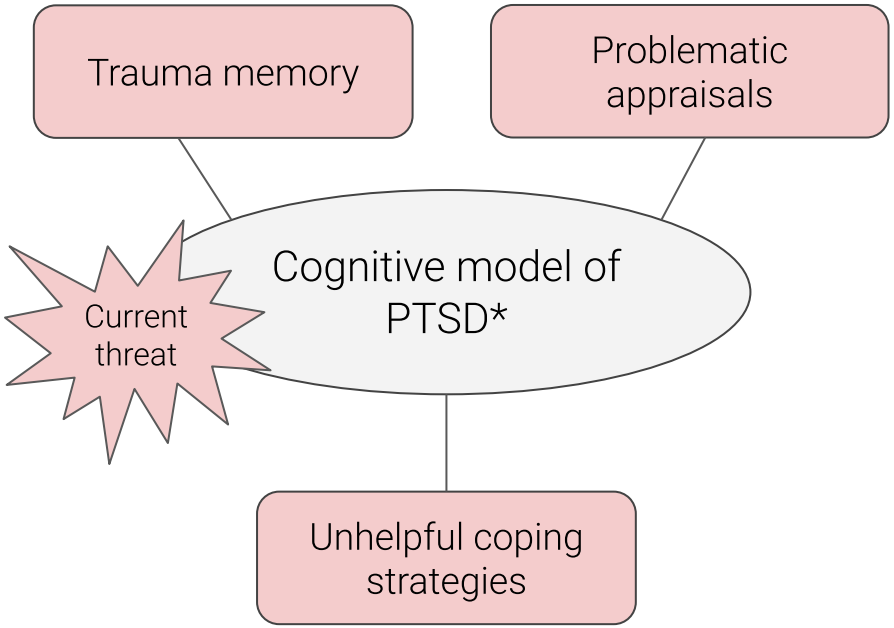
Yes! But what's the mechanism?



* Description of RCT in Ehlers et al. (2014). Discussion about mediation for example in Bollock et al. (2010) and Preacher (2015).

From theory to therapy and back



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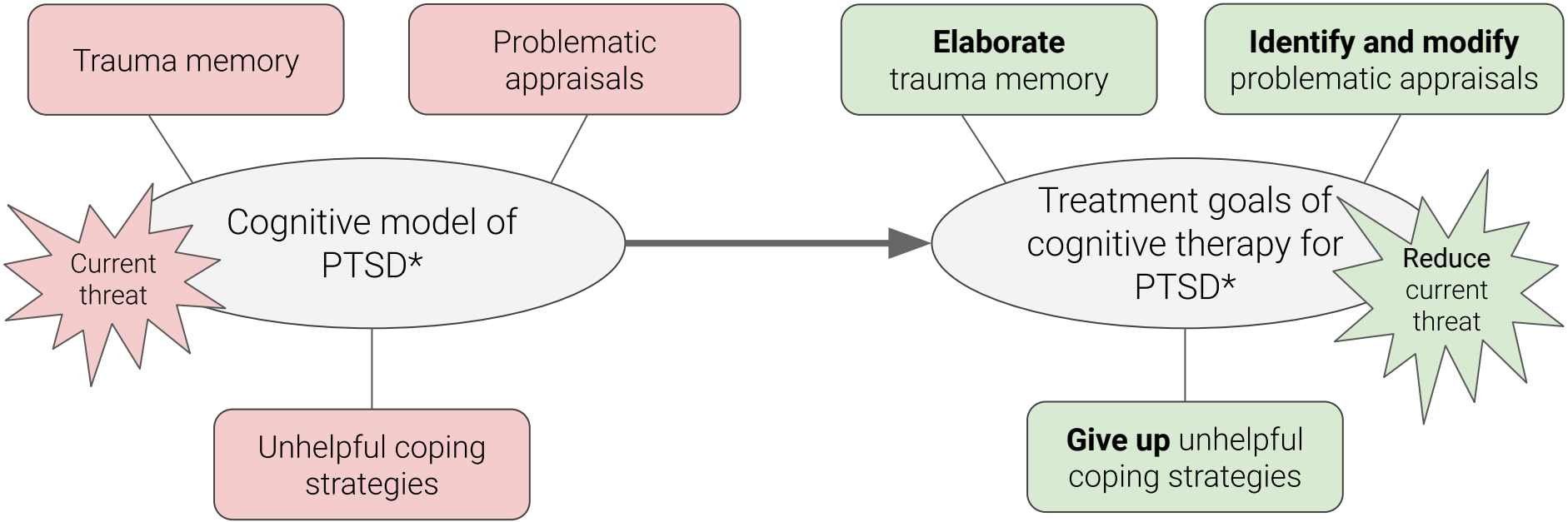
From theory to therapy and back



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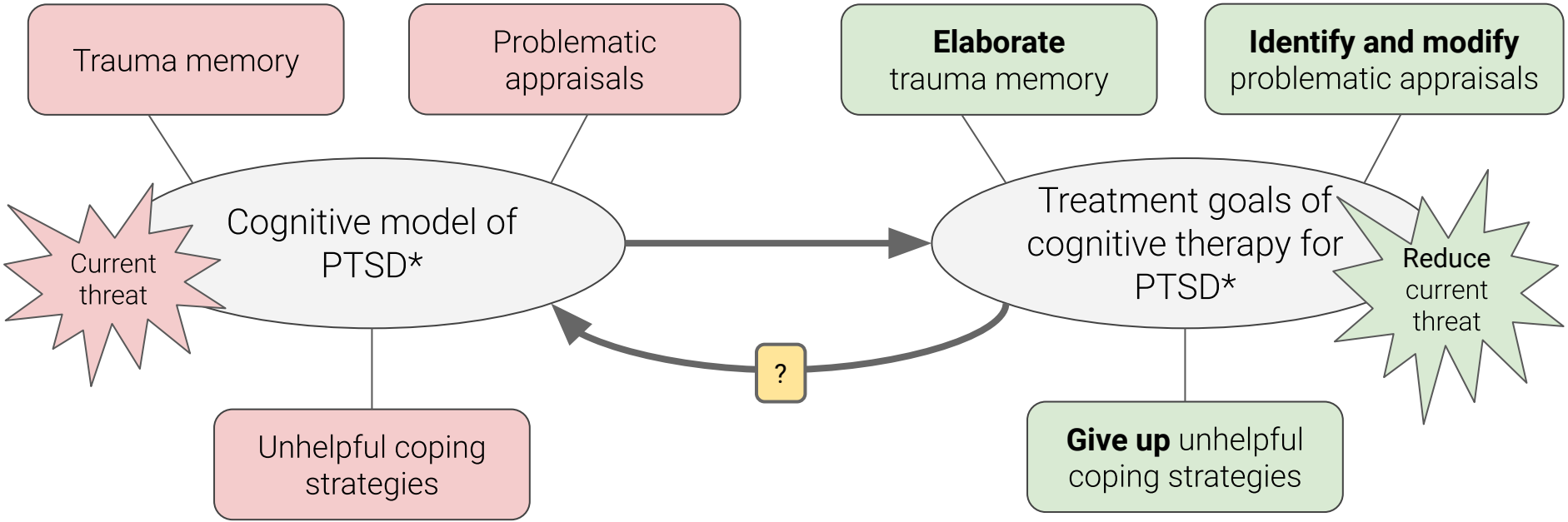
From theory to therapy and back



* Based on Ehlers and Clark (2000) and Ehlers et al. (2005).

Milestones during my R journey

CRAN


```
my_fun <- function(...) {
    trying stuff until it
    works
}
```

blabla ... R Package ...

Project 2: Modeling Change

Project 1: Sudden Gains

Year 1	Year 2	Year 3	Year 4

Problem

Our Solution

Sudden Gains

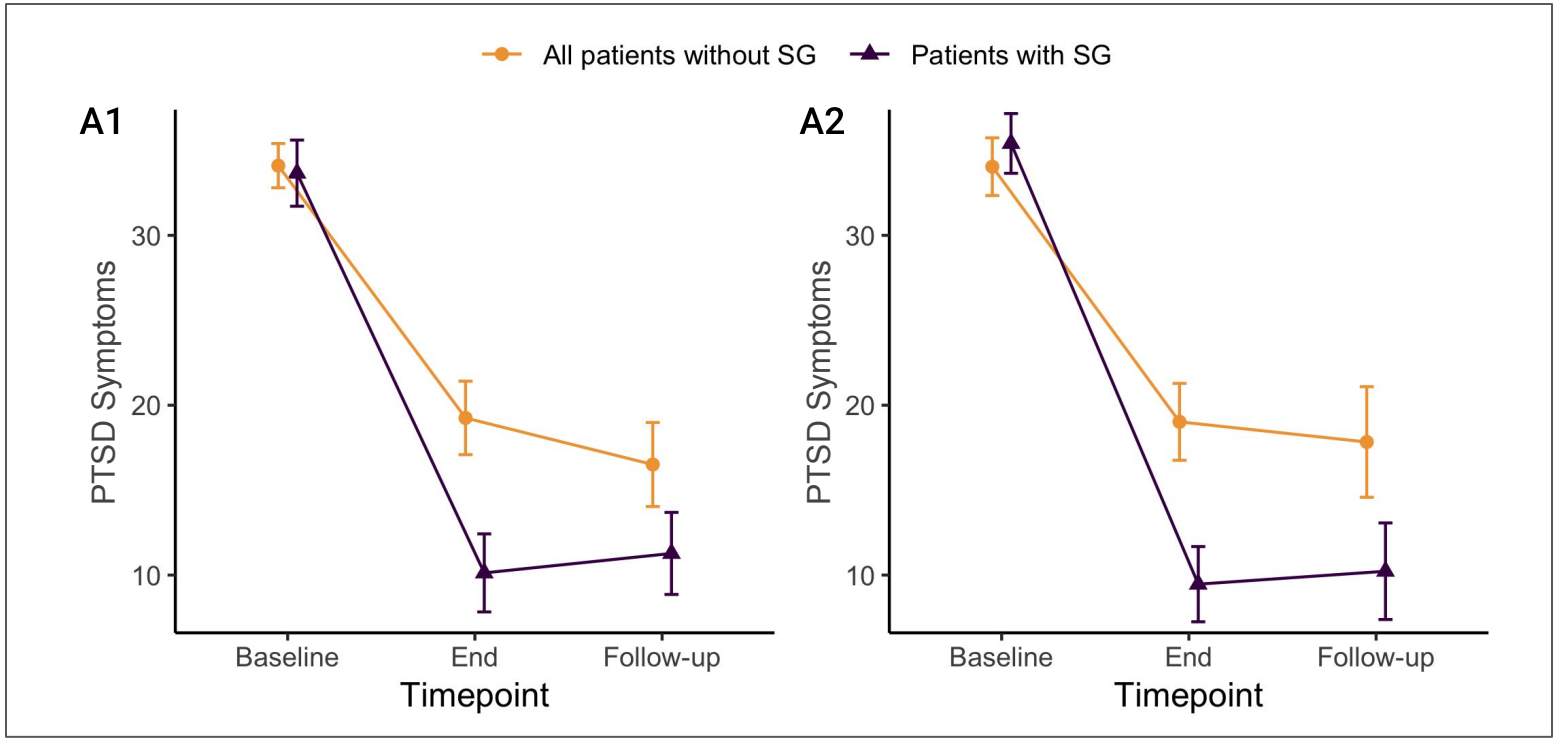
Problem

Our Solution

Modeling Change

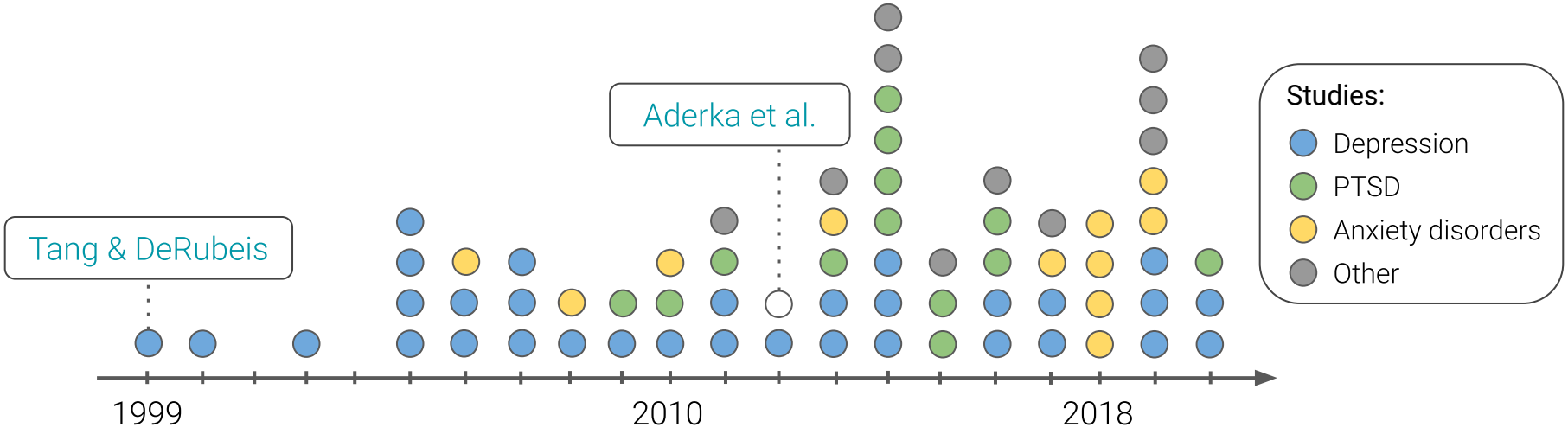
Sudden Gains

Why are sudden gains interesting?



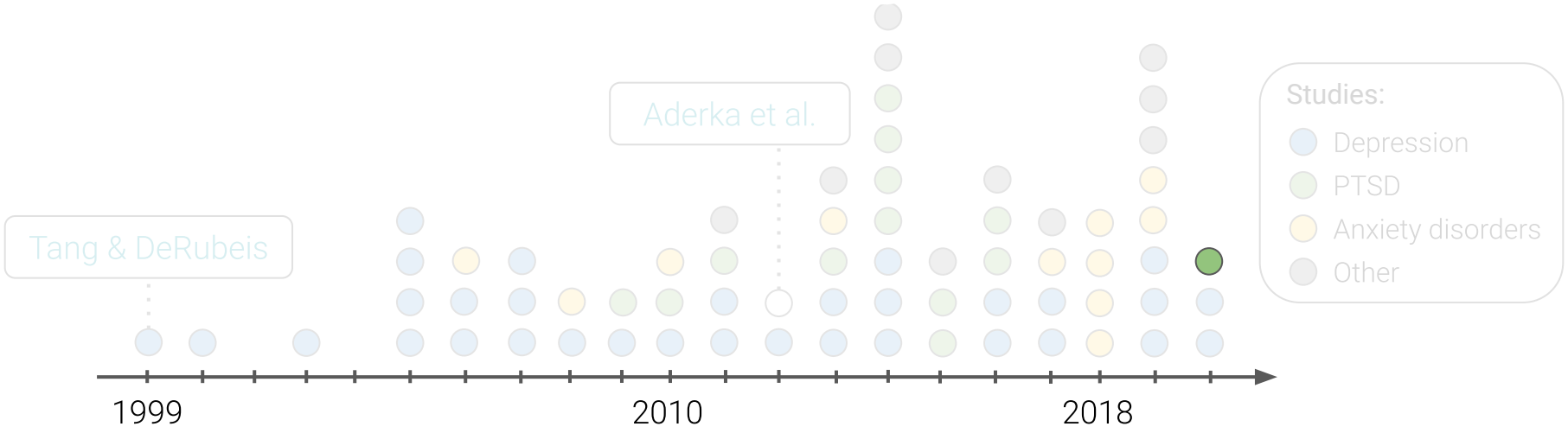
* Results from Wiedemann et al. (2020). SG = Sudden Gain. Sample 1 (A1): *n* = 248, Sample 2 (A2): *n* = 234.

Sudden gains studies in the literature



Sudden gains studies with open code

How were sudden gains identified?



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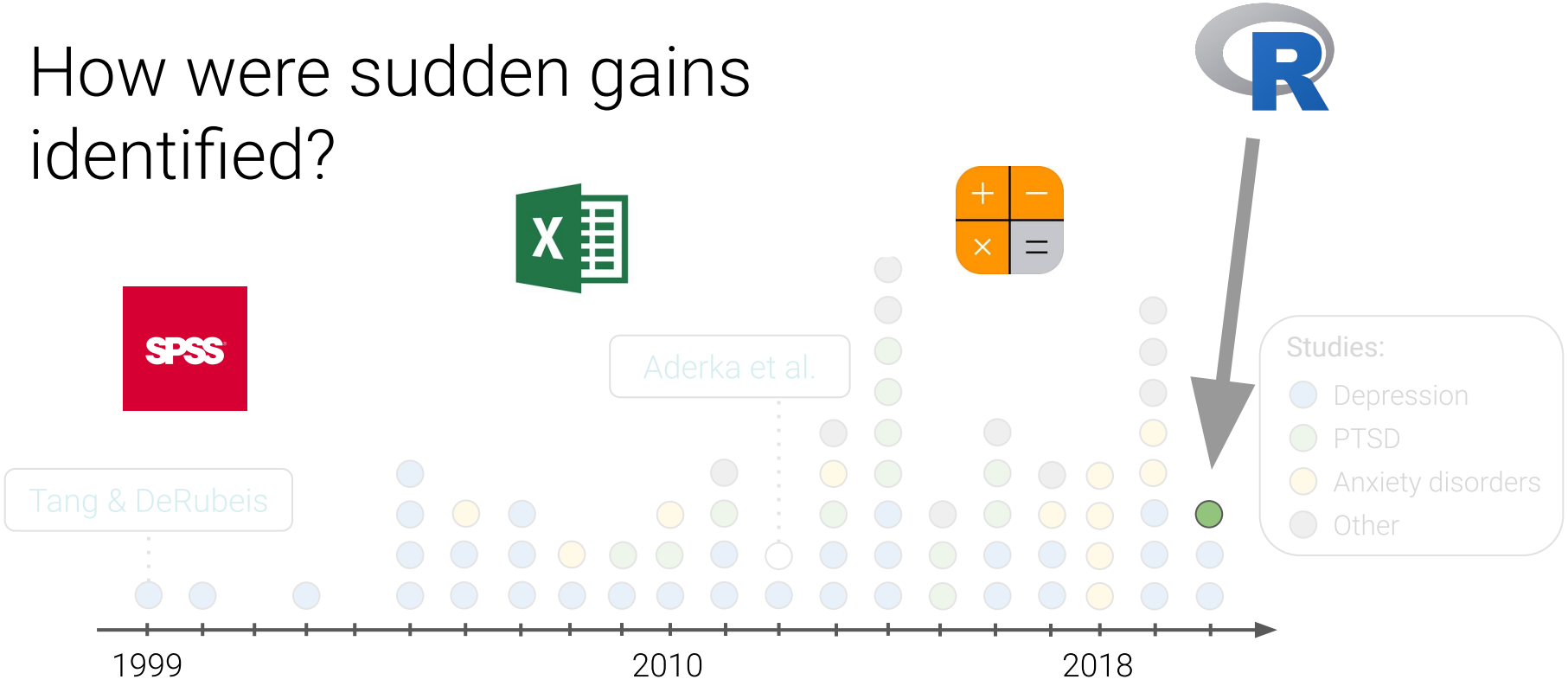
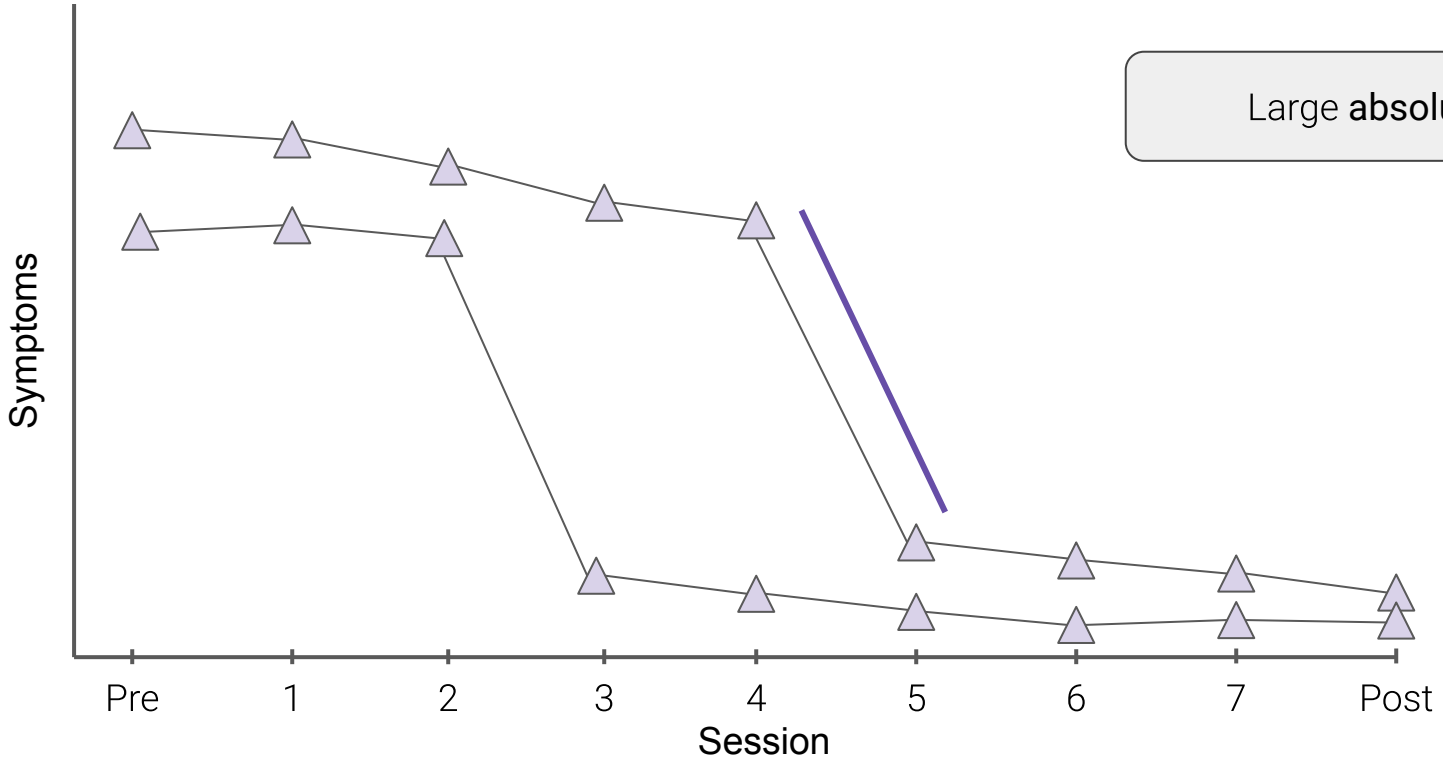


What are sudden gains?



* Definition based on Tang & DeRubeis (1999).

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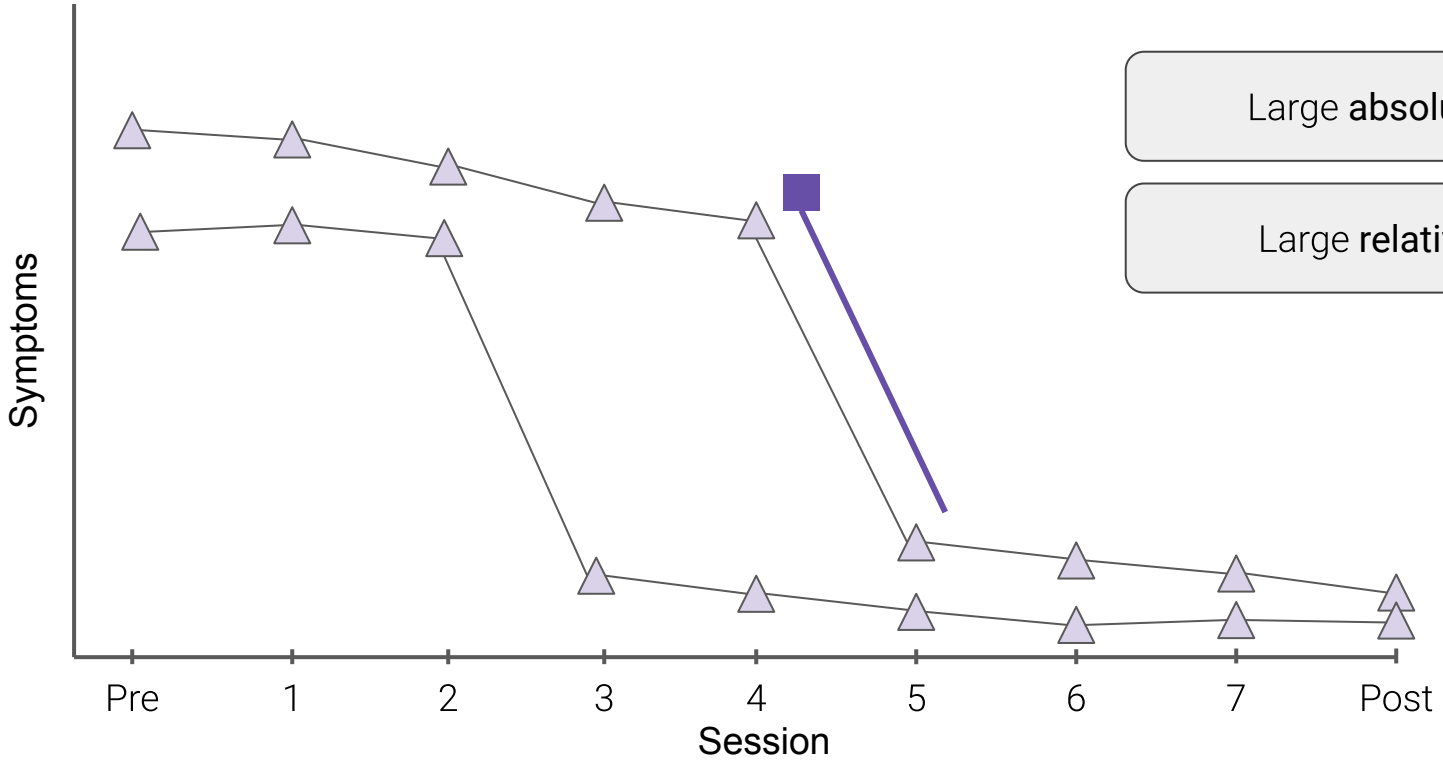

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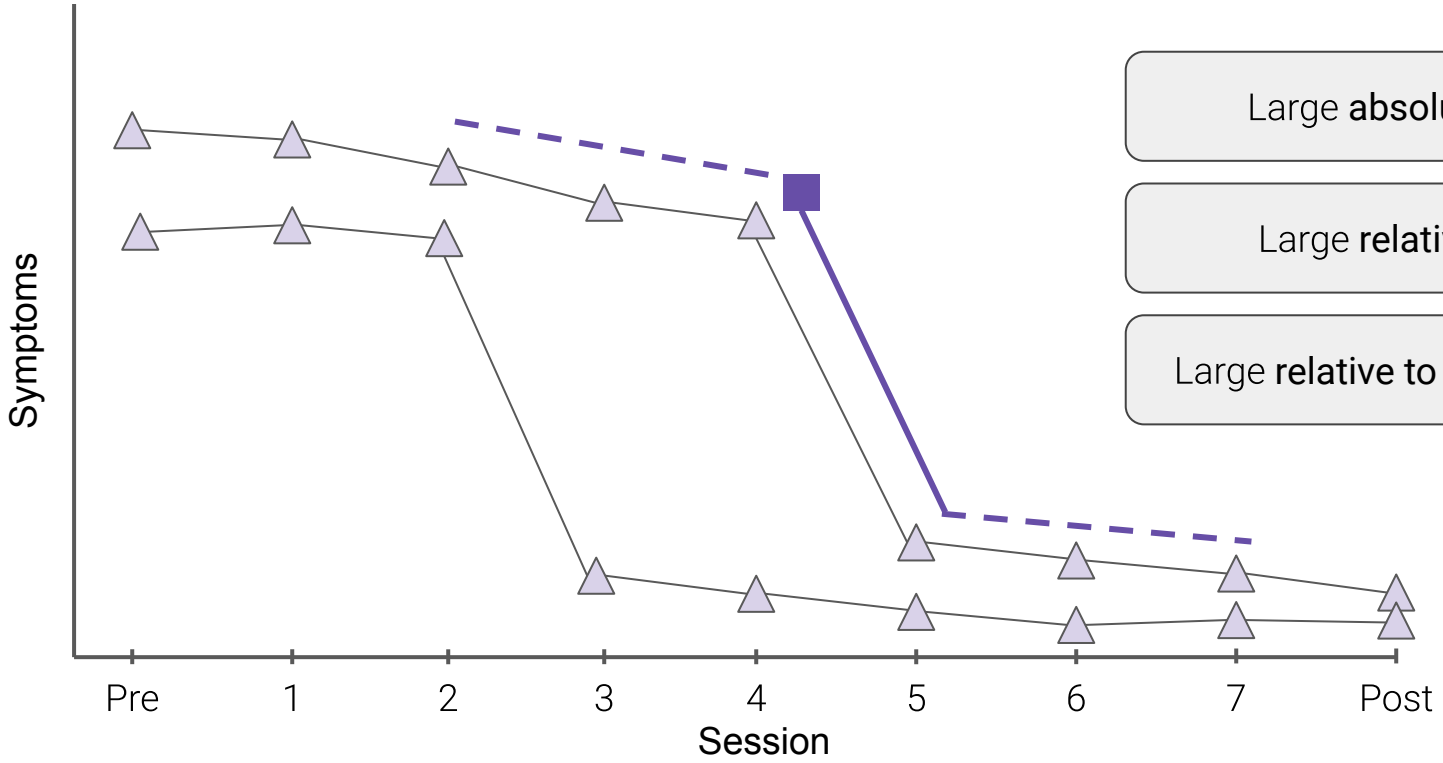

Large **absolute** gain

Large **relative** gain

Large **relative to fluctuations**

* Definition based on Tang & DeRubeis (1999).

For looooooooooooops 🚀

Large **absolute** gain

Large **relative gain**

id	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10
1	35	35	37	20	24	21	24	21	11	11
2	29	26	27	21	20	6	4	5	6	3
3	*NA*	35	38	35	36	37	*NA*	22	11	8
4	33	*NA*	23	21	19	6	5	*NA*	*NA*	9

For looooooooooooops 🚀

Large **absolute** gain

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For looooooooooooops 🚀

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‘Extract scores’ around gains

id	n	s1	s2	s3	s4	s5	s6	s7	s8	s9	s10
1	8	35	35	37	20	24	21	24	21	11	11
2	5	29	26	27	21	20	6	4	5	6	3
3	3	*NA*	35	38	35	36	37	*NA*	22	11	8
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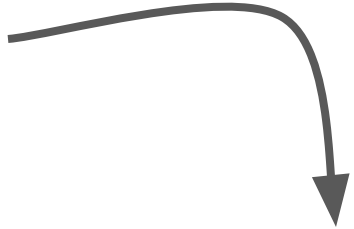

What are the three values before and after time point n?

id	2n	1n	n	n1	n2	n3
1	21	24	21	11	11	*NA*
2	27	21	20	6	4	5
3	37	*NA*	22	11	8	*NA*
4	23	21	19	6	5	*NA*

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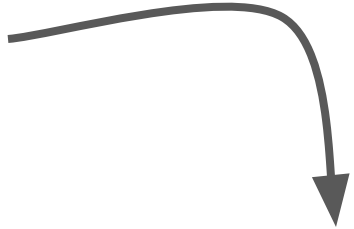

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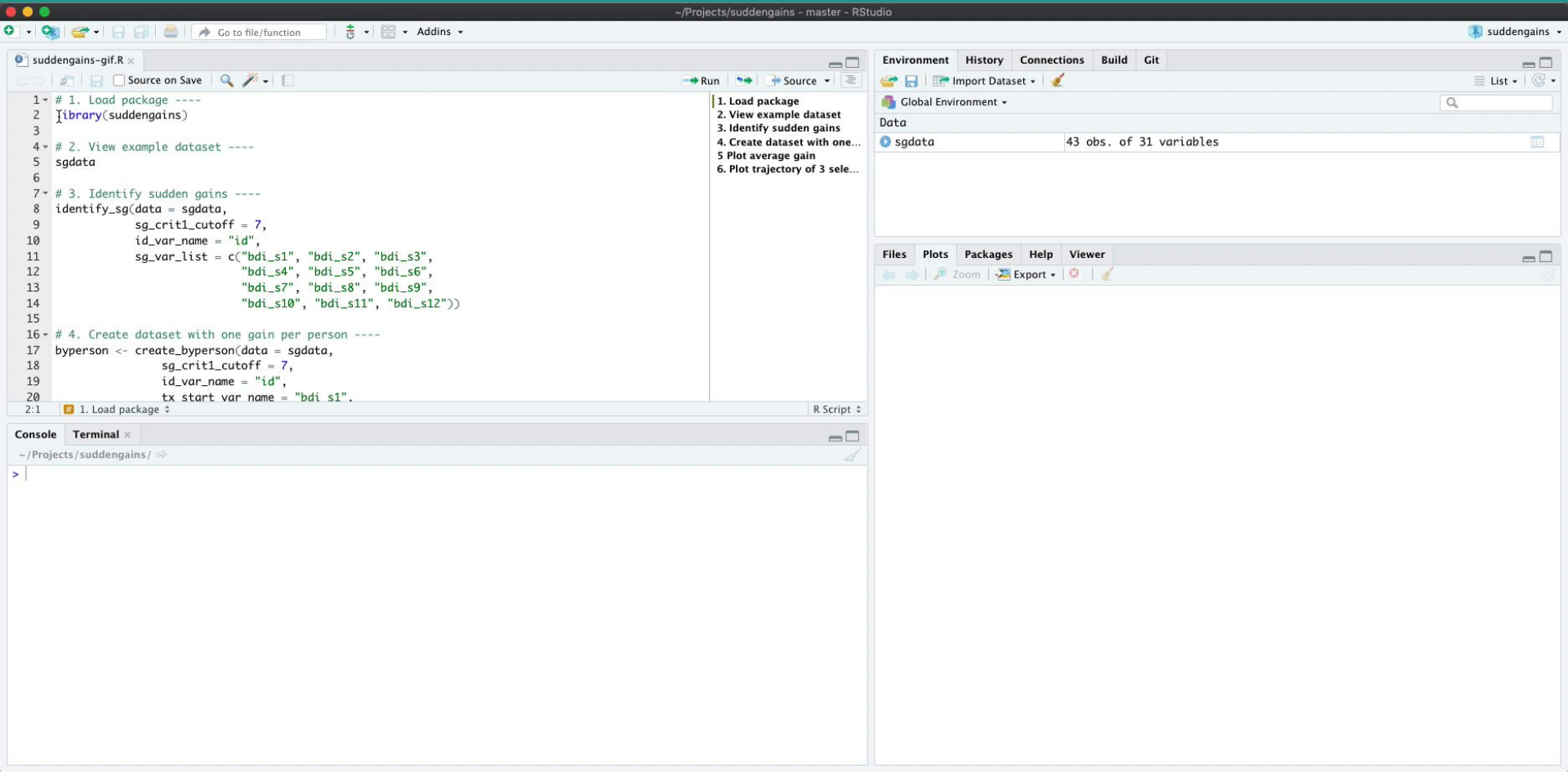
Reproducibility and productivity



```
library(suddengains)
```

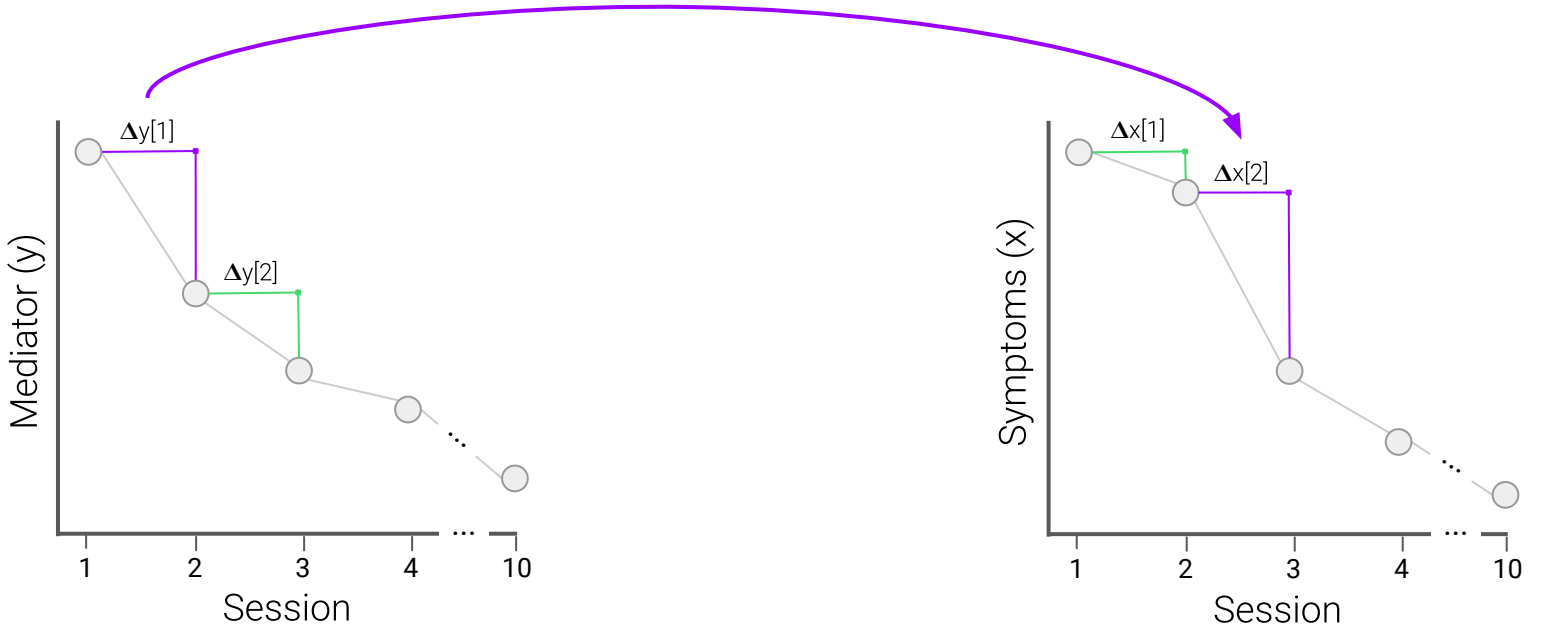
```
runApp(shinygains)
```

Modeling Change

Looking at change to change

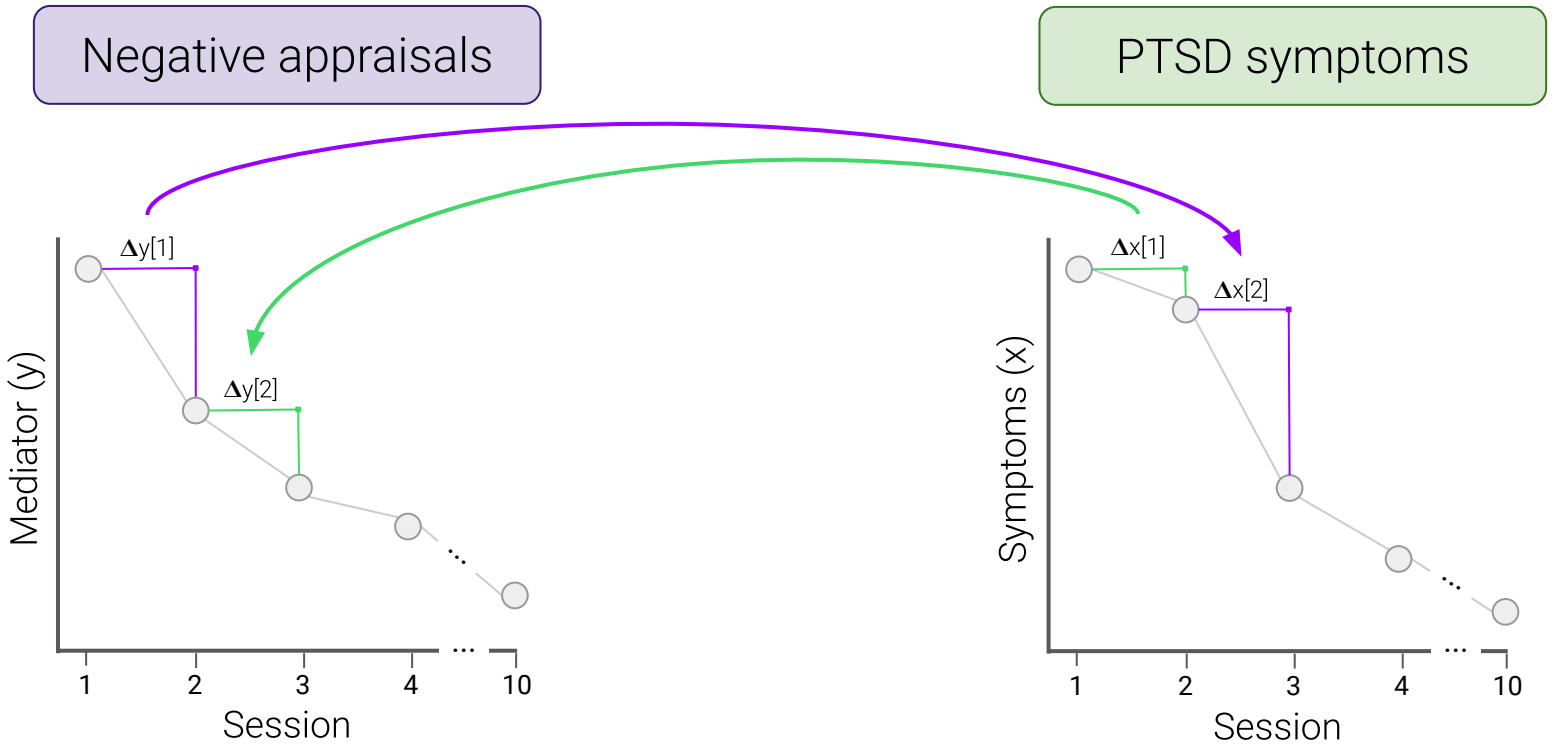
Negative appraisals

PTSD symptoms



* Method implemented in the R package *lcsm* (Wiedemann, 2020) using *lavaan* (Rossel, 2012). Overview of method in Grimm et al (2012).

Looking at change to change



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Bivariate latent change score modeling

PTSD symptoms

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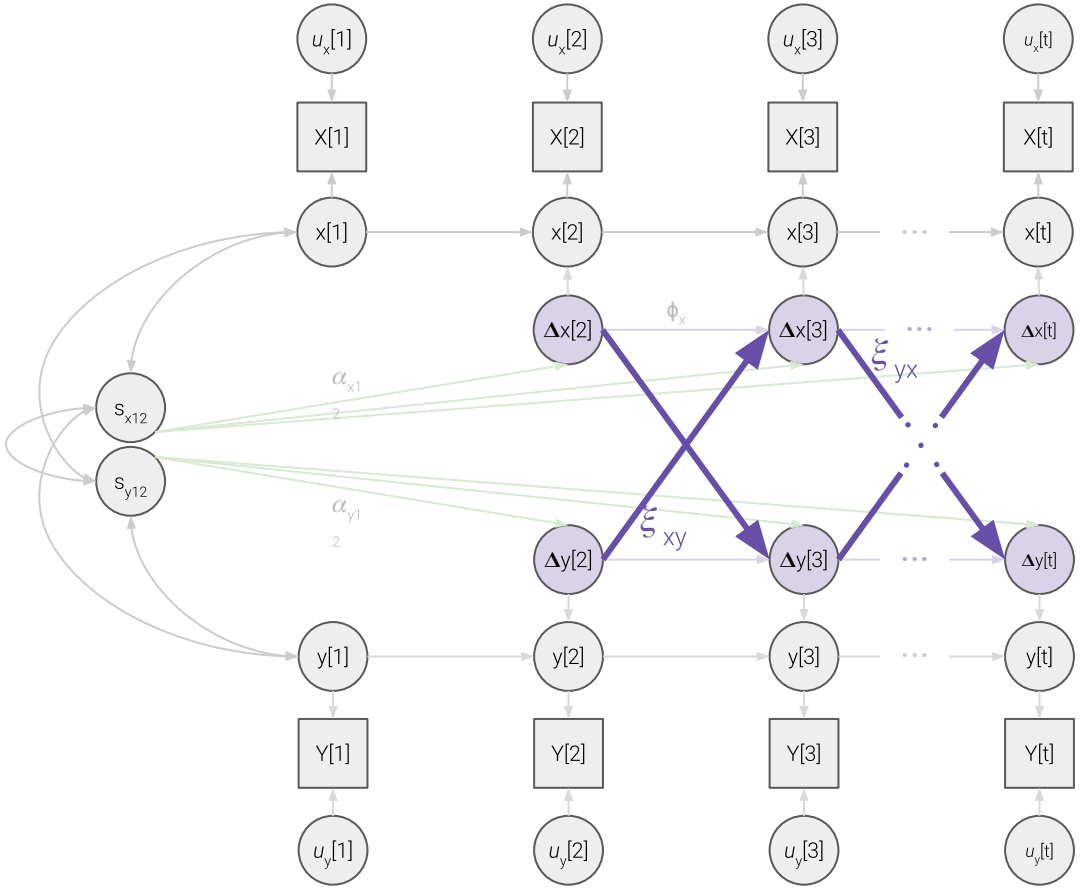


Bivariate latent change score modeling

PTSD symptoms

Example lavaan syntax:

Regression:
```
y ~ x1 + x2 + x3
```
Latent Variable:
```
l1 ~ y1 + y2 + y3
```
Covariance:
```
y1 ~~ y2
```

Negative appraisals

Tools to help understand latent change score modeling

shinychange | Overview | Generate lavaan Syntax | Simulate Data | Fit Model

Options:

Data Characteristics | Select Parameters

Measurement Points:

3

Note: Number of repeated measurement points.

Variable Name:

x

Note: Variable name to be used for generating lavaan syntax, changes wont show on the path diagram. Variable name should start with a letter.

Results:

lavaan Syntax | Path Diagram

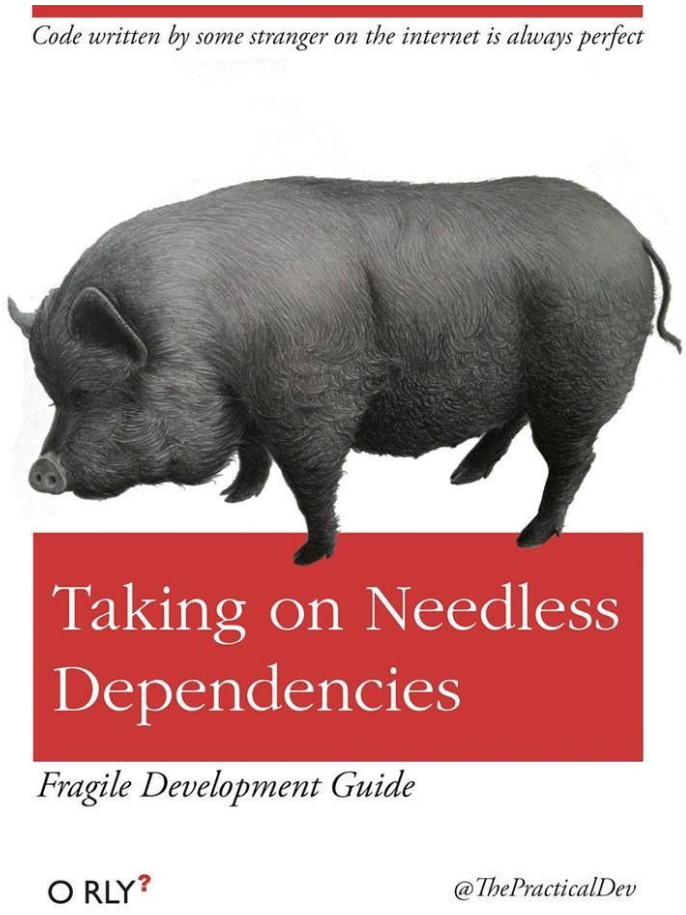
Note: lavaan syntax for the selected data characteristics and model parameters. This syntax includes comments describing the different sections of the model and can be modified by hand. Modified syntax could be used in the 'model' argument of functions from the lavaan package. Observed scores in the syntax are the variable name followed by a number indicating the measurement point. Latent true scores have the prefix 'l' (for latent) followed by the variable name of the observed score. Change scores have the prefix 'd' (for delta) followed by the variable name of the observed score.

```
# Specify latent true scores
lx1 =~ 1 * x1
lx2 =~ 1 * x2
lx3 =~ 1 * x3
# Specify mean of latent true scores
lx1 ~ gamma_lx1 * 1
lx2 ~ 0 * 1
lx3 ~ 0 * 1
# Specify variance of latent true scores
lx1 ~~ sigma2_lx1 * lx1
lx2 ~~ 0 * lx2
lx3 ~~ 0 * lx3
# Specify intercept of obseved scores
x1 ~ 0 * 1
x2 ~ 0 * 1
x3 ~ 0 * 1
# Specify variance of observed scores
x1 ~~ sigma2_ux * x1
x2 ~~ sigma2_ux * x2
x3 ~~ sigma2_ux * x3
# Specify autoregressions of latent variables
lx2 ~ 1 * lx1
lx3 ~ 1 * lx2
# Specify latent change scores
```

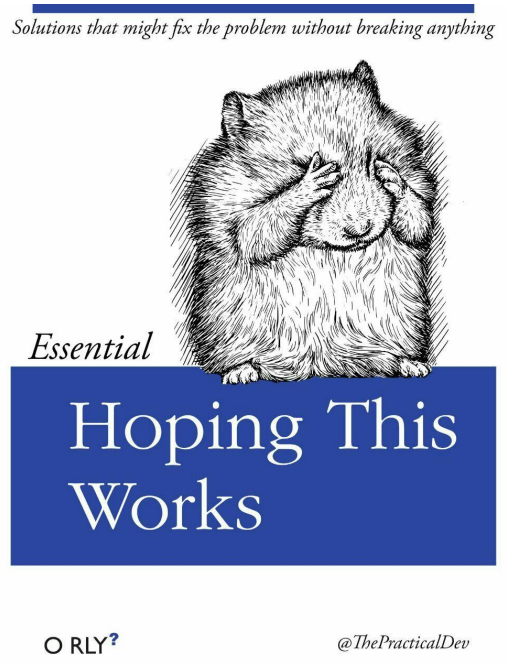
Also see Kievit et al. (2018), Grimm et al (2017), and Ghisletta et al (2012).

```
library(lcsm)

runApp(shinychange)
```



Software implementations are progressing at an increasingly fast pace*



* Reproducibility and Replicability in a Fast-Paced Methodological World by Epskamp (2019).