Generalization of Repetitive Threat-Neutralization Behavior: Associations with Anxiety and Compulsivity

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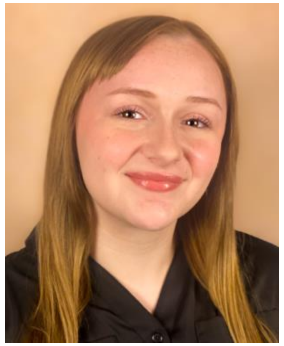

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Background and Rationale

Online Task: Behavioral Results

In-Person Task: Behavioral and fMRI Results

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Background

Why do we need a new task?

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Threat-related behavior takes many forms

A. Active avoidance

safe

danger

Feared Outcome

Maximizing exposure therapy: An inhibitory learning approach

Michelle G. Craske[a,*], Michael Treanor[a], Christopher C. Conway[a], Tomislav Zbozinek[a], Bram Vervliet[b]

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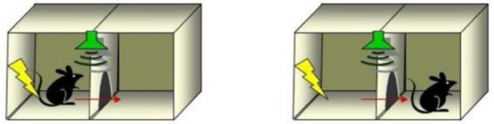
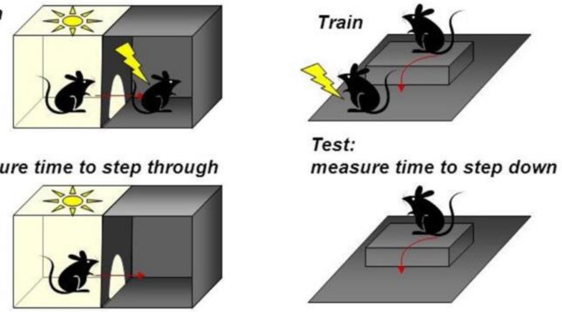


B. Passive avoidance

safe

danger

Feared Outcome



Ghafarimoghadam et al., 2022, *Physiology & Behavior*

C. Repetitive threat-neutralization

- Washing
- Checking
- Re-doing
- Praying
- Reassurance-seeking

danger

Feared Outcome

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Compulsions in OCD are not well-modeled by traditional avoidance paradigms

Obsessive-Compulsive Disorder

Diagnostic Criteria **300.3 (F42)**

A. Presence of obsessions, compulsions, or both:

Obsessions are defined by (1) and (2):

1. Recurrent and persistent thoughts, urges, or images that are experienced, at some time during the disturbance, as intrusive and unwanted, and that in most individuals cause marked anxiety or distress.
2. The individual attempts to ignore or suppress such thoughts, urges, or images, or to neutralize them with some other thought or action (i.e., by performing a compulsion).

Compulsions are defined by (1) and (2):

1. Repetitive behaviors (e.g., hand washing, ordering, checking) or mental acts (e.g., praying, counting, repeating words silently) that the individual feels driven to perform in response to an obsession or according to rules that must be applied rigidly.
2. The behaviors or mental acts are aimed at preventing or reducing anxiety or distress, or preventing some dreaded event or situation; however, these behaviors or mental acts are not connected in a realistic way with what they are designed to neutralize or prevent, or are clearly excessive.

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Compulsions in OCD are not well-modeled by traditional avoidance paradigms

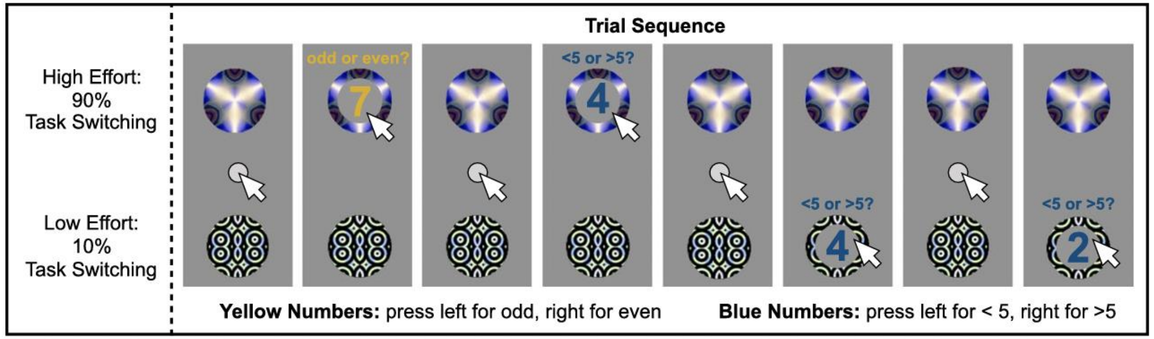
SCIENTIFIC REPORTS

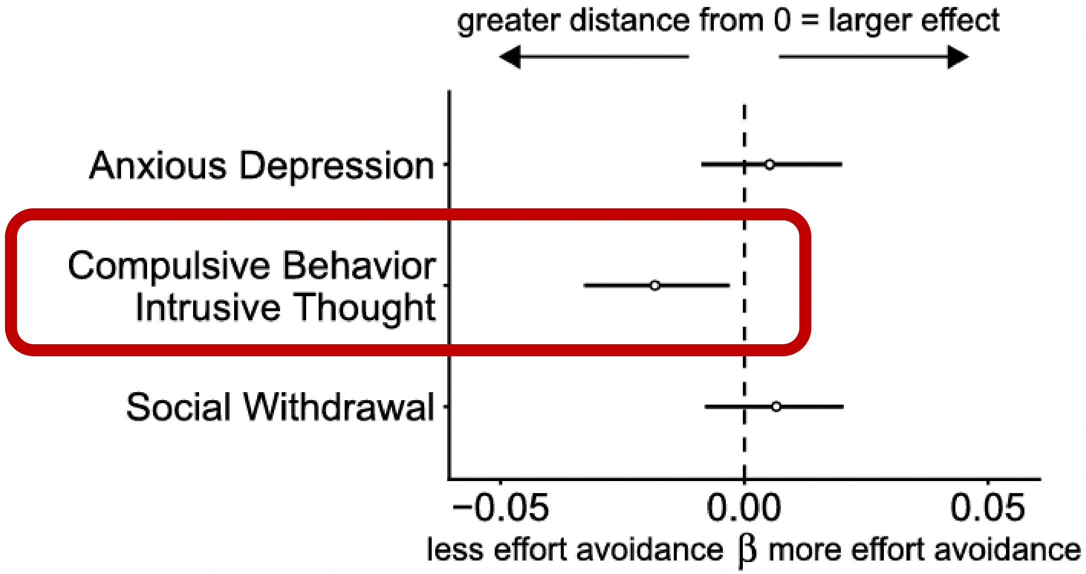
OPEN

The transdiagnostic structure of mental effort avoidance

Edward H. Patzelt[1,2], Wouter Kool[1], Alexander J. Millner[1] & Samuel J. Gershman[1,2]

(2019) 9:1689 | https://doi.org/10.1038/s41598-018-37802-1





ality trait characterized by lack of perseverance. We report that choosing the high effort option more frequently is associated with elevations on several psychiatrically-relevant constructs, including positive urgency, distress intolerance, obsessive-compulsive symptoms, disordered eating, and a transdiagnostic psychiatric factor encompassing compulsive behavior and intrusive thought. This suggests that some psychopathological disruptions may be associated with increased effort expression, rather than reduced effort expression as suggested by common theoretical models of effort-based decision-making[4,58]. The current study has significant clinical implications, sho[illegible] th[illegible]

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Repetitive threat-neutralization (RTN) *is a sparsely studied phenomenon with a high degree of clinical relevance, particularly for OCD.*

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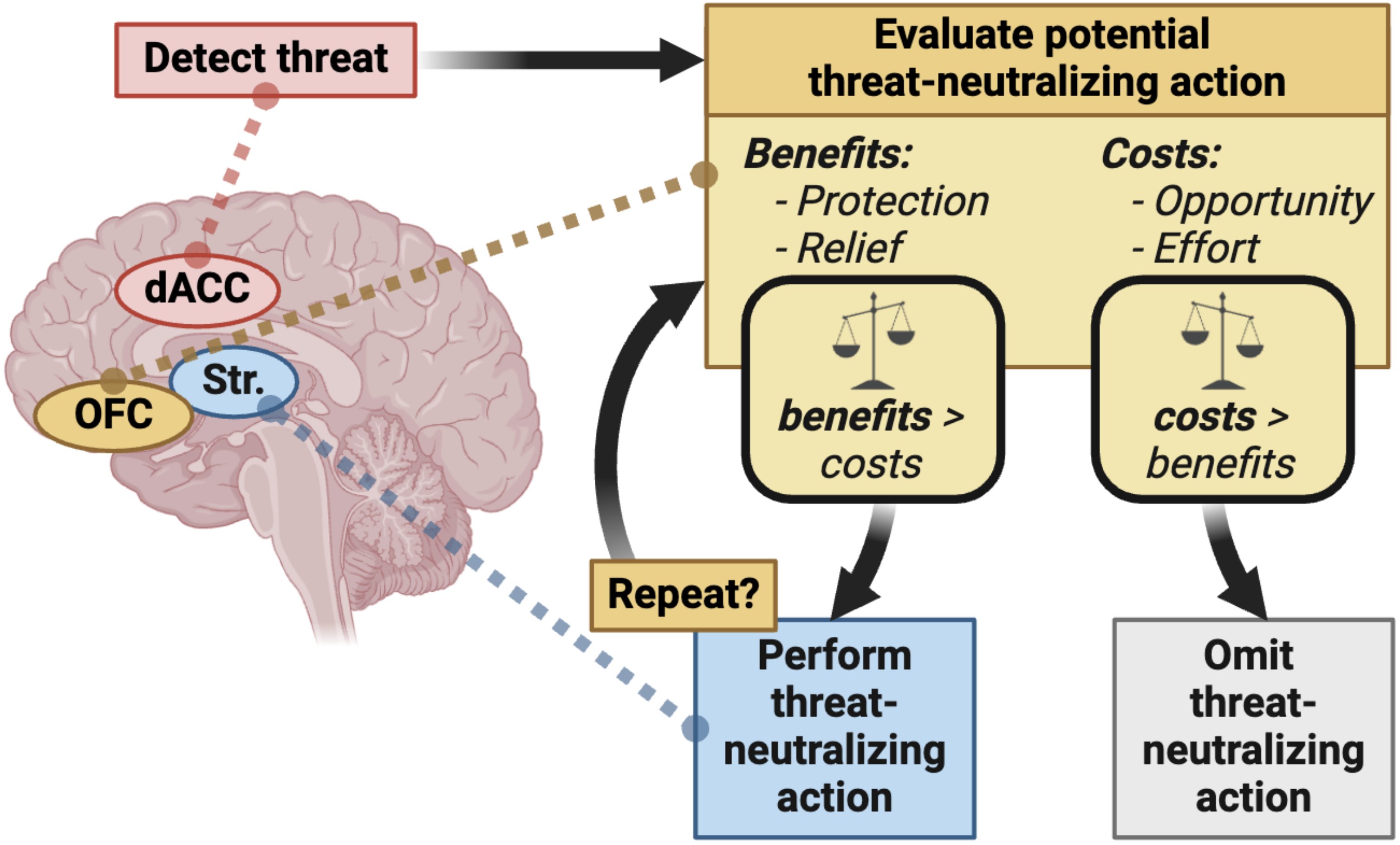
Rigorous RTN paradigms would enable neuroimaging during compulsion-like behavior, to identify treatment targets



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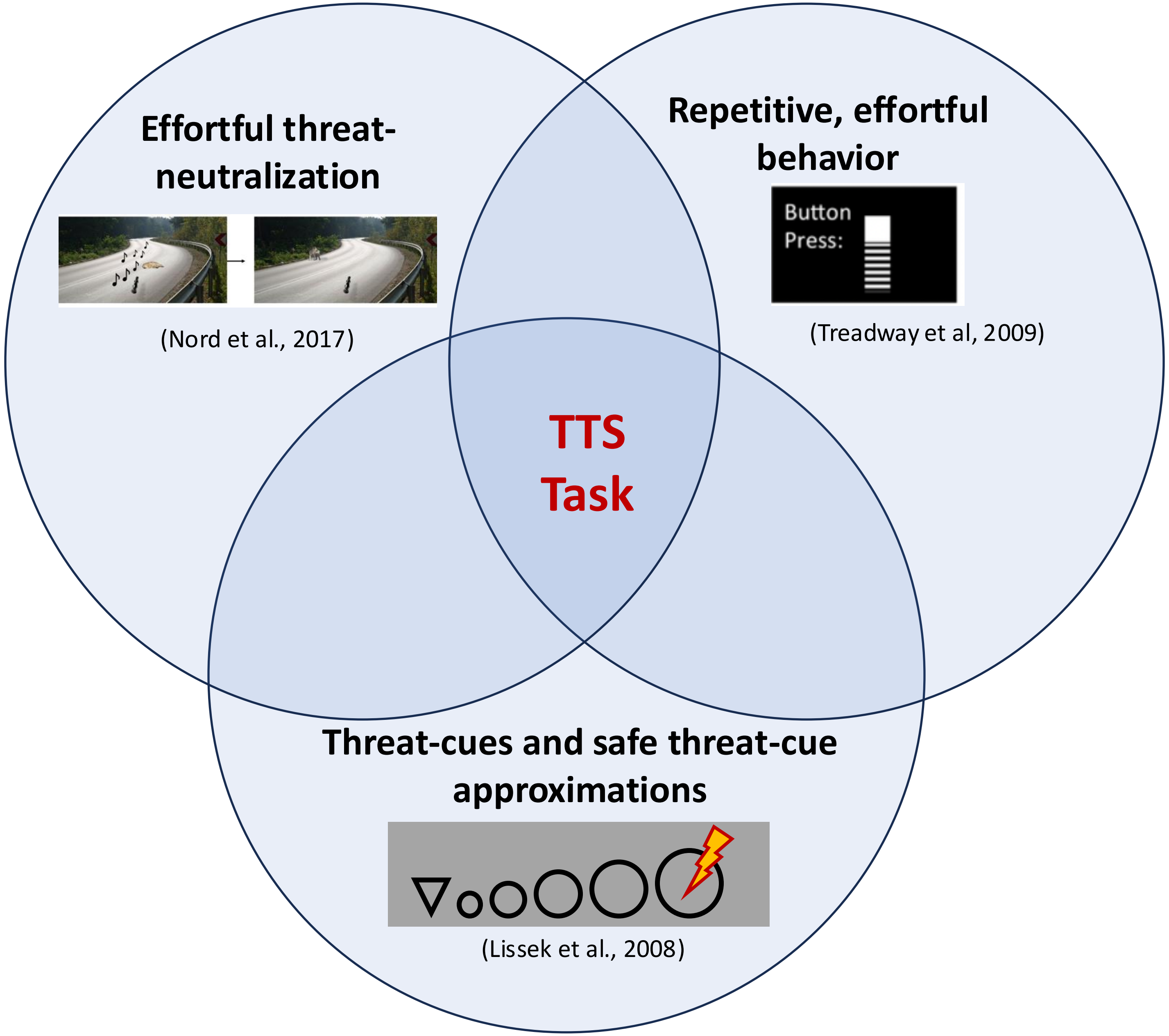
*The **Tap-To-Safety Task** aims to serve as an experimental analogue for OCD compulsions, by eliciting motivation to expend threat-neutralizing effort in the context of uncertain threats.*

*The **Tap-To-Safety Task** combines elements of previously-validated paradigms:*

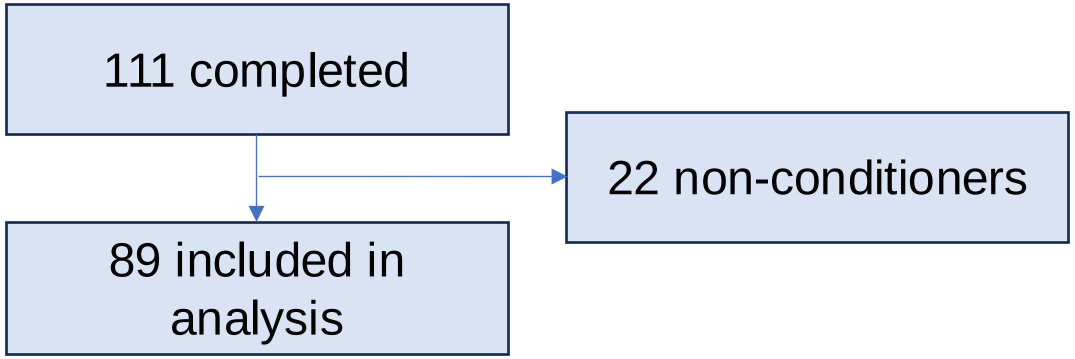


Background and Rationale

Online Task: Behavioral Results

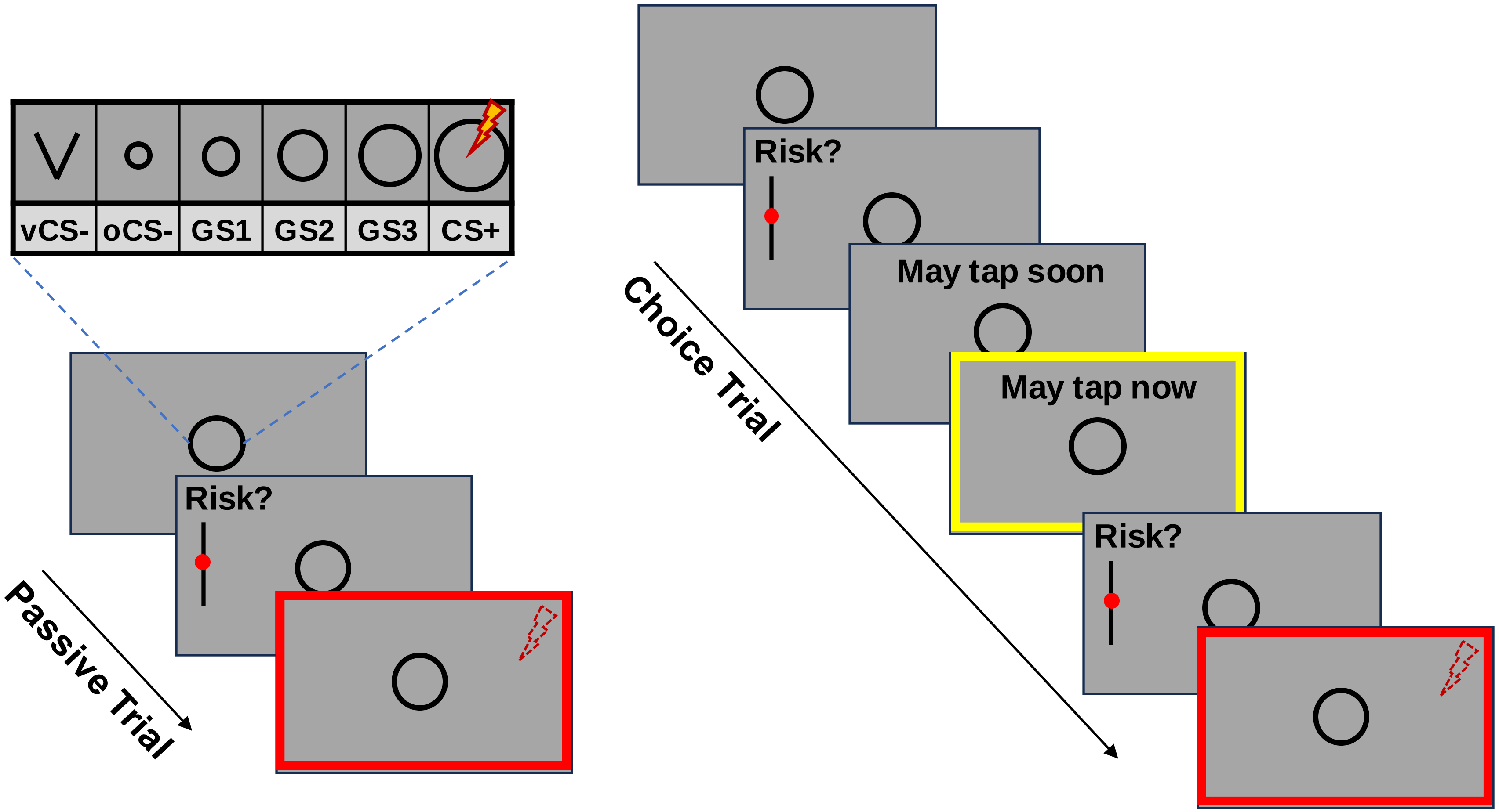
In-Person Task: Behavioral and fMRI Results

Online Study



		Mean	SD
Age		31.21	10.08
		N	**%**
Sex	Male	63	71.59
	Female	25	28.41
Race	Asian	6	6.82
	Black or African American	2	2.27
	Prefer not to say	1	1.14
	White	70	79.55
	Other	5	5.68
	Multiracial	4	4.55

Trial-Types and Stimuli



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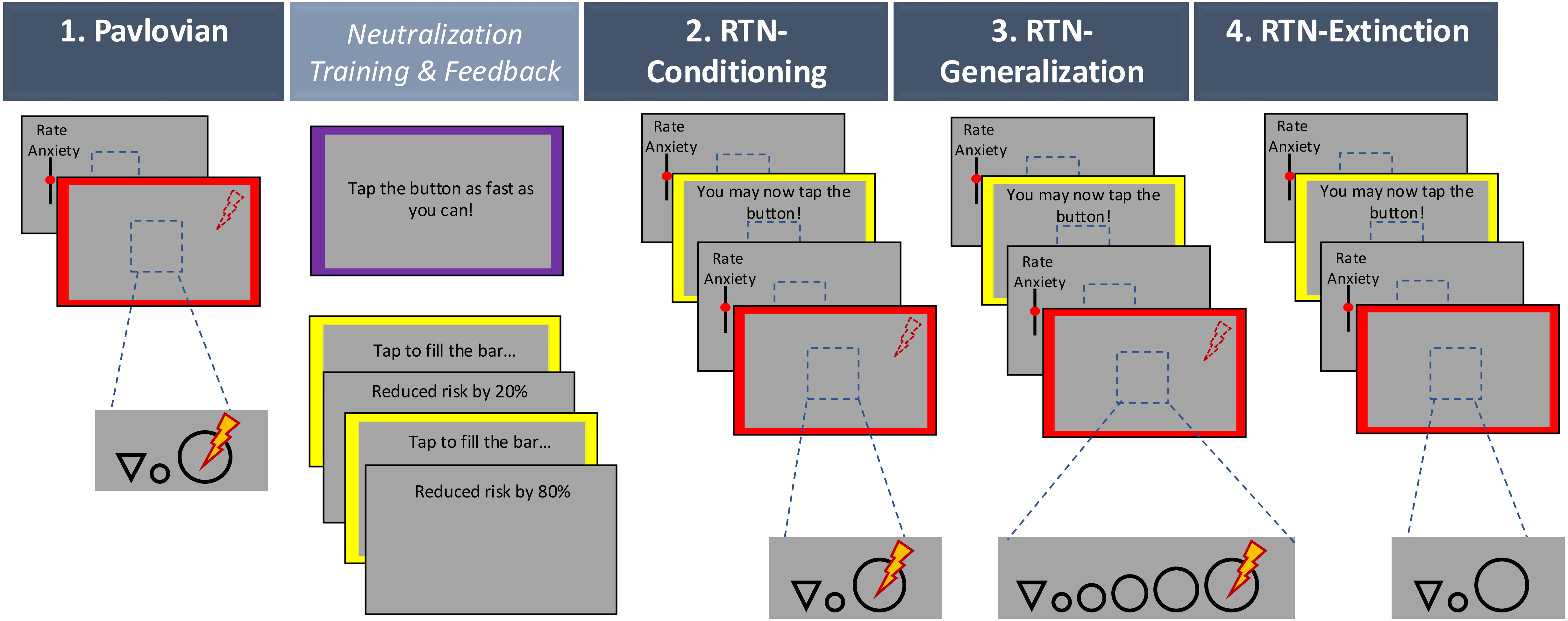
Task Structure



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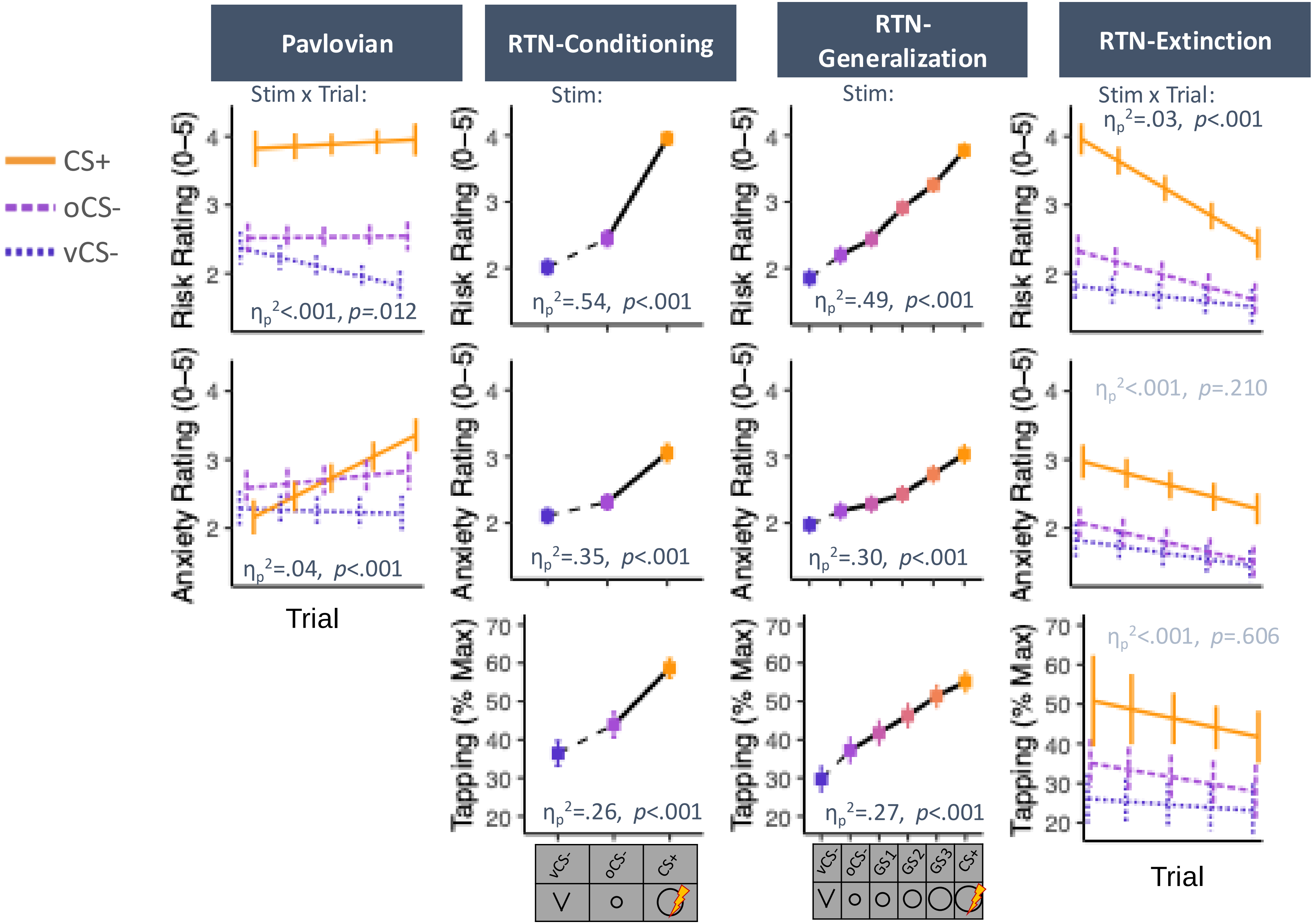

Pavlovian
RTN-Conditioning
RTN-Generalization
RTN-Extinction
CS+
oCS-
vCS-
Stim x Trial:
Stim:
Stim:
Stim x Trial:
η_p^2=.03, p<.001
Risk Rating (0–5)
η_p^2<.001, p=.012
η_p^2=.54, p<.001
η_p^2=.49, p<.001
Anxiety Rating (0–5)
η_p^2=.04, p<.001
η_p^2=.35, p<.001
η_p^2=.30, p<.001
η_p^2<.001, p=.210
Trial
Tapping (% Max)
η_p^2=.26, p<.001
η_p^2=.27, p<.001
η_p^2<.001, p=.606
vCS-
oCS-
CS+
vCS-
oCS-
GS1
GS2
GS3
CS+
Trial

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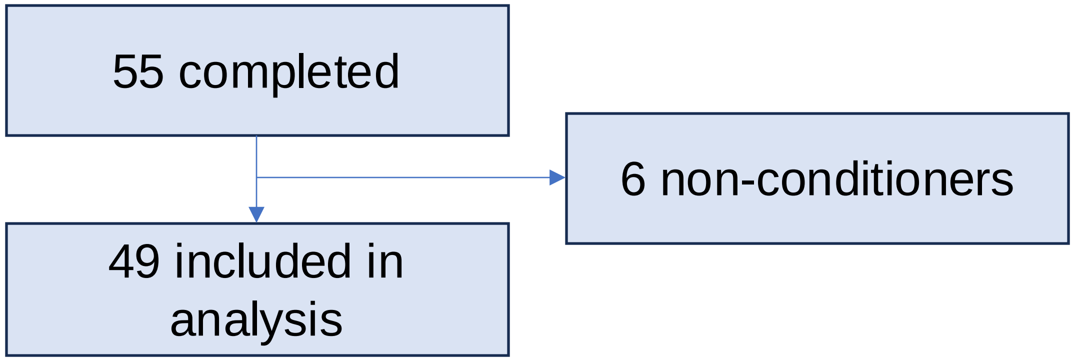
Background and Rationale

Online Task: Behavioral Results

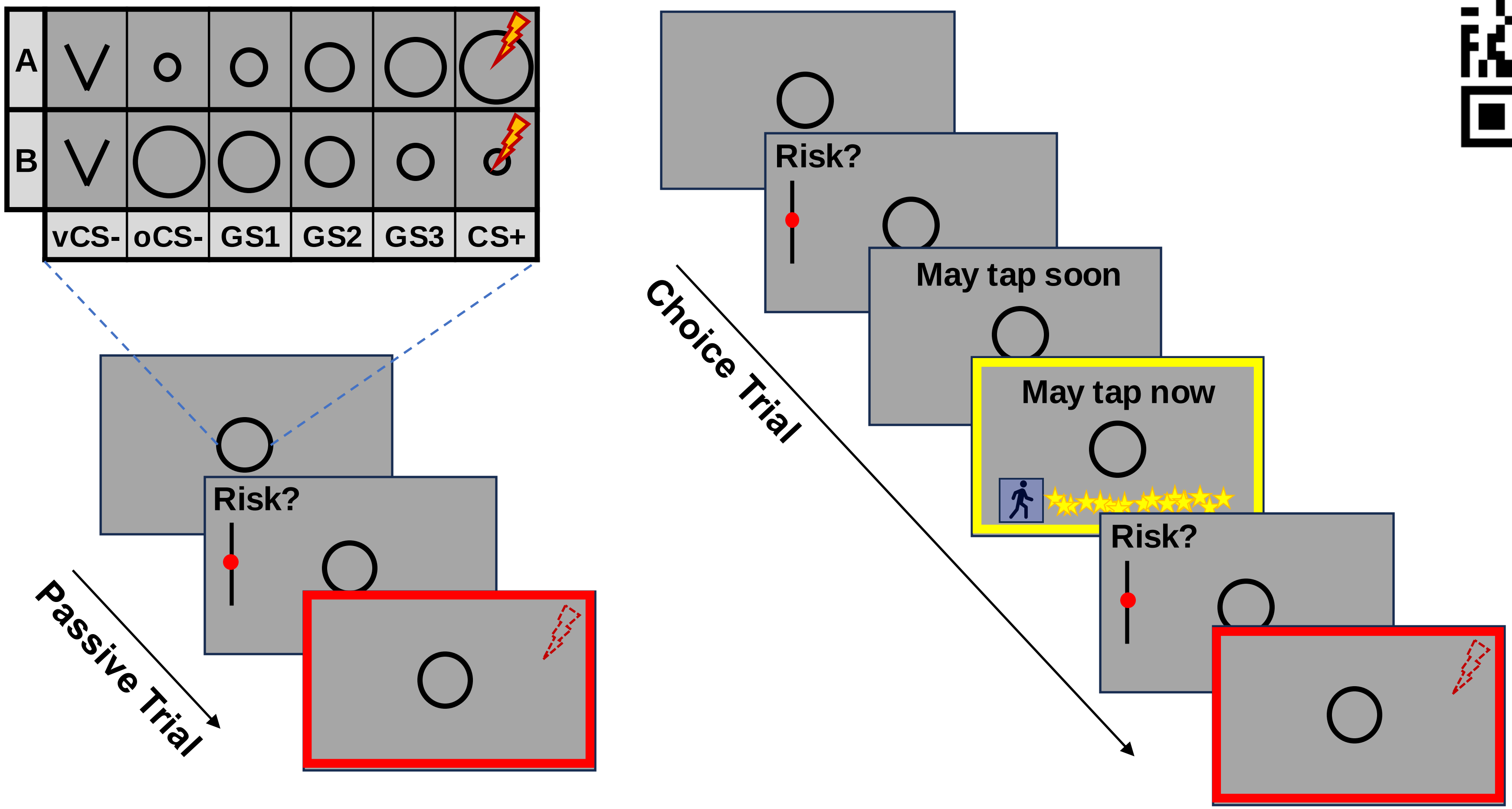
In-Person Task: Behavioral and fMRI Results

In-Person Study



		Mean	SD
Age	36.81 (13.67)	36.81	13.67
		N	**%**
Sex	Male	15	31.25
	Female	33	68.75
Race	American Indian or Alaska Native	3	6.25
	Asian	8	16.67
	Black or African American	2	4.17
	Native Hawaiian or Pacific Islander	0	0
	White	26	54.17
	Other	2	4.17
	Multiracial	7	14.58

Trial-Types and Stimuli



Preprint

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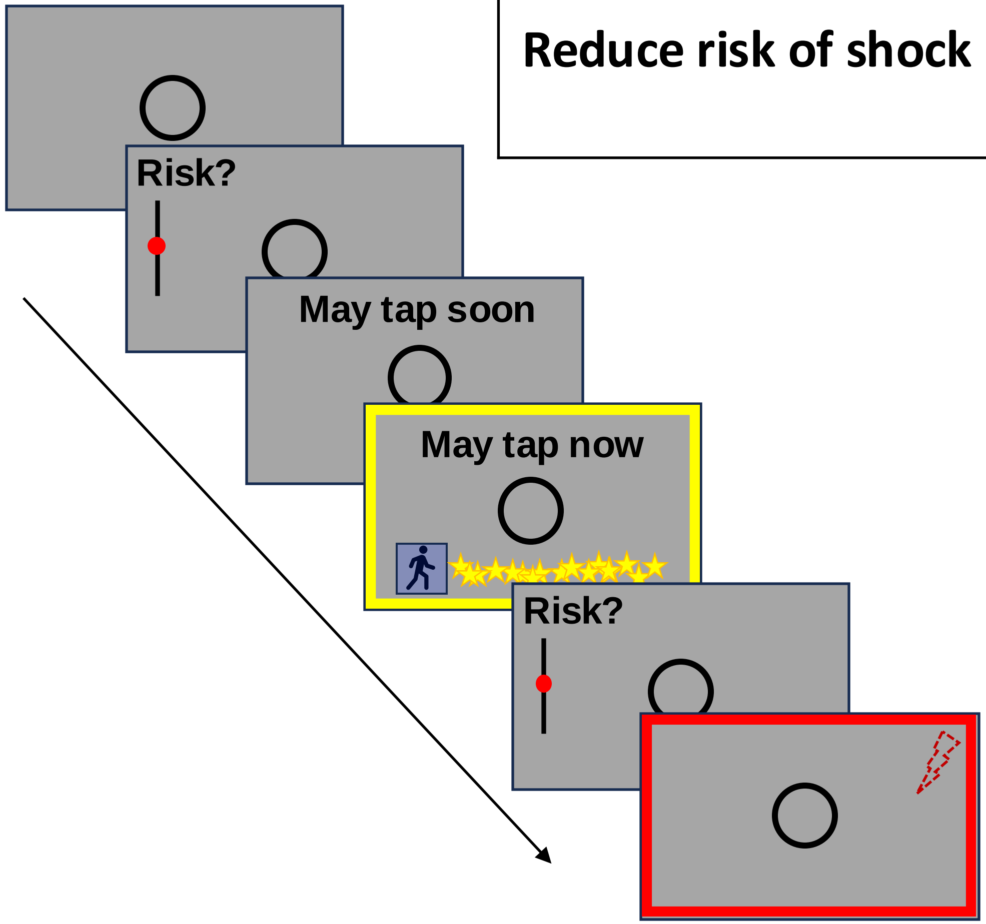
Shock Probabilities on CS+ Choice Trials

% max taps		13%	26%	39%	52%	65%	78%	91%
Reduce risk of shock by:		20%		50%		80%		



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Trial Structure

No-Choice Trial

Stimulus onscreen	O	O	O	O	O	O	O	O	
Other cues onscreen			Rate	Rate	Rate	Rate			+
Regressor type									
Time (seconds)	1	2	3	4	5	6	7	8	

jitter 1-2sec

jitter 3-9sec

Regressor Types

Pavlovian response
Deliberation
Regressor of no interest

Choice Trial

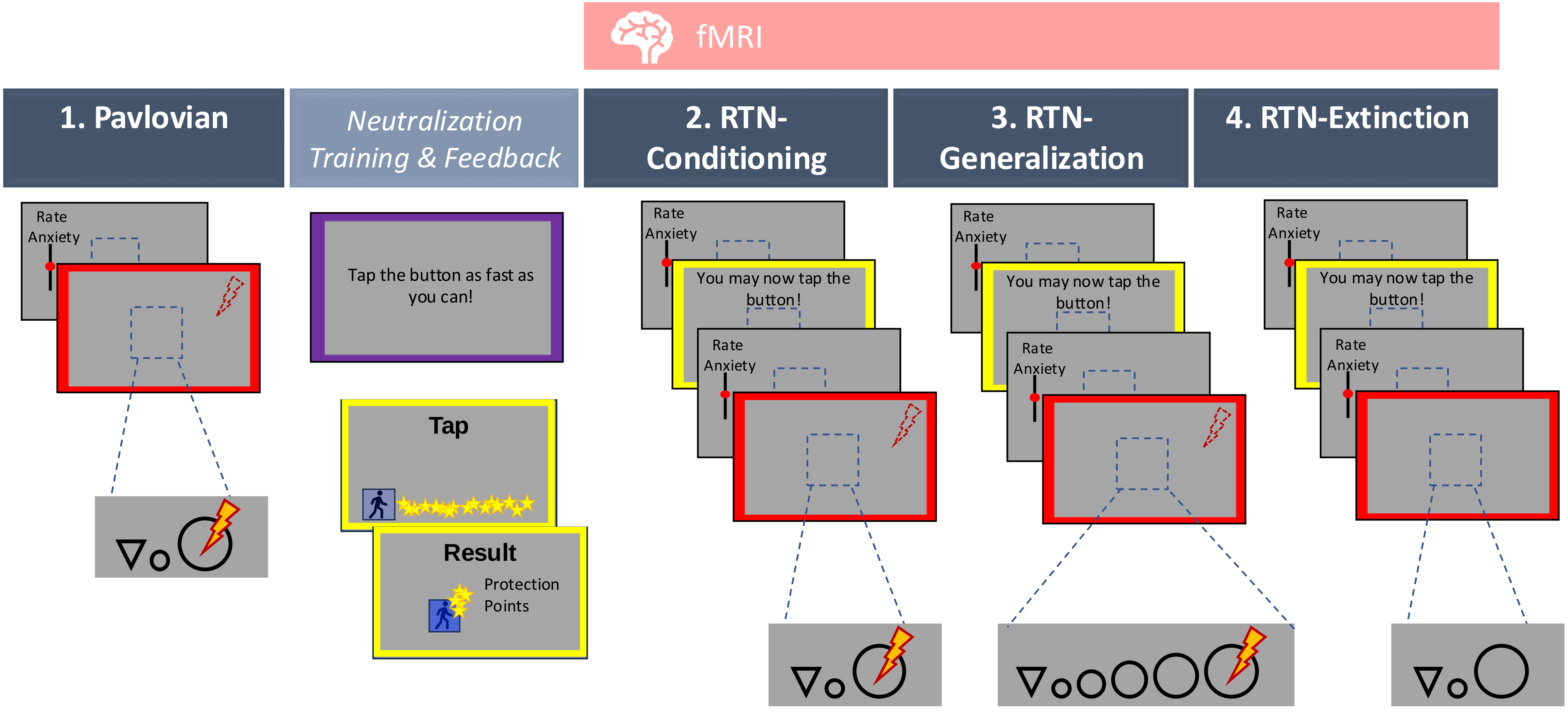
Stimulus onscreen	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
Other cues onscreen			Rate	Rate	Rate	Rate	Tap soon	Tap soon	Tap now	Tap now	Tap now	Tap now	Rate	Rate	Rate	Rate			+
Regressor type																			
Time (seconds)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	

jitter 1-2sec

jitter 0-2sec

jitter 3-9sec

Task Structure



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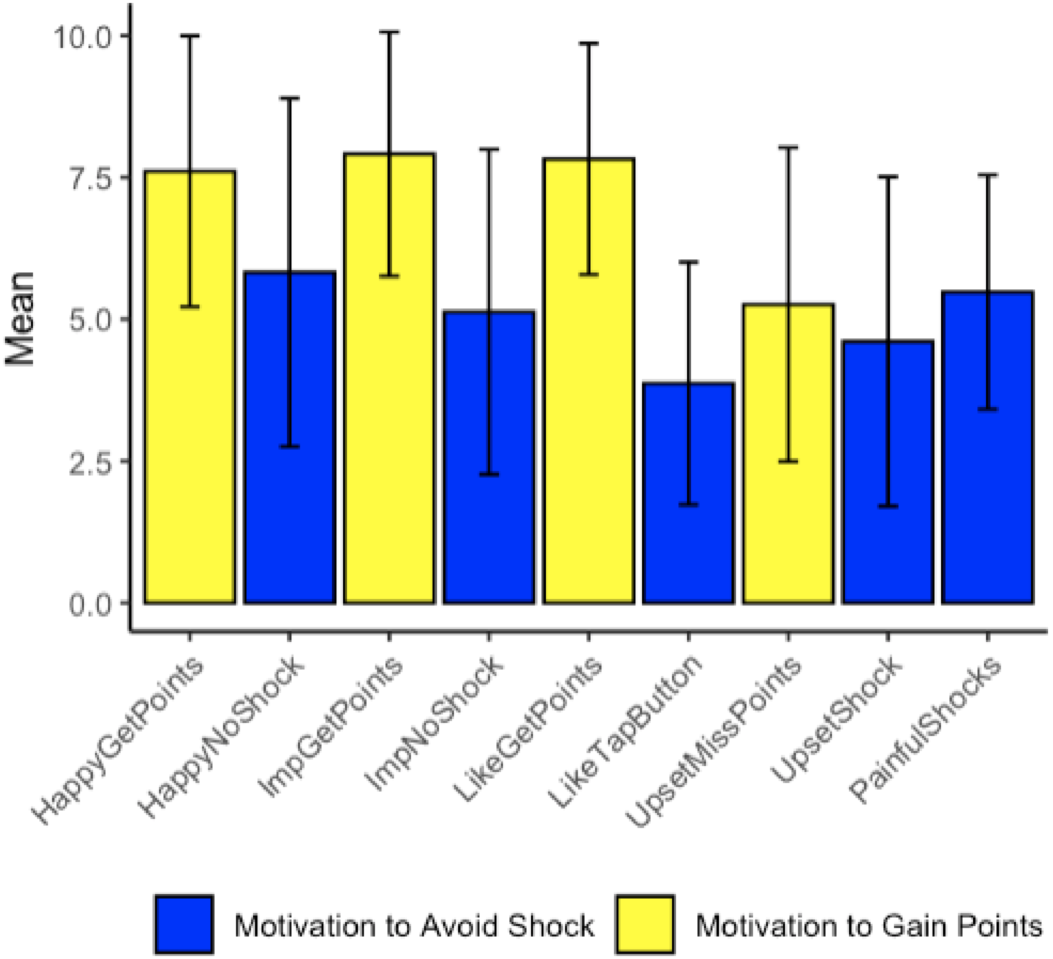
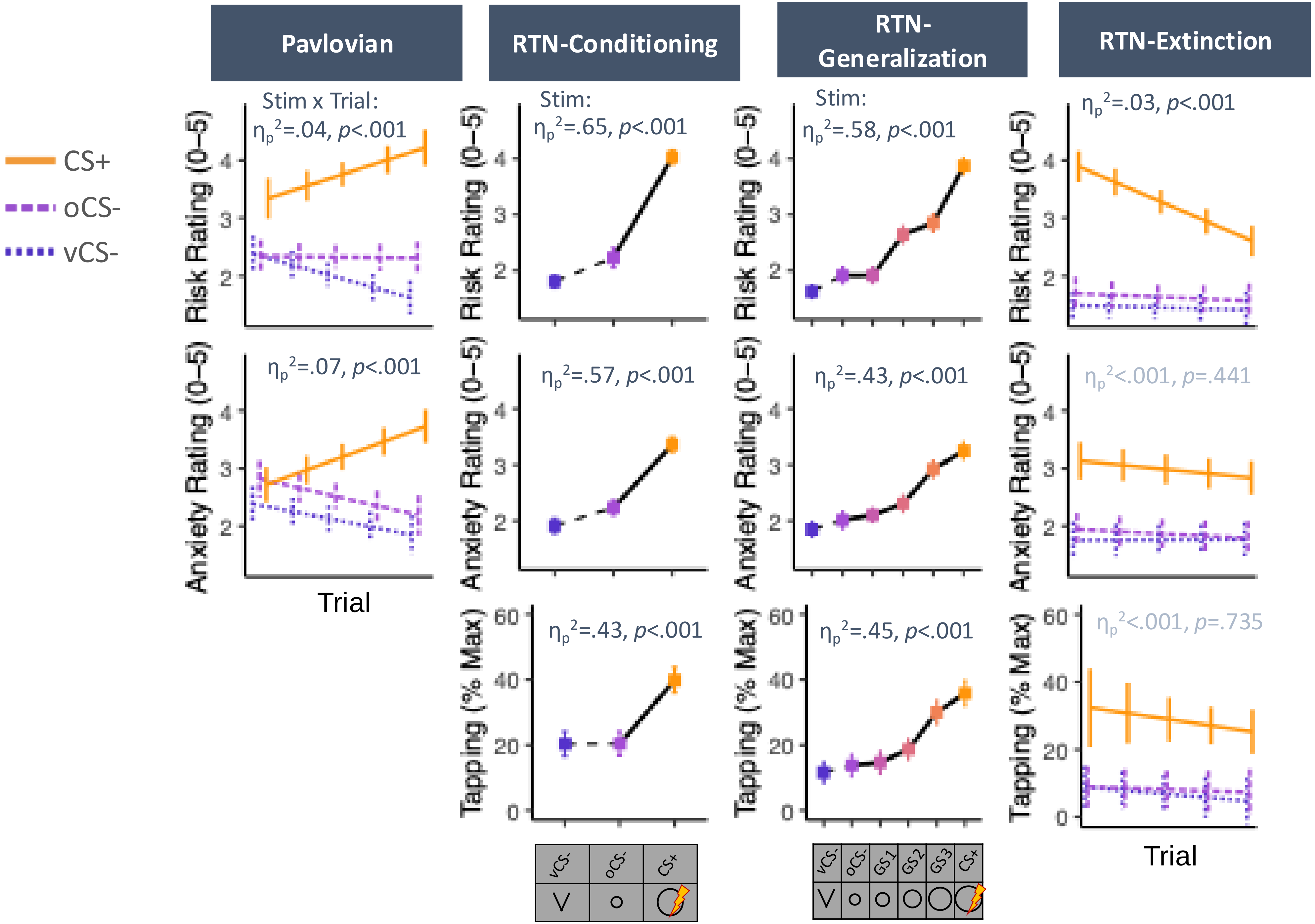
Post-Task Questionnaire

1. How happy were you when you got points?
2. How happy were you when you didn’t get shocked?

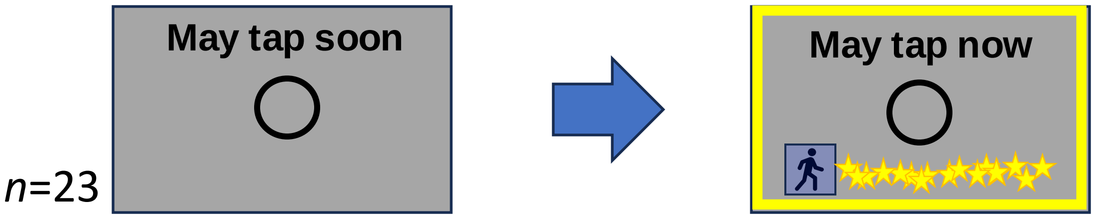
3. How important was it to get points?
4. How important was it to not get shocked?

Post-Task Questionnaire



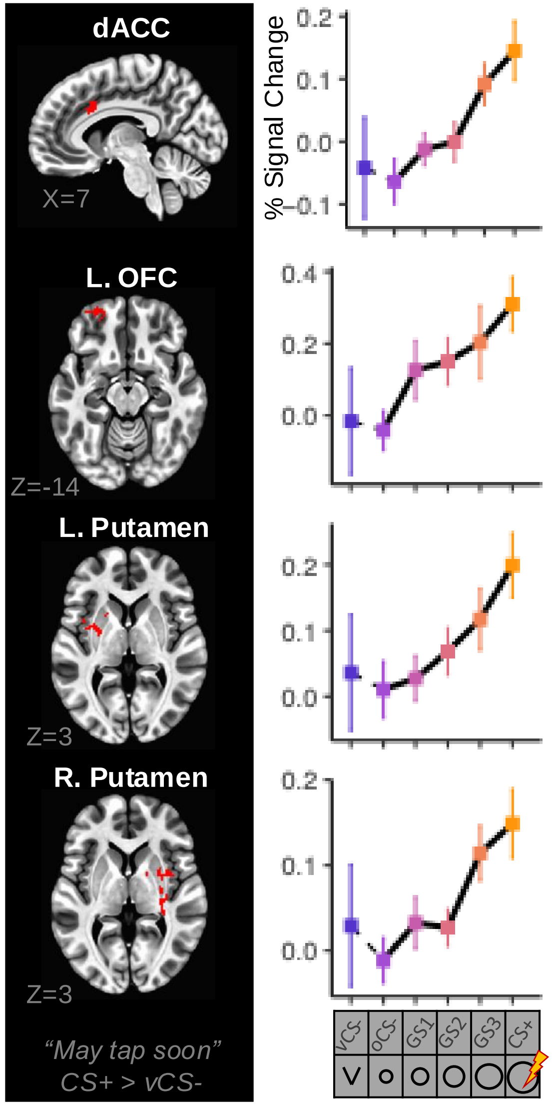


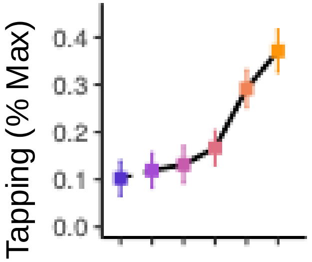
Pavlovian
RTN-Conditioning
RTN-Generalization
RTN-Extinction
CS+
oCS-
vCS-
Stim x Trial:
η_p^2=.04, p<.001
Stim:
η_p^2=.65, p<.001
Stim:
η_p^2=.58, p<.001
η_p^2=.03, p<.001
η_p^2=.07, p<.001
η_p^2=.57, p<.001
η_p^2=.43, p<.001
η_p^2<.001, p=.441
η_p^2=.43, p<.001
η_p^2=.45, p<.001
η_p^2<.001, p=.735
Risk Rating (0–5)
Anxiety Rating (0–5)
Tapping (% Max)
Trial
vCS-
oCS-
CS+
GS1
GS2
GS3



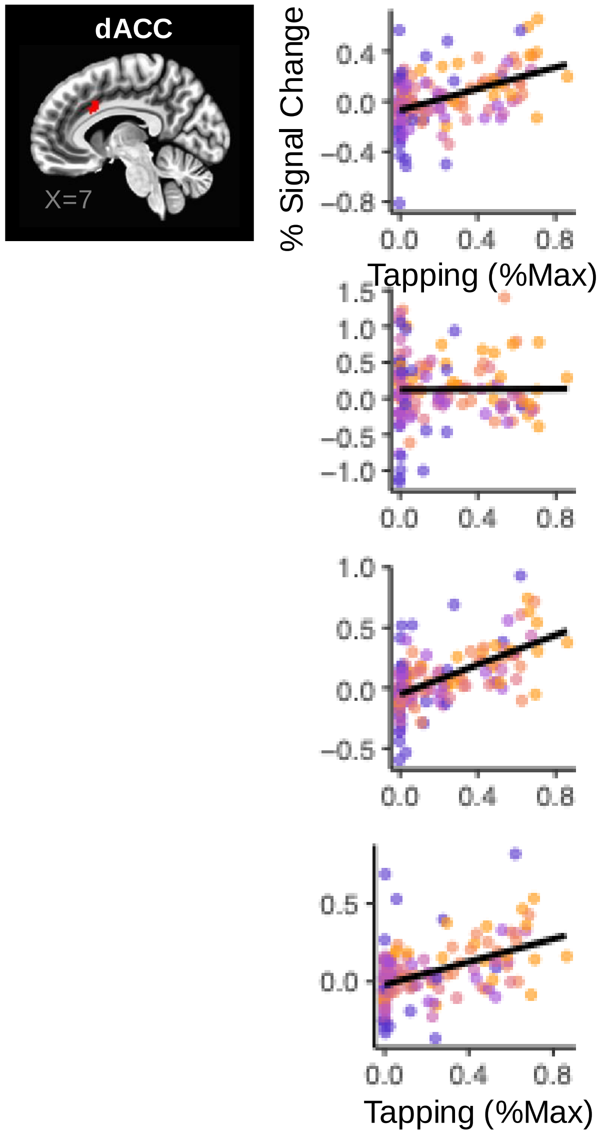
Main effect of neural activity:

CSTC activity during RTN preparation tracks threat-relevance of stimulus.





CSTC activity during RTN preparation correlates with RTN behavior.



η_p^2=.09, *p*=0.001

η_p^2=.09, *p*<0.001

η_p^2=.07, *p*=0.005

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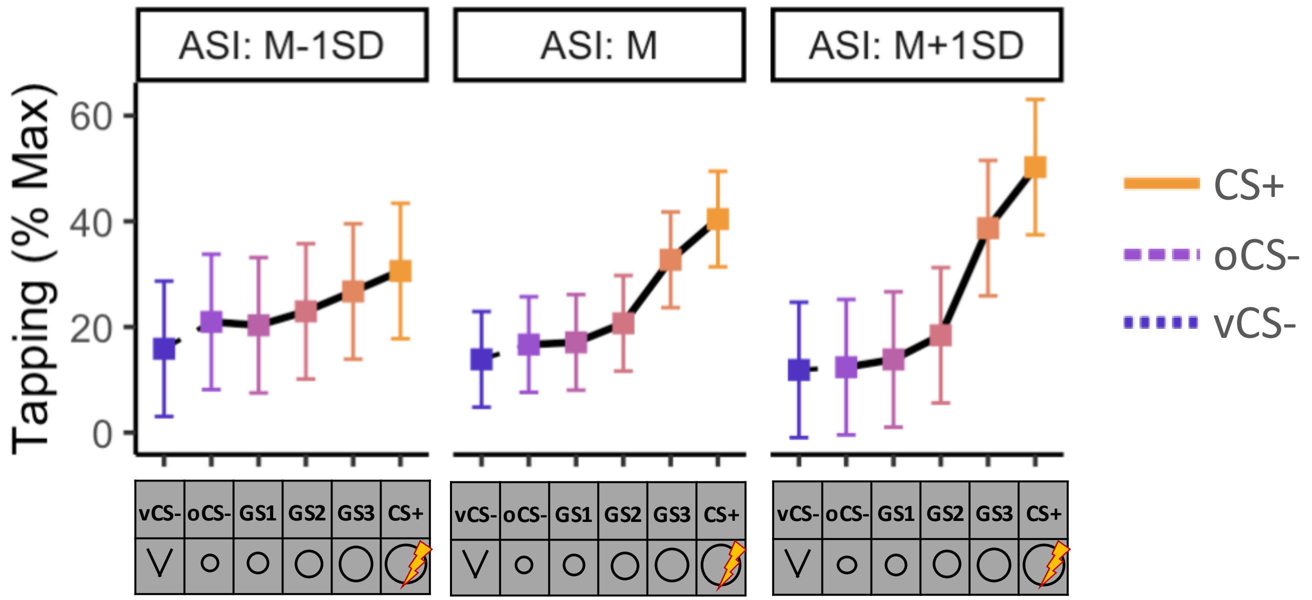
In-Person Study: Individual Differences

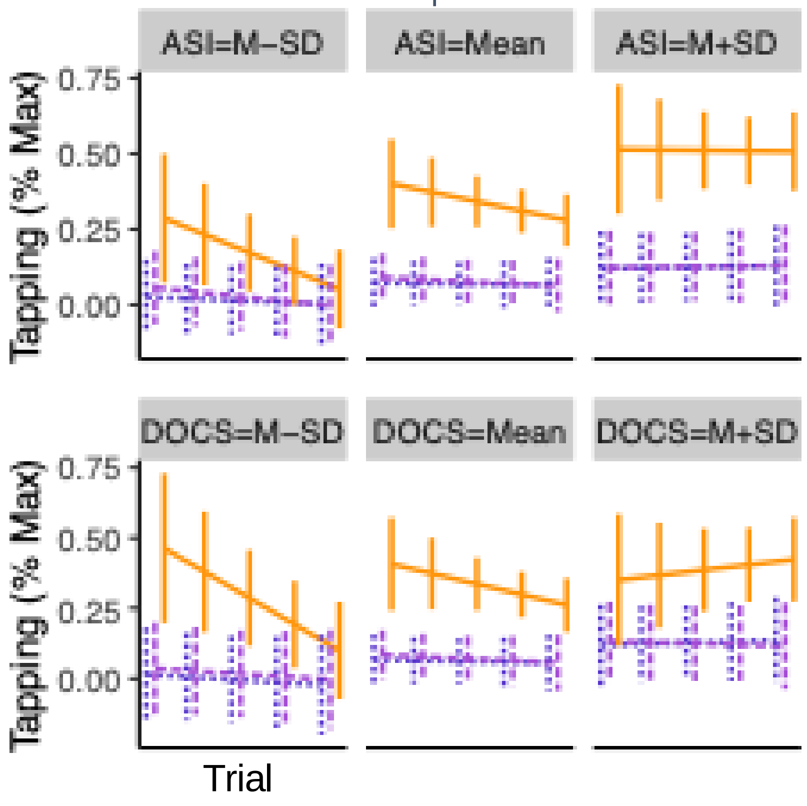
Heightened RTN among those with elevated anxiety sensitivity



ASI x Stimulus: F=10.90, η_p^2=0.29, p<.001***

Slowed extinction among those with elevated anxiety sensitivity and OC traits

ASI: F=5.22, η_p^2=0.26, p=0.024



DOCS x Trial: F=5.46, η_p^2=0.04, p=.021

Saturday Poster: S54

Riley Rozniarek, "Costly, Repetitive Threat-Neutralization: A Novel Task Paradigm and Effects of Anxiety Sensitivity"

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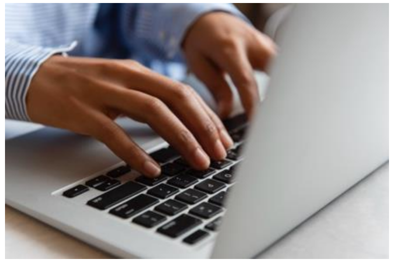
Summary: The Tap-To-Safety Task Elicits Compulsion-Like Behavior

The Tap-To-Safety Task elicits repetitive threat-neutralization RTN behavior that:

- **Is heightened to threat-relevant stimuli**
- **Generalizes from true threat-cues to safe stimuli that resemble the threat-cue**
- **Persists after threat has been removed**
- **Is associated with activity in CSTC circuitry**

Anxiety sensitivity is associated with heightened RTN to threat-cues and former threat-cues

Obsessive-compulsive traits are associated with slowed extinction of RTN to former threat-cues

These findings support the use of the Tap-To-Safety Task to investigate compulsions in OCD

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Thank you!

New preprint

Friday Poster: F43

Hannah Berg, “Repeat Until Safe: A Novel Task Probing Repetitive Threat-Neutralization and Effects of Obsessive-Compulsivity”

Saturday Poster: S54

Riley Rozniarek, “Costly, Repetitive Threat-Neutralization: A Novel Task Paradigm and Effects of Anxiety Sensitivity”

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