Trait Anxiety is linked to higher reliance on priors relative to sensory evidence in visual uncertainty

Trait Anxiety as a Marker of Aberrant Precision Weighting in Perceptual Decision Making

Kraus, N.[1] [2]**; Hesselmann, G.** [1]
[1] Psychologische Hochschule Berlin [2] Freie Universität Berlin

INTRO

- Predictive processing accounts of human brain functioning conceive anxiety as the tendency to change the reliance on either priors or sensory data in belief updating in order to reduce uncertainty. (Clark, Watson & Friston, 2018)
- Therefore, when sensory uncertainty is high, trait anxiety scores should correspond to the degree of influence that priors have in a perceptual decision making task.

METHODS

- Participants (n=117) with varying degrees of trait anxiety (measured via STAI) judged the global motion direction of random dot kinematograms.
- The precision of sensory evidence was varied through the amount of coherently moving dots in three levels of difficulty.
- Prior expectancies were induced by arrow cues indicating motion direction, which could either be valid, neutral or invalid.
- Generalized linear mixed-effects analysis was conducted to calculate the impact of sensory evidence, prior expectancies and trait anxiety as well as possible interaction effects on accuracy rates.

RESULTS

- Regression analyses showed significant effects of cue validity and motion coherence on accuracy rates. Additionaly, a significant interaction effect was found between cue validity and trait anxiety. No other significant interaction effects were found

	accuracy			
Predictors	*DenDF*	*F*	*Z*	*p*
Cue Validity	114	4.47	2.25	**0.025**
Trait Anxietv	114	1.23	-1.35	0.178
Motion Coherence	133	1539.90	27.64	**<0.001**
Cue Validitv:Trait Anxietv	113	5.43	2.56	**0.011**
Cue Validitv:Motion Coherence	129	4.61	-1.52	0.130
Trait Anxietv:Motion Coherence	133	0.10	-0.20	0.841
Cue Validitv : Trait Anxietv : Motion Coherence	129	1.54	0.57	0.567
N $_{subid}$	116			
Observations	51455			
Pseudo R^2	0.130			

DISCUSSION

- The results indicate aberrant patterns of precision weighing in high trait anxious individuals, even in non-threatening perceptual stimuli.
- Trait anxiety is linked to higher reliance on priors, independent of the amount of sensory evidence that is available.
- It is yet to be studied, whether the influence of priors is globally enhanced in high trait anxious individuals or whether the observed effect is indicative of a general tendency to overcompensate for low precision in one informational domain.

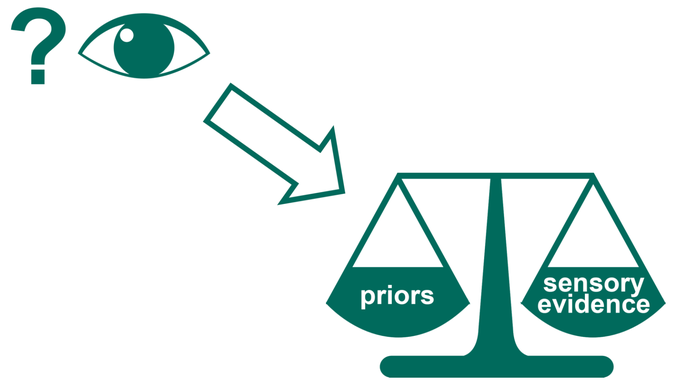

Figure 1: The Process of Precision Weighting
In predictive processing, perception is emerging from matching incoming sensory evidence with predictive expectations (priors). Based on their relative certainty (precision) they can differentially influence the percept.

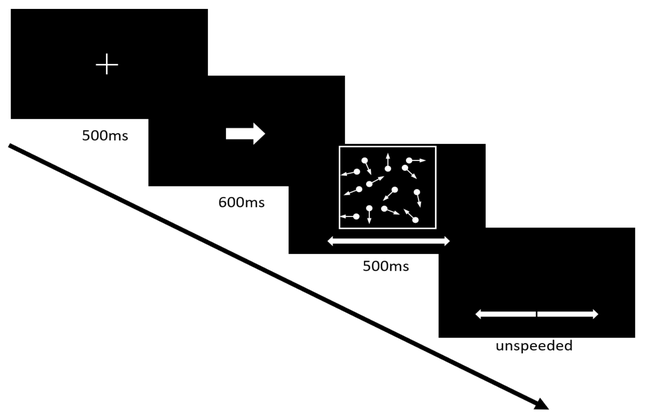

Figure 2: Experimental Design
Participants were asked to judge the direction of a presented set of moving dots. Prior expectations were influenced by arrow cues preceding every trial. Sensory evidence was varied by differering percentages of coherently moving dots.

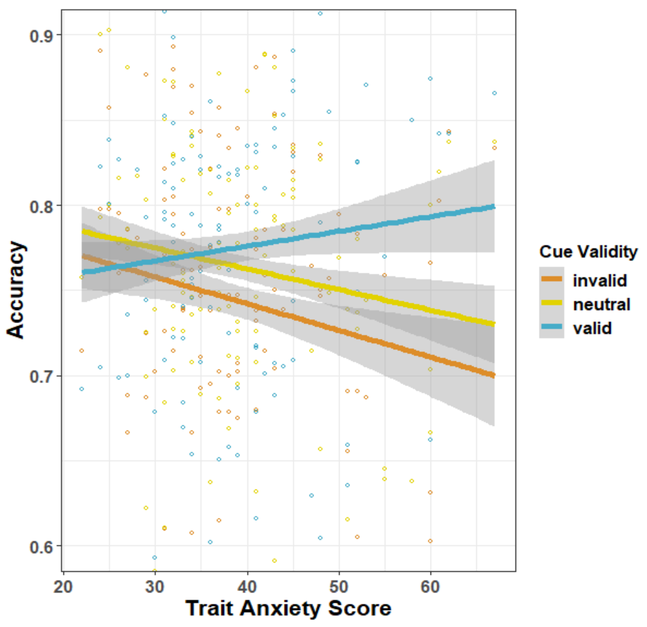

Figure 3: Interaction Effect of Trait Anxiety and Cue Validity
The graph shows varying mean accuracy rates (+/- SD) in participants with varying degrees of trait anxiety when cues were either valid, neutral or invalid. The validity of cues has higher impact on accuracy rates in high trait anxious individuals.

References: Clark, J. E., Watson, S., & Friston, K. J. (2018). What is mood? A computational perspective. *Psychological Medicine*, *48*(14), 2277-2284.

Psychologische Hochschule Berlin

Get to the paper