Individual Differences and Perceptual Biases: Depth-Ambiguity in Biological Motion Stimuli

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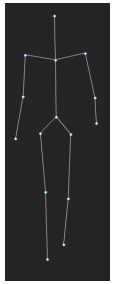
INTRODUCTION

Not everyone perceives ambiguous stimuli the same way. Our perception of multistable objects is affected by perceptual biases that may cause us to prefer one percept over another.



The Facing-the-Viewer (FTV) bias

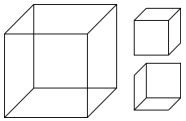
- More often, stick-figure walkers are perceived as facing towards the viewer than facing away.[1]
- Given that it is more dangerous to misinterpret an approaching person as retreating than vice versa, the FTV bias may be sociobiological in nature.
- Thus, the FTV bias may provide a useful tool in observing the relationship between anxiety and perceptual biases.

Purpose: To observe whether there is a relationship between anxiety and the FTV bias for depth-ambiguous stick-figure walkers.

Hypotheses:

1. Higher anxiety scores would predict stronger FTV biases, as we rationalized that more anxious individuals would be biased towards perceiving walkers as facing them (i.e., the more intimidating orientation) and would thus demonstrate a more pronounced FTV bias.
2. Additionally, we measured the viewing-from-above (VFA) bias. Given that this bias does not hold the same social relevance as the FTV bias, we hypothesized that there would be no relationship between anxiety and the VFA bias.

METHOD



Participants

- *N* = 74
- Undergraduate & graduate students (56 women, 18 men)

Stimuli

- Stick-figure walkers based on 15 connected points (80%) and Necker cubes (20%)
- 0.5 s presentation, response prompt, 0.5 s ITI
- Orthographic projection, no occlusion or other depth cues
- Camera Azimuth: 0, 30, 60, … , 330 degrees
- Camera Elevation: -30, -20, -10, 0, 10, 20, 30 degrees
- Rotation: 45 degrees/s

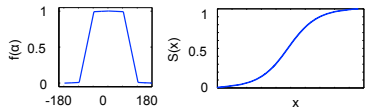
Procedure & Design

- 420 trials: 12 (azimuth) x 7(elevation) x 5 (repetitions)
- Beck Depression Inventory, Second Edition (BDI-II) and the State-Trait Anxiety Inventory (STAI)

"Is the stimulus rotating clockwise or counterclockwise?"

A Generalized Linear Model (GLM):

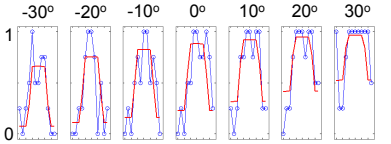
$$r(\alpha, \beta) = S[a + b\beta + c f(\alpha)]$$



r = rate of counter-clockwise responses
α = camera azimuth in degrees
β = camera elevation in degrees/30
a = counter-clockwise bias
b = viewing-from-above (VFA) bias
c = facing-the-viewer (FTV) bias

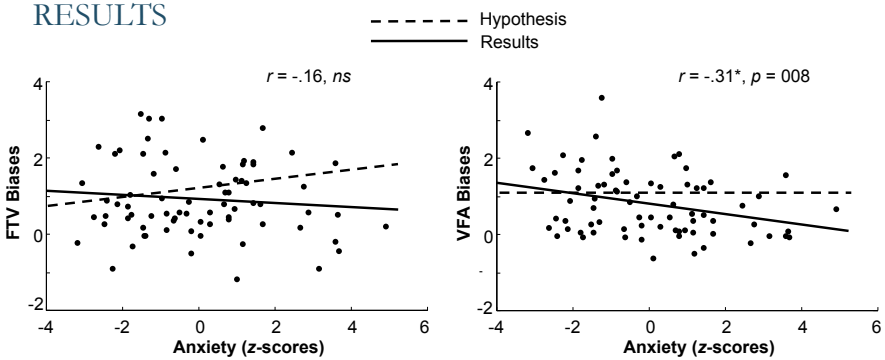
S = the logistic function: $S(x) = 1/(1+e^{-x})$
f = a rectangular function which adopts a value of 1 if -90<α<90, -1 if 90<α<270, and 0.5 if α is either -90 or 90

Example Participant:
Proportion of trials where stimulus was perceived as rotating counterclockwise as a function of camera azimuth (range: -180° to 180°) for all 7 levels of camera elevation.



a = 0.38
b = 1.20
c = 1.61

RESULTS



Pearson's r Correlation Statistics for the VFA Bias, FTV Bias, Anxiety scores (STAI), and Depression scores (BDI-II).

	BDI-II	VFA	FTV
Anxiety	.72**	-.31**	-.10
Depression		-.16	-.16
VFA			-.15

SUMMARY & DISCUSSION

- Stick-figure walkers elicit strong FTV and VFA biases.
- We found that FTV biases were unrelated to levels of anxiety or depression
- Furthermore, increased anxiety was correlated with decreased VFA biases.
- Thus, both of our hypotheses were incorrect.
- Anxiety and the VFA bias may be correlated because anxiety disrupts perceptual biases.
- For instance, anxious individuals have significantly higher reversal rates than controls while observing Necker cubes[2] and during binocular rivalry.[3]
- Since strong biases help to disambiguate stimuli, weakened perceptual biases may lead to increased perceptual alternation rates.
- We provide evidence here that anxiety may increase reversal rates of multistable stimuli by weakening perceptual biases.

REFERENCES

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2. Meldman, M. J. (1965). The quantitative analysis of anxiety and depression. *Psychosomatics*, *6*, 8-15.
3. Nagamine, M., Yoshino, A., Yamazaki, M., Obara, M., Shun-ichi, S., Takahashi, Y., & Nomura, S. (2009). Accelerated binocular rivalry with anxious personality. *Physiology & Behavior*, *91*, 161-165.

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