

Seeing the world differently:

The systemizing trait and perceptual biases



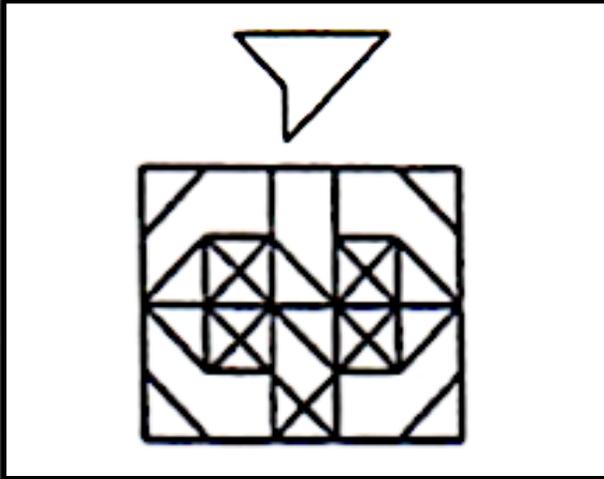
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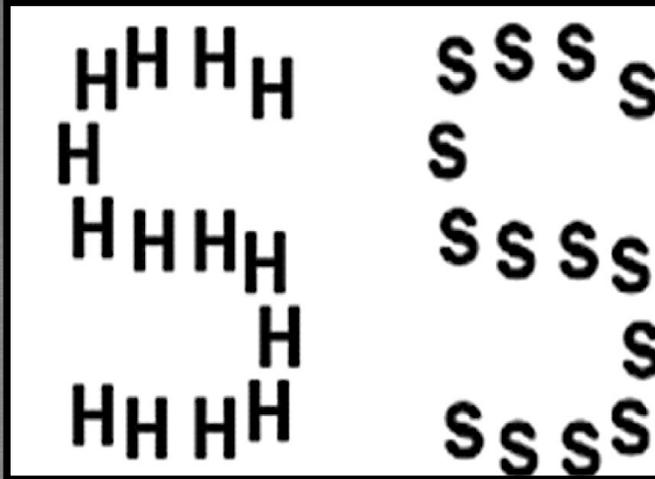
University of Oregon

Background

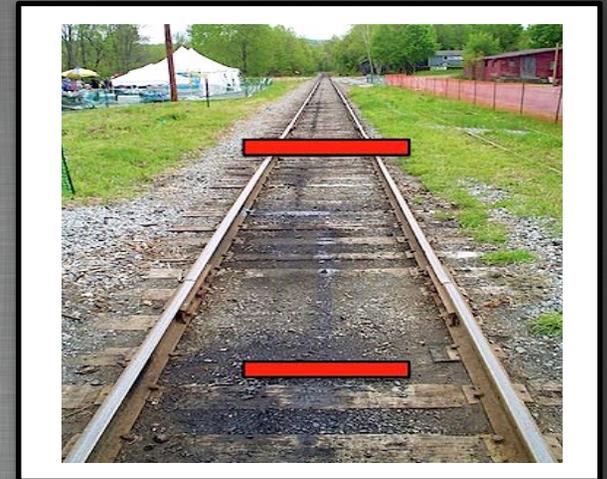
The Embedded Figures Test



The Navon Task



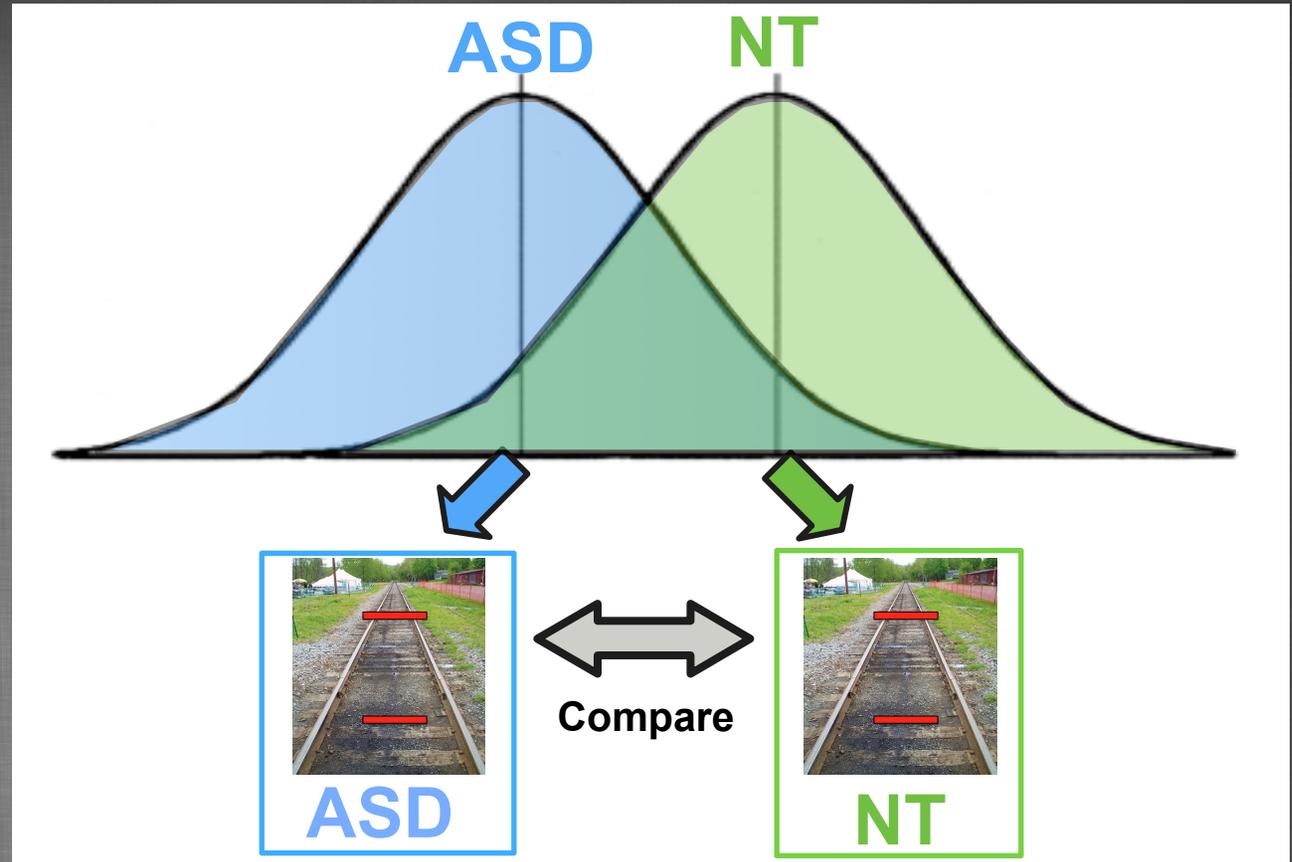
Visual Illusions



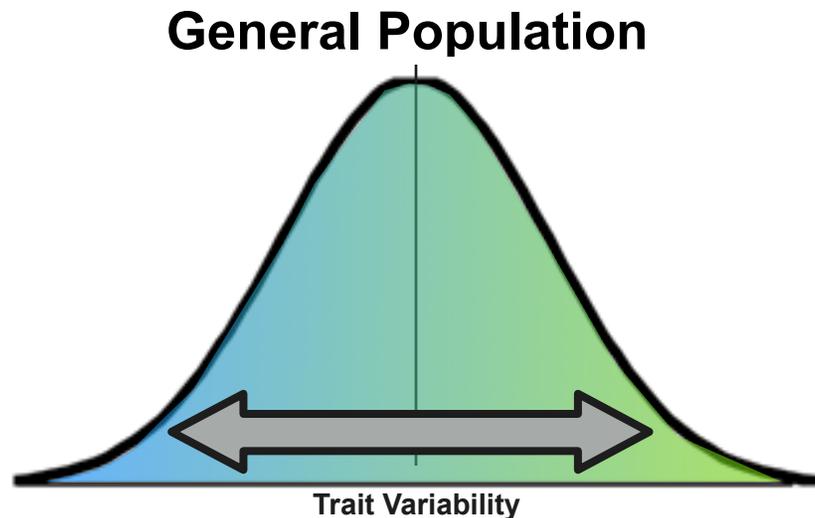
- **Weak Central Coherence** (Frith, 1989)
 - Individuals with Autism Spectrum Disorders (ASD) have difficulties using and integrating contextual information.
- **Enhanced Perceptual Functioning** (Mottron et al., 2006)
 - Individuals with ASD have a detail-oriented processing style due to superior low-level visual processing.

Traditional Group Comparison Approach

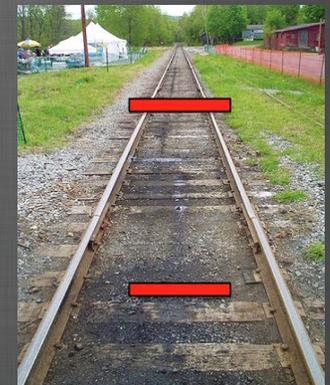
Inconsistent findings due to variability in unmatched traits



Individual Differences Approach



≈



Illusion Susceptibility

The Systemizing Trait of Autism

- **Systemizing**: The tendency to prefer and analyze mechanical systems in the world, where the rules and operations in the system can be understood and predicted.

A. An example of a *technical* system: a sail

INPUT	→ OPERATION	→ OUTPUT
Sail	Angle 10°	Speed slow
Sail	Angle 30°	Speed medium
Sail	Angle 60°	Speed fast

Numerical: preoccupation with numbers, calendars, and timetables

Spatial: fascination with routes

Environmental: insisting on environmental order and consistent positioning of objects

Collectible: organizing collections, making lists and catalogues



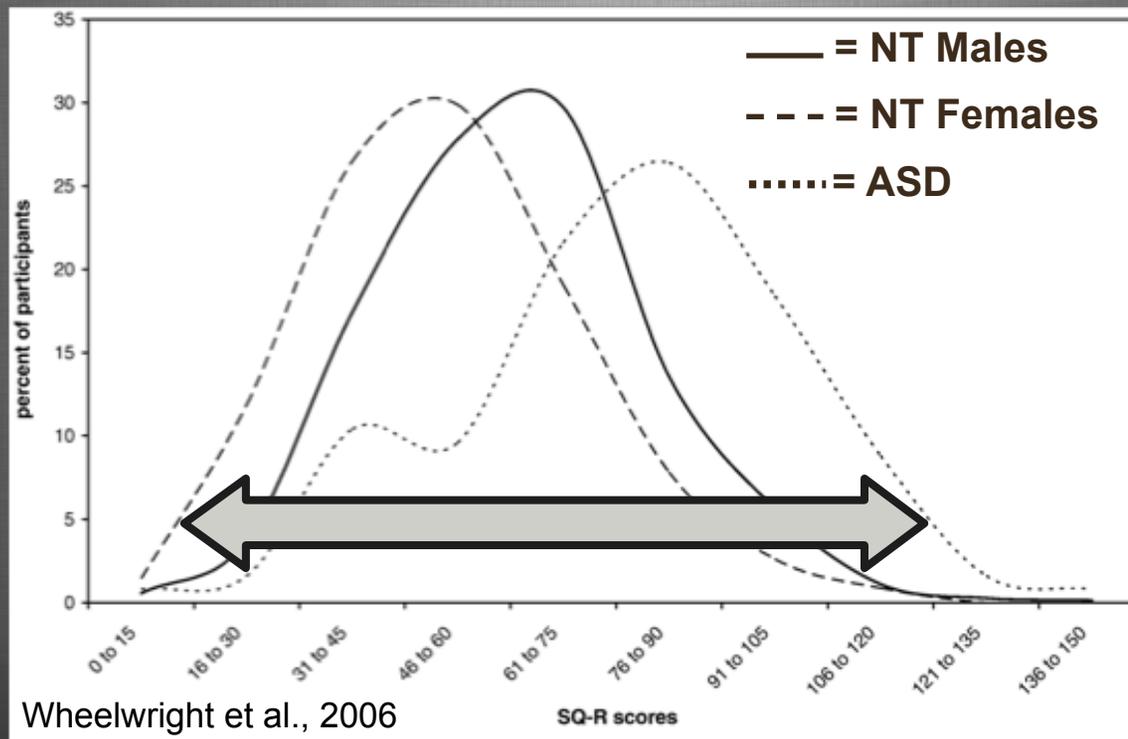
The Systemizing Trait of Autism

- The Systemizing Quotient-Revised (SQ-R)

“In math, I am intrigued by the rules and patterns governing numbers.”

“When I learn about a new category, I like to go into detail to understand the small differences between different members of that category.”

“I find it distressing if people who live with me upset my routines.”



Experiment 1

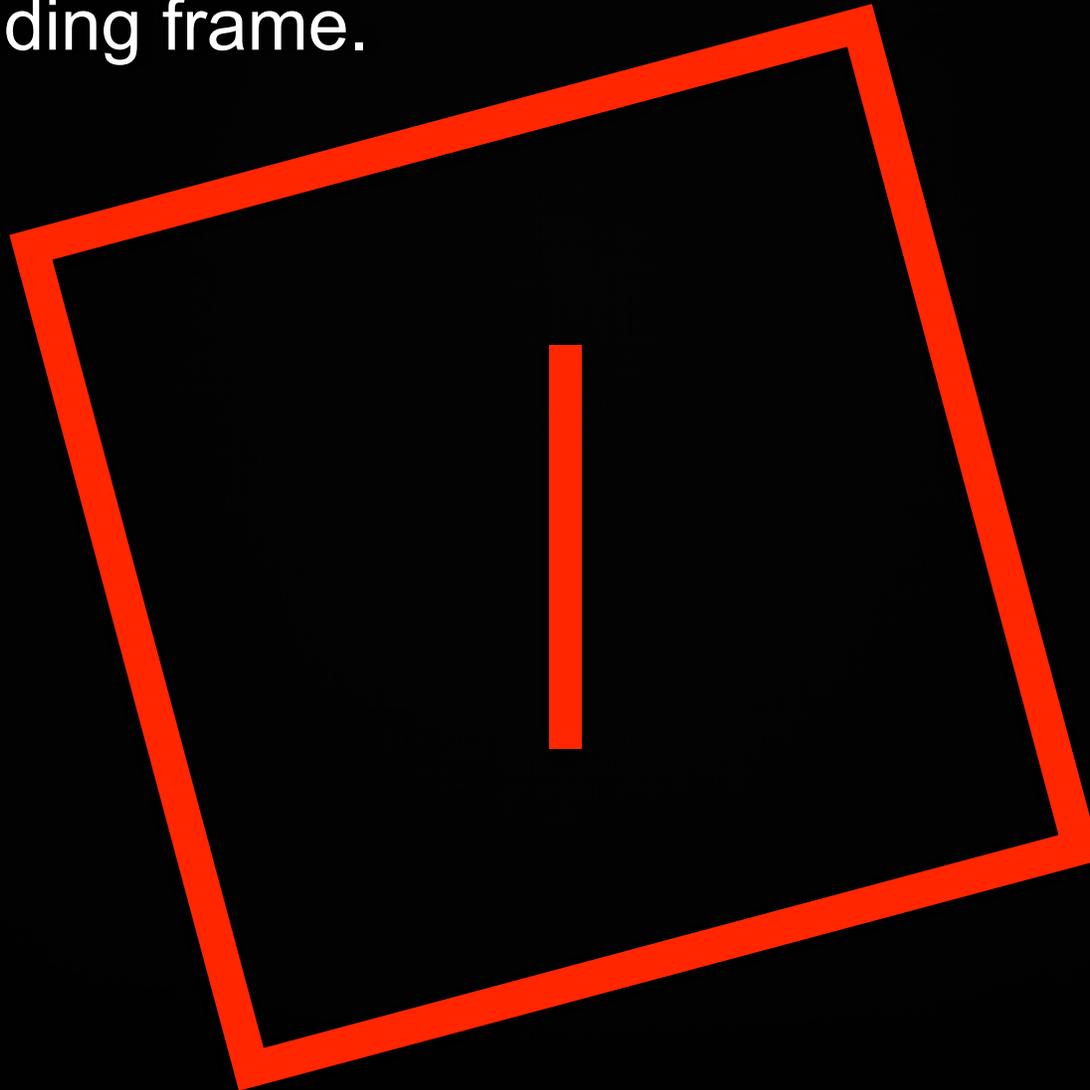
- The Rod-and-Frame Illusion (RFI):
A central line appears tilted in the direction opposite the tilt of a surrounding frame.



Experiment 1

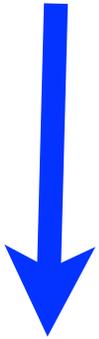
- The Rod-and-Frame Illusion (RFI):

A central line appears tilted in the direction opposite the tilt of a surrounding frame.



Global Effect

(Visuovestibular distortion)



Saccade to Vertical

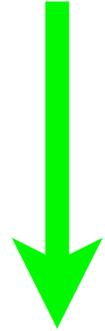
(True vertical - perceived vertical)

Perceived Vertical

True Vertical

Local Effect

(Local orientation contrast effect)



Saccade to Rod

(True rod orientation - perceived rod orientation)

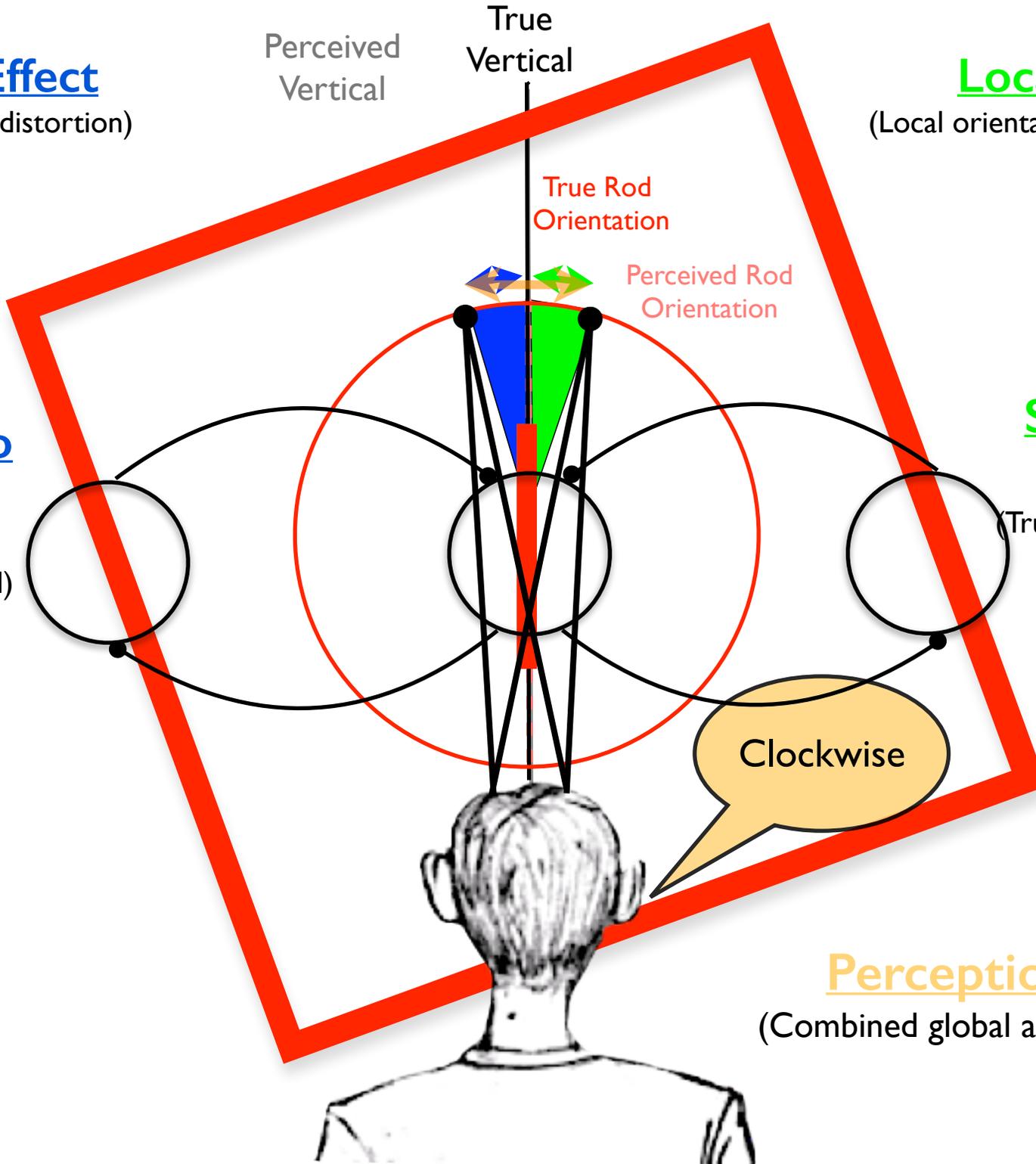
True Rod Orientation

Perceived Rod Orientation

Clockwise

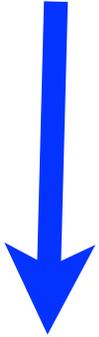
Perception Task

(Combined global and local effects)



Global Effect

(Visuovestibular distortion)



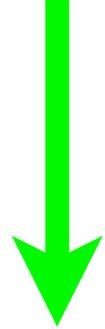
Saccade to Vertical

(True vertical - perceived vertical)

Perceived Vertical
True Vertical

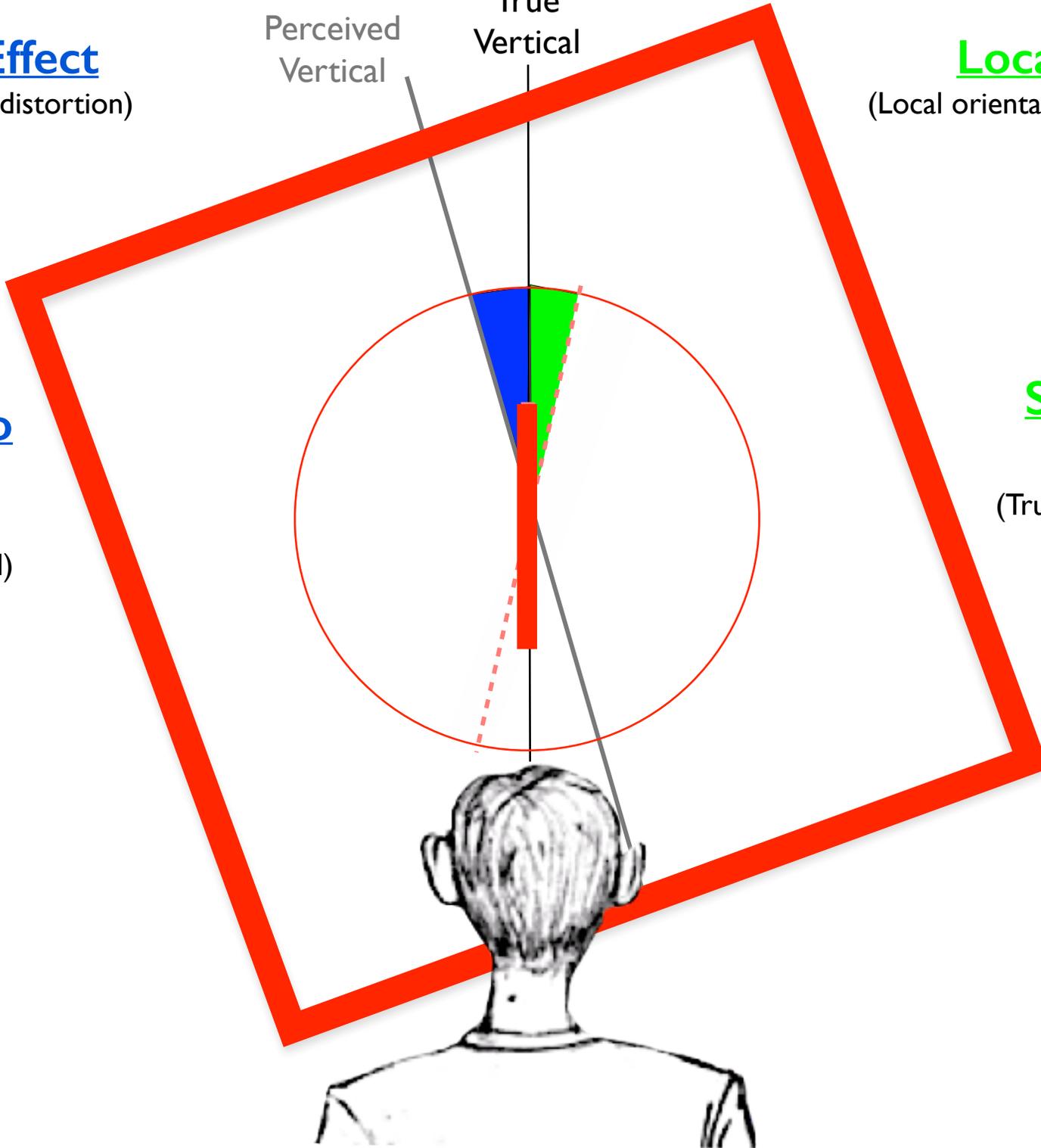
Local Effect

(Local orientation contrast effect)



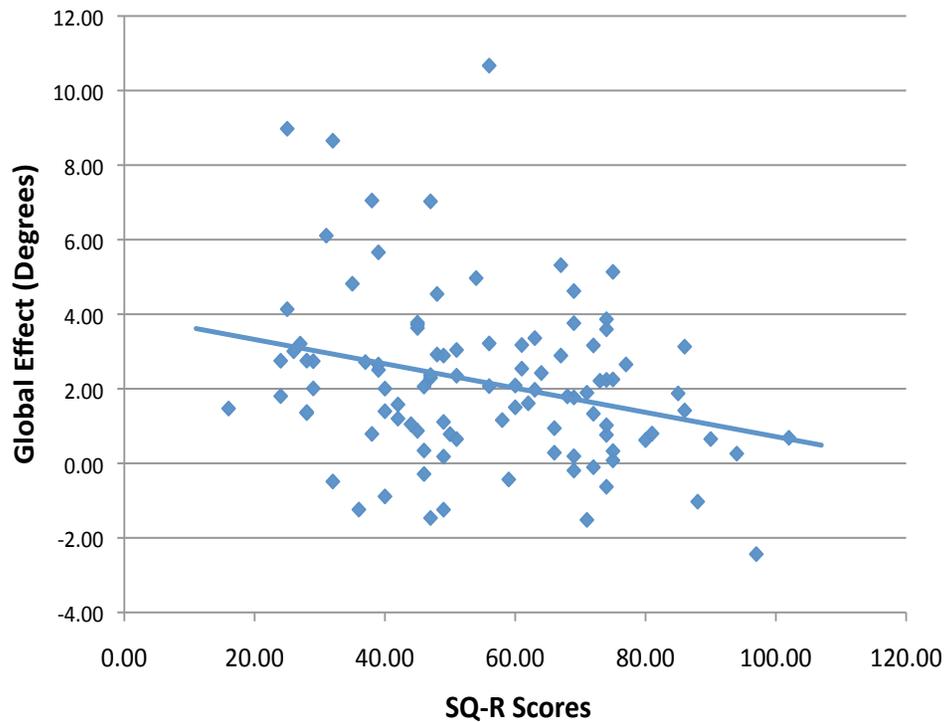
Saccade to Rod

(True rod orientation - perceived rod orientation)

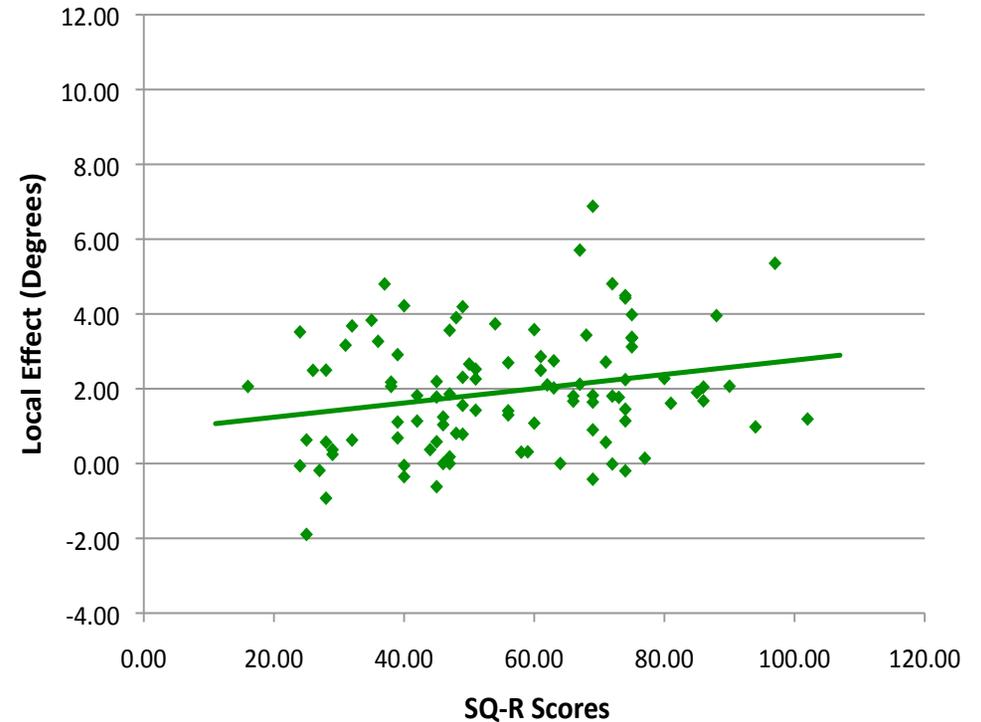


Systemizing and Perceptual Biases

Global visuovestibular effects



Local orientation contrast effects



Global Effect (Saccade-to-Vertical)

Local Effect (Saccade-to-Rod)

SQ-R

-.40 ($p < .01$)

SQ-R

.31 ($p < .03$)

Types of Systemizing

Factor 1

‘Analytical Tendencies’

- When I look at a building, I am curious about the precise way it was constructed.
- When I listen to a piece of music, I always notice the way it’s structured.
- I am fascinated by how machines work.

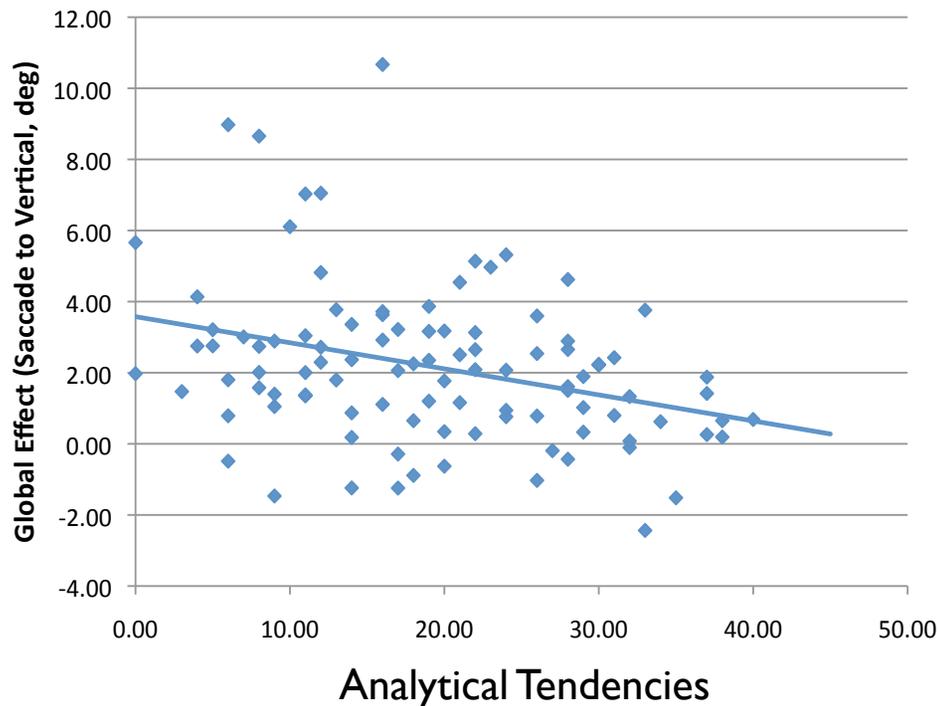
Factor 2

‘Insistence on Sameness’

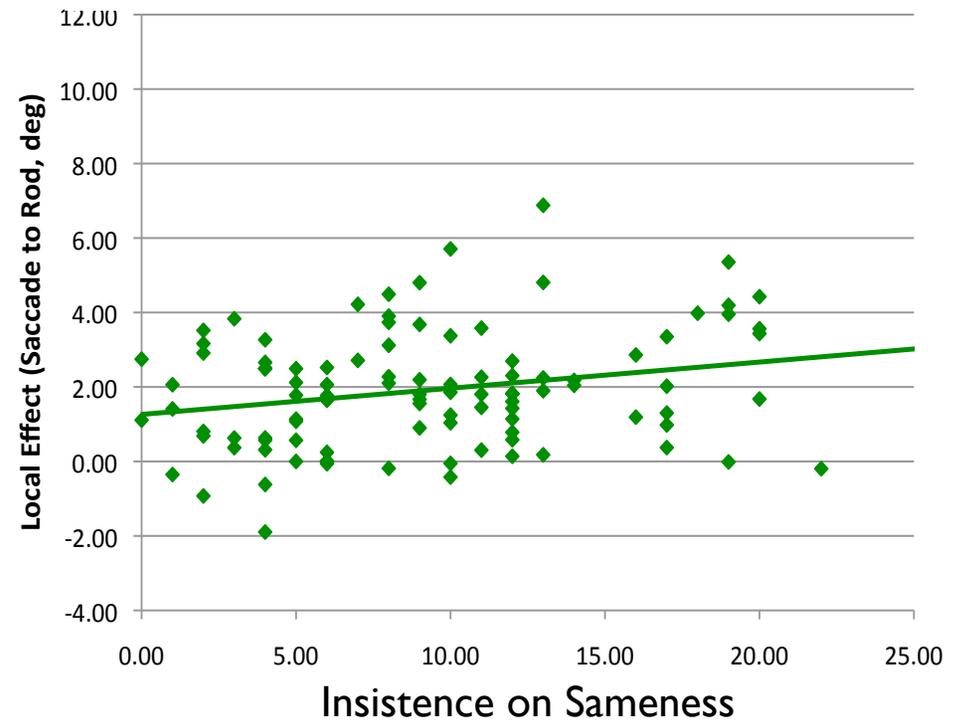
- If I had a collection (e.g. CDs, coins, stamps), it would be highly organized.
- It bothers me if things in the house are not in their proper place.
- I find it distressing if people who live with me upset my routines.

Types of Systemizing

Global visuovestibular effect



Local orientation contrast effect



Analytical Tendencies

Local Effect

.12 (NS)

Global Effect

-.44 (.004)

Insistence on Sameness

Local Effect

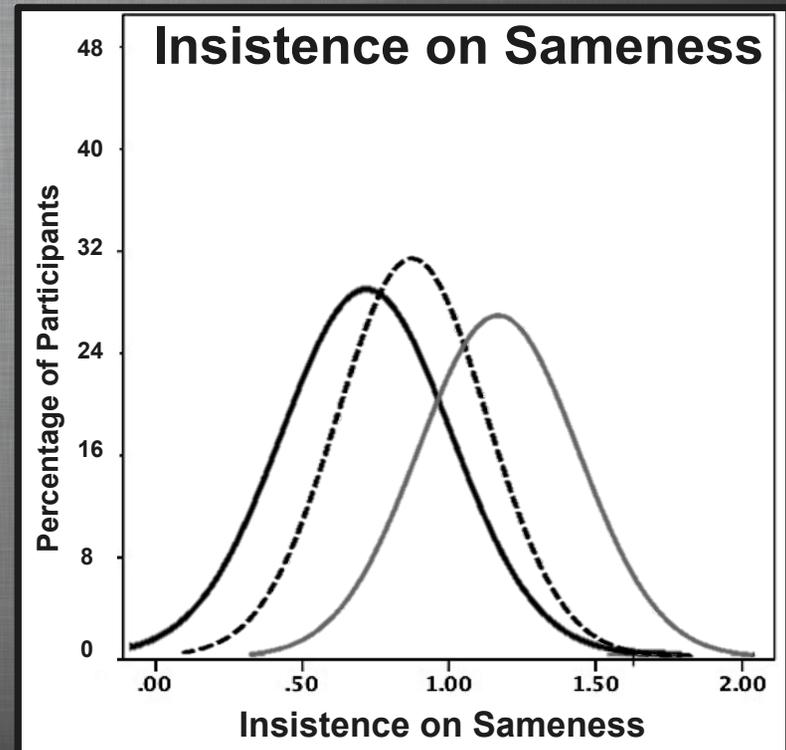
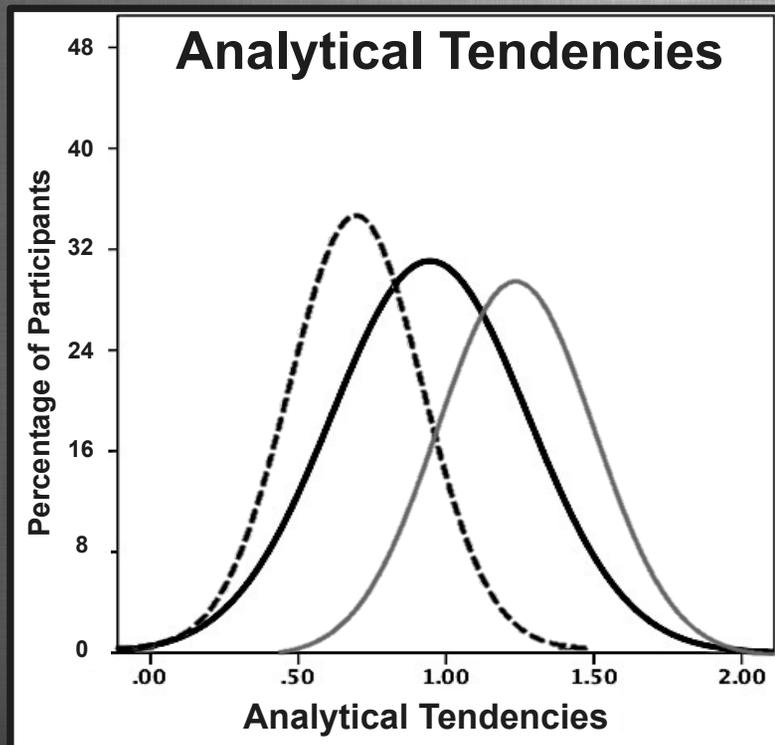
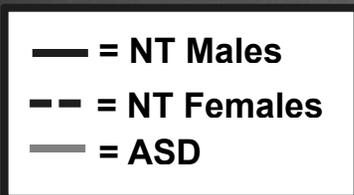
.36 (.019)

Global Effect

-.10 (NS)

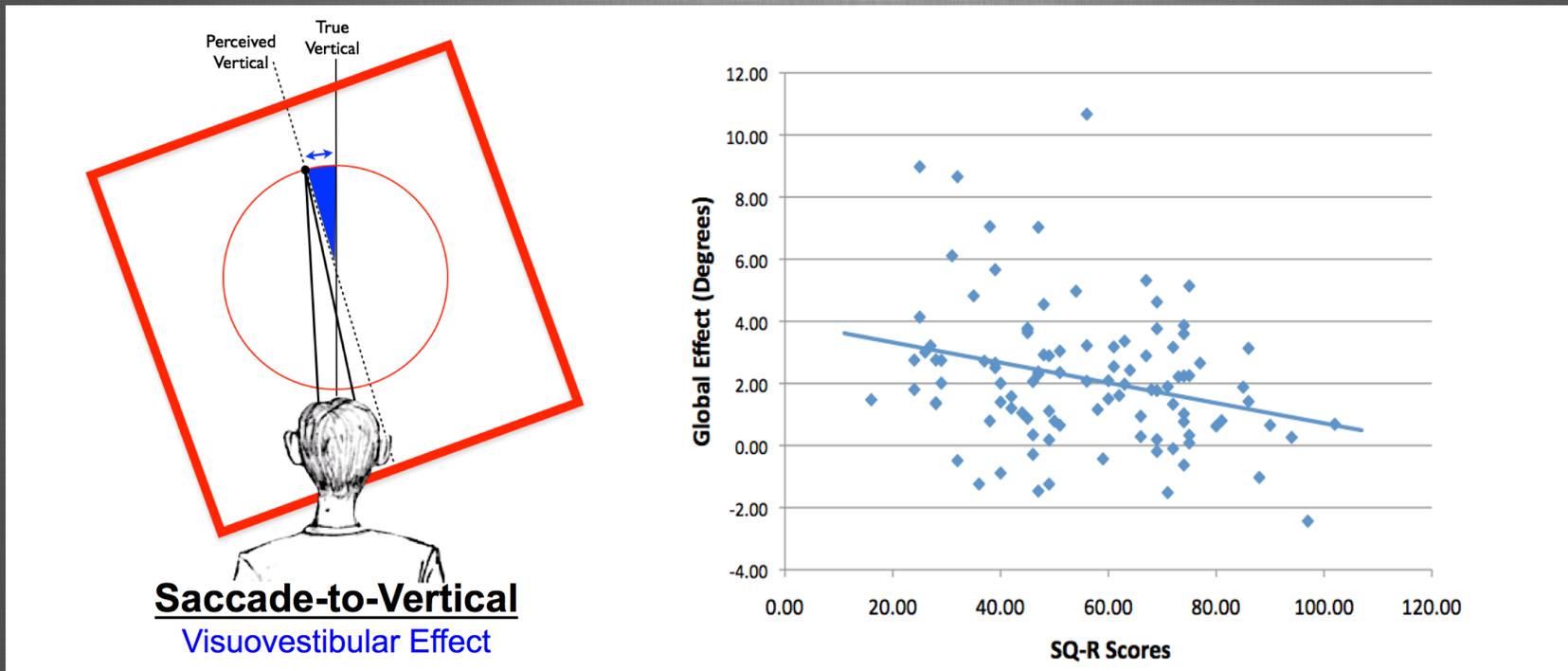
Types of Systemizing

- **Baron-Cohen Data Set** (from Wheelwright et al., 2006)
 - 1761 neurotypical (NT) individuals (41% male)
 - 125 individuals with ASD
 - 110 with Asperger diagnosis, 15 with high-functioning ASD diagnosis



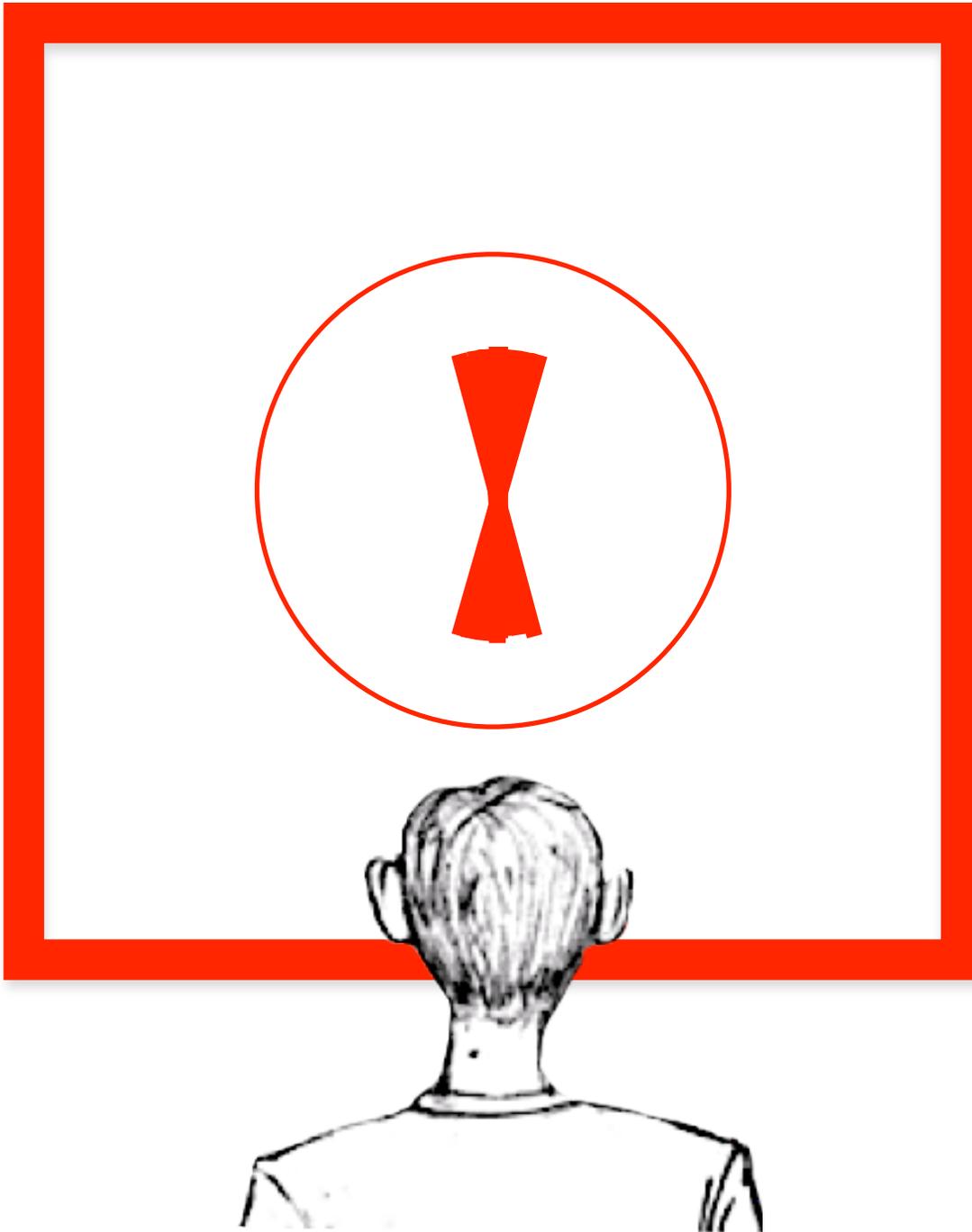
Experiment 2

- Results suggest that there is a reduced tendency for high systemizers to use global contextual information.

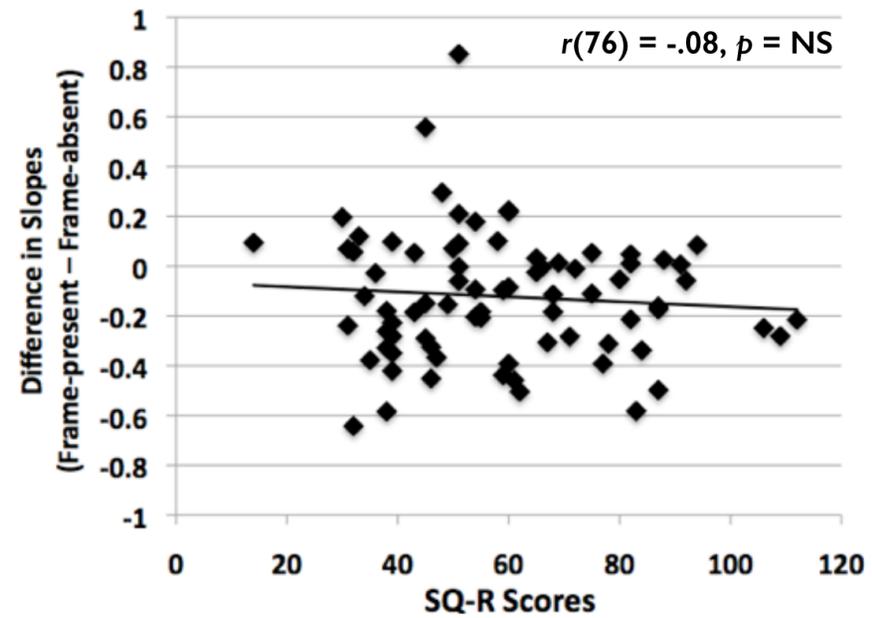
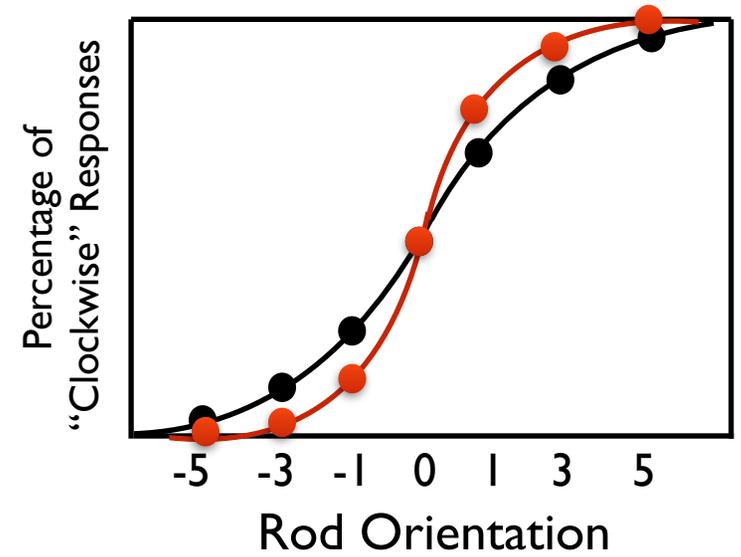


- Does this reflect an *impairment* in using contextual information, or just a *disinclination* to use this information (i.e., in favor of more detail-oriented information)?

Perception Task



Psychometric Function



Summary and Conclusions

- **The Systemizing Quotient-Revised is measuring two distinct forms of systemizing: Analytical tendencies and insistence on sameness.**
- **In high functioning individuals with ASD, both of these types of systemizing are strongly expressed.**
- **Strong analytical tendencies are associated with decreased use of visual context, while a strong insistence on sameness is associated with an increased sensitivity to the visual details in a scene.**
- **Individuals with strong systemizing tendencies can use visual context when it is helpful, or when explicitly asked to do so.**



Thanks to the Dassonville Lab!

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