Measuring Attention Control Abilities with a Gaze-Following Antisaccade Paradigm

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Objectives

▸ Integrate social eye-gaze cues into the antisaccade tasks
▸ Compare attention control performance on tasks using simple and social cues

Background

▸ Attention control is driven by two competing processes
  • Bottom-up selection (involuntary orientation to salient environmental stimuli) and top-down selection (voluntary orientation to goal-related stimuli)[1]
▸ Measures of attention control pit these selection processes against each other[2]
  • The antisaccade task, for example, requires a person to override the reflex to look at a peripheral flash while intentionally looking to an alternative location[2]
  • The antisaccade is often limited to the use of simple stimuli (e.g., geometric shapes)[3]
▸ Socially-rich stimuli, such as the eye-gaze of where another is looking, may have a more profound effect on attention control than simple stimuli [3,4]
  • For example, people orient to eyes in a busy array more often than an equivalent geometric control[5]

Current Study

▸ To evaluate the psychometric value of including gaze cues in the study of attention control, we developed two versions of the antisaccade task that include static and dynamic gaze stimuli

Methods

Each person perform the traditional antisaccade task, one of the new gaze-following antisaccade tasks, and two other widely used attention control tasks (the Psychomotor Vigilance (PV) and Flanker)

Tasks

Traditional antisaccade task with simple stimuli

1. A fixation screen is presented for a random interval
2. An attractor briefly flashes on the left or right periphery of the screen
3. A target letter (B, P, or R) will appear on the opposite side of where the attractor appears
4. The participant reports the target letter

Gaze-following antisaccade tasks

Static version
The fixation is replaced with an image of a woman looking forward. The attractor is replaced with an image of a woman looking left or right

Dynamic version:
The fixation is replaced with an image of a woman looking forward. The attractor is now replaced with a video of a woman's gaze shifting to the right or left

Expected Findings

▸ In comparing antisaccade tasks, gaze cues will trigger greater bottom-up selection, thus greater conflict with top-down selection
  • We predict longer response times compared to simple cues, particularly with dynamic gaze cues
▸ We will compare three structural equation models, (SEM) with each including performance from one of the antisaccade tasks (see Figure 1)
  • We predict the model with dynamic gaze cues will be the strongest indicator of a latent attention control factor (derived from PV and flanker tasks)
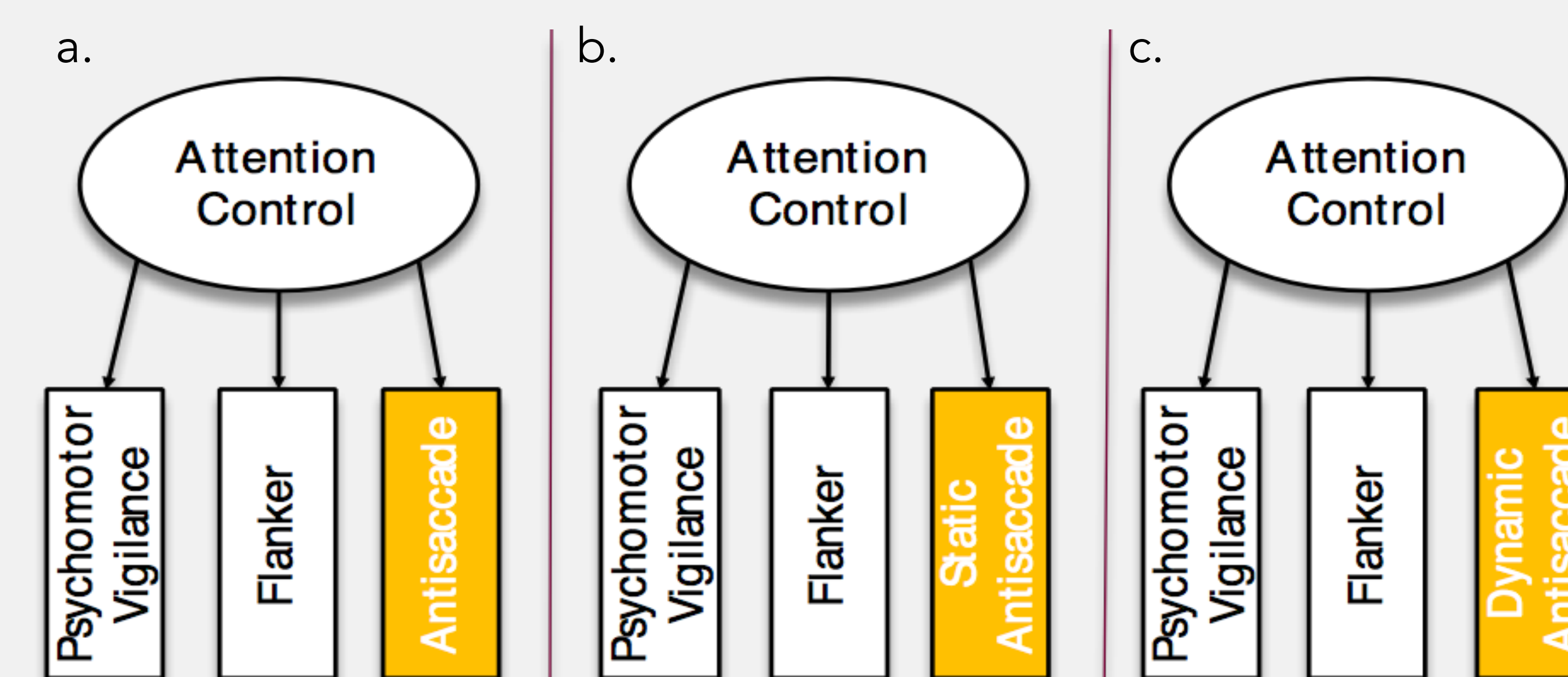

Figure 1. SEM models for testing fit by substituting the (a) antisaccade task with the (b) static antisaccade and the (c) dynamic antisaccade

Future Directions

▸ Gaze cues are just one small part of social interaction. True social interaction requires two people working toward a shared goal
▸ Future studies to focus on gradually increasing the complexity of social stimuli in attention control tasks and including aspects of cooperation
▸ Ultimately, we should work towards creating tasks that measuring attention during real social interaction between two or more people

References: **1.** Theeuwes (2010) *Acta Psychologica* **2.** Heitz & Engle (2007) J of Exp Psych **3.** Friesen & Kingstone (1998) Psychonomic Bull and Review. **4.** Kingstone et al. (2017) On Human Nature Elsevier Inc. **5.** Frischen, Bayliss, & Tipper (20007) Psych Bull