Enemy in imagination: processing of imagery conflict during mental rotation

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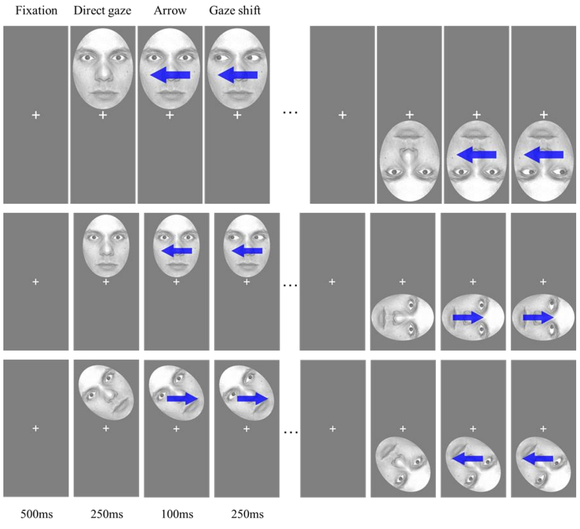
Introduction

The goal of this research was to investigate the interaction between conflict processing and mental rotation

- ✓ Previous studies using the Stroop tasks have focused on stimulus and response conflicts
- ✓ It remains unknown whether conflicts can arise without stimulus conflict
- ✓ We design a novel arrow-gaze Stroop task including three experiments to answer this question

Methods



Participants performed a novel arrow-gaze Stroop task.

- For Exp. 1, responding to whether the direction of the gaze shift to the left or right
- For Exp. 2 and 3, imaging whether the gaze direction shifted to the left or right as if the face were upright

✓ **Experiment 1 (N=36)**
Upright vs. inverted face

✓ **Experiment 2 (N=36)**
Upright vs. 90 degree (clockwise or counter-clockwise)

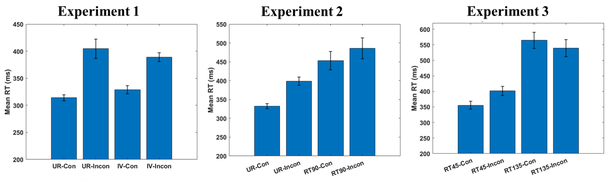
✓ **Experiment 3 (N=36)**
45 vs. 135 degree (clockwise or counter-clockwise)

Data Analysis
- Mean Response Time (RT)
- Delta Plots

Model Fitting
- The diffusion model for conflict tasks (DMC)
- The dual-stage two-phase model (DSTP)
- The shrinking spotlight model (SSP)

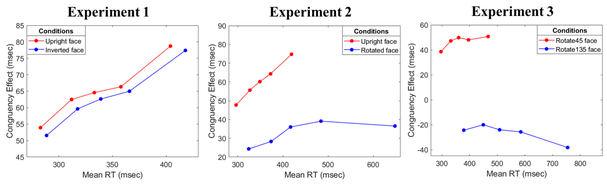
Results

Mean RT



- Conflict occurs even when the face is rotated 90 degree clockwise or counter-clockwise
- When the face is rotated 135 degree, RT of congruent condition is slower than that of incongruent condition

Delta Plots



- The extent of conflicts decreased as the degree of mental rotation got larger

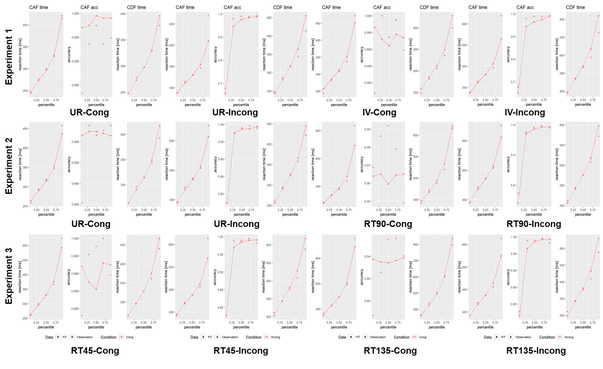
Model Fitting

✓ ***The squared percentage error (SPE)***

- The SPE reflects goodness of fit, the model with the lowest SPE value is preferred
- SSP model provides the best account of gaze Stroop task compared to DMC and DSTP
- We visualized the observed and predicted data of SSP model using CAF plots and CDF plots as following

Experiment 1				
	UR-Congruent	UR-Incongruent	IV-Congruent	IV-Incongruent
DMC	0.039531027	0.074403741	0.050574742	0.086355836
DSTP	0.010636395	0.052354598	0.009576165	0.05226701
SSP	0.002724957	0.045766838	0.008045394	0.045977808
Experiment 2				
	UR-Congruent	UR-Incongruent	RT90-Congruent	RT90-Incongruent
DMC	0.026995711	0.019254693	0.031769966	0.028758118
DSTP	0.009108173	0.013184557	0.031715185	0.012867266
SSP	0.00658779	0.00860457	0.044684356	0.008619724
Experiment 3				
	RT45-Congruent	RT45-Incongruent	RT135-Congruent	RT135-Incongruent
DMC	0.029951208	0.042352058	0.015711737	0.043697103
DSTP	0.010733071	0.032378722	0.05179278	0.03253054
SSP	0.008084999	0.028261343	0.023706194	0.027941896

✓ ***SSP model fitting***



Conclusion

These findings provide novel evidence that conflict can arise without any stimulus conflict during mental rotation, in which the focus of internal attention is constantly shrinking until response.

References

Bayliss, A. P., Pellegrino, G. D. & Tipper, S. P. (2004). Orienting of attention via observed eye gaze is head-centred. *Cognition*, 94(1), B1-10.

Hübner, R. & Pelzer, T. (2020). Improving parameter recovery for conflict drift-diffusion models. *Behavior Research Methods*, 52, 1848–1866.

Servant, M. & Evans, N. J. (2020). A Diffusion Model Analysis of the Effects of Aging in the Flanker Task. *Psychology and Aging*, 35(6), 831-849.

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Meeting ID and Link

- Meeting ID: 810 022 792
- Link: https://voovmeeting.com/s/KsDeIH39TD0w