

Are there opposite pupil responses to different aspects of processing fluency?

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Types of Processing Fluency

Processing Fluency

The more fluently a stimulus can be processed, the more positive the perceivers' aesthetic response will be



Perceptual Fluency

Early, implicit processing



Conceptual Fluency

Later, semantic processing

Distinction not so clear
in practice

Reber, Schwarz & Winkielman (2004)

Processing Fluency in Aesthetics

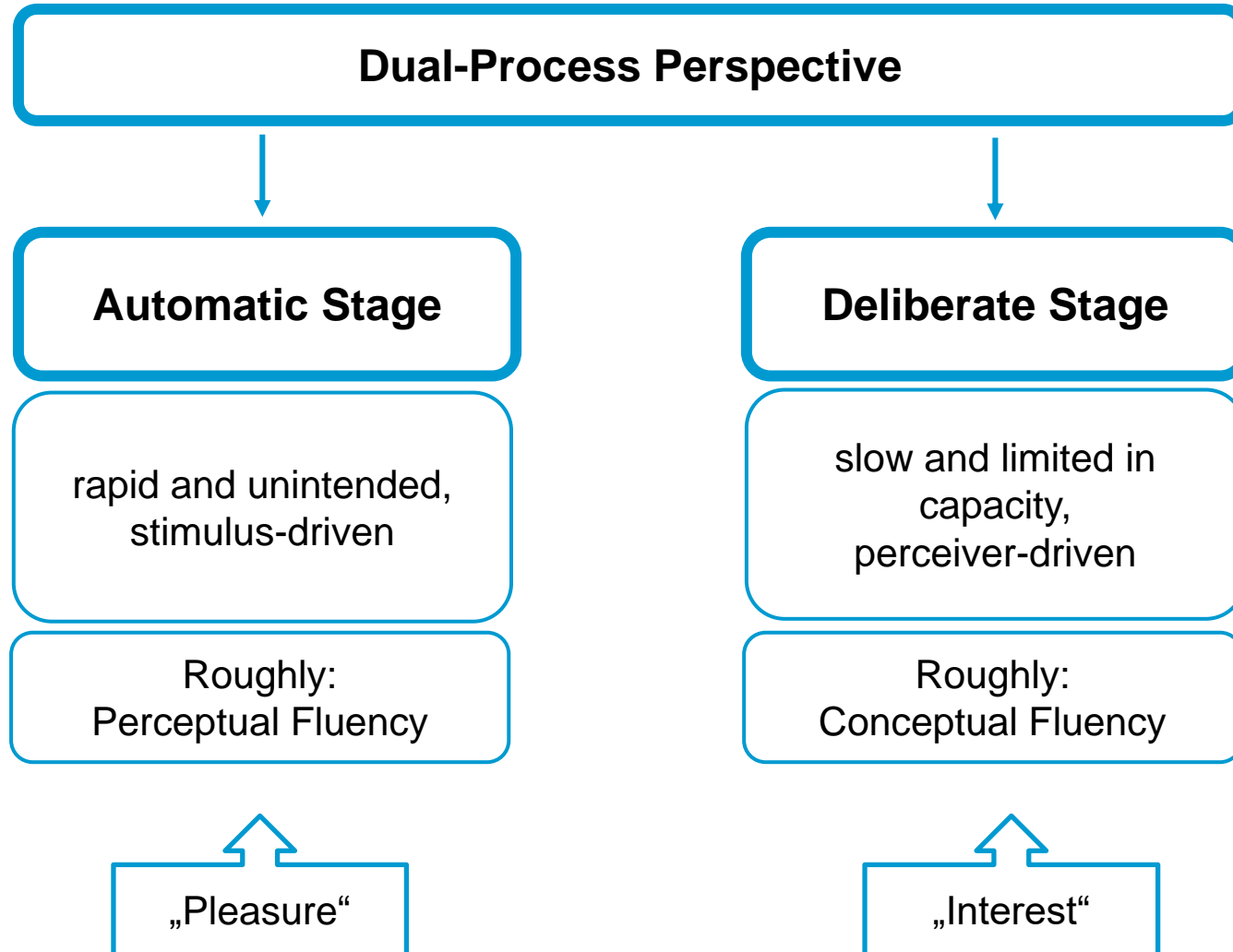
Supporting Fluency Theory

- **Priming with matching instead of mismatching contour**
(Reber, Winkielman & Schwarz, 1998; Winkielman & Cacioppo, 2001)
- **More prototypical patterns**
(Winkielman, Halberstadt, Fanzendeiro & Catty, 2006)
- **Paintings with related vs. unrelated or no title**
(Belke, Leder, Strohbach & Carbon, 2010; Russel, 2003)

Contradicting Fluency Theory

- **Complexity**
(Landwehr, Labroo, & Herrmann, 2011)
- **Novelty**
(Hekkert, Snelders, & van Wieringen, 2003)
- **Ambiguity in Rene Magrittes' paintings**
(Jakesch, Goller & Leder, 2017; Jakesch, Leder & Forster, 2013)
- **Elaboration is pleasurable**
(Muth & Carbon, 2013)

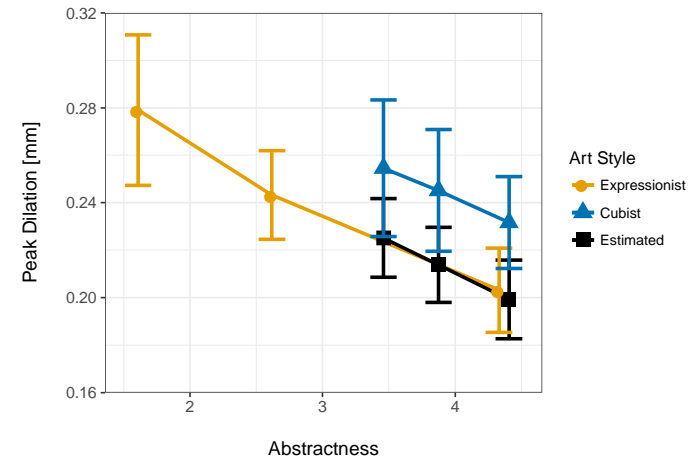
Solution: Pleasure-Interest Model of Aesthetic Liking



Aesthetics and Pupillometry

Greater pupil size for paintings that are less abstract (i.e. easier to process)

- Cubist paintings
(Kuchinke, Trapp, Jacobs & Leder, 2009)
- Conceptual replication with expressionist stimulus set
(Elschner, Hübner & Dambacher, 2017)



Elschner et al. (2017), Fig. 10

General Aesthetics

- Pupil size increases with paintings' pleasantness
(Blackburn & Schirillo, 2012; Johnson, Muday & Schirillo, 2010)
- U-shaped function when unpleasant stimuli were included
(Hayes, Muday & Schirillo, 2013; Powell & Schirillo, 2011)

Participants need to engage in deliberate processing when viewing paintings

Automatic stage:
Are pupil dilations still greatest for easy to process stimuli?

Experiment 1: Stimuli

Symmetry is detected automatically and early in processing

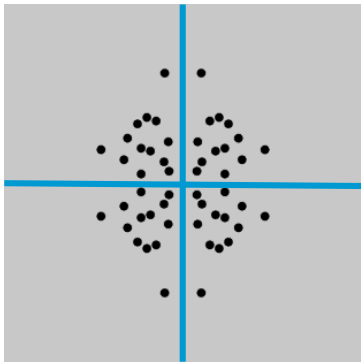
(e.g. Leder, Belke et al. 2004; Tinio and Leder; 2009)

Fluency Operationalization: Symmetry is easier to recognize, when...

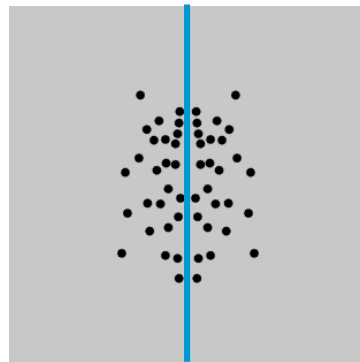
(Palmer & Hemenway, 1978; Pashler, 1990; Royer, 1981; Reber et al. 2004; Wagemans, van Gool, & Dydewalle, 1992)

- ... the axis is vertical rather than horizontal
- ... multiple forms of symmetry are combined

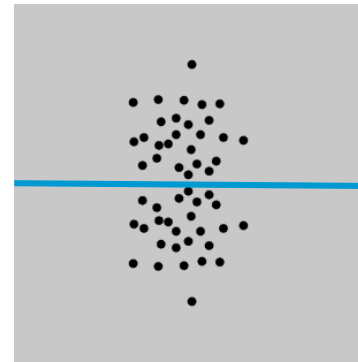
Both Axes



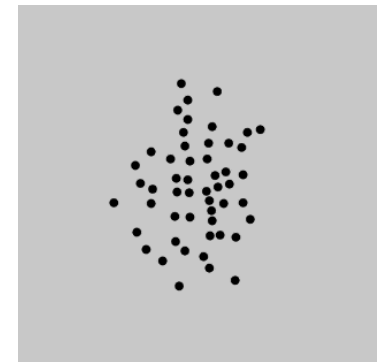
Vertical



Horizontal

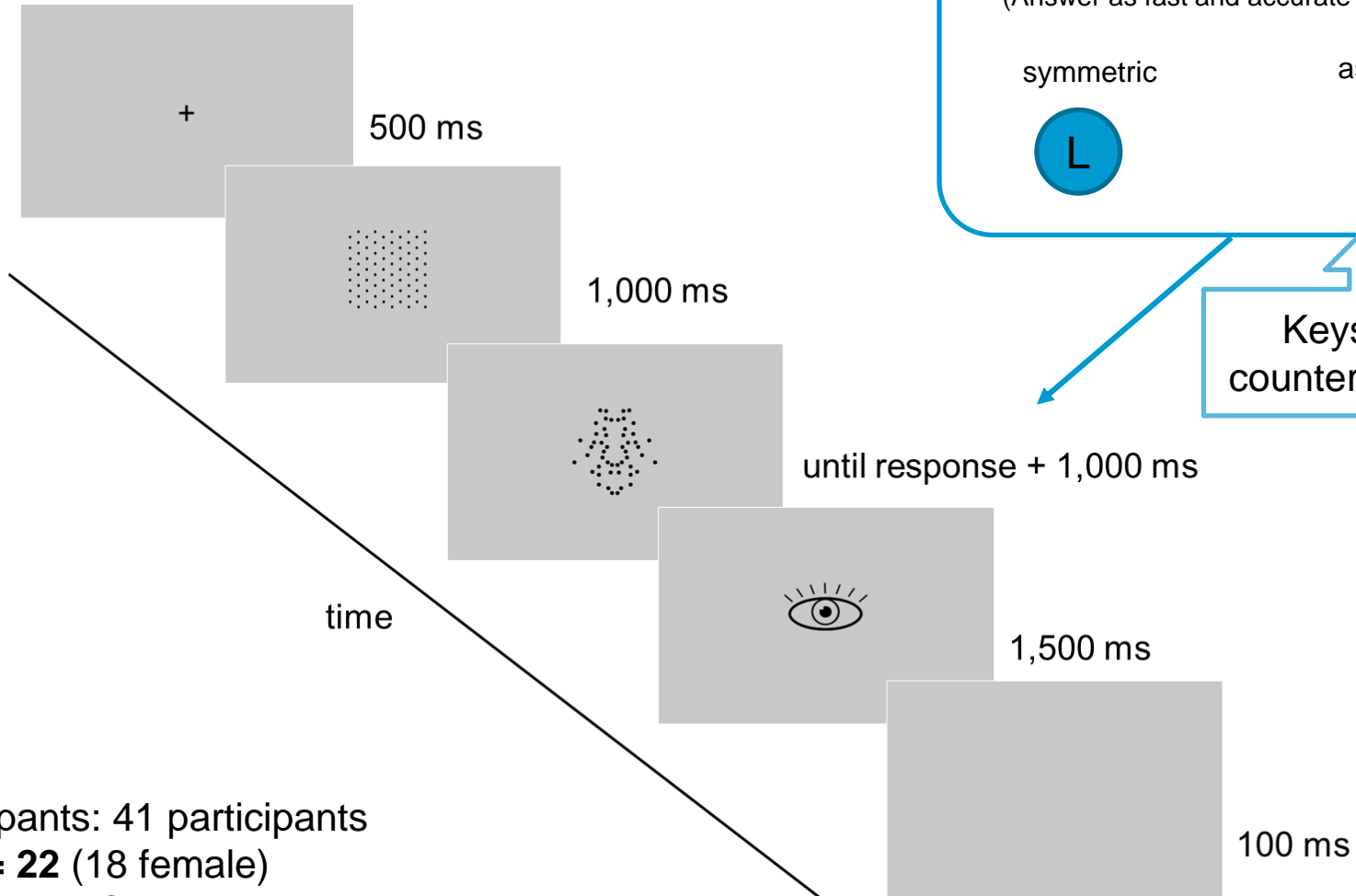


Random



50 Stimuli in each category

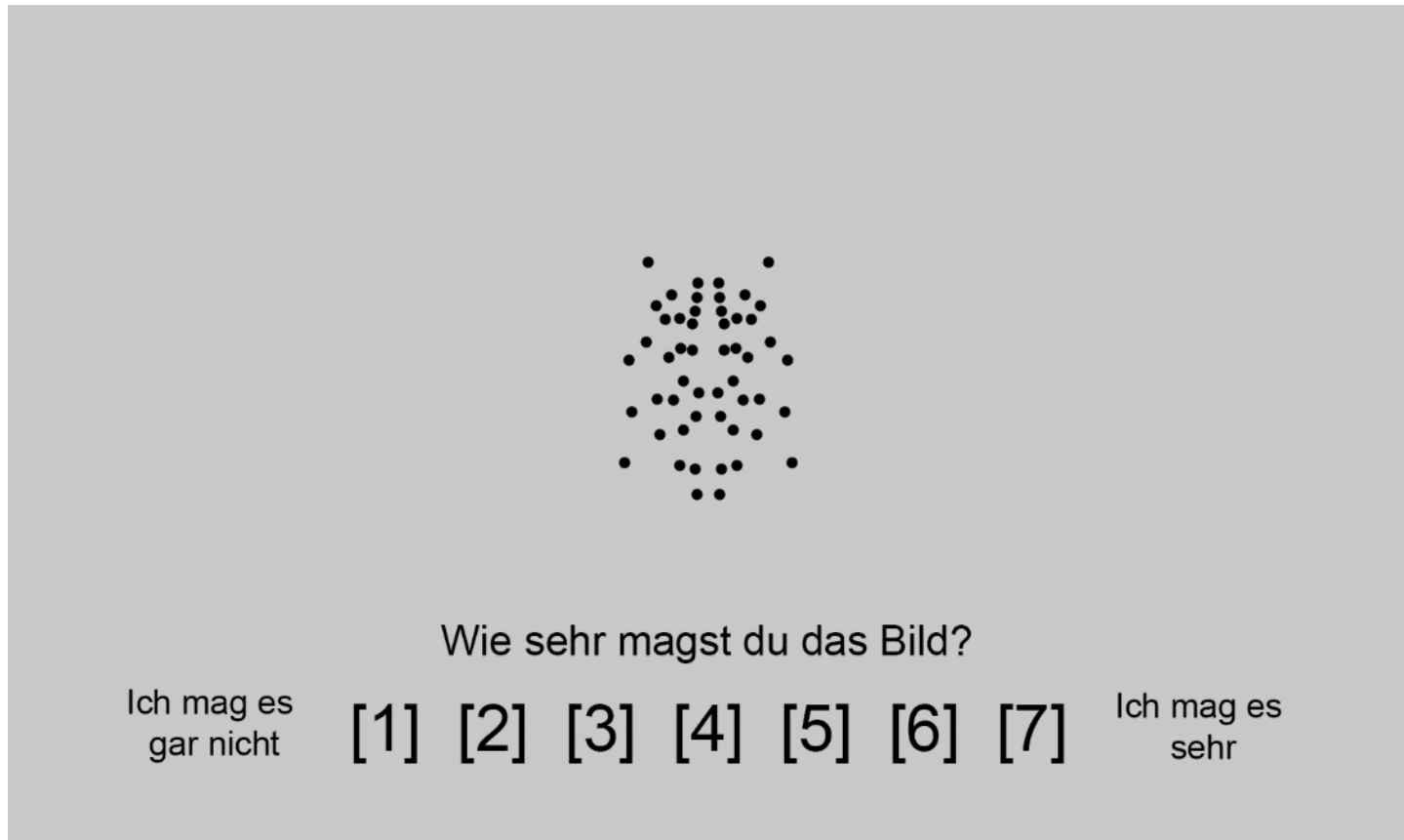
Experiment 1: Procedure



Participants: 41 participants
 $N_{\text{Final}} = 22$ (18 female)
 $M_{\text{age}} = 21.4$; $SD_{\text{age}} = 3.22$

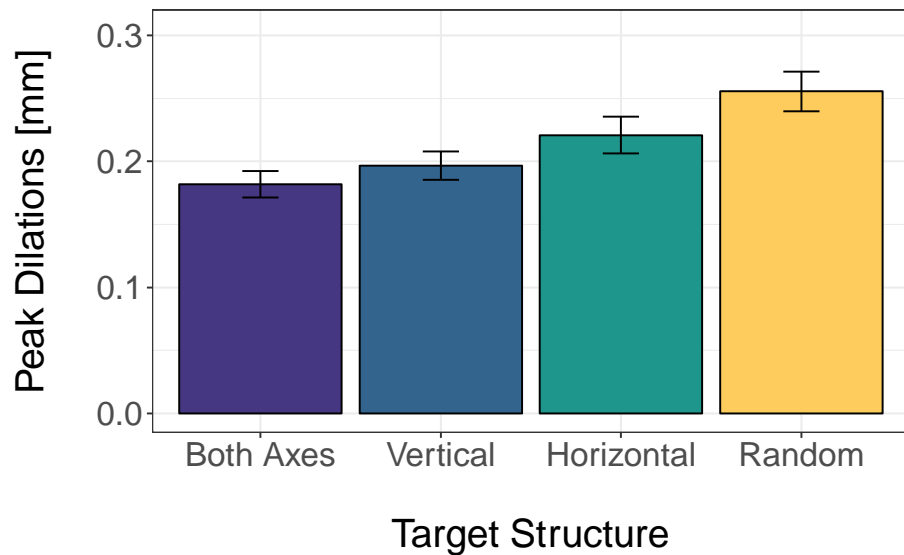
Experiment 1: Procedure

Ratings conducted with 10 randomly chosen stimuli from each category

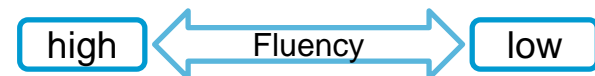
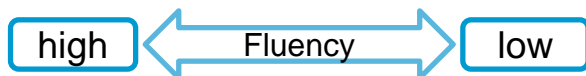
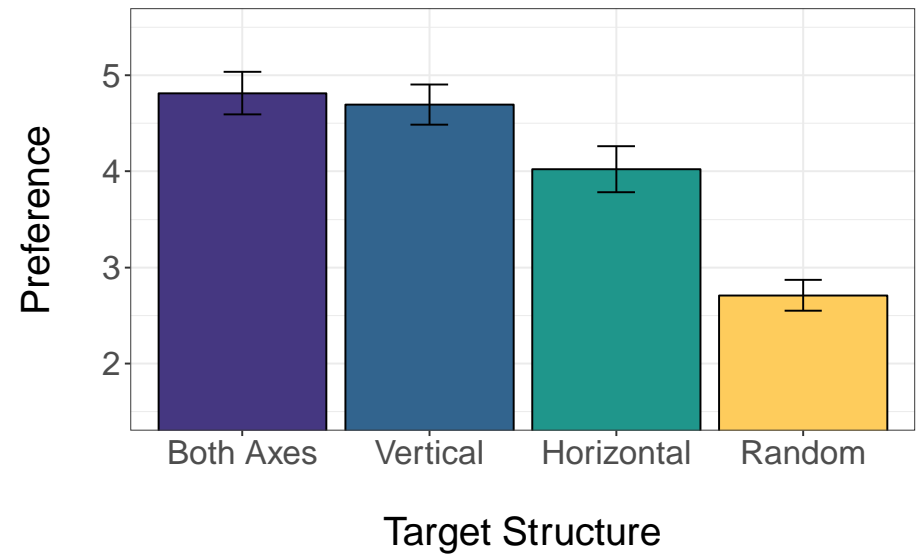


Experiment 1: Results

Pupillary Peak Dilation (response-locked)



Preference Rating



Experiment 1: Summary

Stimuli that were easier to process produced ...

- ... greater preference
- ... **smaller** peak dilation

The direction of pupil dilation was opposite from research done with paintings

The pupil may respond differently during automatic and deliberate processing

If we force people to stay on the automatic stage while processing paintings, do results hold up?

Experiment 2: Stimuli

Abstractness

low

medium

high

Art Style

Cubist



Mujer sentada,
Blanchard (1928)

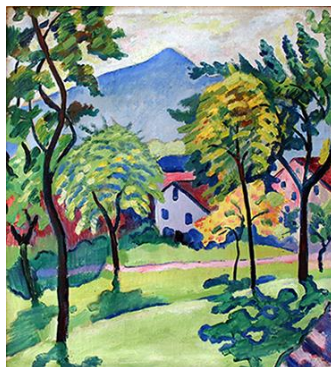


Sitting Man,
De la Fresnaye (1914)

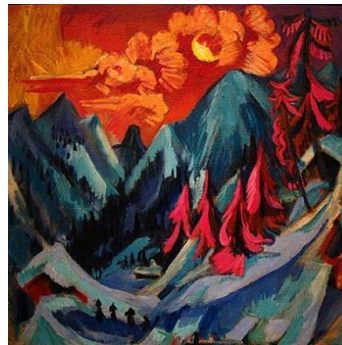


Fate,
Baumann (1918)

Expressionist



Tegernsee Landscape,
Macke (1910)

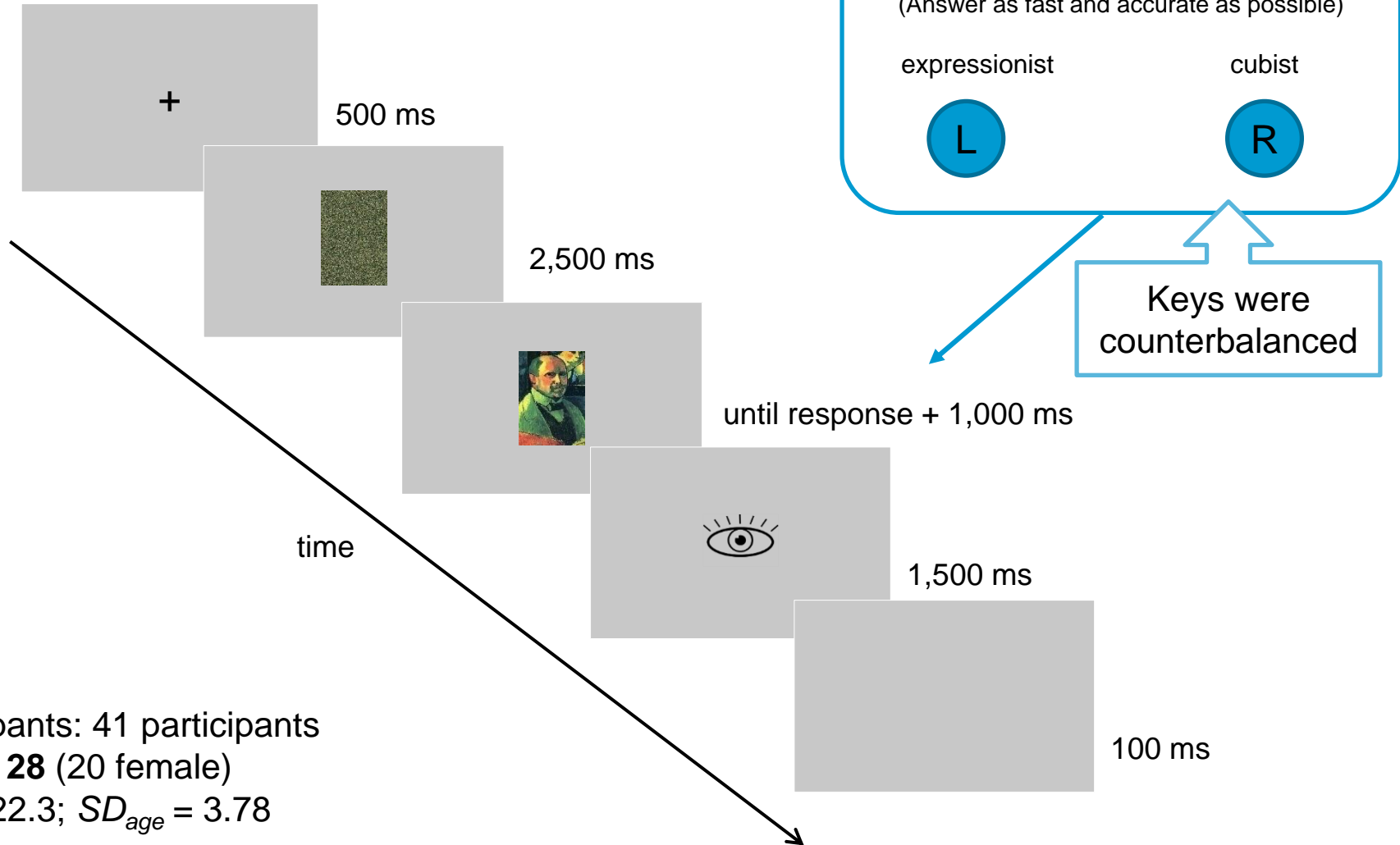


Winter Landscape in Moonlight,
Kirchner (1919)



Caliban,
Marc (1914)

Experiment 2: Procedure



Participants: 41 participants

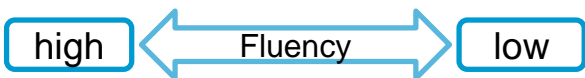
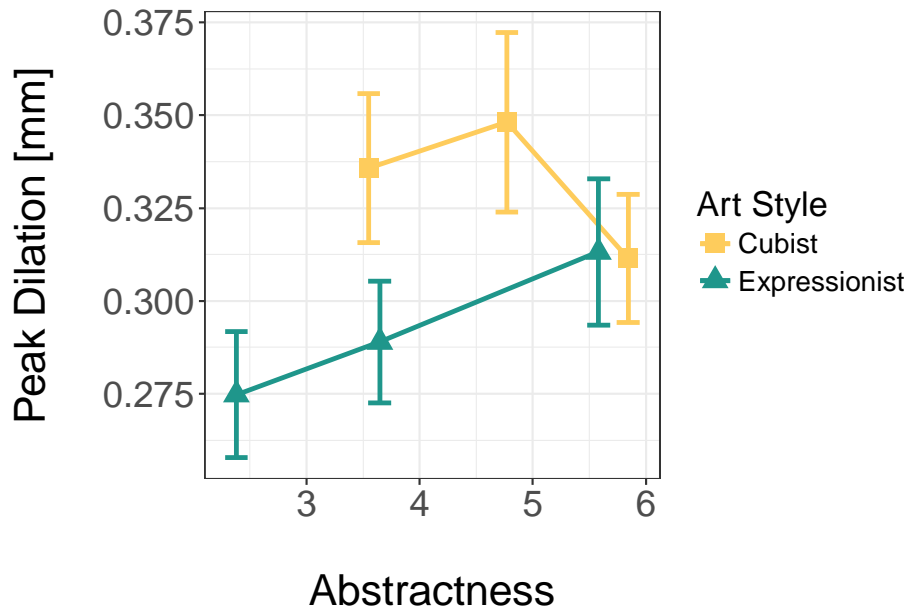
$N_{\text{Final}} = 28$ (20 female)

$M_{\text{age}} = 22.3$; $SD_{\text{age}} = 3.78$

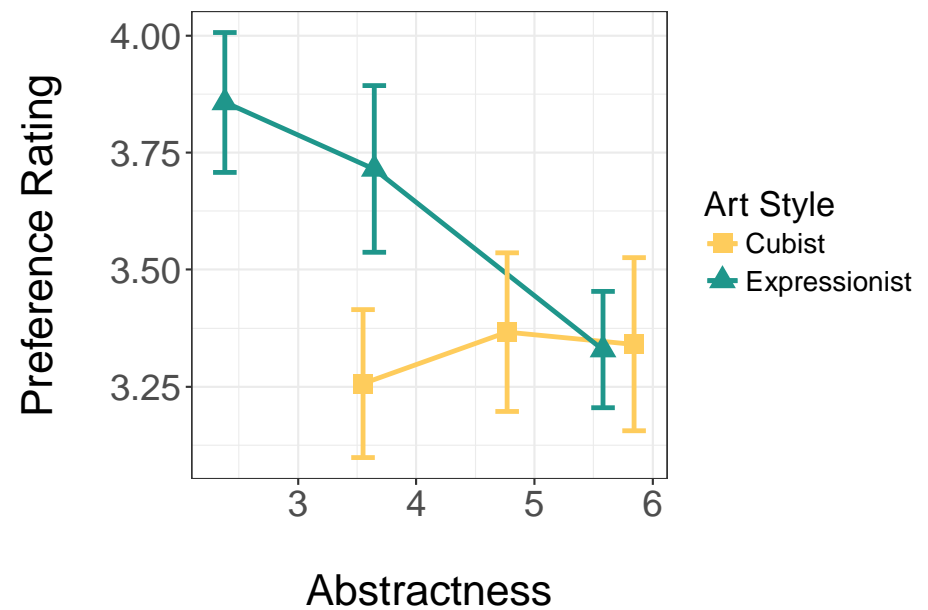
Painting: „Self-Portrait“, Jawlensky, (1912)

Experiment 2: Results

Pupillary Peak Dilation (response-locked)



Preference Rating



Experiment 2: Summary

Expressionists: less abstract produce ...

- ... greater preference
- ... **smaller** peak dilation

Cubists

- ... no significant effect on preference
- ... medium abstractness: greatest pupil dilation

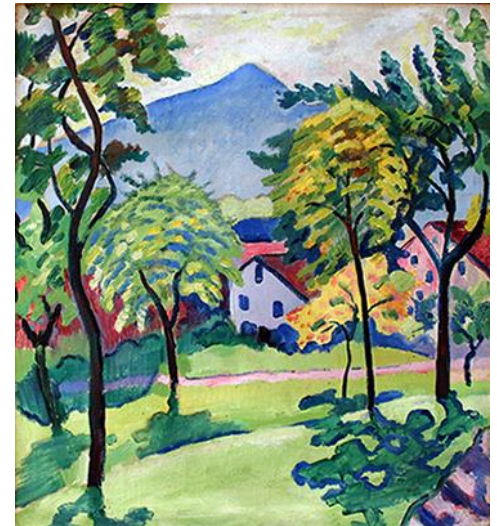
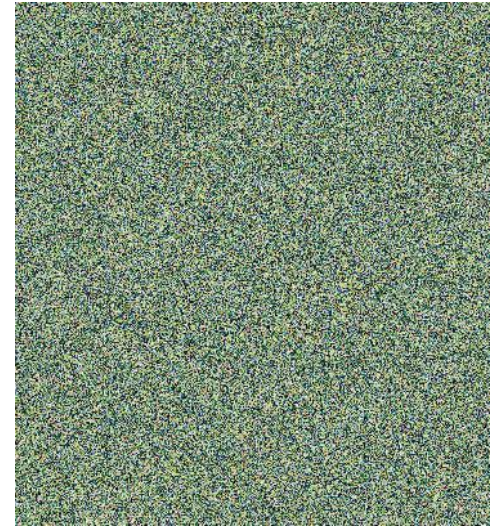
We forced participants to stay on automatic stage, so the pupil response for expressionists is in the...

- ... same direction as with symmetric stimuli
- ... opposite direction compared to earlier studies

(Elschner et al., 2017; Kuchinke et al., 2009)

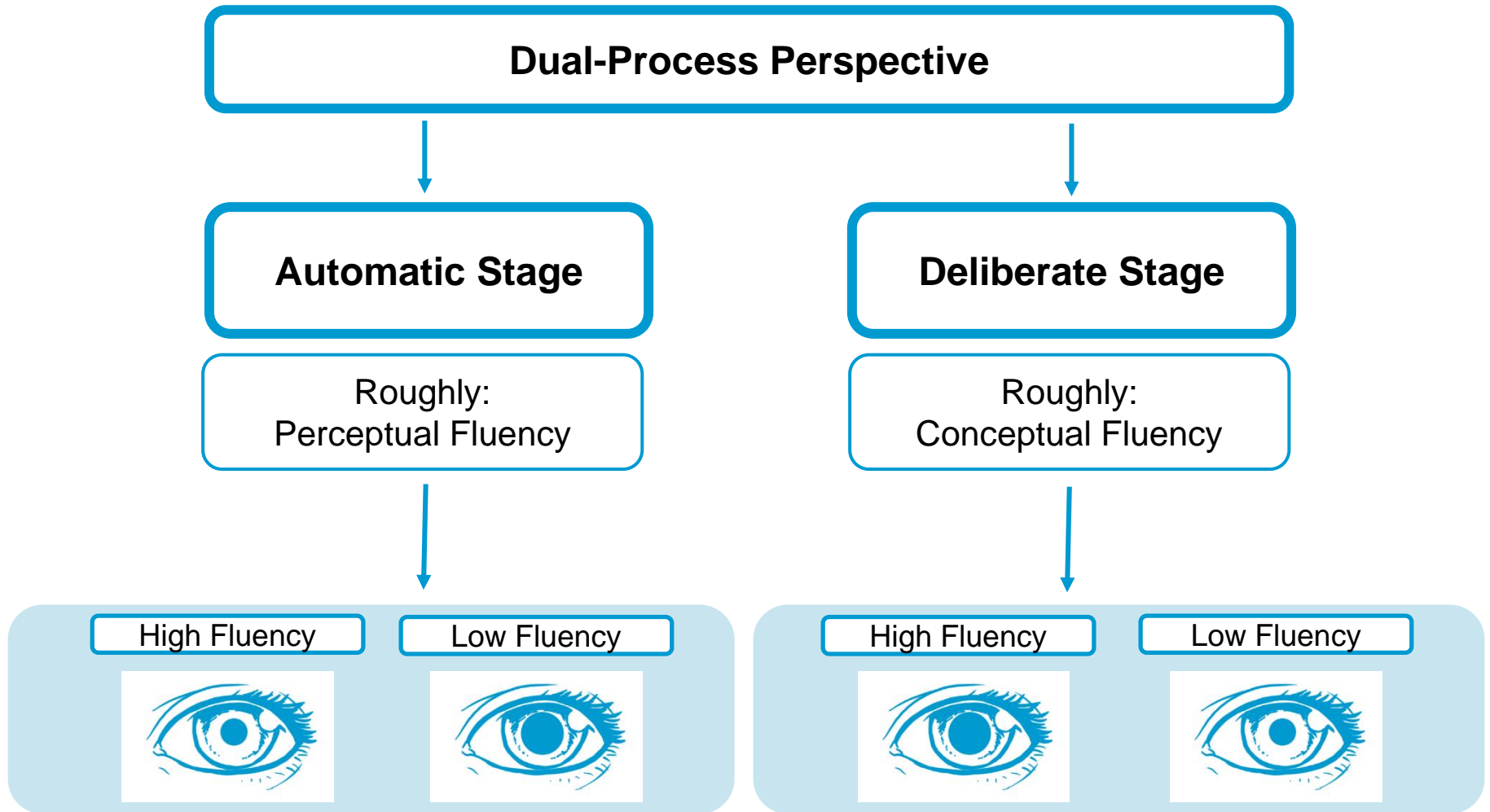
Limitation

- Participants used the color of pre-stimulus as processing cue

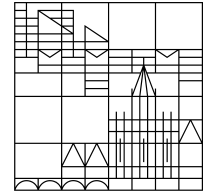


Tegernsee Landscape,
Macke (1910)

Does pupil response reflect processing depth?



Graf & Landwehr (2015); Elschner & Hübner (2018; current talk)



Thank you for attending!

Psychology of Aesthetics, Creativity, and the Arts

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Do Fluency-Induced Pupillary Responses Reflect Aesthetic Affect?

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Recently, Kuchinke, Trapp, Jacobs, and Leder (2009) used pupillary peak dilations (PDs) to test the hypothesis that fluent picture processing elicits aesthetic affects. They used reproductions of cubist pictures of different abstractness as stimuli, which was assumed to modulate processing fluency. As a result, less abstract pictures were not only processed more fluently and preferred, they also produced larger PDs than more abstract ones. This was interpreted as support of their hypothesis. The aim of the present study was to replicate and generalize these results with an improved method and by adding expressionist pictures, which covered a relatively large range of abstractness. In the first experiment, where art style was blocked, there were no clear results. Therefore, the authors randomized art style in the second experiment. This time PDs increased with decreasing abstractness, even though significantly only for the expressionist pictures. However, there was no relation between preference and PDs. Thus, although they also observed a covariation between abstractness and pupil size, the data do not support the idea that PDs reflect fluency-induced aesthetic affect.

Keywords: aesthetic preference, emotion, pupil size, processing fluency

The question of why we like some pictures or objects more than others has been debated in philosophy for hundreds of years and was one of the first investigated in experimental psychology (Fechner, 1876). Whereas some theorists assumed that aesthetic

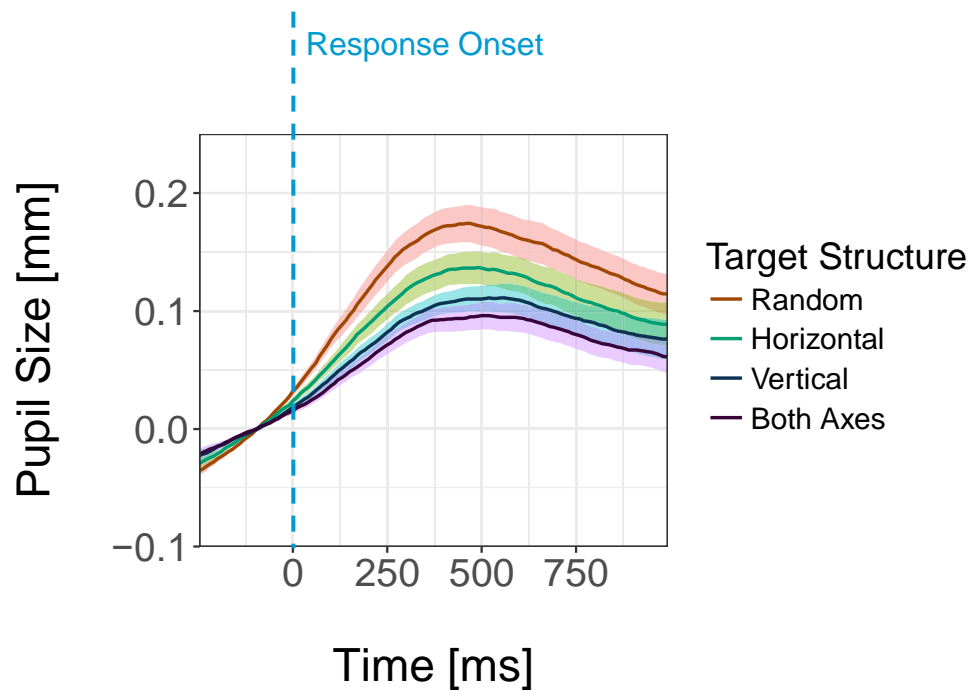
artworks. Recently Kuchinke et al. (2009) tried to answer this question using pupillary responses. Research shows that pupillometry can well be used to examine emotional responses, because pupils dilate if people are excited (Bradley, Miccoli, Escrig, &

Elschner, S. G., Hübner, R., & Dambacher, M. (2017). Do fluency-induced pupillary responses reflect aesthetic affect?. *Psychology of Aesthetics, Creativity, and the Arts*, doi:10.1037/aca0000139.

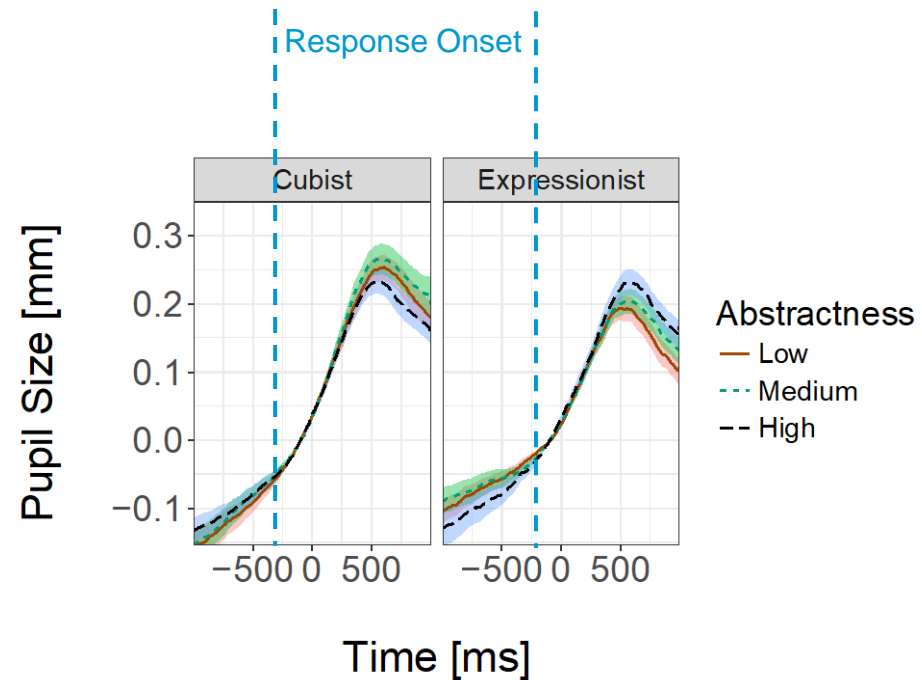
Supplementary Material

Pupil Time-Course (response-locked)

Experiment 1

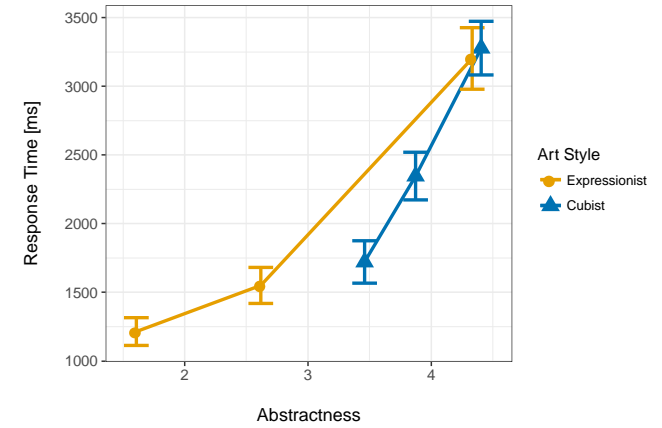


Experiment 2

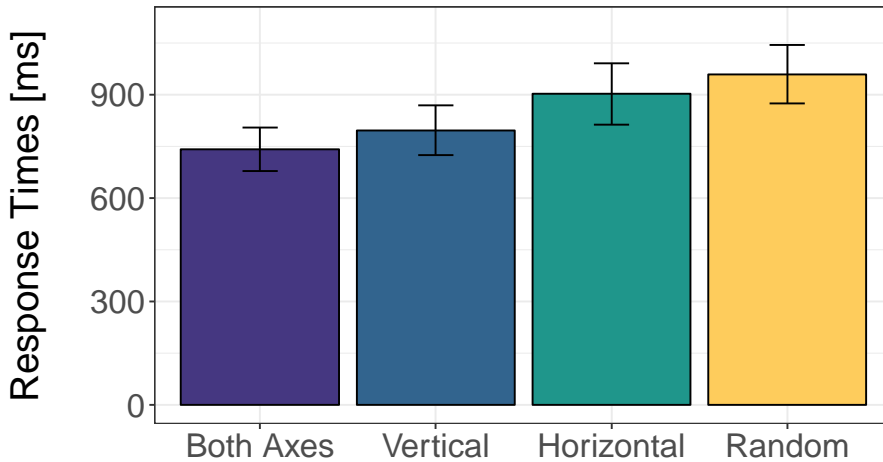


Response Times

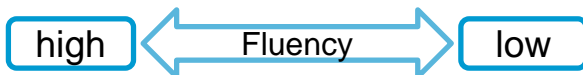
Elschner et al. (2017), Fig. 8



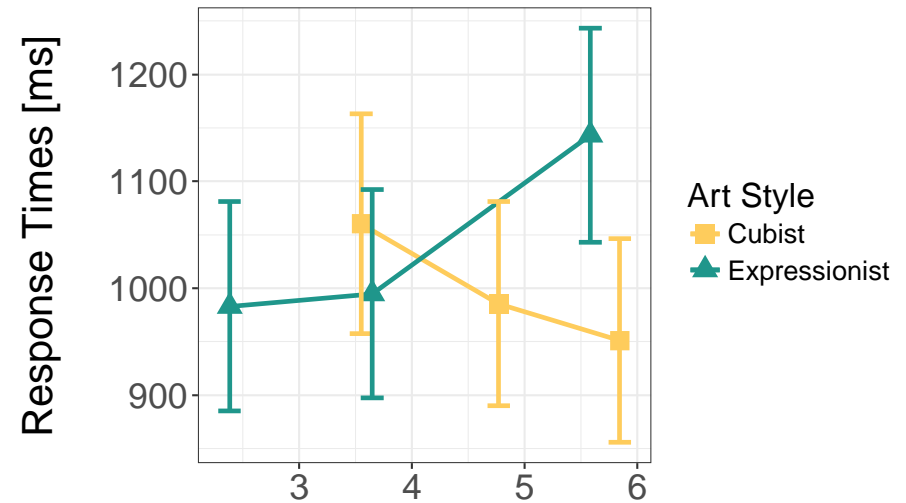
Experiment 1



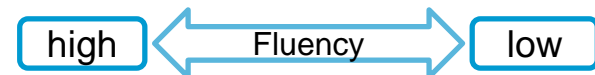
Target Structure



Experiment 2

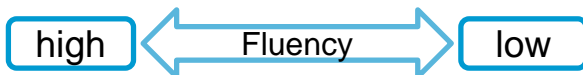
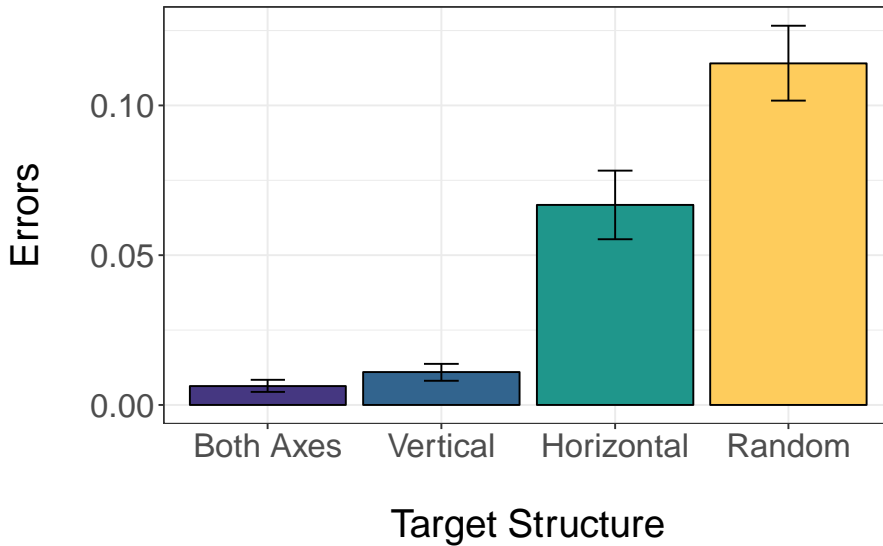


Abstractness

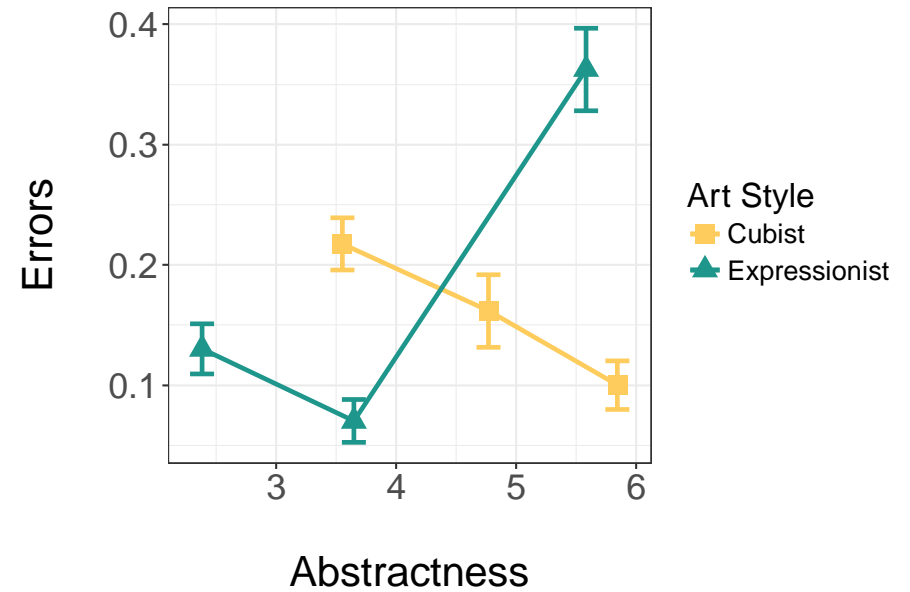


Errors

Experiment 1

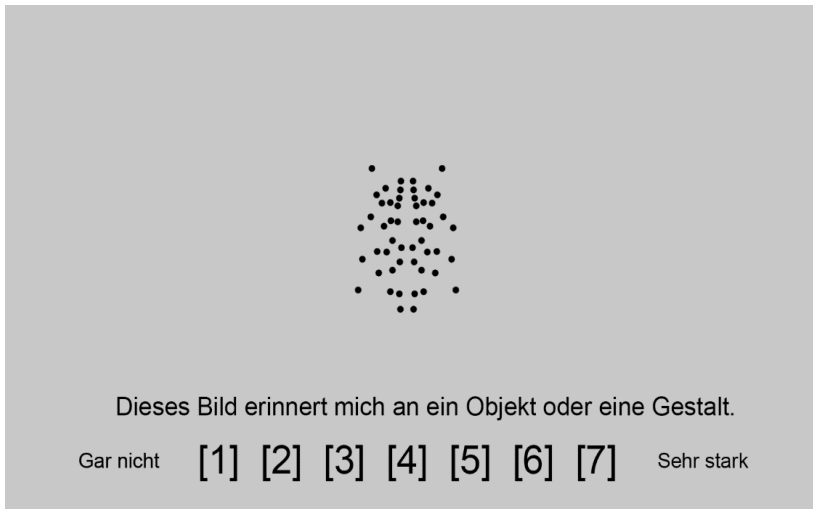


Experiment 2

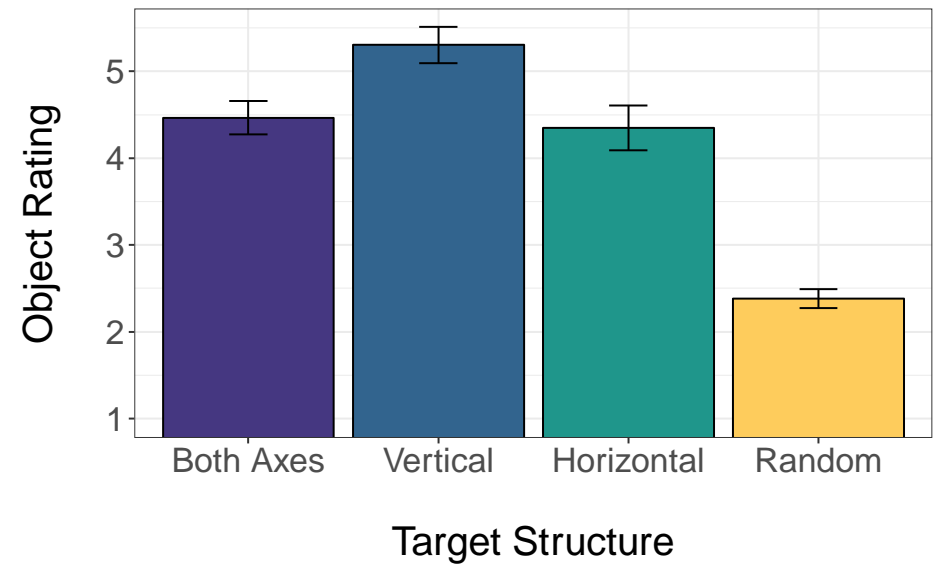


Experiment 1: Content Recognition

Procedure



Results



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