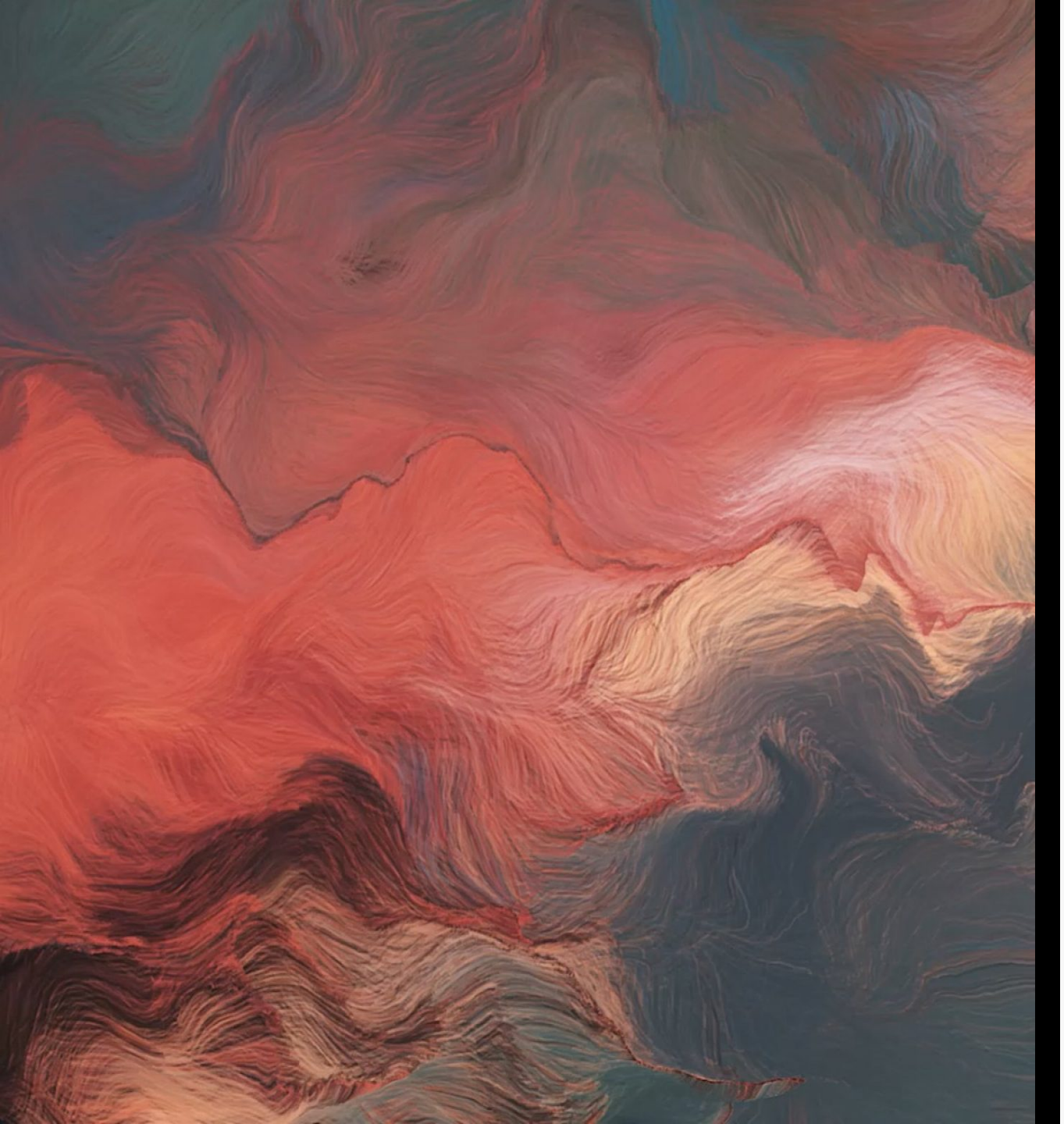
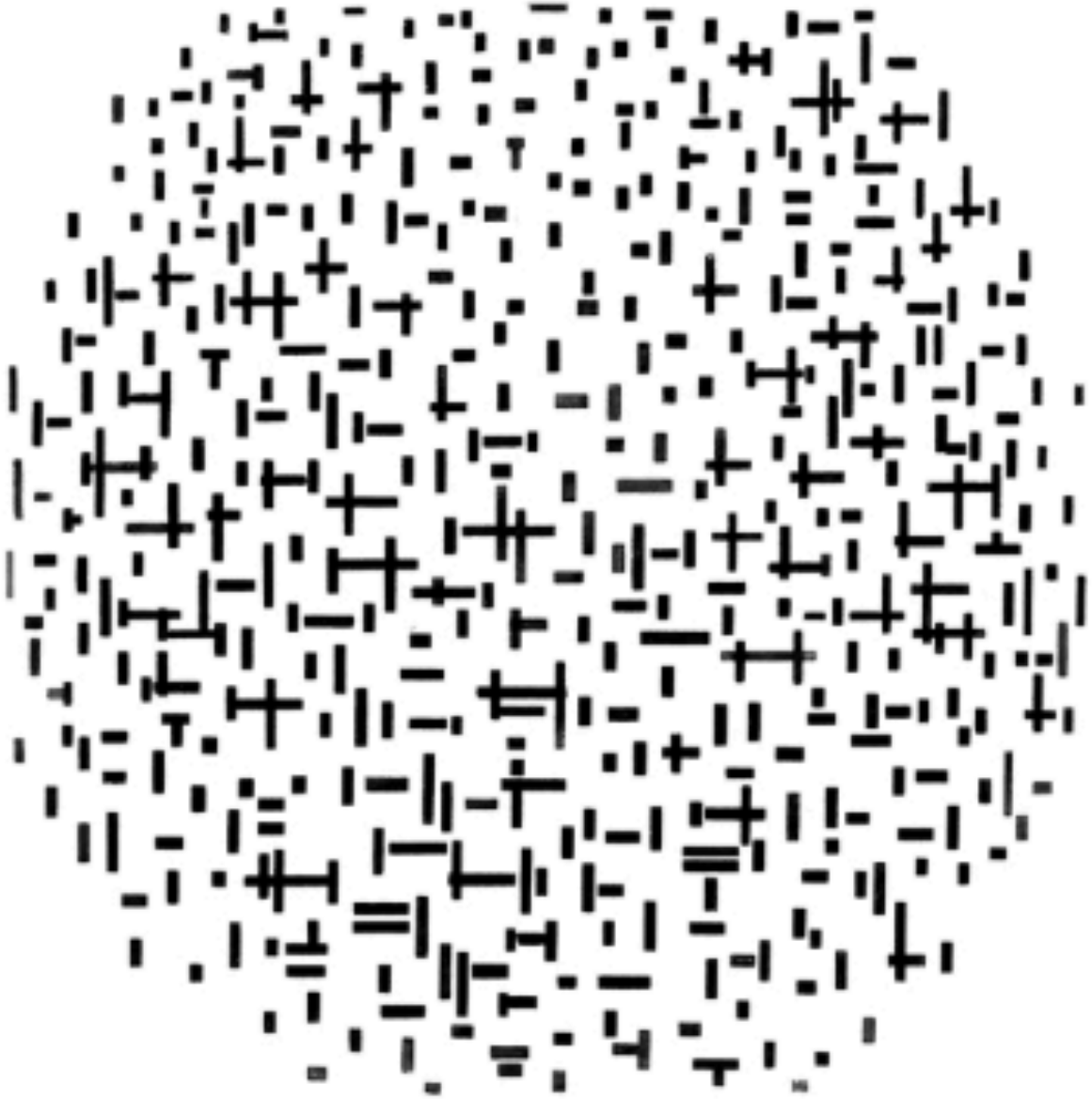


Putting the **Art** in the **Art**ificial

CHAMBERLAIN, MULLIN, SCHEERLINCK, & WAGEMANS, 2017

15TH MAY, 2020



Machine-made or Human-made?

$432,500 / £352,000

Human-made or machine-made?

- Low level image properties
- Rigidity v/s “naturalness”
- Self-similarity
- Complexity
- Heterogeneity
- Anisotropy (uniform distribution of oriented edges)

Aesthetic Preference vs Aesthetic Value

- Intentionality
- Authenticity
- Effort
- Contact between art and artist
- Low level image properties
- Embodiment

- Human-made art valued more & preferred more

Explicit or Implicit Prejudice?

- High level cognitive judgement that computer art is less valuable
- Inherent characteristics of computer generated art that are disliked

Study 1: Is there an aesthetic bias against computer art?

- “any work of art (either abstract or representational) that uses digital technology as an essential part of the creative or presentation process.”
- Between groups (**Rate** first, **Categorise** first)
- Low level image statistics
- Age and education
- Art Education
- Free responses

Study 1: Is there an aesthetic bias against computer art?

- 60 images (30 machine-made, 30 human-made; Representational & Abstract)
- N=65, 20 art-educated, 45 non-art educated
- N=34 Rate first, N=31 Categorise first
- Rate: 1-7 (very unattractive to very attractive)
- Categorise: Computer-generated or man-made?

Categorisation performance

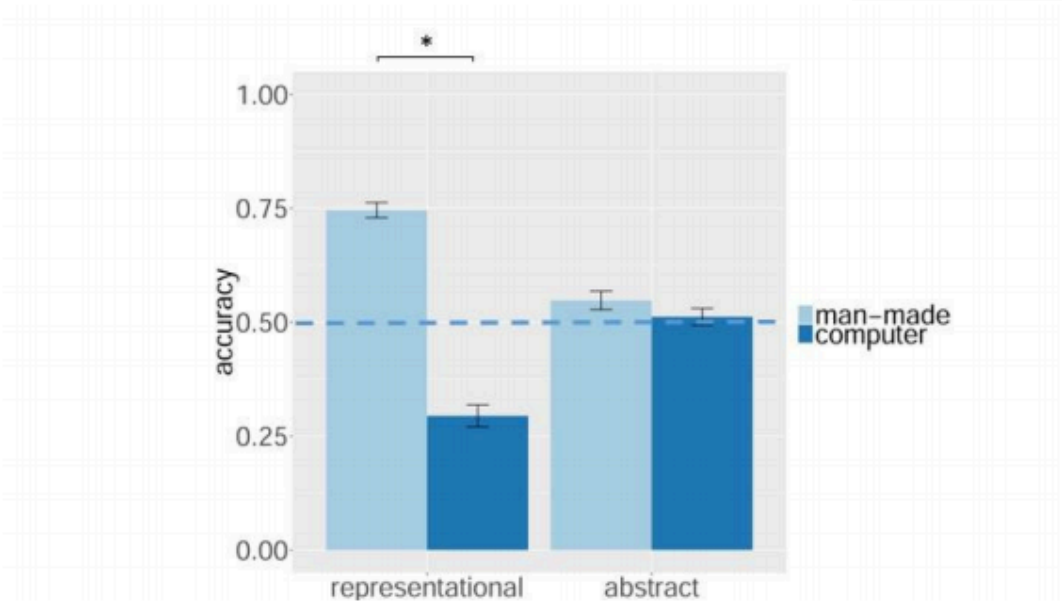


Figure 1. Mean accuracy by image source (computer/man-made) and type (abstract/representational). Error bars represent +/- 1 standard error of the mean. Dotted line represents 50% accuracy.

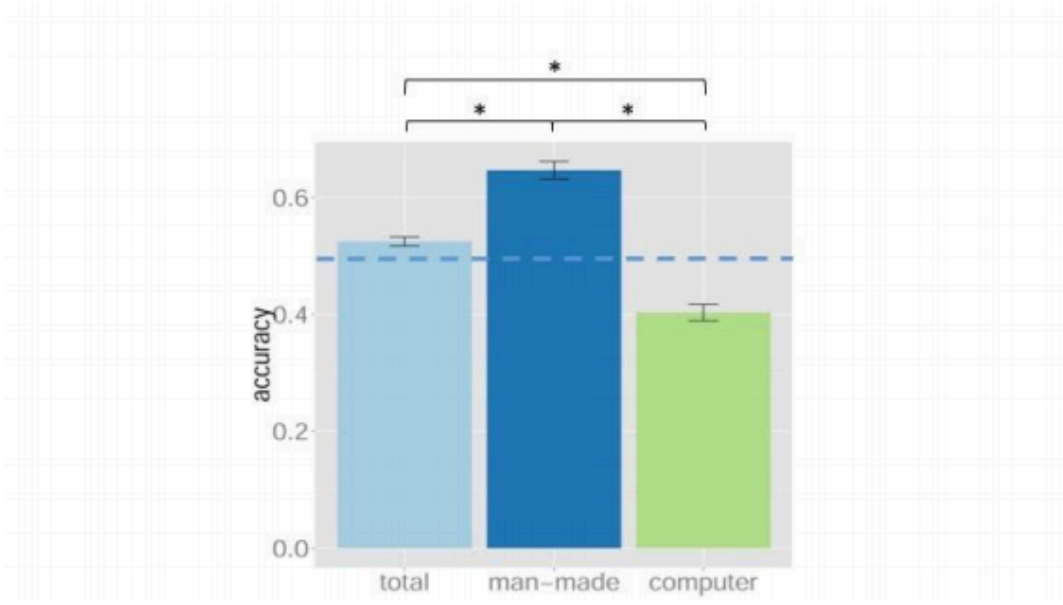


Figure 2. Overall accuracy across image types and accuracy for ground truth man-made and computer-generated image categories. Error bars represent +/- 1 standard error of the mean. Dotted line represents 50% accuracy.

Image properties and choice -> aesthetic ratings

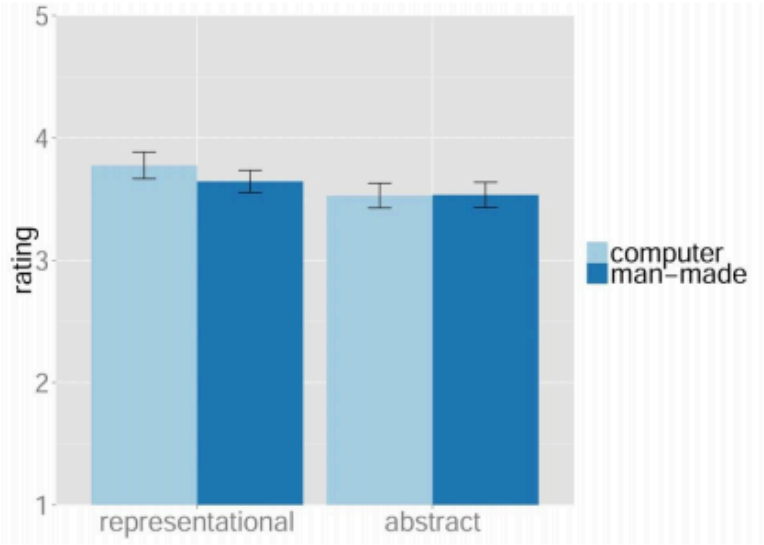


Figure 3. Impact of image type and source on aesthetic ratings. Error bars represent +/- 1 standard error of the mean.

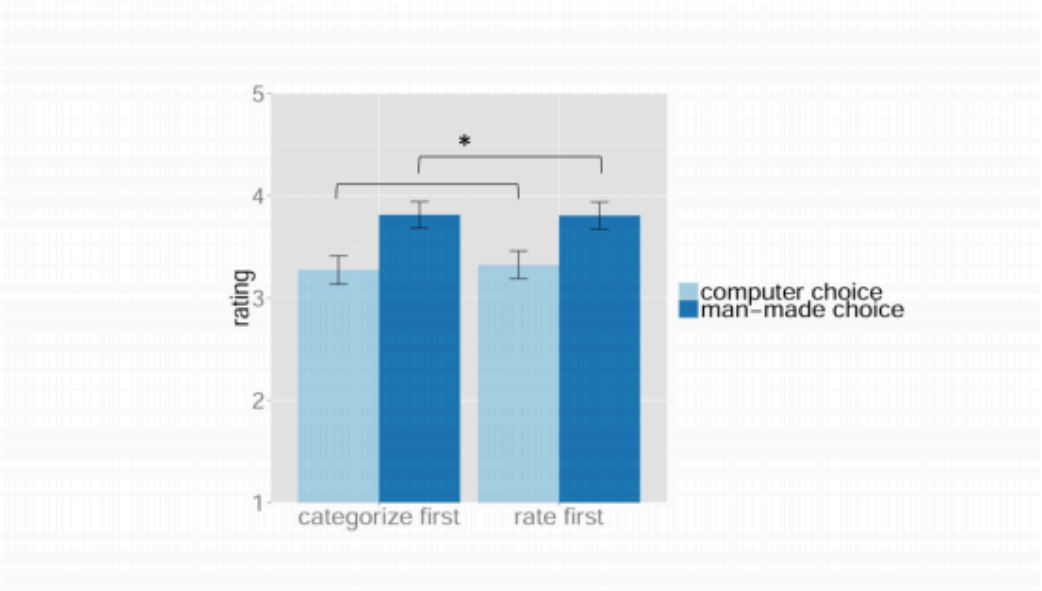


Figure 4. Impact of image choice on aesthetic rating in 'rate first' and 'categorise first' participant subgroups. Error bars represent +/- 1 standard error of the mean.

Effects of expertise

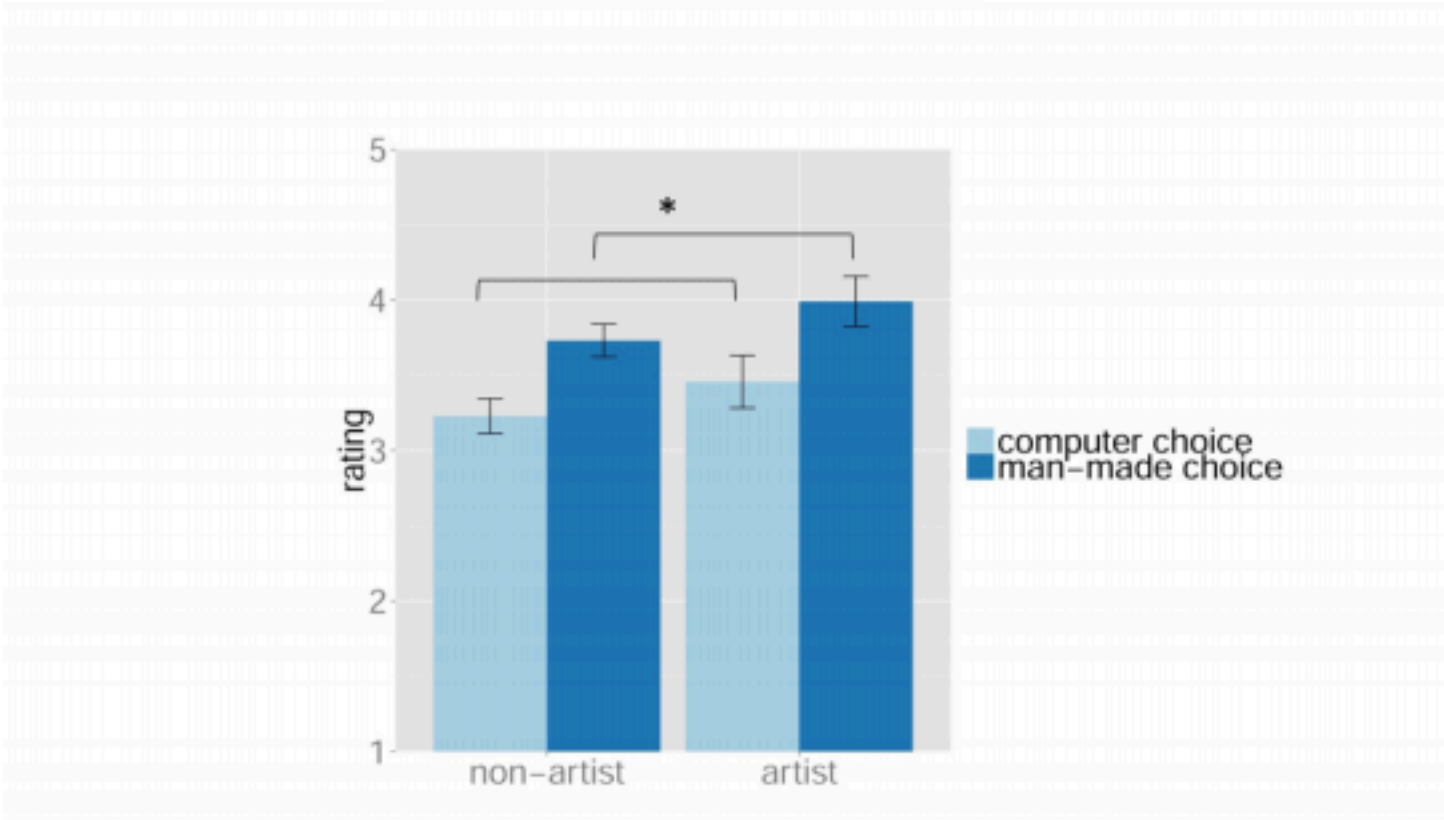


Figure 5. Impact of image choice on aesthetic ratings for art-educated and non-art educated participants. Error bars represent +/- 1 standard error of the mean.

Image stats and categorisation

Table 1. Difference in image statistics for abstract/representational and computer-generated/man-made images.

	Abstract/Representational		Computer-generated/Man-made	
	95% CI of Mean Difference	*t*-test	95% CI of Mean Difference	t-test
Self-similarity	-0.04, 0.08	0.58	-0.90, 0.03	-0.91
Complexity	-1.69, 6.83	1.21	-6.95, 1.57	-1.27
Anisotropy	0.00007, 0.0003	3.08*	-0.0002, 0.00008	-0.91
Fourier Slope	-.010, 0.60	1.94	-0.42, 0.20	-0.71

Notes: *$p<.006$ (Bonferroni corrected for multiple comparisons)

Image stats and categorisation

Table 2. Correlation between image categorisation, aesthetics, accuracy and image statistics.

	Mean aesthetic rating per image	Proportion of trials in which image was categorised as man-made	Mean accuracy per image
Self-similarity	0.04	0.24	0.13
Complexity	-0.08	-0.01	-0.01
Anisotropy	-0.25	-0.43*	0.02
Fourier Slope	-0.20	-0.16	0.06

Notes: *p<.001

Thematic analyses of free responses

Table 3. Thematic analysis of participants' free response when asked how they made their categorisation judgements

		Computer-generated		Man-made	
Theme	Subtheme	Keywords	Frequency	Keywords	Frequency
Surface	Colour	Bright/Artificial	13	Natural/Varied	8
	Line & Shape	Rigid/Perfect/Straight	30	Imperfect	8
	Mark-making	Not hand-made	5	Hand-made/brush strokes	37
Structure	Regularity	Uniform/Symmetrical	6	Random/Irregular	8
	Repetition	Identical/Repetitive	6	Different forms	2
	Complexity	Detailed/Complex	7	Simple	2
	Depth	Lack of depth	1	Depth	2
Content	Abstraction	Abstract	4	Figurative	2
Intentionality	Emotion	Lack of expression	2	Feeling/expression	3
	Cognition	Lack of reason	1	Reason	2
	Uniqueness	Uninspired	1	Unique	2

Discussion

- Bias against computer-generated art
- No difference between rate-first and categorise first:
  1) bottom-up aspects of the artwork (e.g. anisotropy)
  2) initial, rapid aesthetic response occurred before categorisaton
- Nature of the bias still unclear? What about the effort heuristic, intentionality, embodiment (physical presence)?

Study 2: Artistically Skilled Embodied Agents

Figure 6. The installation "5 Robots Named Paul" at the Bozar Centre for Fine Arts in Brussels, Belgium.

Stimuli

Figure 7. Example images displayed during both Condition 2: Source information and Condition 3: No Source Information. The images used in the study were created by the installation "5 Robots Named Paul" but did not correspond specifically to these identities.

Study 2

- Between-groups: Interactive, Source Info, No Source Info
- Interaction: N=145, 56 art educated, 57 art-interest
- Source Info: N=97, 20 art educated, 1 art-interest
- NoSourceInfo: N=107, 18 art-educated, 0 interest

Response to robot drawings

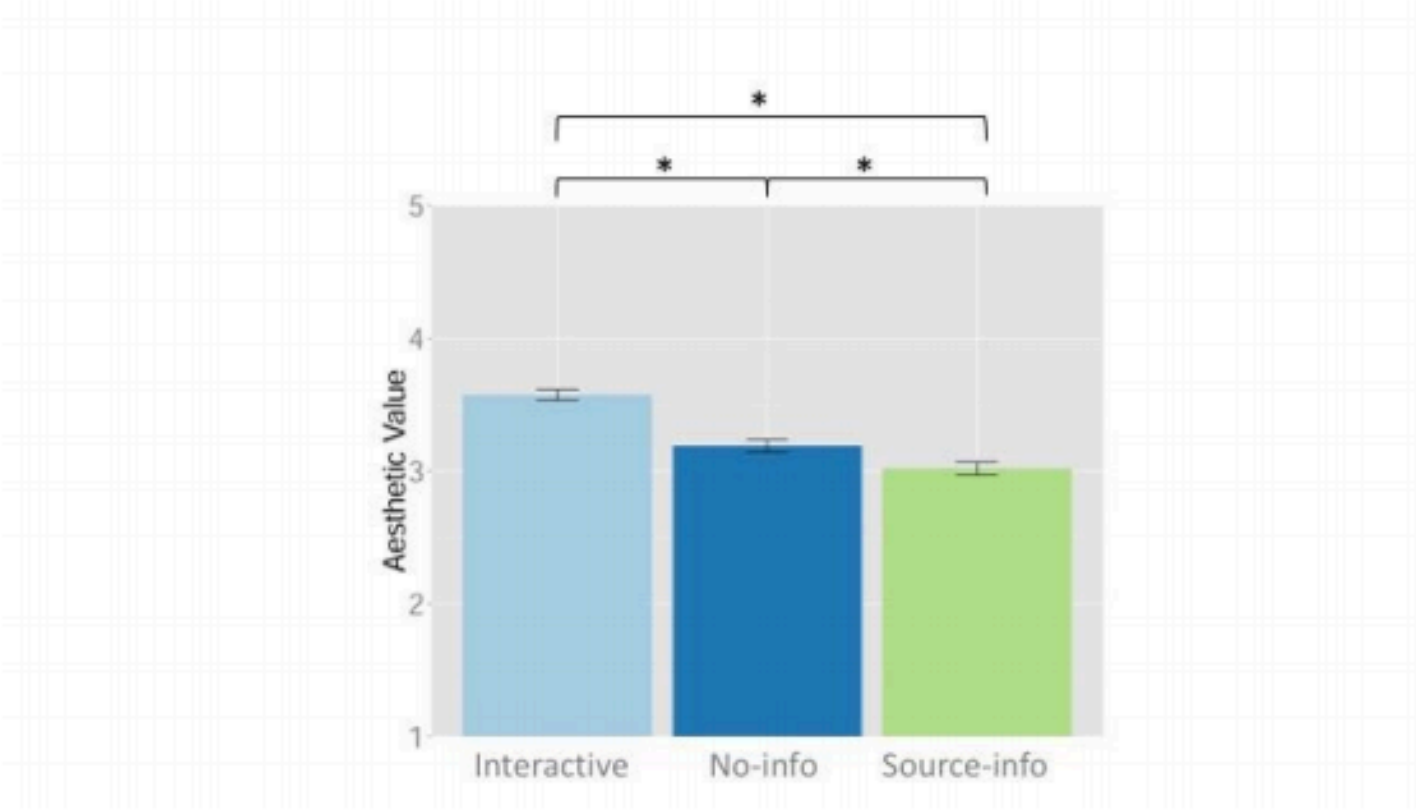


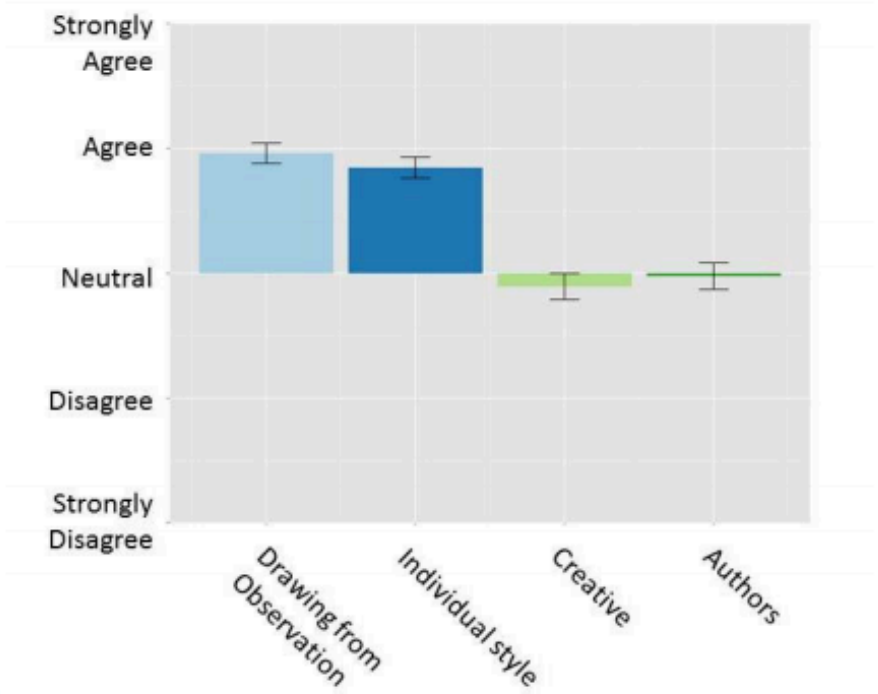
Figure 8. The impact of condition on mean aesthetic ratings of robotic drawings. Error bars represent +/- 1 standard error of the mean.

Art Education & Art Interest

Table 5. Aesthetic ratings grouped by art interest and art education with significance tests for difference between the group means.

		Mean	SD	*t*-value	95% CI	Cohen's D	p-value
Art-interested	No	3.24	.53	5.10	[0.23,0.53]	.55	<.001
	Yes	3.61	.45				
Art-educated	No	3.28	.53	1.28	[-0.04,0.21]	.14	.20
	Yes	3.36	.57				

Interactive condition data



a.

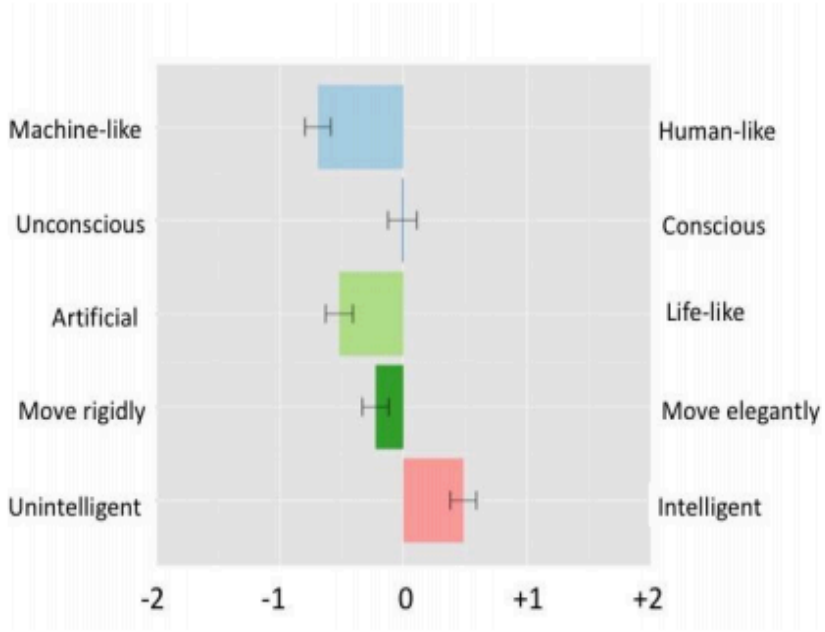


Figure 9. Response to questions pertaining to the a) artistic process of the robots b) the anthropomorphic properties of the robots. Error bars represent +/- 1 standard error of the mean.

Interactive condition data

Table 7. Correlations between responses to HRI and artistic process questions

	2.	3.	4.	5.	6.	7.	8.	9.
1.Human-like	.49*	.53*	.39*	.26	.04	.18	.30*	.17
2.Conscious	-	.55*	.24	.59*	.17	.13	.32*	.25
3.Life-like		-	.32*	.42*	.14	.24	.40*	.18
4.Moving elegantly			-	.35*	.10	.17	.31*	.14
5.Intelligent				-	.23	.17	.36*	.21
6.Drawing from observation					-	.13	.09	.11
7.Individual style						-	.41*	.12
8.Robots Creative							-	.40*
9.Robots Authors								-

Notes: N=129, *Bonferroni corrected p<.001

Interactive condition data

Table 8. Correlations between measures of subjective and objective value for drawings and perceptions of anthropomorphism and artistic process in drawing robots

	Anthropomorphism	Drawing from observation	Individual style	Robots creative	Robots authors
Aesthetic value	.35*	.25*	.35*	.51*	.36*
Anthropomorphism	-	.19	.25*	.46*	.28*

Notes: N=125, *Bonferroni corrected p<.01

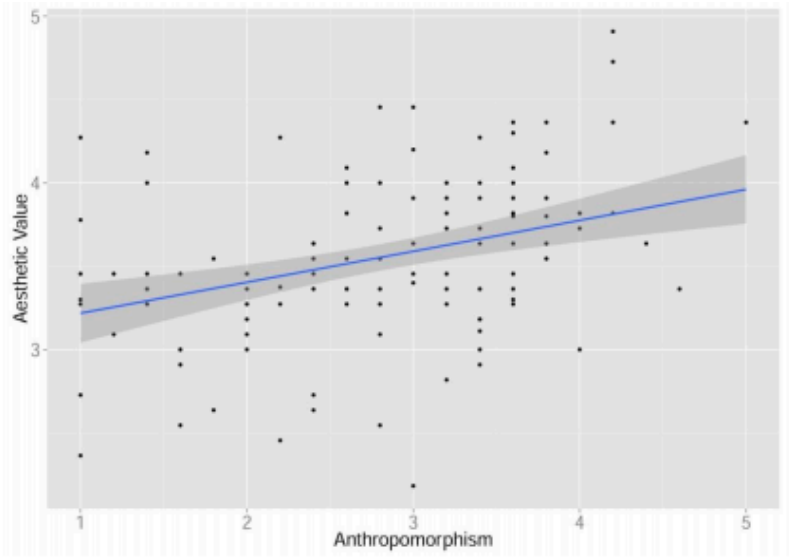


Figure 10. The relationship between perceived anthropomorphism and aesthetic rating. Shaded area represents 95% CI of linear regression line.

Discussion

- Bias against machine-made art: bottom-up & top-down?
- Embodiment + Effort Heuristic
- Conceptual dichotomies
- Aesthetic value v/s aesthetic preference
- Analysis?
- Experimental setup?
- Philosophical: can machine-made art be called “art”?

Thank you