

Dancing Brains & Thinking Bodies



Emily S. Cross
C-DaRE invites...
Coventry University
6 March 2024



**Social
Brain
Sciences**

ETH zürich



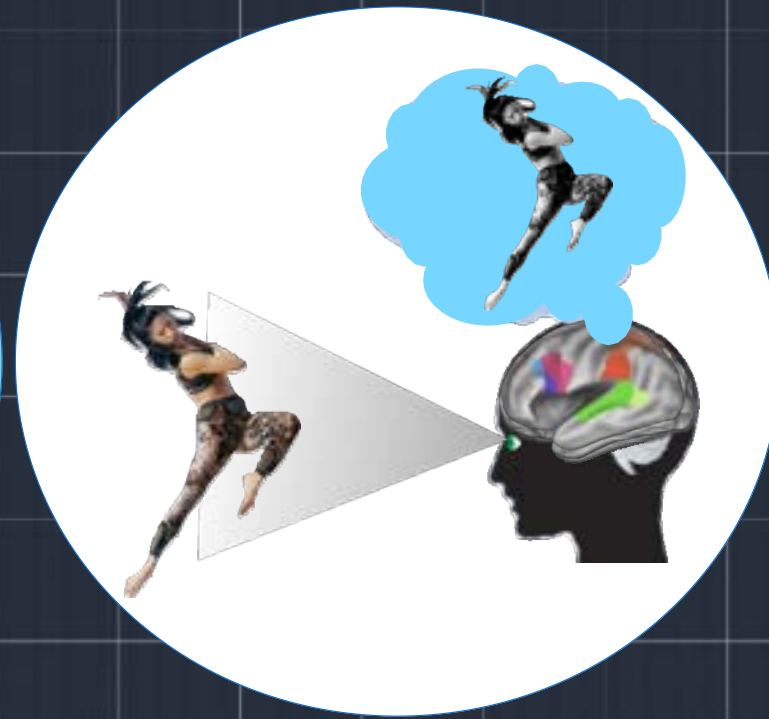
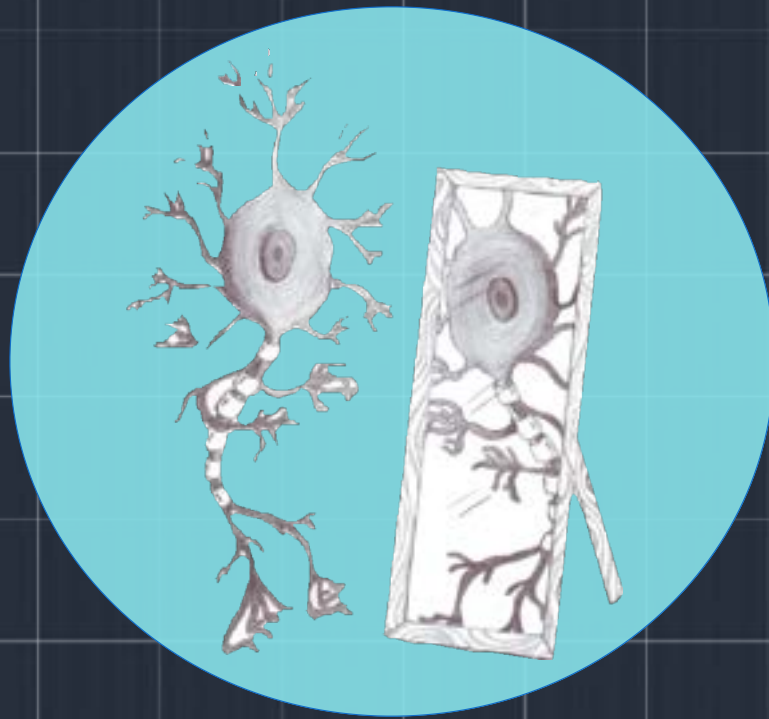
Social Brain in Action Lab

In daily life, we move our bodies, **but we also watch others**



**Social
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Sciences**

From mirror neurons to the action observation network



Actions are understood through directly matching observed actions onto one's own motor system



**Social
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Sciences**

Rizzolatti et al. (2001); gallese et al. (2004)

why might it be helpful to **use dance** to study **Action & aesthetic perception?**

● Most Research in This Domain



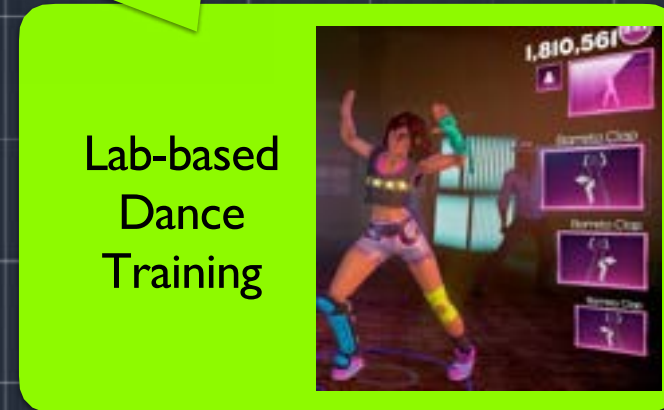
● My Team's Approach



**Social
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Perception & Embodiment explored through two main approaches

How does
experience shape
perception?



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Dance & Aesthetics Research in Focus

Action Expertise

how does action
expertise change
how we see others in
action?



Aesthetics & Embodiment

what is the relationship
between aesthetic
enjoyment and what we can
do with our own bodies?



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how does action expertise shape perception?



Action Expertise



- How does the acquisition of action expertise through weeks of physical practice shape the brain of the learner when he or she watches those same actions?

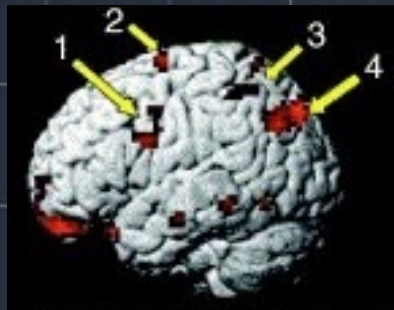


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action expertise, embodiment & aesthetics



Action Expertise



expert > non-expert dance style



Calvo-Merino et al. (2005) *Cerebral Cortex*



more embodiment = greater sensorimotor activity



Cross, Hamilton & Grafton (2006) *Neuroimage*



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perception is shaped by action expertise

- * Watching others in action also elicits subtle **emotional** responses in observers
- * To what extent are emotional responses and explicit ratings of enjoyment influenced by a viewer's **expertise** with observed movements (c.f. Christensen et al., 2016)?

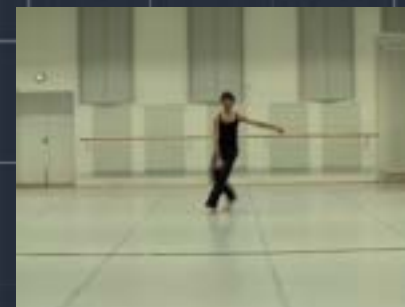


Action Expertise



Participants:

25 expert dancers
26 dance-naive
young adults



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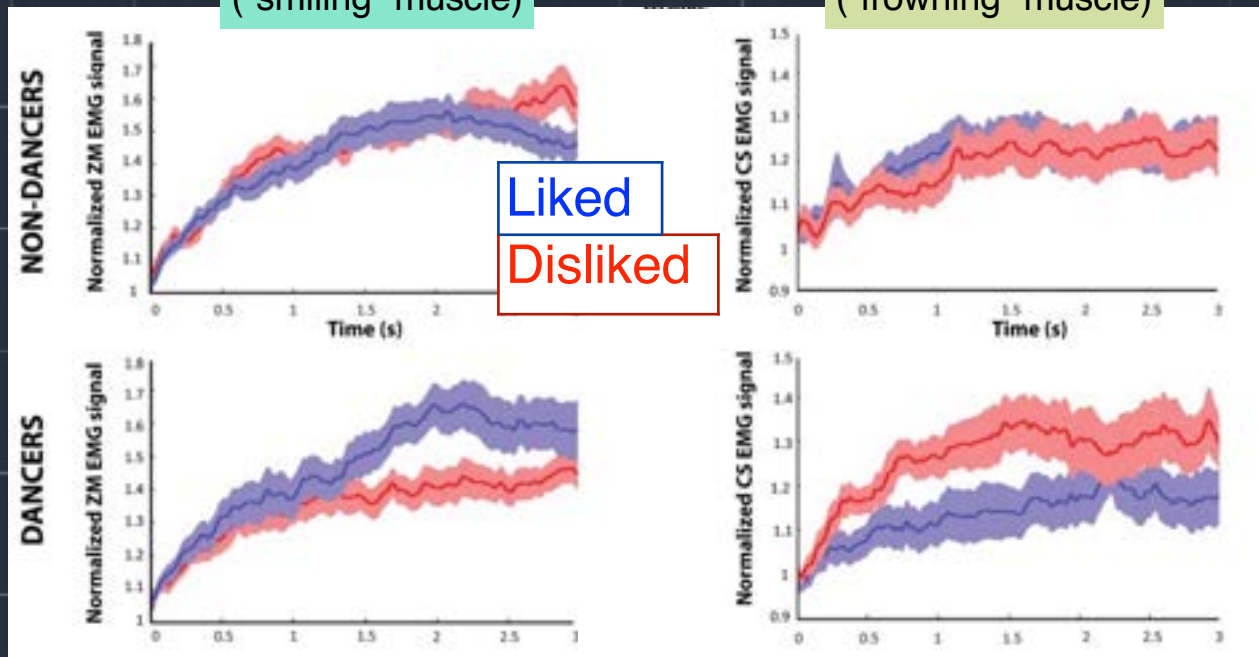
perception is shaped by action expertise



Action Expertise

Zygomaticus
("smiling" muscle)

Corrugator
("frowning" muscle)



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Kirsch, Snagg, Heerey & Cross (2016) *Plos One*

perception is shaped by action expertise



Action Expertise

Physical expertise shapes perception in terms of **sharpening responses** within brain regions that link action and perception, AND amplifying subtle **facial expressions of emotion** when observing others



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neuroaesthetics of dance



Neuroaesthetics

your brain on art



... and dance

limited to visual and reward processes, or might there be a role for the body as well?



Embodiment & Aesthetics



embodied neuroaesthetics

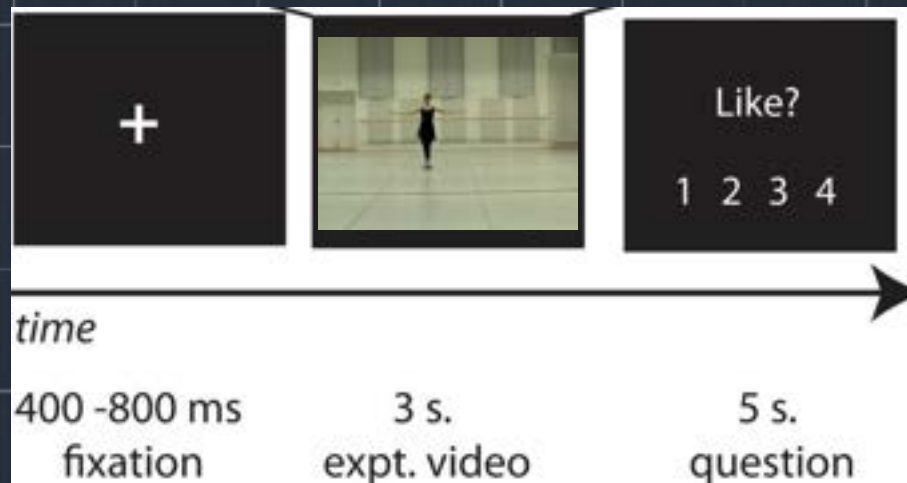


**Social
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Sciences**

Introducing the Cirque Du Soleil Effect



Embodiment & Aesthetics



How much did you like the video you just watched?

1. not at all
2. somewhat
3. I liked it
4. I liked it very much

How well could you perform the video just watched?

1. not at all
2. maybe some part
3. could do the basics
4. could perform well

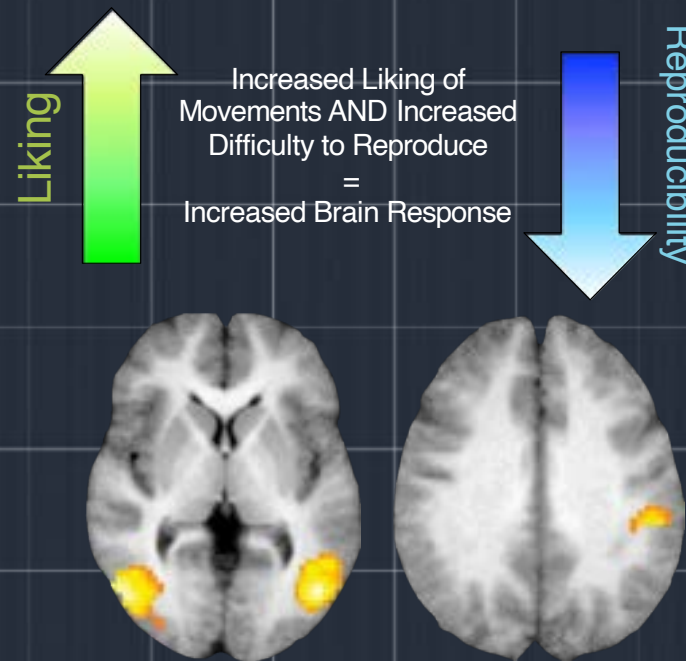
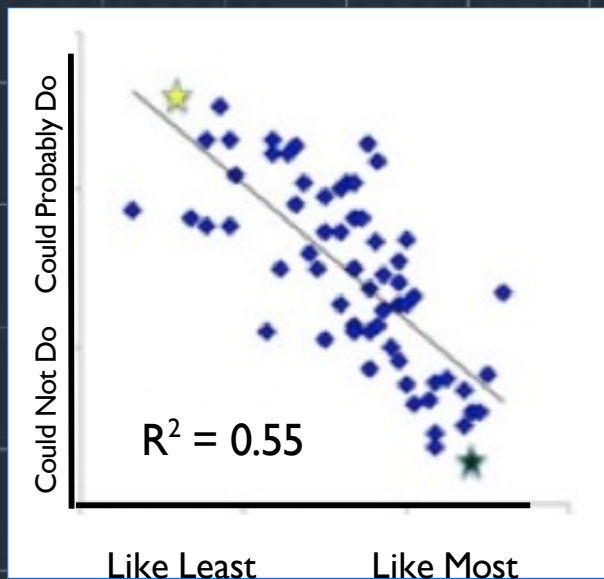


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Introducing the Cirque Du Soleil Effect



Embodiment & Aesthetics

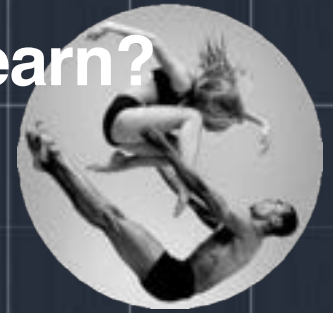


Cross et al. (2011) *Front. Human Neuroscience*



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But what happens to aesthetics when we practice/learn?



Embodiment & Aesthetics

Lab-based
Dance Training

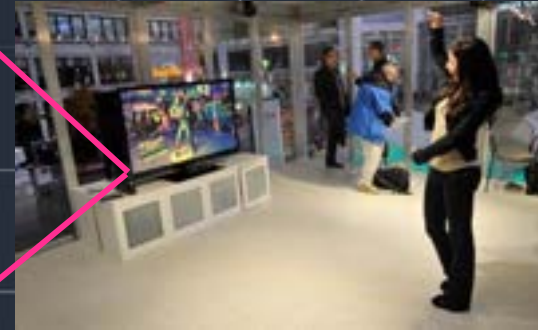


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But what happens to aesthetics when we practice/learn

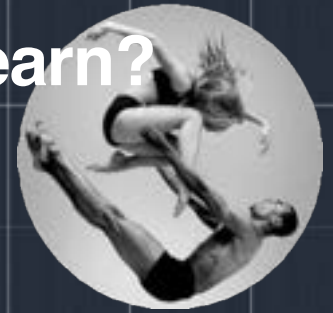


Embodiment & Aesthetics

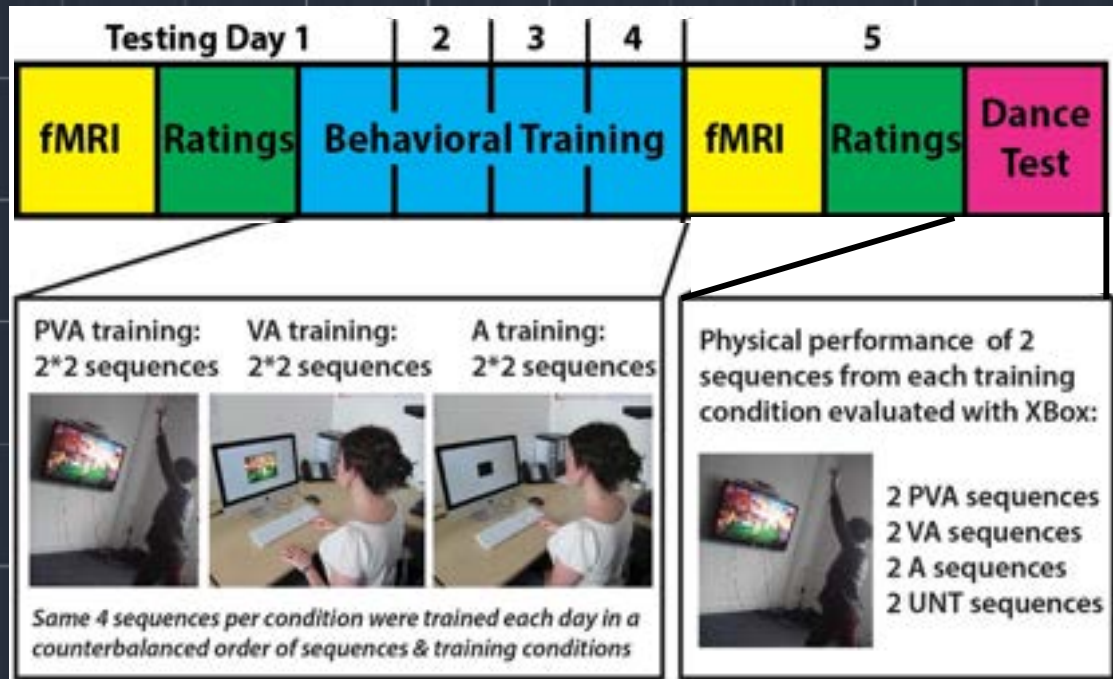


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But what happens to aesthetics when we practice/learn?



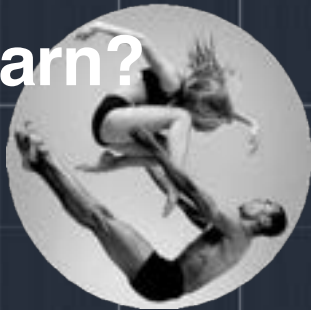
Embodiment & Aesthetics



Participants:
20 dance-naive
young adults

- Music + video + dance
- Music + video
- Music alone
- No training

But what happens to aesthetics when we practice/learn?



Embodiment & Aesthetics



Music + video + dance



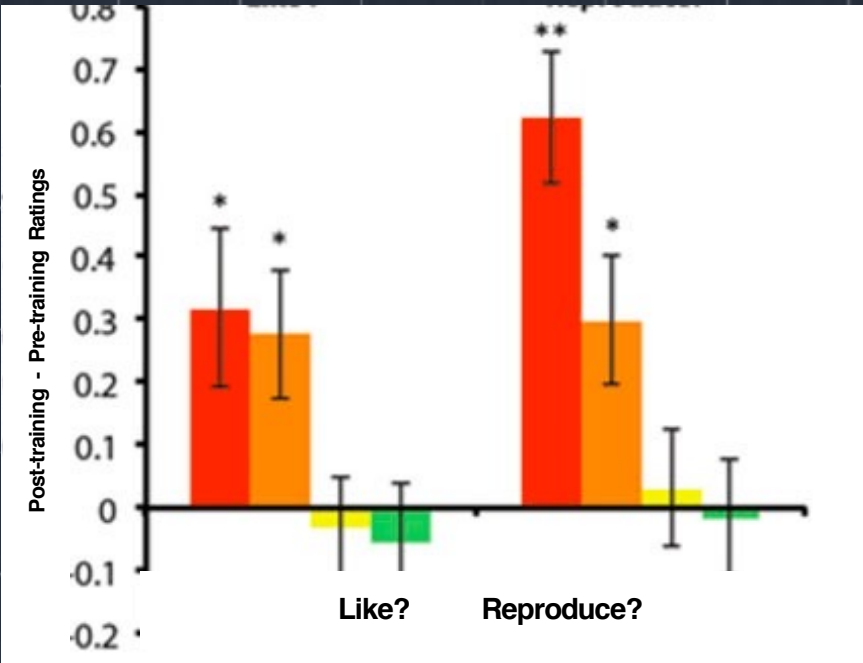
Music + video



Music alone



No training



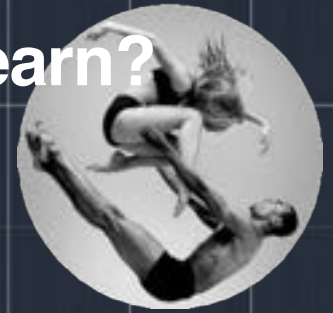
Participant Ratings Based on Training Experience



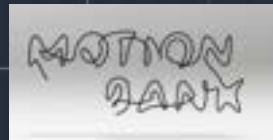
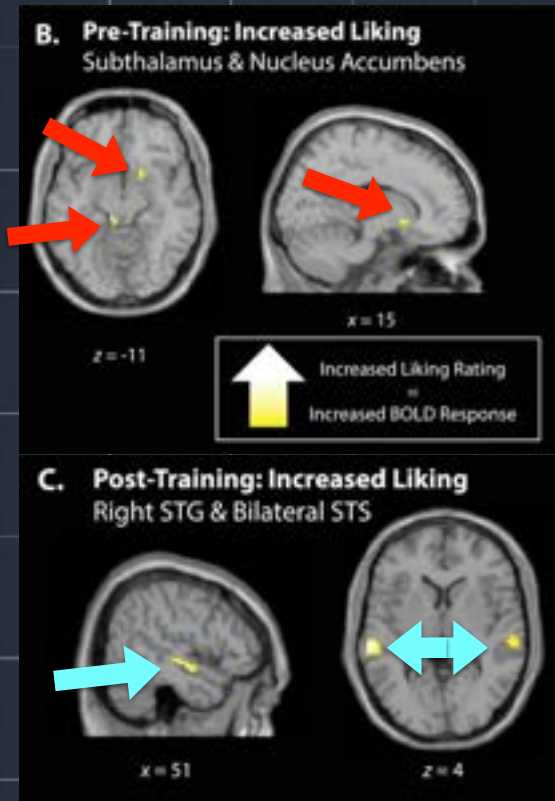
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Kirsch, Dawson & Cross (2015) *Annals NYAS*

But what happens to aesthetics when we practice/learn?



Embodiment & Aesthetics

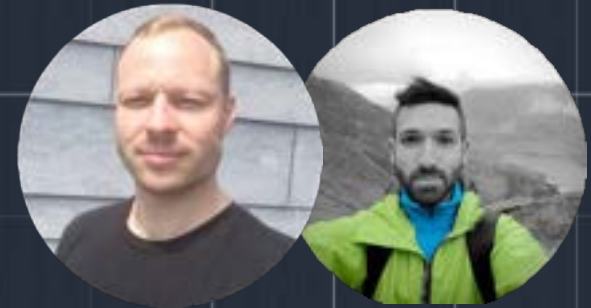


Social
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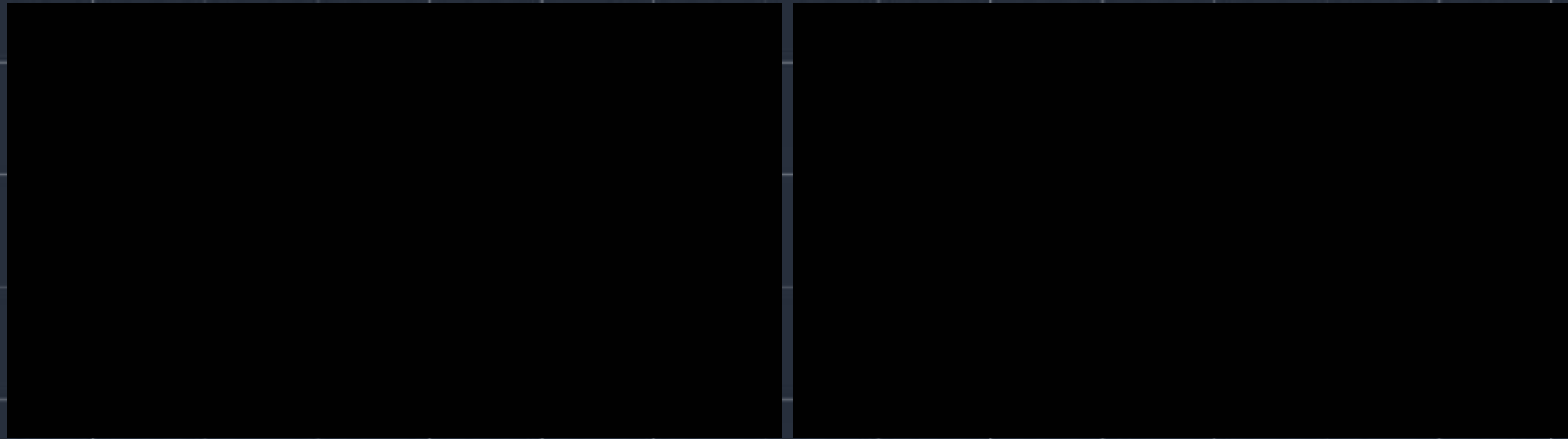
✱ Relationship between what we can do and what we like watching is **nonlinear**, **subtle** and **complex** - as are the underpinning brain mechanisms

Kirsch, Dawson & Cross (2015) *Annals NYAS*

Dynamics of embodied neuroaesthetics



with Guido Orgs (Goldsmiths) & Andrea Orlandi (Rome)



New work examines aspects of performance dynamics, performance feasibility, aesthetics, and expertise with behavioural & brain measures, among dance experts and novices



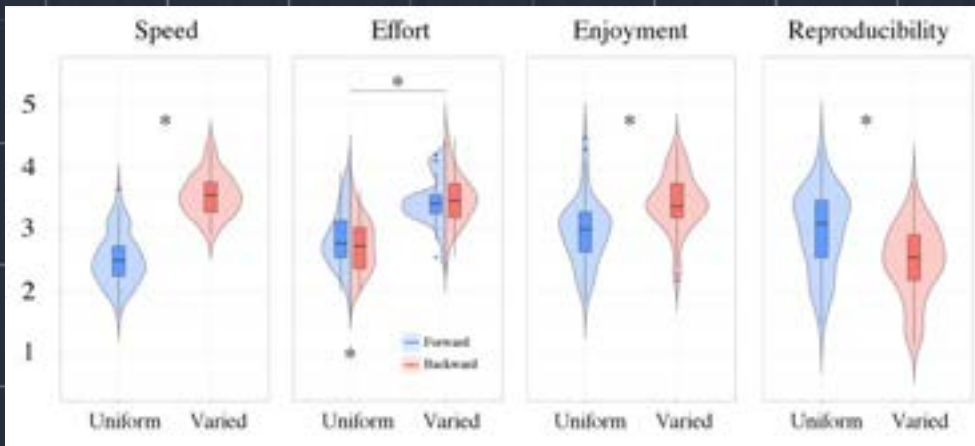
**Social
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ORLANDI, CROSS & ORGS (2021) *Cognition*

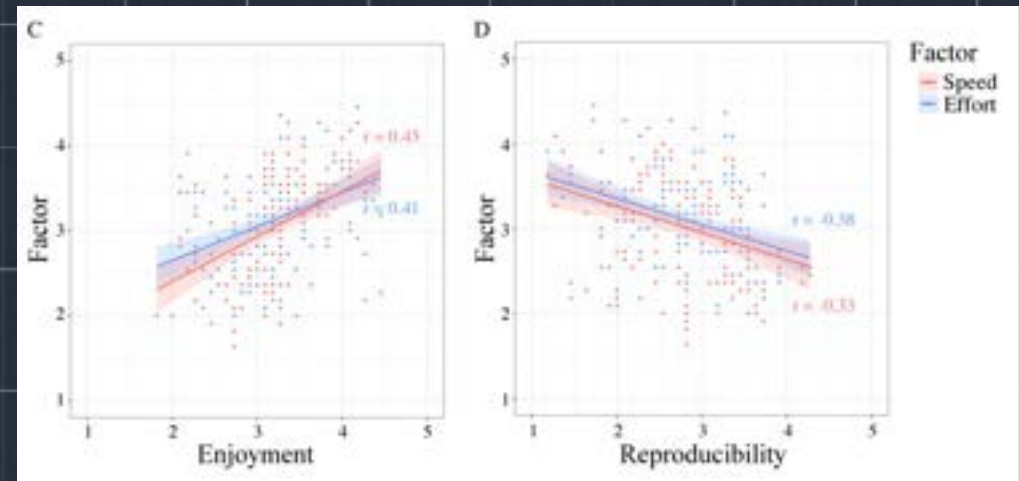
Dynamics of embodied neuroaesthetics



with Guido Orgs (Goldsmiths) & Andrea Orlandi (Rome)



- Both **speed** and **effort** had a positive impact on enjoyment ratings (panel c) and a negative impact on reproducibility ratings (panel d)

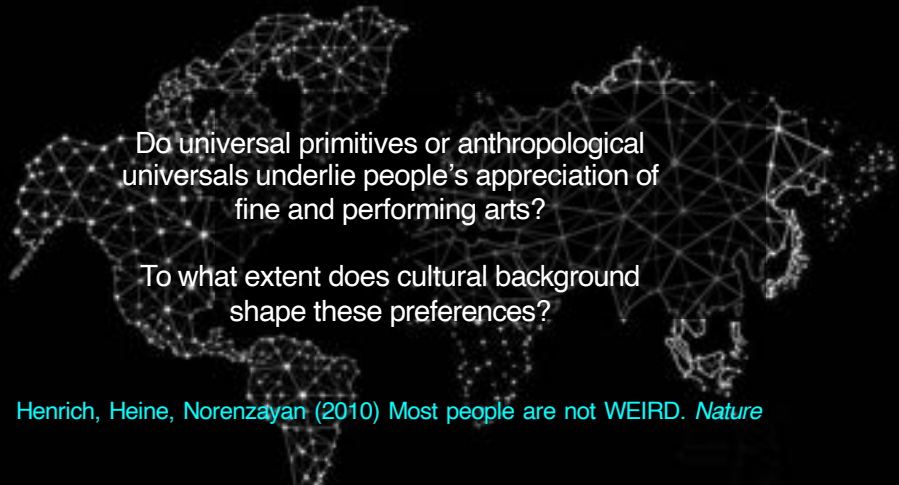


ORLANDI, CROSS & ORGS (2021) *Cognition*

Research Horizons



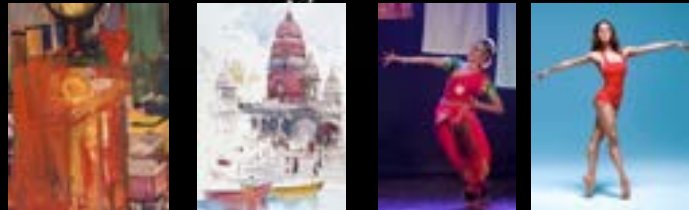
Kohinoor Darda
UPenn



Do universal primitives or anthropological universals underlie people's appreciation of fine and performing arts?

To what extent does cultural background shape these preferences?

Henrich, Heine, Norenzayan (2010) Most people are not WEIRD. *Nature*



Abstract vs. representational art (Vessel & Rubin, 2010)

Modulated by expertise (Leder et al., 2012)

Consistent across cultures (India/EU) and art forms (paintings/dance)?

Darda & Cross (2022). A unifying model of visual art appreciation: The role of expertise and culture. *Scientific Reports*

Preprint: <https://Psyarxiv.Com/Q5Yzb/>
Osf: [Osf.io/Vtw54/](https://osf.io/Vtw54/)



Probing links between aesthetic evaluation and stimulus & knowledge cues to human animacy (c.f. Cross et al. 2012; 2014; 2016)

	Human Agent	Robot Agent
Human-generated choreography (15 x 2 clips)		
Computer-generated choreography (15 x 2 clips)		

Research Horizons



Rebecca Smith
Glasgow

Aesthetic evaluations are influenced by myriad factors, including colour, line & shape (visual arts), pitch & tone (music), and compositional & performative features (dance)



Higher order social constructs (e.g., familiarity, emotional expressivity) can also shape these aesthetic evaluations.



We are now evaluating these features in the MCNORM danced emotion library (Smith & Cross, 2022), as well as more abstract representations (i.e., line drawings) of the same choreography

(with Andres Rodriguez, University of Surrey)

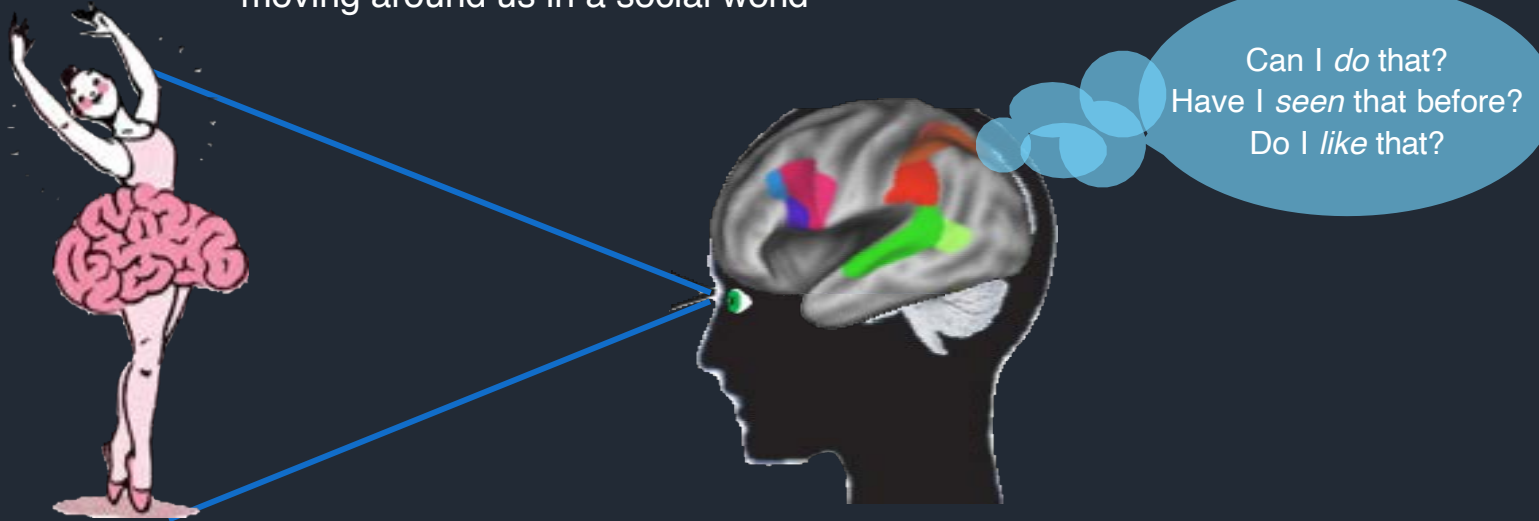


Using skinned multiperson linear modelling (SMPL) and dynamic multiperson linear modelling (DMPL), we aim to understand how effective these approaches are for recreating a range of different body types and dynamics for dance movements, with the aim of developing new choreographic and performance tools.

(with Hedvig Kjellström,
KTH Royal Institute of Technology)

what have we learned?

main research aim Examine how experience shapes brain function and how we perceive others moving around us in a social world



findings in a nutshell Our prior physical & visual experiences profoundly shape how we perceive and derive aesthetic pleasure from others moving around us

So what? Research examining how our bodily experiences shape brain, behaviour, and aesthetics underscores the variety and complexity of embodied experience on how we perceive others in a social world

enormous thanks to MAIN **collaborators** and **funders**



Louise Kirsch
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Antonia Hamilton
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Simone Schütz-Bosbach



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BANGOR
UNIVERSITY



MAX PLANCK GESELLSCHAFT



Netherlands Organisation for Scientific Research

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European Research Council



and thank you for listening

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www.soba-lab.com

Social Brain in Action Lab