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# Behavioral and Brain Sciences

## Dancing robots: Social interactions are performed, not depicted.

--Manuscript Draft--

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<b>Abstract:</b>	Clark and Fischer's depiction hypothesis is based on examples of western mimetic art. Yet, social robots do not depict social interactions, but instead perform them. Similarly, dance and performance art do not rely on depiction. Kinematics and expressivity are better predictors of dance aesthetics and of effective social interactions. In this way, social robots are more like dancers than actors.



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10. ABSTRACT

Clark and Fischer's depiction hypothesis is based on examples of western mimetic art. Yet, social robots do not depict social interactions, but instead perform them. Similarly, dance and

performance art do not rely on depiction. Kinematics and expressivity are better predictors of dance aesthetics and of effective social interactions. In this way, social robots are more like dancers than actors.

## 11. MAIN TEXT

Clark and Fischer argue that social robots are depictions of human social agents. Importantly, their argument draws heavily upon western art in the mimetic tradition, where the primary purpose (and value) of art lies in how accurately an artwork imitates reality (Shimamura, 2011).

Social robots are conceptualised as interactive depictions of real humans and likened to actors in a play. Clark and Fisher link the quality of a social robot to its resemblance to a human agent: the better the social robot *impersonates* a human agent, the more likely it is that people will interact with the robot in the same way.

Here, we argue that the analogy between social robots and mimetic art is flawed. This is because in many cases – including the examples provided by the authors – a social robot does not pretend to be a human agent, but instead participates in genuine social interactions, as a robot.

Social robots are better likened to performance artists or dancers instead of actors; rather than depicting social interactions, they perform social interactions. This distinction between

performance and depiction is important for better understanding and situating the scope and the limits of robots as social agents (Cross & Ramsey, 2021).

Much of western contemporary art neither depicts nor represents. This is especially true for performance art. For example, in Marina Abramovic's famous performance installation "The artist is present" (Abramovic & Biesenbach, 2010), she invites visitors to sit down opposite her at a table in a gallery. Abramovic neither depicts a social interaction in this artwork – she genuinely meets other people – nor does she impersonate a character. The encounter is thus performed, but it is not depicted; depicted and depictive scene are the same. Similarly, many contemporary choreographers and theatre makers create works without narrative, storyline or obvious characters (see Figure 1 for an example). In fact, dissolving the binary distinction between depicted and depictive scene, or acting and not-acting (Kirby, 1987) is an important aesthetic feature of contemporary theatre, dance and performance art (Fischer-Lichte, 2017; Lehmann, 2005). The aesthetics of dance and performance do not necessarily depend on how realistically a character is impersonated, but on a performer's expressiveness (Christensen et al., 2019), changes in the speed and acceleration of movement sequences (Orlandi et al., 2020), or movement synchrony among a group of performers (Cracco et al., 2021; Vicary et al., 2017). Much of contemporary performance art or non-narrative dance therefore lacks a clear separation between depicted and depictive scenes.



Figure 1: Performing without depicting. Seke Chimutengwende and Steph McMann in "Detective Work". Choreography by Seke Chimutengwende in collaboration with Steph McMann, commissioned by NEUROLIVE. Image by Hugo Glendinning.

Clark and Fisher describe a similar example of performing without depicting: the robot "Smooth" offers a drink to Beth, who grabs the drink and thanks the robot. Beth responds to the robot naturally and intuitively, because – as in performance art – there is no distinction between depicted and depictive scene. The robot performs a genuine social interaction: one physically embodied, social agent offers an object to another physically embodied, social agent. The robot therefore does not pose as a social agent, it *is* a genuine social agent.

In both performance art and in social interactions with robots, base scene and depictive scene are still present, yet this distinction is not specific to (or required for) engaging with performance art

or social robots. People consist of bones, blood, organs, water, etc., just as robots consist of metal and wiring. We can choose to interact with real people at different levels. For example, a surgeon spends most of her time working with the physical reality of the body, and not the person.

Moreover, in many real-life social interactions people pretend, simulate or act (Goffman, 1990).

The distinction between three levels of depiction is thus not specific to robotic agents but equally applies to human agents.

Conceptualising social robots as depictions, therefore, does not help to explain in what way robots are similar or different to human social agents. Instead, we argue that social robots are better characterised by the properties of their social interactions, for example human-like movement kinematics or turn-taking behaviour. Importantly, the physical properties of an agent – for example, the extent which it resembles the human body, are arguably less important than the way it moves or interacts with the world around it (Cross et al., 2012; Ramsey & Hamilton, 2010).

Abstract shapes can produce vivid illusions of agency, expressivity and social relationships, as first shown in the now-famous animations of Heider and Simmel (Heider & Simmel, 1944), a finding that has been replicated, extended, and discussed extensively over the past half century (c.f., Press, 2011)

In our own research, we have shown that movements that comply with the kinematics of human action are judged to be more natural and aesthetically pleasing than movements that violate



human kinematics (Chamberlain et al., 2022). In the case of dance, greater predictability of movement kinematics increases aesthetic preference. A given sequence of dance movements is more appealing if the movements are performed with salient and rhythmic changes in speed and acceleration (Orlandi et al., 2020). Importantly, greater movement predictability also allows for smoother social interactions. For example, in cooperative tasks between two people, individuals reduce the variability of their movements to facilitate turn-taking (Vesper et al., 2011).

In other words, we remain unconvinced that the separation between different levels of depiction is necessary or sufficient to explain why people engage socially with robots in some situations but not others. Levels of depiction do not explain why people engage with dance or performance art, since these levels do not necessarily exist for these art forms. Arguably, the interesting question is not what difference exists between real and depicted social agents, but instead: what constitutes an effective social interaction, no matter at what level of depiction it is performed?

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### 13. CONFLICT INTEREST

Both authors declare that they have no conflicts of interest.

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