

## **Abstracts**

Embodied consciousness and its disorders

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Title: One Step Closer to my Heart : Cardiac Cycle is Coupled with Footsteps in Typical but not in Depersonalisation Individuals

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Abstract:

### *Background*

Human bodies are highly dynamic systems, constantly moving both inside (e.g. heart beats) and in the outside world (e.g. footsteps, walking) to secure survival. The mechanisms underlying the interplay between exteroceptive and interoceptive self-related sensory signals are key to understanding the sense of self and its disturbances (Park and Blanke 2009). Previous work showed that the bodily self is not fixed but constantly updated through dynamic sensory feedback, including sound feedback (Tajadura-Jiménez et al. 2012; 2015). Depersonalisation is a very common phenomenon that make people feel detached from their bodily self (Sierra & Berrios 1997). This study investigated the dynamic coupling between bodily movements from the inside the body (i.e. cardiac signals) with bodily actions in the world (e.g. walking) in people with high and low occurrences of Depersonalisation.

### *Methods*

Participants: 60 Participants' experience of DP were assessed using The Cambridge Depersonalisation Scale (CDS-29; Sierra & Berrios, 2000): 30 participants scoring 50 or

higher on CDS (High DP group henceforth) and 30 scoring 20 or lower on CDS (Low DP henceforth).

Apparatus: We used a shoe-based sound device, the so-called 'MAGIC SHOES' (see video here: <https://www.youtube.com/watch?v=moug7IH7w04>) which allow the dynamic modification of footstep sounds, as people walk (Tajadura-Jiménez et al. 2012; 2015). Participants were invited to walk while wearing headphones displaying their natural footsteps auditory feedback, across frequency bands in three conditions (control, high frequency, low frequency) (Tajadura-Jimenez et al. 2015). In parallel, we have recorded participants cardiac signals in real time, as well as gait biomechanics which was used as an implicit measure of changes in perceived body weight across conditions.

Data analysis: We used a 2 x 3 repeated-measures mixed design ANOVAs to examine both self-reported and physiological data. The non-parametric ANOVAs using the Aligned Rank Transform (ART) method were conducted to examine the effects of group (High vs. Low DP), sound condition, and their interaction on three dependent variables: Acceleration, Step Rate, and Interstep Interval. Separate ANOVAs of this type were conducted for the following dependent variables: i) Bodily distortions measured by the Body-Visualization task; ii) Self-reported emotional and bodily feelings; iii) Gait biomechanics parameters derived from accelerometer data; iv) Electrocardio dynamic responses from ECG recordings. In addition, to quantify the strength and stability of synchronization between heartbeats and step cycles, we employed the Index of Stability (IS) analysis, a novel method developed by Zelic et al. (2018) to estimate the mode and stability of spontaneous coordinated behaviors.

## *Results*

We found significant differences between the High and Low DP groups in all three dependent variables - Step Rate, Interstep Interval, and Acceleration, with the High DP group walking faster and having smaller step intervals. No significant effects of Sound Condition or the interaction of Sound Condition and Group were observed for any of the measured variables. The identification of specific gait events, namely Initial Contact (IC) and Toe-Off (TO), was a crucial aspect for our analysis. We found that in the control condition, without any frequency modulations, the proportion of TO events occurring during systole was significantly greater than chance level in the low DP group. The corresponding IC

events occurred randomly across the cardiac phases. The High DP group showed however no synchronization between gait events and cardiac phase. Moreover, in the High DP group, the proportion of both IC and TO events occurring during systole was significantly greater than chance in the Low Frequency sound condition.

### *Conclusion*

Our study reveals for the first time that the dynamic coupling between bodily movements from the inside (e.g. cardiac signals) and bodily actions in the world (i.e. walking) is altered in Depersonalisation, but not in typical individuals. Our results provide further evidence that people feeling detached from their bodies are literally out of sync with their inner body, i.e. heartbeats. Further work is needed to examine the neural mechanisms underlying the atypical interplay between bodily movements from the inside (i.e. heartbeats) and bodily actions in the world (i.e. footsteps) in people with Depersonalisation.

**Anna Ciaunica** (University of Lisbon)

Title: Embodied Joint Agency in Human-Artificial Agents Interactions

Abstract:

Humans have long tried to make artificial versions of themselves. Previous work illustrated that humans anthropomorphize and spontaneously attribute mental and affective states to and feel empathy artificial others. However, the impact of interacting with humanoid robots and virtual agents on the human sense of self and sense of body ownership remains an open question. A recent study illustrated a sense of joint agency in cooperative tasks performed in dyads of humans and humanoid robots vs. humans and non-humanoids (Sahai et al. 2022). This suggests that the embodiment of a co-agent seems crucial for constituting humans' sense of joint agency in joint tasks. Yet, the question of how the human embodiment affects interactions with other humans versus artificial others is less well understood. Specifically, I will look at the effect of Depersonalisation – a condition that makes people feel detached from their self and bodies – on embodied joint agency in humans versus artificial others dyads.

**Axel Cleeremans** (Faculté de Philosophie et Sciences Sociales)

Title: Can a robot have an orgasm?

Abstract:

Why would we do anything at all if the doing was not doing something to us? In other words: What is consciousness good for? Does phenomenal experience have a function? Surprisingly, perhaps, many have answered “no”. In philosophy, epiphenomenalist and illusionist positions have gained strength, and so have panpsychist perspectives, which, while neither denying phenomenology nor its functions, paradoxically deflate it by ascribing it to all matter. The concept of free will has likewise been deconstructed to the point that it has become commonplace to think it simply does not exist. In psychology, while Freud’s influence has now waned, most relevant research nevertheless seems dedicated to documenting what we can do without awareness rather than because of it. This is reinforced by the stupefying advances of artificial intelligence research, which are suggestive that feeling things is simply unnecessary to carry out complex information processing. Finally, even consciousness research itself has fallen prey to deflationist views.

The “search for the neural correlates of consciousness” — the main empirical program in consciousness research for over three decades — has been exclusively focused on identifying the neural basis of the differences between conscious and unconscious processing, so eluding the essential fact that experiences cannot exist independently of the subject whose experiences they are. Contra such views, we propose that subject-level experience—‘What it feels like’ — is endowed with intrinsic value, and that it is precisely the value agents associate with their experiences that explains why they do certain things and avoid others. Perhaps then, is it the case that the functions associated with consciousness are a consequence, rather than the cause, of phenomenal experience. Under this hypothesis of ‘phenomenal primacy’, I argue that it is only in virtue of the fact that conscious agents ‘experience’ things and ‘care’ about those experiences that they are ‘motivated’ to act in certain ways and that they ‘prefer’ some states of affairs vs. others. From this perspective, the possibility of artificial consciousness, that is, of synthetic

phenomenology requires artificial agents to have the capacity to value their own experiences and to care about their own existence.

**Bruno Berberian** (ONERA, Cognitive Engineering and Applied Neurosciences)

Title: Sense of agency during human automation interaction

Abstract:

Situations involving collaboration between human operators and intelligent systems are becoming increasingly common. Interestingly, recent work has suggested that people's sense of agency, i.e. the experience of control over their actions and their effects, may develop abnormally when interacting with an artificial agent. In this talk, I propose to explore the impact of automation technology on human sense of agency.

In a first series of experiments, I will discuss the link between the level of automation and the feeling of control and responsibility. In particular, using tasks related to the aeronautical context (obstacle avoidance task, trajectory planning task) in which the operator is assisted by systems that take more or less charge of the task to be performed, I will show the decrease of the sense of agency generated by automation technology. In a second series of experiments, we propose to mitigate this effect by making AI systems more intelligible to human operators. Based on the literature on joint action and the key role of sharing agents' intentions for coordination, we hypothesised that the readability of system intentions is a key element of the development of operator's sense of agency. Our results indicate that adding intention-based explanations during human-AI interaction improves sense of agency, responsibility and system acceptability.

With this work, we demonstrate both the potential negative impact of technology on human sense of agency but also how to mitigate this negative impact. Given the place of artificial agents in the future and the importance of the sense of agency in terms of responsibility, these results can guide the way we perceive and design future artificial partners.

**Duarte Araújo** (Faculty of Human Kinetics, University of Lisbon, Portugal)

Title: Sport motor control demand situated cognizant bodies

Abstract:

How can we perform actions better than we did before? The traditional understanding of motor control attributes to the brain the power of predicting action consequences, as well as predicting the immediate changes in the environmental circumstances where such action will occur. However, this view is quite 'sedentary' because it assumes that the brain is lagging behind, i.e. it is making inferences before the body moves, and that the body is simply input for brain inferences. I'll present an ecological dynamics approach to skilled behaviour, aligned with Gibson, where behaviour is understood in terms of self-organised action directed towards affordances. The research I'm presenting focuses on sport performance, where solutions to the problems placed by the task environment demand active cognizant bodies, instead of bodies instructed by the brain. Consequences for modifying or enhancing behaviour are discussed at the end.

**Eva Anjos (Artist Speaker)**, University of Lisbon

Title: Art as Self-revealing

Abstract:

In this talk, I navigate the relationship between art and Self, elucidating how the act of artistic creation can serve as a reverse pathway to understanding ourselves. I explore how the immersive nature of art-making, particularly in music, dance, and cinema, serves as a way to demonstrate the decentralized way in which we perceive the world. Drawing upon theories of embodied cognition, we can explore the phenomenon of flow and altered states of consciousness that can be experienced during artistic work, and highlight their significance for our understanding of what makes up our self-consciousness.

A case study of my own experience is presented, wherein I explain how music-making served me as a tool for processing challenging emotions I was not consciously aware of, and that the process of creating such songs released something in me without conscious awareness of it explicitly. I highlight how cinema has served in my life as a means of documenting fragmented life experiences and navigating personal identity.

I end the talk by sharing a vision for future that makes space for contemplative spaces designed to induce reflective states of mind, using technology, human creativity and AI. These environments (of awe, complete immersion) can offer an alternative approach to understanding oneself and others, embracing conventional scientific methodologies while also harnessing the intuitive and rich transformative capacities of art.

In conclusion, while science plays a crucial role in explicating observable phenomena and discerning patterns, art operates on a subtler, more implicit level, fostering a connection with oneself even in the absence of definitive answers. Through this juxtaposition, we may build futures in science and art that harness a more holistic approach to studying the self, recognizing the complementary roles of science and art in illuminating the multifaceted nature of human experience.

**Frank Röhrich** (Queen Mary University of London , Innovation & Medical Education at East London NHS Foundation Trust)

Title: Body-oriented psychological therapy (BOPT) for self-disorders in schizophrenia

Abstract:

Utilising the theoretical framework of the phenomenology of disembodiment, I am going to introduce the rationale for a body-oriented psychological therapy strategy for the treatment of self-disorders in schizophrenia. This new approach to treatment arises from the identification of so-called „basic self-disorders“ in the context of schizophrenic psychosis, which are also described in connection with the term 'insufficient embodiment' or 'disembodiment' (Fuchs 2005, Fuchs & Röhrich, 2017; Raballo et. al, 2012; Nordgaard & Parnas, 2014).

Cross-disciplinary research findings point towards a necessity to specifically address basic self-disorders at the level of deficient embodiment rather than through cognitive exploration.

The therapy operates simultaneously at the levels of sensory perception, action processes, emotional expression, and fosters social interactions through anchoring of the self in the physically demarcated space of the patients own bodies.

**Joe Perkins** (Trustee of Unreal Charity, UK / Author of *Life On Autopilot*)

Title: Dreaming Your Life: The 'Reality' Of Depersonalisation

Abstract:

As with all conditions, I believe we are best able to understand clinical phenomena when we combine academic theories with lived experience perspectives. By doing this, both sides can inform and support each other's work – leading to a deeper understanding for everybody and increased opportunities to advance the field.

I am not an academic, nor a researcher. I have zero medical training. But – I do have over 16 years lived experience of chronic Depersonalisation and Derealisation. It can be very normal to encounter these feelings, and fortunately, most who do make a full, swift recovery. But for an unlucky minority – approximately 1% of the general adult population – the symptoms remain persistent, pervasive, and painful.

Others speaking at this conference will be able to examine my condition from a more scientific angle. But, as somebody whose entire adult life has felt like a hazy fever dream, I can stand in front of you and tell you exactly how DPDR impacts an individual's life. So, I will be offering you my real-world perspectives on how constant dissociation affects a person's concentration, judgement, and abilities to function as a (so-called) 'normal' human being.



**Konstantina Kilteni** (Department of Neuroscience at Karolinska Institute, Sweden)

Title: Self-touch versus external touch: how action influences somatosensory perception.

Abstract:

How do we distinguish self-touches from touches caused by sources other than the self? While this classification seems trivial, it poses a demanding task for the brain given the massive amount of somatosensory information that needs processing at any given moment. Motor control theories propose that the brain uses motor information to predict the somatosensory consequences of our actions and attenuate the associated responses. In this talk, I will provide a brief overview of our work on this self-touch attenuation phenomenon, focusing on when these predictive processes are engaged, and the role of schizotypal personality traits.