

Mirror and Self

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Abstract

Beyond its use as a tool for self-viewing, the mirror has functioned as a simple yet useful research tool in many studies of mirror self-recognition. Mirrors provide reflected images of ourselves giving the mirror self-experience. However, for Merleau-Ponty, mirror self-experience is a profoundly alienating self-experience and for Rochat, this alienating self-experience is forming a deep experiential “me but not me” paradox. It is widely assumed that monkeys see a stranger in the mirror, whereas apes and humans recognize themselves, although this potential ability not necessary implicating a psychological self-awareness. Experiments show that “self” is not simply there waiting to be discovered, but is continually in process. According to Cooley’s “looking glass self”, looking in a mirror I am seeing myself as others sees me, or/and I am seeing myself as if I was another, or/and the me I see has not quite the same familiarity as the me I know from inner experience. According to Mead, the “Me” is the social self and the “I” is the response to the attitudes of others, being in an intersubjective space. The different aspects and distinctions between “Me” and ‘I’ during the mirror self-experience could be examined through the phenomenological and psychodynamic theories, the theory of mind, the social mirror theory, and the findings in neuroscience. Brain models, such as the interoceptive predictive coding and the ego- and allo-centric mind systems, might increase our understanding of mirror-self reflections, and moreover the perception of “self” and “body ownership”. Finally, some therapeutic interventions indicate that mirror self-observation, mirror meditation, or even mirror gazing, can have beneficial effects in patients suffering from neuropsychiatric disorders, by increasing ‘self-focus’ and self-compassion and relieving stress.

Key-words:

Mirror, self, mirror self-recognition test, mirror therapy, social mirror, ego, emotions, interoception

The mirror and man

Mirrors were inaccessible for most people and most of the people have never seen their reflections even in water. Mirrors were used for personal grooming by those few who had access to them. Visual anthropologist Edmund "Ted" Snow Carpenter, described the reactions, after introducing in 1976 mirrors to members of an isolated tribe (the Biami) living in the Papuan plateau, where neither slate or metallic surfaces exist, and where rivers not provided clear reflections *"They were paralyzed, after their first startled response – covering their mouths and ducking their heads – they stood transfixed, staring at their images, only their stomach muscles betraying great tension. Like Narcissus, they were left numb, totally fascinated by their own reflections.."* Why is there such anxiety associated with mirror self-experience? Since most people could only view their reflections in still water, manipulating their appearance relied to a great degree upon feedback from other people. Mirrors prompt greater self-awareness in humans, although the *self*, as analyzed into the present paper, is not simply there waiting to be discovered, but is continually in process.

Ancient mirrors were usually small, capable of reflecting only one face. Most were made of bronze, which was a costly material. Ancient Greek, Etruscan, and Roman representations usually show women, not men, using mirrors. Mirrors are found in burials and sacrificial deposits. The idea that mirrors were placed in burials to ward off evil is particularly common in Chinese archaeology. The world's first archaeologically-identifiable mirrors, made from polished cones of obsidian, were discovered in burials at Çatalhöyük, Turkey, 6200 BC. Metal mirrors do not appear until 4000 BC, when small copper disks were evidently used as mirrors in Mesopotamia from about 2900 BC. Handled copper mirrors, designed in "life-force [*ankh*]" are found in Egypt during the same period. In 2000 BC, bronze mirrors first appeared in western China, while in 1500 BC, mirrors had been independently invented in the Americas, appearing first in present-day Peru, and subsequently in Mesoamerica. Bronze mirrors appeared in Mediterranean by the mid-5th century. Glass was not widely used for making mirrors until the

Renaissance and by the 16th century, the glassmakers of Murano had a virtual monopoly in the new age mirrors constructed from silica, derived from the sand, combined with soda and other materials [1].

In Greek mythology, Narcissus was a hunter from Thespiæ in Boeotia who was known for his beauty, falling in love with his own reflection in a pool of water. Mirror images systematically distort the original, by inverting left and right. Plato may use such metaphor to point out the ontological gap between the archetypal form and its sublunary copies. People may believe that another world may lie behind the mirror's surface, and that the soul can temporarily leave the mirror, or can bring others into it. In ancient Eurasian folklore, mirrors can act as portals or containers of the soul. They help crossing between worlds, and/or viewing one world from within another. Covering mirrors or turning the mirror to face the wall after a death in the house was a custom based on the belief that the soul projected out of the living person in the form of his reflection in the mirror, may be carried off by the ghost of the deceased, which hovers around the house until burial [2].

A recurrent theme is the belief that, once a mirror has reflected a person, it will always contain some intangible part of him. In a Harry Potter story for example, two fragments of a mirror each reflect the environment around them, even when widely separated, allowing one to use one fragment to see what is around the other. Moreover, it was believed that mirrors can act as apotropaic devices. Certain Chinese mirrors, such as the eight-sided ba-gua, are used as apotropaics to avert the danger of threatening forces. While European texts literature emphasize the distortion or inversion of mirrors, Buddhist believe that the mirror is a metaphor for perfect clarity and truthfulness. Buddhist use mirrors in feng shui and geomancy, suggesting that mirror does not reflect, but embodies, light. Their beliefs also included that if the edge of a mirror "cuts off" the reflection of part of the body, especially the head, it is said to cause health problems. Mirrors in the bedroom can ostensibly increase anxiety and insomnia, while under the bed or mattress can help cure ailments of the body part beneath which it lies [1,3].

The mirror self-recognition test

Beyond its use as a tool for self-viewing, the mirror has functioned as a simple yet valuable research tool in many studies of mirror self-recognition. The inspiration for the *mirror test* comes from an anecdote about Charles Darwin and a captive orangutan, named Jenny, while visited the London Zoo in 1838. In the paper “Chimpanzees: self-recognition”, published in *Science* (1970) Gordon Gallup [4] found that after prolonged exposure to their reflected images in mirrors, chimpanzees marked with red dye showed evidence of being able to recognize their own reflections, while monkeys did not appear to have this capacity. About 10 years later Gallup found self-recognition in chimpanzees and orangutans, but not gorillas [5], while in a recent paper he postulated: “reproducible experimental evidence only some great apes and humans have shown clear, consistent and convincing evidence that they are capable of correctly deciphering mirrored information about themselves” [6].

Mirror-induced behaviour has been described as a cognitive ability of an animal to self-direct their image in front of the mirror. It seems that most animals when exposed to a mirror responded with a social interactive behaviour such as exploratory and repetitive behaviour or even aggressiveness. Animals respond to their reflection in one of three ways: they recognize the image as an illusory, they behave in front of the mirror due to the conspecific or another animal, showing aggressive behaviour towards it, or they recognize themselves in front of the mirror and starts to self-directed interaction. Kohda et al (2019) [7] in their article titled “If a fish can pass the mark (mirror) test, what are the implications for consciousness and self-awareness testing in animals?”, found that when fish provided with a coloured tag in a modified mark test, they attempt to remove the mark by scraping their body in the presence of a mirror. Moreover, Marie-Claire Cammaerts and Roger Cammaerts (2015) [8] described some ants that can recognize themselves when confronted with their reflection view, but the authors postulated that this potential ability not necessary implicating some self-awareness.

Animals that are considered to be able to recognize them-

selves in a mirror typically progress through four stages of behavior when facing a mirror: they have social responses, physical inspection, like looking behind the mirror, repetitive mirror-testing behavior, and realization of seeing themselves. Suggesting that research on mirror-induced self-directed behaviour in wildlife may have profound implications in understanding the cognitive ability of wildlife, Hamdan et al, (2020) [9] examined the mirror-induced self-directed behaviour on wildlife at the Royal Belum Rainforest, Malaysia. They found that barking deer was the species showing the highest interaction in front of the mirror, elephants displayed self-directed response through inspecting behaviour via usage of their trunk and legs while interacting to the mirror, while the absence of interactive behaviour of the Malayan tiger indicated a decreased social response behaviour.

It is widely assumed that monkeys see a stranger in the mirror, whereas apes and humans recognize themselves [10]. Jenkinson & Preston (2017) [11] showed that humans observing the body via a mirror (as an outside observer) is subjectively equivalent to observing the body directly (from our own viewpoint). However, there has been much recent debate about whether the self-awareness in question is psychological or bodily self-awareness. Alexandria Boyle (2017) [12] argues that “whilst self-recognition does not require psychological self-awareness, to claim that it requires only bodily self-awareness would leave something out”. If an individual attends to the mirror, how is the information interpreted? What type of behavioral responses do mirrors elicit? [13]. Moreover, does mirror self-recognition utilise the same mechanisms as recognising oneself in a photograph or a virtual representation of our body in a computer game or experimental setup?

The social mirror

Mirrors allow us to view our own body from a third-person (observer) perspective. The American sociologist Charles Horton Cooley (1902) [14] created the term “looking glass self”, describing our reflection of how we think we appear

to others, and suggested three steps: (a) how one imagines one looks to other people, (b) how one imagines the judgment of others based on how one thinks they view them, and (c) how one thinks or feels of how the person views them based on their previous judgments; for example you may feel some sense of pride, happiness, guilt, or shame. Cooley also formulated the crucial role of primary groups, like family or playgroups, the first groups of individuals one is influenced in their ideas and beliefs.

George Herbert Mead [15, 16], developed William James' distinction between the 'I' and the 'Me', suggesting that the 'Me' is the social self and the 'I' is the response to the 'Me'. The 'I' is the response of an individual to the attitudes of others, while the 'Me' is the organized set of attitudes of others which an individual assumes. Mead uses the word self to refer to the "Me". The "Me" is a cognitive object, which is only known retrospectively, that is, on reflection. The "I" comes in as a historical figure. It is what you were a second ago that is the "I" of the "me." Once the actions of the "I" have become objectified and known, they have become a "Me." Indeed, the "I" is not available to us in our acts, that is, it is only knowable in its objectified form as a "Me".

Theory of mind (reading other people's minds) appears to be similar with reflective consciousness (reading your own mind). We may suggest that *mind theory* is a modern variant of *social mirror theory*. We cannot become self-aware without simultaneously knowing that others are aware. Also, we know that others are aware because we can get inside them, through role-modelling. Mead denies the first-person subjectivity of self-awareness, He suggested that since it depends on a third-person perspective, self-awareness belongs to the public domain. According to *social mirror theory*, described by Charles Whitehead (2001) [17], we cannot have mirrors in the mind unless there are mirrors in society. What is not public is not conscious, since according to Gregory (1970) [18], in a world of objects, we become aware of ourselves as an object among objects, of our bodies in contradistinction to other bodies. Philippe Rochat & Dan Zahavi (2011) [19] point: "Is social interaction and the awareness of the attention of others a precondition for the emergence of

mirror self-recognition?". And moreover, "the ability to construe oneself as another, to adopt an alienating perspective on oneself, is a precondition for being able to encounter other subjects as others?".

The "me but not me" paradox

What is self-consciousness? Is it the awareness of one's body as a physical object, or the awareness of one's own mental states, or even the awareness of one-self as perceived by others? The extension of Bretano-Husserl thesis: a conscious being x is conscious about y , if x is aware of y and x is aware of the awareness of x , correspond to the *social mirror theory*, as well to the *theory of mind theory*. Paraphrasing also the Cooley's (1902) "looking glass self", we may suggest that looking in a mirror I am seeing myself as others sees me, or/ and I am seeing myself as if I was another, or/and the me I see has not quite the same familiarity as the me I know from inner experience. For Maurice Merleau-Ponty (1964) [20], mirror self-experience is a profoundly alienating self-experience and for Philippe Rochat (1995) [21], this alienating self-experience is forming a deep experiential "me but not me" paradox.

Mirrors provide us with reflected images of ourselves, the mirror self-experience. As Merleau-Ponty (1962) [22] added, «At the same time that the image makes possible the knowledge of oneself, it makes possible a sort of alienation. I am no longer what I felt myself, immediately, to be; I am that image of myself that is offered by the mirror". Mirrors have a special role for viewing the self. Based on Merleau-Ponty thesis, Rochat & Zahavi (2011) [19] posted the following for the subject-mirror relationship: "I exist in an intersubjective space. I am exposed and visible to others. When seeing myself in the mirror, I am seeing myself as others see me. I am confronted with the appearance I present to others. Not only am I seeing myself as others sees me, I am also seeing myself as if I was another, i.e., I am adopting an alienating perspective on myself. It is me that I see in mirror, but the me I see has not quite the same familiarity and immediacy as the me I know from inner experience. The me I see in the

mirror is distant and yet close, it is felt as another, and yet as myself”.

Working on “me but not me” paradox, Preston et al (2015) [23] used multisensory full-body illusions to modulate feelings of ownership over a mannequin body that was viewed from a third-person perspective through a mirror, from a third-person perspective without a mirror and from a first-person perspective. They found that, in contrast to non-mirror third-person perspective, synchronously touching the participant’s actual body and the mannequin body viewed in the mirror elicited strong feelings of ownership over the mannequin. The authors posted the importance of egocentric reference frames for body ownership, but they also suggested that “mirror reflections of one’s own body are related to peripersonal space, which enables updating of central body representations”. This “peripersonal space”, together with “temporality”, two fundamental Husserlian concepts, may be the ground of “I” actions in a continuous intersubjective space. In these multisensory body illusions experiments underly the body ownership processes, which is first demonstrated in the *rubber hand illusion* experiments. Here, synchronously touching a hidden real hand with touches delivered to a fake (rubber) hand elicits feelings of ownership over the fake hand [24]. This *rubber hand illusion* can be elicited when the rubber hand is viewed through a mirror, although it remained unclear whether such an illusion reflected body ownership or self-recognition [11, 25].

Ego reflection

Self-reflection is thinking about yourself. Ego-reflection is thinking about what you think about yourself, and mirror is a good ego reflection provider. Husserl’s thesis “all consciousness is consciousness of something”, implies a distinction between “acts of thought” (the *noesis*) and “intentional objects of thought” (the *noema*). Husserl also describes the *ego-pole* (*Ich-pol*) as a point where are initiated and are referred all the intentional actions, while Merleau-Ponty demonstrates a corporeity of consciousness as much as an intentionality of the body. Heidegger (1962) [26] uses the

expression *Dasein*, meaning “being there” or “presence”, to refer to the experience of being, a term possibly inspired by the concept of *das-in-der-Welt-sein* (being-in-the-world-ness, worldliness), as expressed in Taoist philosophy by Kakuzō (1906) [27]. However, which would be my awareness of my “I” in front of the mirror? As Mead [15] pointed: “The ‘I’ gives the sense of freedom, of initiative. The situation is there for us to act in a self-conscious fashion. We are aware of ourselves, and of what the situation is, but exactly how we will act never gets into experience until after the action takes place”. The “I” is a “source” of both spontaneity and creativity... but the “I” is not available to us in our acts, that is, it is only knowable in its objectified form as a “Me... The “Me” follows the “I” so closely in time that it appears as if the “I” is the source of the “running current of awareness””.

We may suggest that neuroanatomically, short-term memory, deriving from the orbitofrontal cortex, supports the “I” functioning, while the implicit and long-term memory, deriving from the limbic-prefrontal connections, support the “Me” functioning. On the other hand, we might think of the “Me” as similar to the Freudian conscious *super-ego* in the commentary that it provides. Lacan (1953) [28] proposes that human infants pass through a *mirror stage* in which an external image of the body, reflected in a mirror, or represented to the infant through the primary caregiver, produces a psychic response that gives rise to the mental representation of an “I”. Seeing this *mirror stage theory*, Lacanian psychoanalyst Philippe Julien (1994) [29] suggests the two phases of narcissism and aggressivity, during that *mirror stage*: “Narcissism, in which the image of one’s own body is sustained by the image of the other, in fact introduces a *tension*: the other in his image both attracts and rejects me”.

Reflections of ego in front of the mirror can be parallelized with different developmental processes. For example, *projective identification*, a primitive form of relationship and a route to psychological change, can be manifested in different ways: *acquisitive projective identification*, where someone takes on the attributes of someone else, *attributive projective identification*, where someone induces someone else to become one’s own projection, *projective counter-identi-*

fication, where someone unwittingly assumes the feelings of the other to the point where he acts out within this assumed role that has been projected into him, and *dual projective identification*, when both partners in a relationship simultaneously project onto one another. In pathological projective identification, what is projected is splintered into minute pieces before the projection takes place.

On the Rochat & Zahavi (2011) [19], question: “to adopt an alienating perspective on oneself, is a precondition for being able to encounter other subjects as others?”, we can think on different brain connections. Human brains are so large maybe because they are adapted to running multiple dissociated minds in parallel [19], while, as Maturana (1970) [30] pointed, “the nervous system, as a mode of organization, seems to begin at any arbitrary point that we may choose to consider”. As a profoundly alienating self-experience [20], mirror self-experience needs accurate memory recognition, and especially familiarity recognition memory, which is derived from the comparison between incoming information and previously stored representations. For example, Kafkas et al (2020) [31] showed that the mediodorsal thalamus plays a material-general role in familiarity, while the anterior thalamus plays a material-general role in recollection. Also, increased functional connectivity between the mediodorsal thalamus and the parahippocampal and perirhinal cortices of the medial temporal lobe underpinned increases in reported familiarity confidence.

Other brain models, like the ego- and allo-centric systems provide ideas into how the brain differentiates between the mirror-self reflections. It has been proposed that the *ego-centric system* is part of a sensorimotor loop giving rise to a *feeling of agency*, when motor predictions and inputs are in good match. The *allo-centric system* generates *judgments of agency*, representing generative causal models of the world, including the self, and is modulated by higher-level priors such as an intentionality or a self-attribution bias [32]. Having in mind the Mead’s social theory on ‘I’ vs ‘Me’, we may suggest that, running in a continuous intersubjective space, the ‘I’ could correspond to the ego-centric system, which generate the *feeling of agency*, while the ‘Me’ correspond to

the allo-centric system, generating the *judgments of agency* and then the final product of *sense of agency*.

Reflecting emotions

Early studies have shown that mirror self-observation may increase the so-called ‘self-focus’ of individuals. Weisz et al (1988) [33] have found a significant increase of self-attention in manipulation on heartbeat when placing a mirror in front of the subjects. Similarly, Gibbons et al (1979) [34] tested the hypothesis that mirror-induced self-awareness would minimize a “placebo” effect, since some subjects were led to believe that a drug that they were about to ingest would produce arousal symptoms as a side effect. Self-aware subjects in this condition subsequently reported experiencing less arousal from the placebo, and fewer of the side effects ascribed to it, than did less self-aware subjects. In addition, painful conditions may disturb body image and disrupt an individual’s sense of ownership of their painful body part. In *mirror therapy*, inspired by Ramachandran (2007) [35], a mirror can create the illusion that an amputated limb appeared fully intact when an individual observed a reflection of their intact limb in a mirror.

Because of the social implications of mirror view, like seeing our own body as others see us, body size modulations while looking in a mirror may have greater effects on our emotions [23]. The long history of research in *emotions* is almost identical with that of *interoceptive perception* and *interoceptive sensitivity*. It begins from James’ (1890) aspects that emotions arise from perception of changes in the body, to the Damasio’s (2000) [36] “somatic marker hypothesis”, following the Craig’s (2009) [37] “sentient self” model, and finally to the Seth & Critchley’s (2019) [38] aspects of “interoceptive awareness”. This would be a new view of emotion as an active interoceptive inference. We now know that interoception is represented within the insula and anterior cingulate cortex, leading these structures to be collectively referred to as the ‘interoceptive cortex’. Large portions of the brain participate in *interoceptive-exteroceptive integration*, a function long ascribed to “limbic” and related regions, such

as the basal ganglia and interoceptive cortex. Such integration is both central to the perception of “self” and “feelings of body ownership” [39].

Focussing on interoceptive inference can better explain conscious phenomenology, especially in relation to affect, emotion, and self [40]. Moods seem to be a pre-intentional state, constituting the background in the context of which intentionally directed emotions target their objects, while *predictive processing* is a theoretical framework that posits that the brain’s overall function is to minimize long-term average prediction error. We may think that emotions, intentionality, as well as *emotional intentionality*, can bridge the gaps in this predictive processing framework [41, 42]. Research showed that disrupted interoceptive predictive coding may causally account for a range of psychiatric disorders [39]. Interoceptive sensitivity can predict the malleability of body representations, that is, people with low interoceptive sensitivity experienced a stronger illusion of ownership in the *rubber hand illusion* experiment [43]. Mirror self-observation, implicating interoceptive perception, can increase the so-called ‘self-focus’ of individuals. In Ainley et al (2012) [44] experiment, participants performed a heartbeat detection task while looking at their own face in a mirror or at a black screen. There was significant improvement in interoceptive sensitivity in the mirror condition for those participants with lower interoceptive sensitivity at baseline. The authors suggested that self-observation may represent a viable way of manipulating individuals’ interoceptive sensitivity.

Finalizing, research tells us that we need face-to-face contact to develop a sense of self, to manage our emotions, and to develop empathy for others. Mirrors can evoke strong feelings in us and they can also be incredibly powerful tools for changing our perspective. The mirror reflects back to us the feelings we have about ourselves. Mirror meditation, which involves meditating by looking in a mirror, can increase self-compassion and relieve stress. Even *mirror gaze* can become deeply intimate, since it requires to spend a few quiet, mindful moments sitting with not just our thoughts, but our own watchful eyes [45].

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