

# THE THERAPEUTIC RECONSTRUCTION OF AFFORDANCES

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**Abstract:** I argue that a variety of physical disabilities, and neurological and psychiatric disorders can be understood in terms of changes to the subject's affordance space. Understanding disorders in this way also has some implications for therapy. On the basis of a phenomenological- and pragmatist-inspired enactivism I propose an affordance-based approach to therapy with a focus on changing physical, social, and cultural environments, and I consider the role of virtual and mixed realities in this context.

We must observe and understand internal processes and their interactions from the standpoint of their interactions with what is going on outside the skin . . .

John Dewey,  
Lecture to the College of Physicians,  
Saint Louis, 1937, 326

My aim in this paper is to follow through on Dewey's advice in the context of thinking about the employment of embodied-enactive-ecological (and specifically, affordance-based) approaches in psychotherapy. I'll start by reviewing some basics about affordance theory, as found in Gibson (1977) and ecological psychology, and some more recent thinking on the notion of affordance in relation to psychiatric disorder. I'll pursue the idea that we can characterize some disorders in terms of changes in a subject's affordance space and suggest that this has some implications for therapy. Finally, I'll offer an affordance-based enactivist approach to therapy, with a focus on virtual and mixed realities. The affordance-based approach is not intended as a complete account that captures everything of importance in therapeutic settings. Clearly there are other aspects, such as personal understanding and empathy, that are important but not emphasized here. At the same time, a focus on the notion of affordance can be productive in such settings.

## 1 The Concept of Affordance

The concept of affordance was developed by James Gibson as a way to explain how perception of our surrounding world is pragmatic or action-oriented. We perceive the world in terms of the various possibilities it affords. To take a simple example, a chair affords sitting. Note that it affords sitting for someone of a certain size who has flexible joints of the right sort. The chair does not afford sitting for an elephant or an ant. It may afford something else to such creatures, but not sitting. Likewise, a hammer affords picking up and hammering, but only if the agent has hands and can swing it. The important point here is that an affordance is relational. Although it is in some sense anchored in the physical object, it is not simply something that is objectively there in the environment; it is also dependent on various characteristics of the agent, which may include talents and learned skills. The cliff may afford climbing, but only if I have the skill and stamina to climb. “Stated in precise terms, affordances consist in the opportunities for interaction that things in the environment possess relative to the sensorimotor capacities of the animal” (Varela et al. 1991, 203).

Gibson suggested that there are not only physical affordances, but also social affordances. Another person offers the possibility of conversation and with others my affordances may increase. Together we can move a heavy table—something I cannot do on my own. Note, however, that others may also be disaffordances, or may decrease or change my affordances by getting in the way or preventing me (physically, or normatively) from doing what I could otherwise do.

Gibson’s idea was that we perceive the world in terms of affordances. The claim is that perception is intrinsically action-oriented in the sense that we perceive things in terms of our pragmatic possibilities for acting on or with them. Gibson was influenced by the phenomenological tradition in this regard. For example, Edmund Husserl (1989) proposed that perception is guided by what he called the ‘I can.’ I see the world in terms of what I can do. Likewise, Martin Heidegger (1962) regarded our everyday way of being-in-the-world as best described in pragmatic terms. Things and artifacts appear ‘ready-to-hand’ (*zuhanden*) rather than as objects to be understood theoretically or intellectually. Our primary relation to things is that we treat them as something that we can (or cannot) pick up and use in the framework of some overarching project.

These phenomenological ideas were taken up by Maurice Merleau-Ponty in his book *Phenomenology of Perception* (2012), which Gibson read and recommended to his students (see Heft 2001; Chemero and Käufer 2016). Merleau-Ponty frames his analysis in terms of embodied action, so that our perception of the world is not just passive but a sensory-motor activity that is reflected in a form of motor intentionality—that is, a form of intentionality that is intrinsic to the kinematics of action.

Gibson was also influenced by pragmatism and once described himself as “having a taste for pragmatism” and as being a “radical empiricist” (1967). He was influenced by his reading of James, Dewey, and Mead (e.g., Noble 1981; Burke 2013; Chemero and Käufer 2016). The relational nature of affordances, for example, is reflected in Dewey’s relational notions of organism-environment and his concept of *situation*.

The statement that individuals live in a world means, in the concrete, that they live in a series of situations. The meaning of the word ‘in’ is different from its meaning when it is said that pennies are ‘in’ a pocket or paint is ‘in’ a can. It means . . . that interaction is going on between individuals and objects and other persons. The conceptions of situation and of interaction are inseparable from each other. . . . In actual experience, there is never any such isolated singular object or event; an object or event is always a special part, phase, or aspect, of an enviroing experienced world—a situation. (Dewey 1938, 43, 67)

Affordance theory has also been taken up by enactivist approaches to embodied cognition (Gallagher 2017a; Hutto and Myin 2017; Varela et al. 1991). Enactivist theories, influenced by both phenomenology and pragmatism, have recently extended the concept to include considerations about culture and institutions. Ramstead et al. (2016), for example, propose the notion of cultural or conventional affordances.

Conventional affordances are possibilities for action, the engagement with which depends on agents’ skillfully leveraging explicit or implicit expectations, norms, conventions, and cooperative social practices. . . . Engagement with these affordances requires that agents have the ability to [cope with] the culturally specific sets of expectations in which they are immersed—expectations about how to interpret other agents, and the symbolically and linguistically mediated social world. (Ramstead et al. 2016)

Rietveld and Kiverstein (2014) also extend enactivist views of affordances. They argue that our perceived world is shaped by a “landscape of affordances,” which they define as the total ensemble of available affordances for a population relative to a form of life. By conceiving of affordances as relative to a form of life they introduce the idea that affordances have a socially or culturally constituted objectivity independent of any specific individual. Even if I myself do not have the skill for cliff-climbing, the fact that there are people (sometimes organized in groups or clubs) who engage in cliff-climbing, means that even for me, in some indirect way, the cliff affords climbing, and I may perceive it as such, since I could obtain the skill or join the cliff-climbing group. The affordance exists independently of me

as an individual, at least insofar as it is available as a cultural practice in a form of life.

The “field of affordances” is defined as “the affordances that stand out as relevant for a particular individual in a particular situation; i.e., the multiplicity of affordances that solicit the individual” (de Haan et al. 2013). These are the current affordances or solicitations that are a function of the agent’s interests, concerns, and bodily states. A solicitation is an affordance that draws an agent to action due to its relevance, or the way that it stands out in the perceptual field. If the doorbell rings, the door suddenly becomes solicitous in the sense that it becomes the most relevant object to guide my action to let my friend in. As I get close to the door, the doorknob becomes more solicitous for what I need to do. The environment is typically more complex than this, and there may exist a number (a field) of affordances of varying degrees of relevance to my actions.

A related concept that falls somewhere between the landscape and field concepts is the notion of *affordance space* (Brincker 2014; Gallagher 2015, 2017a). An affordance space includes the full range of possible affordance fields relative to an individual, including the current affordance field plus any possible changes in that field due to changes in physical or cognitive skills or environment. The affordance space for any individual is defined by *evolution* (e.g., the fact that she has hands), *development* (her life-stage—infant, adult, aged) and *social and cultural practices* (including normative constraints), as well as the individual’s experience. All of these factors enable and constrain the individual’s action possibilities.

A human’s affordance space, for example, differs from a non-human animal’s due to species differences in evolution. Humans not only have hands and capacities for certain kinds of movement, but also, for just those reasons, a variety of cognitive possibilities are afforded and constrained by these anatomical differences. A relatively large brain size, together with language and other cultural practices, allows for a variety of skills that can include abilities in conceptual manipulation, problem-solving, imagining, and planning. A concept can be viewed as an affordance if, for example, we think of it as a tool that can be used in a skillful way to solve a problem. In this regard, human cognition is affordance based. One individual’s affordance space differs from another’s due to differences in experience, skill level, education and normative constraints, etc. In this respect, an attorney may have a different affordance space than an engineer due to their different trainings (skills), the different concepts they have to work with, and the way they solve problems.

One might object that the concept of affordance become meaningless if everything (including, e.g., a concept or a rule of inference) is an affordance. Not everything is an affordance, however. In precise terms, affordances are defined relative to the capacities (sensorimotor, social, cultural, cognitive) of the agent. Affordances are characterized as *relational* and *actionable*—and not everything is relational and actionable. Nothing counts as an affordance unless there is an agent around to engage with it.

## 2 Pathological Changes in Affordances

Physical damage to the body will result in the loss, disappearance, or change of physical affordances. Consider, for example, the variations in affordance space following limb amputation, heart attack, or stroke. Such changes may lead to new or different physical (but not only physical) affordances. For example, the affordance space of a person confined to a wheelchair is different than for someone who is not, and these differences may be due to the person's wheelchair skills, environmental design specifics, and differences in social and cultural attitudes on the part of others (Cole 2004). In a wheelchair, social affordances change in part because others' attitudes and expectations change. Physical changes bring along psychological, affective, and social changes that modulate affordances, and vice versa.

In addition, fatigue, hunger, and other affective changes can change perception and our perceptual interests—what we see as possibilities (Galagher et al. 2013). It's not just whether 'I can' or 'I can't' that modulates affordances, but also whether I have the energy, the interest, or the desire to engage in a particular action. Likewise, psychological changes bring along physical, affective, and social changes that modulate affordances.

We can see such changes in affordance space, for example, in the case of depression.

[In major depressive disorder] the conative dimension of the body, that is, its affective and appetitive directedness, is lacking or missing. Normally, it is this dimension that opens up peripersonal space as a realm of possibilities, 'affordances' and goals for action. In depressive patients, however, drive and impulse, appetite and libido are reduced or lost, no more disclosing potential sources of pleasure and satisfaction. (Fuchs and Schlimme 2009, 572)

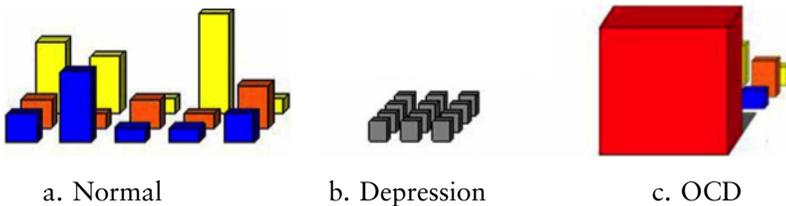
Likewise, in schizophrenic delusions, affordances change. For example, Séchehaye (1968) in *Autobiography of a Schizophrenic Girl*, describes affordance changes in Renee, a schizophrenic patient.

[A jug appeared to her] not as something to hold water and milk, a chair not as something to sit in—but as having lost their names, their functions and meanings; they became 'things' and began to take on life, to exist. (cited by Sass 1992, 118)

In the case of obsessive-compulsive disorder (OCD) there is a serious restriction of affordance space as the subject finds herself limited to one repetitive action, or one set of specific actions, and unable to move beyond that. In the case of utilization behavior (following frontal damage), everything becomes a solicitation. Presented with any object (e.g., a hammer), the subject is unable to refrain from picking it up and using it.

De Haan et al. (2013) offer a figural representation of affordances that helps us to picture the differences involved in different conditions, for example, typical subjects *versus* subjects with depression *versus* subjects with OCD (Figure 1). They explain this figure in the following way.

The ‘width’ refers to the range of affordances or the amount of action options that one perceives. The ‘depth’ of the field refers to the temporal aspect: one not only perceives the affordances that are immediately present here and now, but one is also (pre-reflectively) aware of future possibilities for action. That is, one may already anticipate the affordances on the horizon. Lastly, the ‘height’ of each of the affordances refers to the relevance or salience of this particular option. The different colours refer to variations in affective allure: something may be relevant because it is dangerous, or rather because it is highly attractive. It is a dynamic field: to the extent that either our concerns or the environment changes, the field of relevant affordances changes too. (de Haan et al. 2013, 7)



**Figure 1.** A schematic depiction of different fields of relevant affordances (normal *versus* depression *versus* obsessive compulsive disorder) (from de Haan et al. 2013).

Gallagher and Janz (Forthcoming) suggest that the number and quality of an agent’s affordances reflect changes in a person’s agency or autonomy. That is, we can think of autonomy in terms of the affordances available to a particular situated agent, where that situation is both physical and social. A higher number of affordances (i.e., range and temporal proximity), together with a better quality of affordances (i.e., salience and affective allure), roughly correlates with greater autonomy and directly relates to one’s sense of agency. This is also closely tied to social or intersubjective circumstances. If, as the result of depression, for example, my intersubjective relations shrink or become impoverished, both the number and the quality (especially the affective allure) of my social affordances will decrease. Likewise for physical, cognitive, and other types of affordances.

Thus, just as in typical behavior, in various psychiatric and neurological disorders, “affordances are modulated by states of the organism (concerns, interests, abilities) and states of the environment” [physical, social, cultural] (Ramstead et al. 2016). Particular types of psychiatric disorders reorient or reorganize concerns, interests, and abilities, and thereby change what counts as an agent’s affordances or solicitations (Frith and Gallagher 2002). If affordance theory offers a way to think about the changes brought on by such disorders, it also offers a way to think about therapy.

### 3 Implications for Therapy

In some cases, one might think of the task of therapy as restoring function. As Hans-Georg Gadamer puts it, “Convalescence, becoming well again, is a process of returning once more to one’s accustomed form of life” (1996, 97). In some cases, however, as one is in the middle of a prolonged, chronic, or clinical condition, it seems possible that the illness itself can shape our life so pervasively that it (re)defines our form of life. Thinking in these terms, Merleau-Ponty notes that “Illness, like childhood . . . is a complete form of existence . . .” such that it can lead to permanent adjustments in optimal grip—that is, in the way that we pragmatically attune to the world (2012, 110). In other words, illness can redefine our affordance space and our being-in-the-world in a way such that there is no going back. Tracking these different ways of considering illness, there are debates in physiotherapy about whether the goal of therapy is restoration or reconstruction (Øberg et al. 2015). Given changes in one’s physical-mental-affective health, Ramstead et al. (2016) suggest that adjustments across the affordance space can start to resculpt “a field of solicitations out of the total landscape of available affordances,” dynamically moving the organism toward transformations in what counts as optimal grips on various situations.

The field of affordances thus changes dynamically along with perception-action and changes to states of the organism and environment. Responsiveness to the field, informed by states of the organism and environment, prescribe modes of optimal coupling. (Ramstead et al. 2016, 13)

It is not just that the patient can no longer lift up a cup, sit in a chair, complete a task, or appreciate another person’s emotional expression—it’s rather that the world has taken on a different meaning—or that the affordance space has been reconfigured. Accordingly, therapy involves not just understanding what patients can or cannot do, and effecting adjustments—it involves understanding their form of existence, their changed experience, and how they are differently enabled. In this respect, I note the importance of taking a phenomenological approach—that is, an approach that attempts

to understand the patient's first-person experience and their changed being-in-the-world, factors that can be worked into a "rich diagnosis" (Parnas and Gallagher 2015), with implications for therapeutic practices (see Gallagher and Daly 2018). Following this line of thought, in the remainder of this section I outline six (relatively unsystematic but connected) ideas that form part of an enactivist, affordance-based approach to therapy.

First, in cases of both physiotherapy and psychotherapy, optimal coupling needs to be understood, at the start, not in terms of a previously established form of life, but in terms of an agent's changed form of existence. Once again, Merleau-Ponty's words describe such changes: "Illness . . . is a complete form of existence. . . . The procedures it employs to replace normal functions which have been destroyed are equally pathological phenomena. It is impossible to deduce the normal from the pathological" (2012, 110). This is a theme frequently found in the phenomenological literature. It corresponds to the idea that we experience the world by enacting meaning, and that meaning or an agent's form of life changes relative to the agent's capabilities. The starting point for therapy is the agent's changed form of existence and what the patient is able to do rather than what the patient is unable to do relative to their previous form of life.

Second, the idea that the normal can't be deduced from the pathological suggests that we need to distinguish between a non-disturbed ability and a compensatory rearrangement. For example, Kurt Goldstein's patient Schneider, famously discussed by Merleau-Ponty (2012), presented with problems performing abstract behavior (e.g., pointing), but not concrete behavior (e.g., grasping). The distinction between grasping and pointing has been taken by many phenomenologists to mean that grasping, as a concrete behavior, is more basic (it survives certain pathologies where pointing does not), and it characterizes our normal motor intentionality in its non-representational, non-conceptual form (e.g., Kelly 2000, 2004). In some cases, however, communicative pointing and gestures may remain intact when concrete grasping and non-communicative pointing are impaired (e.g., the case of I. W. [see Cole et al. 2002]). In any case, Schneider's diagnosis has never been very clear. And, as both Merleau-Ponty and Tony Marcel (2003) note, careful analysis is required to distinguish between normal functions that manifest themselves more clearly in pathological cases, and functions that emerge as compensatory within the pathology. That is, one should not assume that Schneider's intact concrete capacities are normal.

Third, an enactivist-inspired (affordance-based) therapy should understand the relations between abstract (higher-order) and concrete (lower-order) behaviors and corresponding affordances according to a gestalt principle summarized succinctly by Goldstein and Scheerer.

Although the normal person's behaviour is prevailingly concrete, this concreteness can be considered normal only as long as it is embedded in and codetermined by the

abstract attitude. For instance, in the normal person both attitudes are always present in a definite figure-ground relation. (Goldstein and Scheerer 1964, 8)

This is consistent with enactivist claims about the continuity between lower-order (basic) and higher-order cognition—but conceived of in a non-hierarchical structure. Suggestive (neurological and behavioral) evidence for this can be found in the analysis of intersubjective alignment and synchronic joint action, where the formation of ‘joint body schemas’ is modulated by cultural factors. Soliman and Glenberg (2014) show that joint actions involving synchronic movements lead to the incorporation of the co-actor—that is, an expansion of peripersonal space to include the co-actor’s peripersonal space, similar to the incorporation of tools (often described in terms of an extended body schema or expanded peripersonal space). The interesting twist is that Soliman and Glenberg compared culturally defined “independent” (e.g., North American) versus “interdependent” (East Asian) subjects (see Park and Kitayama 2012). It turns out that the adaptation of a joint body schema is more pronounced for those who self-identify as interdependent in contrast to those who self-identify as individualist. They conclude:

Culture is not a psychological structure that exists apart from more mundane [actions]. [Rather] the psychological underpinning of culture consists of an individual’s sensorimotor tuning arising from and guiding social interactions. (Soliman and Glenberg 2014, 209)

This likely has implications for the use of synchronic movement in both physical therapy and body-psychotherapy, but the point I want to emphasize is that you cannot think of culture as a set of higher-order cognitive practices that are distinct from lower-order bodily processes. Embodied, agentic behaviors are always embedded in cultural practices, and vice versa, so that they always operate in a dynamic gestalt figure-ground relation.

Fourth, it is important to distinguish between recognized and unrecognized differences in patients. In some cases patients recognize that they have changed, or are undergoing change, either as the result of a disorder or as the result of a type of treatment. In other cases, the patient does not recognize this change. For example, in some cases of Parkinson disease or OCD treated with deep brain stimulation, the patient’s personality and behavior undergo significant changes of which they are not aware, even though it is evident to their loved ones or care givers (de Haan et al. 2013; Gallagher 2018). Likewise, congenital blindness is not experienced as a form of incompleteness—it is “[not] a state of blackness, absence, and deprivation. . . . The long-term blind do not experience blindness as a disruption or absence. . . . the blind do not experience their blindness at all” (Noë 2004, 3). Just as when we cannot see through the wall into the next room, we do not experience this as a disruption or disability, or

just as we cannot pick up as many odors as a bloodhound, or see as many colors as some birds, we do not experience this as a lack in our sensory field, so the congenitally blind person does not experience her blindness as an absence. Or again, some children with cerebral palsy do not become aware that they move differently from typically developing individuals until they are made aware of it by others (Martiny 2015).

Fifth, therapists need to address modulations in social affordances that may come about not just as a result of the generative disorder, but as a result of social and intersubjective factors. This can go in two directions. First, social context may enhance therapeutic effects in a positive way. In cases of apraxia following stroke, for example, motor rehabilitation is improved when patients engage in actions in meaningful social contexts, in contrast to when they engage in less meaningful, non-social exercises (Marcel 1992; Gallagher and Marcel 1999). Second, negative social contexts can complicate disorders. For example, studies of individuals with autism, Moebius Syndrome, spinal cord injury, or congenital deaf-blindness suggest that the non-social or socially limited behavior of such individuals may in part be due to the way that others treat them (McGeer 2001; Cole 1999; Krueger and Michael 2012). “A common complaint is that other people do not greet the deaf-blind individual or inform about their presence” (Rönnerberg and Borg 2001; see Gallagher 2017b). In such cases, therapy aimed just at the disabled individual is not sufficient—the reconstruction of affordances might involve reconstructing social attitudes more generally.

More broadly, the way that larger-scale social and institutional practices are organized, including architectural practices, may constrain the landscape of affordances. Jonathan Cole (2004) recounts the complaint of a wheelchair disability activist who points out that the problem is not his body or his wheelchair—the problem is that societies build stairs rather than ramps. Therapy should not aim to fix his body, but to give him better equipment and better access. This can be said of disability more generally (see Barnes 2016).

There can only be two explanations why disabled people experience a quality of life so much poorer than everyone else: one, that disability has such a traumatic and psychological effect on individuals that they cannot ensure a reasonable quality of life by their own efforts; the other that economic and social barriers that disabled people face are so pervasive that they are prevented from ensuring a reasonable quality of life by their own efforts. (Oliver 1990, 65; cited in Cole 2004, 222)

Finally (adding to an incomplete list), we should draw no strict lines between physical (embodied), psychological, and social disorders. Working in the tradition of phenomenological psychiatry, Medard Boss (1979), for example, broke new ground by dissolving the traditional dualism between

somatic and psychiatric illness, illuminating how the experience of illness, whether mental or physical, is always already shaped and mediated by a changed form of being-in-the-world. Consistent with Goldstein's gestalt and with the enactivist idea that the unit of explanation is the brain-body-environment (something already implied by the examples I've been citing), it is difficult to pull apart psychological and physical changes in many disorders.

#### 4 Enactive Therapies in Virtual and Mixed Realities

The model for rich diagnosis and enriched therapy—a phenomenologically informed enactivist approach that considers not just cognitive abilities, but also issues of motor performance, emotional experience, social interaction, etc.—emphasizes the brain-body-environment as the explanatory unit, including the affordance space and the *situation* of the patient.

What would an enactivist, affordance-based approach look like in an actual clinical setting? Clearly, it would be more holistic—treating not just the brain (with medications), or not just the mind (with talk or Cognitive Behavioral Therapy). On the one hand, it may emphasize body-based, action-oriented therapies—body psychotherapy, dance, play therapy, etc. (Fuchs and Koch 2014). These are therapies that not only change the way we move; they change the patient's affordance space. On the other hand, an enactivist approach may work more directly on social affordances (in therapist-patient relations or group therapy). In line with Dewey's lecture to physicians in Saint Louis, given the relational character of affordances, an agent is never isolated from environmental features. Physical environments and social contexts in the clinical setting itself set up specific expectations in the patient, setting the stage for, or interfering with effective therapeutic practice. The physical/social environment frames interaction and enables the co-creation of meaning that characterizes intersubjective interactions, including the therapist-patient relationship.

Consistent with these enactivist ideas, Röhrich et al. (2014) suggested the relevance of a high-tech approach to address environmental and social factors in the context of therapy. Specifically, the use of virtual reality (VR) and mixed reality (MR) in therapeutic contexts allows for the adjustment of environmental (virtual) affordances to facilitate or support embodied, interactive, and affective therapies.<sup>1</sup> In a 'mixed reality clinic' environments are created where participants interact with both physical (real) and digital (virtual) objects and environments in an integrated way (Milgram and Kishino 1994). The construction of such virtual environments in a clinical setting can introduce novel (more thoroughly embodied/enactive

<sup>1</sup> The suggestion in Röhrich et al. (2014) was motivated by some work on the concept of enactive metaphor in educational contexts, which involves placing subjects in mixed reality environments (see Gallagher 2015).

and environmentally situated) aspects into the therapeutic process. VR has been used in a variety of medical contexts. For example, Cole et al. (2009) employed a virtual arm for amputation patients to reduce phantom limb pain. There are also psychotherapeutic applications of VR and MR that address a variety of anxiety disorders, Acrophobia (Emmelkamp et al. 2002; Rothbaum et al. 1995), Arachnophobia (Carlin et al. 1997), a variety of eating disorders such as Anorexia (Riva 2005; Riva et al. 1998), and PTSD (Difede et al. 2007).

The construction of MRs that replicate places familiar to the patient finds application in neuro-physiotherapy. Skills that are learned or re-learned within MR settings transfer to corresponding real-world situations better than those learned in VR settings. For example, following stroke, the use of a mixed-reality kitchen that replicates the patient's real kitchen or introduces some modifications, facilitates both motor and memory recovery so that the patient can eventually take care of himself in his own home (e.g., Edmans et al. 2006; Pridmore et al. 2007). Enactivists would emphasize an important principle behind such MR therapies, namely, metaplasticity (Malafouris 2013). The important thing, in other words, is not just brain plasticity, but overall system plasticity, where *system* means the self-adjusting system of brain-body-environment that defines the affordance space of the patient (Gallagher et al. 2013). On the enactivist principle that treats the system as a dynamical gestalt, changes to any one of these integrated factors will generate changes in the system as a whole, leading, in the therapeutic context, to readjustments that address the disorder.

Consider the idea of a psychotherapeutic practice that incorporates MR design to replicate a particular environment (based perhaps on a patient's drawing or photographs), or to expose a patient to an object or set of objects (Röhricht et al. 2014). For example, employing advanced avatar technology, one could introduce an avatar that resembles a particular person normally encountered in the environment replicated in MR.<sup>2</sup> The patient (or the patient and therapist together) could walk into an MR environment where the patient interacts with a virtual version of the significant other. Or consider the possibility that a therapist and patient might co-construct an MR environment that replicates the patient's delusional reality. Could the virtual construction and then deconstruction of that delusion have positive therapeutic effects?

This is no longer science fiction (see Freeman et al. 2017 for a comprehensive review). For example, avatar-based therapy is being used at

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<sup>2</sup> The use of avatars in virtual environments have been shown to elicit significant changes in bodily and affective experience, including the experience of peripersonal and extrapersonal space, indicating a change in affordance space (Pasqualini et al. 2018). The suggestion here is that such changes extend to social affordances. One way to understand the specific affordance-related effects of such changes in bodily experience is on the model of the joint body schema discussed above.

University College London to allow patients with schizophrenia to control a hallucinated voice (Rus-Calafell et al. 2018; Rus-Calafell et al. 2014).

The first stage in the therapy is for the patient to create a computer-based avatar, by choosing the face and voice of the entity they believe is talking to them. The system then synchronises the avatar's lips with its speech, enabling a therapist to speak to the patient through the avatar in real time. The therapist encourages the patient to oppose the voice and gradually teaches them to take control of their voices.<sup>3</sup>

Three patients had been hearing voices for 3–16 years stopped hearing them completely.

VR has also been used to diagnose paranoid schizophrenia (Freeman 2008). A neutral social situation is presented using a VR library scene or a 5-minute ride on the London underground metro. Individuals at high risk for psychosis, and individuals with persecutory delusions report persecutory thoughts about the neutral avatars in these setting. Individuals who experience auditory hallucinations in social situations report voices in the virtual metro.

The interactions of patients in the social world are key to understanding and treating psychosis. . . . [T]he virtual world can be altered to determine the environmental elements that increase the likelihood of delusional ideas, hallucinations, or social difficulties. For example, paranoid ideation may partly depend on the size of a room, whether the person feels “trapped” in the situation, the distribution and distance of other people, the amount of eye contact, the facial expressions of other people, and the level of background noise. (Freeman 2008, 607–608)

All of these factors are easily adjusted in the digital environment. Freeman's therapy recommendations are based on CBT, but they lean toward the behavioral, emphasizing exposure and the development of coping methods, learning new emotional and behavioral responses (Rus-Calafell et al. 2018). All of these factors—embodied immediacy, the intersubjective, the cultural contextualization, and social-cultural background, complicate, but also form crucial parts of therapeutic processes. Moreover, these VR/MR therapies have proven to be effective. Treatment efficacy for high quality VR therapy

has been shown in meta-analyses to be large (e.g., Opreș et al. 2012), with evidence that the beneficial effects transfer to the real world (Morina et al. 2015). When long-term

<sup>3</sup> Quoted from the Wellcome Trust website: <https://wellcome.ac.uk/press-release/avatar-therapy-helps-silence-voices-schizophrenia>. Accessed August 21, 2018.

follow-ups have been included, treatment effects for these short-term therapies have strikingly been shown to persist over a number of years (e.g., Rothbaum et al. 2002; Wiederhold and Wiederhold 2003). (Freeman et al. 2017, 2396)

From the perspective of an affordance-based therapy, all of these interconnected factors—and not just a person’s mental interior, or not just the person’s social environment, or not just the person’s affective existence must be taken into account when attempting to alleviate stress and/or change patterns of self-regulatory responses to a range of challenging/distressing/problematic/traumatic/ adverse events. This brings us back to Dewey’s lecture to physicians.

We need to recover from the impression, now widespread, that the essential problem is solved when chemical, immunological, physiological, and anatomical knowledge is sufficiently obtained. We cannot understand and employ this knowledge until it is placed integrally in the context of what human beings do to one another in the vast variety of their contacts and associations. A sound human being is a sound human environment. (Dewey 1991 [1937], 336)

Part of Dewey’s advice to physicians was to treat not only the body, but to include relevant aspects of the environment. This would seem to be a large challenge for physicians since it could entail prescribing social and political arrangements and not just medications. At least in the cases described in the previous paragraphs, however, it seems realistic that, in clinical settings and with opportunities introduced by new technologies, we could fulfill Dewey’s recommendation in some significant part through the reconstruction of affordances.

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