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Distal engagement: Intentions in perception

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ABSTRACT

Non-representational approaches to cognition have struggled to provide accounts of long-term planning that forgo the use of representations. An explanation comes easier for cognitivist accounts, which hold that we concoct and use contentful mental representations as guides to coordinate a series of actions towards an end state. One non-representational approach, ecological-enactivism, has recently seen several proposals that account for “high-level” or “representation-hungry” capacities, including long-term planning and action coordination. In this paper, we demonstrate the explanatory gap in these accounts that stems from avoiding the incorporation of long-term intentions, as they play an important role both in action coordination and perception on the ecological account. Using recent enactive accounts of language, we argue for a non-representational conception of intentions, their formation, and their role in coordinating pre-reflective action. We provide an account for the coordination of our present actions towards a distant goal, a skill we call *distal engagement*. Rather than positing intentions as an actual cognitive entity in need of explanation, we argue that we take them up in this way as a practice due to linguistically scaffolded attitudes towards language use.

1. Introduction

Our actions are often aimed toward fulfilling long-term goals. We plan meetings and social engagements far in the future, we save for retirement, and we think about mitigating the effects of global warming in the coming decades. Cognitivists have long explained this kind of planning by positing a sophisticated computational machinery that manipulates mental representations of these long-term intentions in order to guide our actions. However, accounting for the ways in which we, as human agents, temporally extend our concerns, projects, and plans has been difficult for non-representational approaches.

One such non-representational approach is ecological-enactivism. Through the development of the Skilled Intentionality Framework (hereafter SIF), ecological-enactivism has provided a non-representational account for how our skills and concerns can affect the way in which we perceive affordances in terms of relevance and saliency (Bruineberg & Rietveld, 2014). The SIF provides resources ecological-enactivists have used to expand the affordance framework to capture the various complex cognitive activities that have traditionally seemed to require a foundation in representational capacities—e.g. those that involve ‘higher cognition’ (Bruineberg, Chemero, & Rietveld, 2018), ‘representation-hungry’ cognition (Kiverstein & Rietveld, 2018), and long-term planning (van Dijk & Rietveld, 2018).

Ecological psychology and enactivism both view perception as an active skill rather than a passive collection and processing of information about the environment. We see an increasing uptake of the use of the affordance framework in recent enactive accounts (see Di Paolo, Buhrmann, & Barandiaran, 2017, Gallagher, 2017). While misunderstandings about both the metaphysical nature of

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information and what it means to perceive information have kept many enactivists from fully endorsing ecological psychology (see Segundo-Ortin, Heras-Escribano, & Raja, 2019), the ecological-enactive framework embraces both approaches (see Rietveld & Kiverstein, 2014).

In this paper, we address ecological-enactive accounts of ‘high-level’ cognition, especially as related to long-term planning. Although we agree with ecological-enactivists that we should understand affordances as “determined in activity and intertwined across timescales” through skill and habit (van Dijk & Rietveld, 2018, p. 3), we argue that this does not fully account for the way that humans use language to deliberate, create, and coordinate their actions in line with achieving a long-term goal—a skill we will call *distal engagement*. Using the taxonomy of Pacherie (2008), we offer some clarification on the kinds of intentions we are concerned about. Pacherie’s distinctions have already been utilized within the enactivist literature (see, e.g., Gallagher, 2012, Brancazio, 2019). While her framework is explicitly committed to a representational view of intentions, we show that it is possible to retain Pacherie’s taxonomy without the necessity of representations. We offer this account to supplement ecological-enactive accounts of ‘higher-level’ cognition and to show how the use of an enactive account of language (Di Paolo, Cuffari, & De Jaegher, 2018, Cuffari, Di Paolo, & De Jaegher, 2015) can fill the explanatory gap.

The paper will proceed by first giving the basic tenets of the ecological approach to affordance perception, as well as describing the ecological-enactive approach. In the second section, we argue for the importance of taking into account intentions as relevant to acts of perception. In the third section we introduce the skill of distal engagement, illuminating how we might think of the differences between immediate and long-term goal fulfilment on the ecological-enactive account. Then, in the fourth section, we provide an enactive explanation of the skill of distal engagement that we consider to be amenable to ecological-enactive theories.

2. The ecological-enactive approach to affordance perception

The ecological-enactive theoretical framework is partly founded in the Gibsonian, or ecological, approach to perception. Ecological psychology (Gibson, 1966, 1979/2015) is a theory of perception that focuses on the ongoing perceptual processes by which agents adapt to their environments. The core tenets of the ecological approach are that perception is *direct*, *active*, and *action-oriented*.

To say that perception is direct is to say that it consists of the unmediated (non-representational) detection of information. This information is presented in the form of patterns in the ambient energy array of the perceiver—namely, the ambient optic array. According to the ecological approach, these patterns correspond lawfully or reliably enough with properties of the environment, which means that animals can perceive the environment *directly* by detecting these patterns.

This brings us to the second tenet of ecological psychology: the idea that perception is active. The claim that perception is active can be unpacked in two tenets. First, perception requires the agent to modulate her attention, selecting or picking up those patterns that are relevant for what she aims to perceive (Gibson & Rader, 1979). In this sense, perception is not something that happens in the animal, but something the animal does. Second, perception occurs in the context of active sensorimotor engagements between animals and their environments. Because informational patterns are not always available for the agent to be detected, perceptual tasks often involve the agent’s active exploration of the environment to generate the required information (Mossio & Taraborelli, 2008). As Mace puts it, “information does not come to the animal. The animal goes to it, actively obtaining the information” (2015, p. xx).¹ In light of this, we think that the correct way to understand perception from a Gibsonian point of view is to think of *acts of perception*—acts that involve not only the sensory organs, but the whole body and its activity (Gibson, 1979/2015, Ch. 12).

Lastly, Gibsonians think that perception is action-oriented—that is, that perception is primarily for the control of action. According to ecological psychology, for an agent to perceive the environment is to perceive the opportunities for interaction this environment offers—so-called *affordances*. Perceptual information is thus conceived of as information that allows the agent to prospectively control its actions.

2.1. The social shaping of affordances

Traditionally, affordances have been cashed out in terms of physical relations. For instance, a mug is said to afford ‘graspability’ to animals that have opposable thumbs. Likewise, whether an agent perceives a step as ‘climbable’ depends on a relation between the height of the step and the length of her leg (Warren, 1984). So conceived, affordances are properties of the environment taken relative to the animal’s body features and capabilities (Gibson, 1979/2015, p. 119–120; Chemero, 2009).

However, it has been stressed that an approach that focuses exclusively on physical relations is too narrow to account for the actual richness of human perception and action. A fully developed account of affordance perception is likely to require social and

¹ To see this, think of motion parallax and its relation to the perception of size and distance (see Favela & Chemero, 2016). The image produced by a large, distant object at a particular moment would be of the same size as the one produced by a smaller but closer object. The question is then: how can we know if the object is far from us or if it is just small? This is a very ordinary perceptual problem. We face this problem every time we want to reach for a cup, and so do other animals when they need to escape from their predators. For Gibsonians, this problem disappears as perception is conceived of as an *active process*. For example, as we move our eyes and head to look at the cup we generate motion parallax—that is, the regular and continuous transformation of the apparent position of the cup relative to the other visible objects in front of and behind it. In this movement we see that the objects move for us at different speeds. These differences in speed lawfully relate to the differences in relative distance—the objects that are closer to me move faster for me than those that are further away. Detecting these different speeds is enough to know whether we can reach the cup.

cultural aspects of human niches “to be recognized as *constitutive* rather than peripheral features of the ecological approach” (Heft, 2007, p. 92, emphasis original). Since human development takes place within a socio-cultural environment, taking into account socio-culturally situated practices and habits of engagement is crucial for understanding how a human perceives what they can do. In brief, as Heft says, “perception–action processes need to be viewed as *socially mediated processes*” (2007p. 92, emphasis original; see also van Dijk and Rietveld, 2017).

It follows that we cannot account for an individual’s perception of affordances only by referring to the relation between her body and the environment. In many cases, a particular object affords some actions only because the perceiver is immersed in a specific set of cultural practices (Costall, 1995, 2012). These affordances depend on the complex network of norms and rules within which objects and individuals are integrated. An important aspect of SIF is its emphasis on the sociomaterial norms which influence how we perceive possibilities for interaction (van Dijk & Rietveld, 2017). Rietveld and Kiverstein (2014) put the acquaintance to norms and rules in terms of “forms of life”—that is, the relatively stable patterns of behavior that are shared by the members of a community:

Affordances are not simply properties of an animal’s environment conceived of as a material or physical environment. It is the ecological niche of a particular form of life that is made up of affordances, and each affordance must be understood in relation to the abilities available in a form of life. In the case of humans these abilities are generally acquired through training and experience in sociocultural practices. (p. 340)

According to Rietveld and Kiverstein, the affordances that are available for a specific individual to be perceived and acted upon also relate to the practices, conventions and customs that are shared across the members of her community. Partaking in these forms of life, they claim, involves learning to attend to a specific myriad of affordances. Relatively stable patterns of doing things manifest, for example, in the regularities of interaction that characterize our common use of everyday artifacts such as chairs, books, and so on, and also in the expert performance of architects, academics, or footballers. The richer the form of life of an agent, they conclude, the wider the myriad of affordances that a particular niche offers to her—that is, she has a more complex *landscape of affordances* (2014, p. 331).

Moreover, Rietveld and Kiverstein suggest that being trained in a specific form of life does not solely affect the number of affordances that we can perceive and act upon within a given niche. Rather, it also habituates us to distinguish the ones that are relevant to us from the ones that are not, constraining our attention and responsiveness. Rietveld and Kiverstein dub this capacity to distinguish relevant affordances from irrelevant ones *skilled intentionality* (Bruineberg & Rietveld, 2014; Kiverstein & Rietveld, 2015; see also Rietveld & Kiverstein, 2014; van Dijk & Rietveld 2017). Skilled intentionality can be summarized as the individual’s expertise in responding adequately to the simultaneous actions that a niche affords in a particular situation in order to improve the grip on this situation.

Rietveld and Kiverstein argue that for a skillful agent, the subset of relevant affordances will not just be perceived but experienced as solicitations (see also Withagen, de Poel, Araújo, & Pepping, 2012). This means that the relevant affordances prereflectively stand out as more inviting than others given the situation and action(s) in progress. These affordances form what they call the *field of affordances*, which is comprised of “[t]he affordances that stand out as relevant for a particular individual in a particular situation” (Bruineberg & Rietveld, 2014, p. 2). Further:

The aspects of the landscape that make it into the field of affordances of an individual animal are therefore always those that are of affective significance to the animal. The skilled individual animal and the landscape of affordances together form a coupled self-organising dynamical system. The dynamics of this self-organising system are such that the individual finds itself drawn to those aspects of the landscape of affordances that relate to what the animal cares about. (Kiverstein & Rietveld, 2015, p. 11)

Think, for instance, of taking a trip to the grocery store. A grocery store is a complex local landscape of affordances, but the affordances are not all equally relevant or adequate for your situation. Depending on the number of items on your list, a trolley may grab your attention on the way in rather than a basket. Though you may be selecting the items on your list on your way through the store, your attention can be attracted by some new item or a particularly good sale. Further, all the possible affordances are situated in a *sociomaterial environment* (the store). This sociomaterial environment makes some actions appropriate and some others inappropriate. A shopping trolley may be appropriate for holding your purchasable items, your bags, your child, and perhaps even your small dog as you stroll, but it is not an appropriate place to set your grandfather, for example.

3. Affordance seeking: intentions in perception

The SIF promises to be a valuable tool for understanding how social enculturation affects both the affordances it is possible for us to perceive and the relevance of the actions afforded. For humans, relevance often will be tied to intentions to achieve goals, perhaps long terms goals, that in a sense are guiding the actions of the person. In the above example, for instance, the trip to the store may happen on a particular day of the week because it does not conflict with any of your family members’ plans. Or, perhaps, your trip to the store is coordinated around a special meal you are planning to make for an evening with some friends. Either way, the explanation for the relevance of certain affordances might involve accomplishing a goal at some remove.

To explain the ability to undertake long-term projects, van Dijk and Rietveld (2018) propose a “process-based account of affordances in which affordances are determined in activity and intertwine across timescales” (p. 3). This account of affordances is meant to pick out not just the affordances of the immediate environment, but to connect related affordances along a longer-term

trajectory. In this way, neither the goal nor the trajectory need be represented in one's mind—rather it is an “attunement to the unfolding situation” that comes from the development of practices and skills which allows for “the openness and receptivity to the movement of an increasingly determining situation, seeing *along* the direction in which the situation is unfolding” (p. 19).

However, we think that the process-based account of affordances needs a bit more to fully explain our selectivity in attention as it relates to our experience of planning, changing and coordinating projects and long-term goals. More particularly, we'd like to more fully develop the account of how it is that affordance salience might be influenced by distal intentions—the intention to buy a house, for example. These intentions, usually the result of a deliberation process and involving ongoing reflective consideration, are completed through the execution of many smaller goal-oriented actions over a longer period of time. Taking into account these long-term goals seems to be necessary if we aim to understand what it is that links affordances across a timescale, or how some of these trajectories stand out as more salient or soliciting than others though our skills remain the same. That is, we need a more detailed account of how it is that our personal practices of deliberation and intention-formation fit into an explanation for why it is that processes “unfold” in a particular way. (For example, after having decided that I want to save up to buy a house I might be less inclined to accept an invitation to go out to a new restaurant with friends.)

To understand how intentions matter for perception, understood in the ecological way, think of the number of actions we can perform with a single object—say, for instance, a pen. First of all, we can either grasp it or push it to the other side of the table with our finger. If we opt for grasping it, a different myriad of actions become available. We can use the pen to write down some notes about a paper, but we can also draw a portrait with it. Likewise, we can use it as a missile, as a blowpipe, as a bookmark, or even to stir our coffee. The number of actions we can perform with an object such as a pen are potentially infinite, and so are the affordances we can perceive (Cutting, 1982).

This is not to say, however, that we perceive all of them all the time. In fact, if that were the case, the control of action—that is, acting upon one affordance (or a series of affordances) instead of another—would depend either on one of two things: (1) another mechanism that mediates between perception and action, whose function is to choose an affordance to be acted upon from all the possible affordances we perceive, or (2) the environment itself, where the environment determines how we act while we remain passive. Both options are at odds with ecological psychology and, as we will describe in the next section, conflict with an enactive account of the role of intentions in action guidance.

To see why this is not a problem for ecological psychology, recall that we said before that perceptual processes should be thought of as actions (acts of perception). On this view, perceivers are considered to be seekers of information for action, meaning that the intentions or goals of the agent will play a crucial role in perception (Gibson & Rader, 1979). The agent actively looks for particular affordances in the present environment—or, more precisely, actively looks for the information that is relevant for her to know whether an action is possible. Affordances are *found* in the active, goal-oriented, exploration of the environment.²

Gibson himself endorses this view:

[W]hat about the “intentionality” of perception when an observer is seeking information instead of simply having it presented to him? ... What to me sounds promising is to begin with *the assumption that active perception is controlled by a search for the affordances of the environment and that active behavior is controlled by perceiving these affordances.* (1974/1982, pp. 387–388, emphasis added)

It may be a source of confusion that Gibson uses the word “intentionality” here as meaning something more akin to “goal-directed”. In the SIF literature, however, “intentionality” is used in the traditional phenomenological sense of the experiential aboutness, directedness, or towards-ness of activity. For example, van Dijk and Rietveld “propose that a skilled individual can experience the increasing determinacy of action from *within* the unfolding act as ‘directedness’ toward the relevant affordances available in the form of life that she is in the process of enacting. This unfolding enactment can be experienced pre-reflectively as having an ‘intentional’ character” (van Dijk & Rietveld, 2017, p. 9). We agree that the phenomenological sense of intentionality is central to understanding affordance perception and salience, but like these authors, we do not take this to mean that intentionality implies the existence of intentions. On this view, intentions are used in a more deflated or retrospective sense, in line with the phenomenological usage. That is, they in no way imply that there is a pre-existing “goal” or any reflective thought process involved in the activity—an “intentional act” (see also Heft, 1989) can be pre-reflective, with the “intention” attributed retrospectively (also see van Dijk & Rietveld, 2017 for a similar treatment of “affordances” as retrospectively applied to the goals of intentional acts or intentional arcs).³

Kiverstein and Rietveld do point to the importance of the *concerns* of the agent in determining her field of affordances, where concerns are defined as an agent's “interests, preferences, and needs” (2014, p. 341). Conversely, they say that “[s]ome affordances the environment offers will be irrelevant to the agent because they have no bearing on the individual's concerns at the time” (2014, p. 341). This seems helpful in illuminating the idea of affordance saliency in the immediate environment, but we would like to add to this that often times these concerns might be in relation to a long-term goal or behavior guiding-rule that has been arrived at through

² This is most clearly seen in experiments of ‘dynamic touch’ where the perceptual information is found through the haptic exploration (“dynamic effortful touching”) of the objects of the environment (Turvey & Carello, 2011).

³ Heft attributes this view to Merleau-Ponty (1963): “An intention is not describable in the absence of some foreseeable expression of it in the world. In this respect, intention does not refer to a mental representation; it is *not* a mentalistic notion. Rather, it refers to possibilities that are only realizable as situated behavior” (1989, p. 11).

a reflective process. Adding an account of the dynamics between reflective and pre-reflective cognition provides a fuller explanation about how we choose between salient affordances. Distinguishing intentions from concerns (where concerns could be thought of more as preferences resulting from successes or failures in previous engagements, for example) opens up a space for more precise theorizing about skill development and scaffolding, the upstream and downstream dynamics between skills, and effects on perception and action coordination.

In the terms of our previous example, we would say that we don't perceive all the possible actions the pen affords—not even to different degrees of saliency. On the contrary, since our seeking of information is always goal-oriented, our perception–action cycle is constrained by what we are seeking to achieve. Goal-orientation constrains both our exploratory activity and the meaning of the information we find. It is because we want to use the pen as a bookmark that we will look for the information that is behaviorally relevant for this usage (namely, its shape, length, etc.), thereby perceiving that the pen can be used that way. If I have made a decision to observe a more environmentally conscientious diet, it could alter how different items on a menu attract my attention. The differences between these intentions will be detailed in the next section. For now, we simply want to make the point that the perception of the affordances offered by a situation partly depend on the intentions of the agent. This has also been discussed by Michaels and Palatinus (2014), who use the example of an outfielder to point out that her intention to catch a fly ball “harnesses [her] perceptual system to detect information appropriate to guide the deployment of [action]”, while “[t]he intention to escape a lobbed grenade would entail other set-ups [of the perception–action system]” (p. 24).

None of this should be taken as implying that the agent's intentions change or create the affordances of the environment. What intentions modulate, instead, is the acts of perception and the saliency of these *searched for* affordances. It is the perception and relevance of the affordances that is affected by the intention, not the affordances themselves. Being so, even in the cases where the design of an object prompts the perceptual saliency of some affordances over others, for instance, making some affordances harder to perceive than others (Withagen et al., 2012; Norman, 1988/2013), it is the intention of the agent that modulates perception and makes the affordances effective constraints of behavior. By giving intentions a more central role in affordance perception and salience, we avoid having to put the burden of explanatory power in either the environment or an internal mechanism when discussing affordance saliency and relevance.

A potential concern might be that introducing intentions would make perception indirect, thus contradicting the core tenets of ecological psychology. As Withagen and van der Kamp (2010) put it, introducing the agent's intentions in our explanation of perception “implies that perception includes more than the detection of information” (pp. 155–156). We think, however, that this critique would be misguided. Nothing of what we have said implies that intentions mediate perception in the sense of acting over the detected information. It is not the case that the agent detects information, somehow combines it with her intentions, and then infers the presence of an affordance. Intentions don't enrich or add anything to the information detected, turning it into a percept. Instead, intentions modulate the perception-action cycles through which the agent interacts and explores the environment, determining what informational variables are relevant and need to be attended to at each moment, thus constraining the saliency of the affordances the agent perceives. So conceived, introducing the agent's intentions into the story does not imply that perception becomes indirect.

There is another, even more pressing concern regarding the introduction of (distal) intentions in perception. This concern has to do with the assumption that involving intentions and their formation processes is itself is often thought to require a representational explanation. We think this representational undergirding is what van Dijk and Rietveld are concerned with here: “Crucial for our process account of affordances is that we will understand concrete situations as *continuations* of real-life ongoing practices in terms of unfolding activities of individuals rather than as *realizations* of possibilities pre-existing *in abstracto*” (2018, p. 6). We agree with their claim, but would also like to explore a third option in which pre-existing possibilities are not so abstract. The challenge here for us is then to resist framing the problem in a way that implies that: (1) the positing of an intention is purely an abstraction or that (2) integrating an intention as part of the explanation of how it is that we organize our activities over a longer process would risk the need for a representational account.

In the following two sections, we will show why language is a crucial part of the explanation of how we (humans) intertwine affordances over timescales so as to engage with distal goals, and we will show that giving an account of language's role in doing so does not require a representational explanation. For, as van Dijk says elsewhere, it does seem that the “production of words within the flow of an ongoing situation re-shapes the situations from which *and* into which this situation flows” (2016)—but it is still unclear how reflective processes fit into the account. We shall argue that the incorporation of reflective processes in action coordination over time should be thought of as a skill, in line with the processual account of affordances, which we will call distal engagement.

4. Distal engagement as a skill

As shown in the preceding section, intentions play an important role in affordance perception. In order to begin to develop an account of *how* it is that intentions play this role, however, we have to be clearer about what we mean by ‘intentions.’ The sense of intention that we argue needs to be incorporated into the ecological-enactive framework are reflective, distal (future-directed) intentions, which can coordinate our current actions in order to achieve some later goal. These intentions are often at some remove from the possibility of their actualization, such as the intention to buy a house in five years, the intention to retire someday, or the intention to make better choices based on concerns about my impact on the environment.

In the philosophy of action and mind, all intentions have been thought of as future goals, arrived at through a deliberative process, that allow for practical planning or coordinating actions toward their achievement (Bratman, 1987). In contemporary work, they have been described more specifically as “a mental state that represents a goal (and means to that goal) and contributes through the guidance and control of behavior to the realization of what it represents” (Pacherie, 2015, p. 1). We will return later in the next

section to the issue of whether or not intentions necessarily involve representations (we argue that they do not). Here we want to look at the dynamic between pre-reflective cognition and reflective deliberation processes and the role they both play in leading us to a course of action oriented toward some future achievement.

Pacherie (2008) offers a taxonomy of intentions based on their temporal and spatial proximity and phenomenological accessibility. This framework has been utilized elsewhere in the enactivist literature for distinguishing between reflective and pre-reflective intentions (for example, in Gallagher, 2012, Brancazio, 2019). This taxonomy can be of use in clarifying what we think needs to be added to the ecological-enactive account. She distinguishes between distal intentions (D-intentions), present intentions (P-intentions), and motor intentions (M-intentions). D-intentions are the result of a reflective deliberation process as discussed above, and would include goals such as taking a holiday, building a skyscraper, or as mentioned in the previous section, the example of intending to make more ethical dietary choices, P-intentions are those that guide our present actions, the goal of which can be accomplished in our immediate spatio-temporal environment. These aim at the immediate accomplishment of a goal, such as responding to an email, getting another beer, or using a pen to mark one's place in a book. They can also be pre-reflective, such as when one opens a door because they intend to enter a room (Gallagher, 2012). Finally, there are M-intentions, which are generally sub-personal motor programs for accomplishing P-intentions: one may not reflectively consider the comportment of her hand and the motion of bringing her glass to her mouth when taking a drink, for example, but she can certainly change her grip if the glass is slipping.

The ability to form D-intentions is one of the defining features of human forms of life.⁴ The formation of D-intentions, as described, usually involves using linguistic or other kinds of symbolic reasoning. Thus, any account of their influence in affordance perception needs to involve a story of how it is that we are able to actively orient ourselves to a distal goal—specifically those that are the outcome of some such deliberative process at a spatio-temporal remove from the achievement of the intention's goal. Most accounts of this type of capacity tend to posit mental representations. Mental representations, however, are anathema to both ecological psychology and most branches of enactivism.

In several recent papers, ecological-enactivists have attempted to address 'higher-level' forms of cognition, which are usually taken to be 'representation-hungry' (see van Dijk & Rietveld, 2017; Bruineberg et al., 2018; Kiverstein & Rietveld, 2018). Reference to higher cognitive processes can include memory, abstract reasoning, and the kinds of deliberation and action coordination processes associated with D-intentions.

Bruineberg et al. (2018) aim to show that the information available for perception, combined with the agent's previous history of interactions, can be rich enough for agents to coordinate with distal or absent aspects of the environment without requiring internal states that function to represent those distal aspects. For example, they suggest that "[a]nyone with the right abilities and sensitivity to the regularities that allow one to reliably couple to the affordances will be able to coordinate with distal aspects of the form of life in virtue of information about more local aspects" (p. 11).

According to their account, agents can coordinate their behavior regarding aspects of the environment that are not immediately present by relying on law-like or reliable enough constraints, and hypothesize that these constraints can be based on conventions (see Bruineberg et al., 2018; Chemero, 2009).⁵ To use their example, a tram need not be physically present for me to act in order to catch it. I can coordinate my behavior with the 4 pm tram by relying on the constraint that exists between the tram driver's clock and my own. Because I am attuned to this constraint, I can perceive that I have to leave my apartment right now to catch the tram simply by looking at my watch. Further, they claim that "it is the existence of these constraints that enable us to coordinate our behavior with respect to aspects of the environment to which we are not sensorily coupled" (Bruineberg et al., 2018, p. 11).

While we wish to stay neutral on whether conventional constraints suffice for perceptual information of the kind required in ecological psychology, we nonetheless think that even on their own account this would be necessary but not sufficient for giving an explanation of affordance relevance and the selectivity of the agent. The tram would likely not be relevant to us, even as an absent or virtual affordance, were we not already intending to catch it. The coordination process discussed in their account already seems to assume a D-intention. In order to be distally engaged to catching the tram such that my actions are organized to exploit the information given by these regular-enough covariances (4 pm and the tram's arrival) and constraints (that my 4 pm is the tram driver's 4 pm) requires that I intend to catch the tram in the first place.

Using Pacherie's taxonomy, the accounts provided by ecological-enactivists seem to provide only a story of the link between successive P-intentions toward the satisfaction of a D-intention. The present field of affordances allows us to fulfill a range of P-intentions. In some cases, though, being coupled to whatever affords the fulfillment of a P-intention could present a distal aspect that links to the fulfillment of a successive P-intention. For example, I might check my watch and see that it is time to catch the train, walk to the train station, check that the tram will be on time, and then board the tram and find a seat. At the present time the environment contains a certain set of affordances, and because of the regularity of relationships between some of those affordances and their distal aspects, the possibility for fulfilling linked P-intentions presents itself such that one action leads to the next in a coordinated and pre-reflective manner. This may suffice as an explanation for how it is that the fulfillment of P-intentions unfolds, but doesn't quite tell us

⁴ However, there is some evidence that other animals, such as corvids and non-human primates, form long-term plans (see Boeckle & Clayton, 2017).

⁵ Part of their argument is based on the assumption that the information for perception needs not be specific or lawful. This is why they speak of "general ecological information," as a type of information that is more inclusive than lawful or specific information (see also Chemero, 2009). Canonically, specific information has been taken as to the condition of possibility of direct perception (Michaels & Carello, 1981; Turvey, Shaw, Reed, & Mace, 1981; Turvey, 2019), and it is an open debate whether this general, non-lawful information suffices for direct perception (Segundo-Ortin et al., 2019).

how to think of how a D-intention—the plan to catch the tram to go see a concert, for example—can guide this process.

Bruineberg et al. (2018) argue that “it just takes a process of selective openness to arrive at only the relevant affordances, or solicitations” (p. 14). However, it still seems that the *selectivity* at play here may often involve more than skill or concerns. In other words, we still need to account for the relationship with the guiding D-intentions, the reflective processes that often precede but nonetheless coordinate our current actions. And as they themselves say, “[t]here is no light bouncing off the future” (Bruineberg et al., 2018).

This need is even more clear if we look at a more complex version of the tram example: “I can, for instance, use the affordances of my watch to ensure that my activities over the course of the afternoon are coordinated to the 17.30 train that will leave the train station located in the city centre in time to take me home for dinner when my family are expecting me” (Bruineberg et al., 2018). It seems that what coordinates my present actions here is not the regularities of the environment. Rather, these regularities become relevant for my current intentions—they are perceived as solicitations to act—because I want to fulfil a specific distal goal—namely, having dinner with my family at 17.30. The guiding D-intention in this situation is to go home for dinner, where the author has presumably agreed to meet with their family, but there is no accounting for how this D-intention can help shape the relation with the affordances of the environment.

Similarly, the process-based account of van Dijk and Rietveld (2018) seems to offer a reconceptualization of how we can think of the intertwining of affordances rather than an explanation of what intertwines them. In arguing for a “scalable” process account of affordances, they apply a distinction between *activity* (ongoing) and *action* (completed process) that can be useful for understanding what exactly is being posited in the case of multiple acts being connected through an unfolding process. This allows for the use of *affordance* to describe a long-term process rather than just immediate actions. However, in putting too much of the explanatory power in the affordances themselves, we don’t get much to explain why it is that any particular process unfolds rather than another. Again here, it is often the case that a D-intention pre-dates the activity (process) and acts as its impetus and unfier. We have numerous skills that we can make use of at any given time, and which might be appropriate in our socio-cultural setting, as described by SIF. However, we are missing a piece of the puzzle through which relevance is established, through which opportunities are anticipated, and explains why certain acts of perception happen instead of others. Making sense of distal engagement, at least for humans, will require more than pointing to skill and social practices on the one hand and lawful or general constraints on the other.

Without accounting for D-intentions, the coordination of P-intentions in order to fulfill a long term goal – what we call distal engagement – still seems to require the need to overcome the issue of having our behavior guided by something that sure looks, by any critic’s account, to involve an internal representation. We agree with Neander (2017) that what makes something a representation is that it is being used “to represent a ... target as being a certain way it might or might not be” (p. 35). The question is, then, whether we can make sense of the role that linguistic utterances play in the formation of D-intentions without assuming these linguistic utterances function to represent the world in the sense above specified. As we see it, if we can think of the reasoning involved in forming D-intentions as a pragmatic tool for the self-control and self-organization of behavior—that is, if we can think of language as a means of coping with the world, not copying it (Rorty, 1979)—the problem beings to disappear. With this in mind, we propose that incorporating an enactive account of language can do much in providing an adequate solution for the issue of distal engagement.

5. An enactive proposal for distal engagement

A non-representational account of distal engagement requires that we draw more from the enactivist side of the ecological-enactivist family. Enactivism in general holds that cognition ought to be thought of as a lifelike process that involves the active relationship between organisms and the world, “anchored in the living body” (Di Paolo et al., 2017, p. 20), rather than as a computational process that happens inside the brain. Enactivism, as articulated by Di Paolo et al. (2017), argues that we should conceive of complex organisms as sensorimotor agents, which are “forms of life that are constituted as self-sustaining, habitual organizations in the structural and functional interrelations between their acts, skills, and dispositions” (p. 7). They follow the autopoietic tradition in distinguishing three cycles of operations that constitute the life of complex sensorimotor agents (Varela, Thompson, & Rosch, 1991; Thompson & Varela, 2001). First, sensorimotor agents are in a constant state of regulation and construction of themselves. Second, sensorimotor agents maintain cycles of coupling with their environments. This coupling with the environment involves perceiving the surroundings in terms of potentials for interaction (affordances) and relevancy based on the self-maintenance of the organism.⁶ And, third, sensorimotor agents maintain cycles of intersubjective interactions, “involving the recognition of the intentional meaning of actions and linguistic communication” (Thompson & Varela, 2001, p. 424). Di Paolo et al. (2017) refer to these cycles of operations as *dimensions of embodiment*, and claim that although they constitute autonomous domains of inquiry, each of these dimensions of embodiment is intimately related to the other two, being “mutually constraining and mutually enabling” (p. 5).

To make sense of our regular activities, enactivists introduce the notion of ‘sensorimotor schemes.’ These are organized, task-related sensorimotor patterns of coordination that have been established as preferable due to the existence of some normative framework for evaluation (Di Paolo et al., 2017, p. 58). Consider, for example, the act of driving. The first thing you might do when

⁶ Di Paolo et al. (2017) break with ecological psychology, saying that Gibsonians conceive of cognition as a form of information processing (p. 227). We differ in our reading, and hold that though ecological psychology describes perception as information pick up, it explicitly rejects that this information is gathered, collected, manipulated, or stored. Information pick up is understood here as detection, where detection involves the active exploration of the environment by the agent (see Segundo-Ortin et al., 2019).

you get in a car is to adjust your chair. To do this, you don't measure the length of your legs but simply rely on your sense of comfort as you move the seat forward or back. Then, you may want to adjust the mirrors so that you are confident that you can see all that surrounds your car at any moment. After this, you fasten your seatbelt. All these individual actions involve specific sensorimotor patterns that become get intertwined as a whole sensorimotor scheme and become pre-reflective as you drive more frequently.

As we explained previously, the fulfillment of a P-intention can point to the fulfillment of a subsequent P-intention through exploitation of the distal aspects of present affordances. In enactivist terms, we would say that the enactment of a sensorimotor scheme, in interactive coupling with the environment, can engender or inhibit related schemes. If we put these accounts together, we get a fuller picture of how sensorimotor schemes (which involve interactions with affordances) can point to distal possibilities for action through the activation of related sensorimotor schemes, bringing forth "whole streams of virtual activity at the moment I enact a single particular scheme" (Di Paolo et al., 2017, p. 231). So, for instance, after getting the car adjusted for driving, a distant location may become a possibility that might not have been available to you on foot.

But how can we account for D-intentions, which *are* pre-existing goals set up through a deliberate reflective process? We claim that the resources we need are found in the extensive enactivist treatment of language recently provided by Di Paolo et al. (2018; see also Cuffari et al., 2015). If enactivists are on the right track that the three dimensions of embodiment are mutually constraining and enabling, then we need to understand the role that language plays in enabling and inhibiting sensorimotor schemes and in influencing changes in our field of relevant affordances.

For human forms of life, the development of language skills allows for special kinds of cooperation and coordination with others within the bounds of normative practices established by one's community and within particular contexts (participation genres).⁷ In intersubjective engagements (such as a conversation), there is often a need to perform regulatory acts in order to relieve tensions and asymmetries with other participants. While developing the skills of navigating these tensions with others, we also develop the ability to self-direct regulatory acts, of which self-directed speech is a kind. For instance, I might remind myself that I have an appointment that I need to get to and end a lunch date with a friend, even though we are having a good time. I'm self-directing a regulatory speech act and coordinating my activity accordingly, in order to relieve the tension involved having a pre-existing appointment (a distal goal, or D-intention). In giving their account of self-directed speech, Di Paolo et al. (2018) follow Vygotsky (2012) in pointing out the intertwining of the development of speech and thought, but they steer away from the idea that thought should be considered "inner" in any real sense. They specify that we should think of "incorporated speech rather than inner or internalized speech, since we do not think the *partially* nonovert character of self-directed utterances makes them at all less than proper acts of a world-situated agent" (2018, p. 224, emphasis original).⁸

Languaging, a term inherited from Maturana and Varela (1980, 1992), is a skill we develop in the intersubjective dimension of embodiment. And, as a dimension of embodiment, our linguistic agency constrains and enables our other dimensions of embodiment. Following Di Paolo et al. (2018), we propose that our self-directed utterances are an integral part of our acts of perception, affecting both the ways we are invited or solicited by affordances and how we coordinate with distal aspects of the environment. And as Cuffari et al. say of our use of linguistic skills, "we develop sensitivities to certain acts and strategies of coping, and we incorporate the coping practices until they become constitutive of our way of being in the world" (Cuffari et al., 2015, p. 1092). Again, when we get in the car, places that might otherwise not be reachable for time or distance constraints are now available to us. For example, we can now get that burrito we've been craving from the other side of town. The car changes the way in which we perceive what we can do in the environment, and what distal aspects the present affordances offer. However, self-directed speech can also serve a regulatory role when we remind ourselves that we need to run some important errands before we indulge in any distal burritos. This self-regulation—reminding myself of my D-intention to run those errands—makes some affordances more salient and influences what information I am looking for in the environment. In this way, language is inextricably bound up with our habits of engagement and interaction, action coordination, and perceptual processes.

What we propose is that an ecological-enactive account of distal engagement will benefit from a more developed understanding of the role of this self-directed aspect of linguistic agency as an integral part of our skilled intentionality. That is, it is a vital inclusion in the repertoire of skills involved in skilled intentionality. Given this, two items will need further explanation: the process of deliberation (the formation of D-intentions), and the coordination of actions toward the fulfillment of such D-intentions.

First, the self-directed speech involved in the formation of D-intentions can be part of the regulatory process of evaluation and selection between different courses of action. It is very much a situated, nested process.⁹ Considering the regulatory roles that other-directed and self-directed utterances play in navigating tensions, we can also think of self-directed deliberation and evaluation as playing a regulatory role in regards to our sensorimotor habits. Through ongoing development of this recursive skill, we become able to regulate more complex, temporally distributed, or abstracted intentional acts over time.¹⁰

⁷ This is very much in line with the discussion of how language can be viewed as a social affordance given by Kiverstein and Rietveld (2014), though they stop short of discussing self-directed language.

⁸ Rather than treating the individual as an isolated locus of cognitive phenomena, they point out that this Western view is, as they say, "an abstraction of concrete processual patterns" (ibid, p. 255). Instead, they hold that the processes that provide the conditions for the possibility of consideration of oneself as an "individual" are themselves "interpersonal constitutive relations enacted in and sustaining communities" (Di Paolo et al., 2018, p. 254).

⁹ Sensorimotor schemes and evaluation are given a dynamical systems explanation in Di Paolo et al. (2018), but we will not have room to provide the details of that account here.

¹⁰ This is similar to the ecological-enactive account of imagination, in which the agent is said to be coupled to something local that allows for imagining "in virtue of constraints in the form of life bring[ing] the agent in touch with some distal aspect of the environment" (Bruineberg et al.,

In terms of the ecological-enactive account, we could say that self-directed speech can be an aspect of the processes of attunement to law-like or conventional constraints between present and distal aspects of the environment. Van der Herik (2018) has made a similar point about how we should conceptualize communicative language acts, arguing that language is “a system of social actions that function by constraining unfolding cognitive and interactive dynamics. ... In line with the action-oriented nature of cognition, language is reconceptualised as a mode of action” (p. 98).

Evaluating these distal aspects of the environment, we suggest, will often involve the self-directed regulatory aspects of language that we have described. However, there is no reason that this would be limited to present and distal aspects of the environment in a strict physical sense. That is, it could include interactions with social affordances, institutions, and collective practices (see Gallagher 2013, van Dijk and Rietveld 2017, Gallagher 2017 Ch. 3), accounting for the formation of more abstract D-intentions like those that have been mentioned above (saving for retirement or making more ethical choices).

With this in place, we can look at the issue of coordinating one’s activities toward the fulfillment of a D-intention. For this, we turn back to Pacherie (2015):

[I]f action control is an essential function of intentions, then we should stop thinking of intentions as simply mental representations of goals somehow triggering motor processes that, if everything goes well, will yield the desired outcome. Rather, we should think of monitoring and control processes as intrinsic to intentions, that is, of intentions as encompassing not just representations of goals but also a specific set of monitoring and control processes organizing and structuring the motor processes that themselves generate movements. (p. 10)

Action control indeed seems to be an essential function of intentions. However, we see no reason why we ought to think of these intentions, even D-intentions, as mental representations. Rather, this confuses the phenomenological aspects, or what we experience when we linguistically self-regulate, with the underlying monitoring and control processes (involving the link between languaging and action evaluation and coordination). In other words, D-intentions, though involving language when made explicit, should be seen as “evidence of something humans are capable of doing, evidence of a type of activity, not in itself evidence that the processes underlying this activity are themselves representational” (Di Paolo et al., 2018, p. 220). We see no need to posit a D-intention as a mental representation guiding the monitoring and control processes; the D-intention simply is part of those regulatory processes over a period of time. The long-term coordination process is what we have called *distal engagement*.

Distal engagement, we claim, is then achieved by sustained coordination of sensorimotor schemes towards a goal through ongoing engagement with the environment, social affordances, institutions, normative frameworks, and the like. Similar to the point made in the last section, we think the problem with treating language as intrinsically representational stems from treating language skills as involving the products we are familiar with generating *through* language (statements, questions) rather than looking at the skill of creation itself (see van Dijk, 2016 for a related discussion). From the fact that we can create language artifacts that may have a representational function (that can be used to represent in some context) it does not necessarily follow that the process by which these artifacts are created involve representations (a point also made in Zahnoun, 2019). While we can succeed or fail in aiming at a specific outcome, this success and failure is not due to the fact that our intentions themselves have any veridicality beyond what we attribute to them in the course of certain linguistic practices. That is, we remain coupled with distal aspects of the environment that are relevant to and through which we are able to coordinate future actions, for “I’m no less embodied and coupled to the world when I plan my holidays than when I ride a bike; I’m simply doing different things with my body and my coupling” (Di Paolo et al., 2018).

We have here provided a sketch of distal engagement, accounting for how it is that a human agent might be able to formulate long term goals, or D-intentions, and coordinate their actions toward their fulfillment, using both the ecological and enactive frameworks. Further, we have done so without the need to posit representations. The coordination of actions over time in order to achieve a distal goal does not require representing the world but, instead, involves the continuous coordination of multiple sensorimotor schemes in regards to the affordances of the environment and their distal aspects. The enactive account of linguistic agency provides a non-representational way of understanding how it is that we can form D-intentions and their role in distal engagement by means of self-directed regulatory processes that involve the intertwining of immediate with virtual or distal affordances, sensorimotor scheme selection, and monitoring and control processes. Thus, to say that our intentions influence affordance perception requires no positing of representational mental entities, regardless of whether the intention is formed through a deliberative process which serves a regulatory role over a series of actions or whether it is attributed to an intentional arc or process in reflection.

6. Concluding remarks

What we have proposed in this paper is the beginning of an ecological-enactive account of planning and distal engagement. We’ve argued that the intentions of an agent, or what they want to do in an environment, can shape affordance perception and salience. We’ve also shown that long-term planning or coordinating actions toward achieving distant goals does not necessarily need to involve the positing of representations. In doing so, we maintained that both the agent and the environment play important roles in the explanation of this capacity. In bringing language into the discussion of skilled intentionality, we keep in mind that languaging is not just for social purposes, but involves “reflexive and reflective negotiating with one’s self” (Cuffari et al., 2015, p. 1110), which is a

(footnote continued)
2018).

crucial when explaining the activities of human forms of life.

We have argued that such an account needs to take into consideration the integration of self-directed speech and other skills alongside the education of attention toward affordances within a socio-cultural community. Of course, there is far more fine-grained work to do to in expanding and refining such an account. Doing so would involve the integration of several different areas of research—those previously discussed, and for a few examples, work on affordance space perception and decision-making (Brincker, 2015), institutionally scaffolded goals and affordance saliency in regards to gender (Yang & Barth, 2015) or other socio-cultural identities, and studies linking language area activation and sensorimotor areas in action perception circuits (Pulvermüller, 2018).

The advantage of the ecological-enactive framework provided above is that it prioritizes agent-environment coupling, and in doing so, does not posit agent nor environment as explanatorily privileged while staying true to both ecological and enactive frameworks. It also offers more resources for exploring other aspects of intention formation processes and affordance perception, such as the ways that social expectation and accountability can influence skill development across affordance scales. Specifically, we think an approach like this is important as a groundwork for further research on the ways that social identities, gender, race, ability status, sexual orientation, and political oppression can shape our languaging habits and affordance relevance and solicitation.

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References

- Bockle, M., & Clayton, N. (2017). A Raven's memories are for the future. *Science*, 6347, 126–127. <https://doi.org/10.1126/science.aan8802> (July 14, 2017).
- Brancazio, N. (2019). Gender and the senses of agency. *Phenomenology and the Cognitive Sciences*, 18(2), 425–440. <https://doi.org/10.1007/s11097-018-9581-z>.
- Bratman, M. E. (1987). *Intention, plans, and practical reason*. Cambridge: Harvard University Press.
- Brincker, M. (2015). Beyond sensorimotor segregation: On mirror neurons and social affordance space tracking. *Cognitive Systems Research*, 34–35, 18–34. <https://doi.org/10.1016/j.cogsys.2015.07.002>.
- Bruineberg, J., Chemero, A., & Rietveld, E. (2018). General ecological information supports engagement with affordances for 'higher' cognition. Synthese. Advance online publication. Doi: 10.1007/s11229-018-1716-9.
- Bruineberg, J., & Rietveld, E. (2014). Self-organization, free energy minimization, and optimal grip on a field of affordances. *Frontiers in Human Neuroscience*, 8, 599. <https://doi.org/10.3389/fnhum.2014.00599>.
- Chemero, A. (2009). *Radical embodied cognitive science*. Cambridge, Mass: MIT Press.
- Costall, A. (2012). Canonical affordances in context. *Avant: Trends in Interdisciplinary Studies*, 3(2), 85–93.
- Costall, A. (1995). Socializing affordances. *Theory & Psychology*, 5(4), 467–481. <https://doi.org/10.1177/0959354395054001>.
- Cuffari, E. C., Di Paolo, E., & De Jaegher, H. (2015). From participatory sense-making to language: There and back again. *Phenomenology and the Cognitive Sciences*, 14(4), 1089–1125. <https://doi.org/10.1007/s11097-014-9404-9>.
- Cutting, J. E. (1982). Two ecological perspectives: Gibson vs. Shaw and Turvey. *The American Journal of Psychology*, 95(2), 199–222.
- Di Paolo, E. A., Cuffari, E. C., & De Jaegher, H. (2018). *Linguistic Bodies: The Continuity Between Life and Language*. Cambridge: Massachusetts: MIT Press.
- Di Paolo, E. A., Buhmann, T., & Barandiaran, X. E. (2017). *Sensorimotor Life: An Enactive Proposal*. Oxford: United Kingdom: Oxford University Press.
- Favela, L. H., & Chemero, A. (2016). The animal-environment system. In Y. Coello, & M. H. Fischer (Eds.). *Foundations of Embodied Cognition: Volume 1: Perceptual and Emotional Embodiment* (pp. 59–74). Routledge.
- Gallagher, S. (2012). Multiple aspects in the sense of agency. *New Ideas in Psychology*, 30, 15–31. <https://doi.org/10.1016/j.newideapsych.2010.03.003>.
- Gallagher, S. (2013). The socially extended mind. *Cognitive Systems Research*, 25–26, 4–12. <https://doi.org/10.1016/j.cogsys.2013.03.008>.
- Gallagher, S. (2017). *Enactivist Interventions: Rethinking the Mind*. Oxford: United Kingdom: Oxford University Press.
- Gibson, E. J., & Rader, N. (1979). Attention. In G. A. Hale, & M. Lewis (Eds.). *Attention and Cognitive Development* (pp. 1–21). Boston, MA: Springer US Doi: 10.1007/978-1-4613-2985-5_1.
- Gibson, J. J. (1966). *The senses considered as perceptual systems*. Westport: Conn: Greenwood Press.
- Gibson, J. J. (1974/1982). Notes on action. In E. Reed, & R. Reed (Eds.). *Reasons for Realism. Selected Essays of James J. Gibson* (pp. 385–392). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Gibson, J. J. (1979/2015). The ecological approach to visual perception, Psychology Press classic editions. Psychology Press: New York, NY.
- Heft, H. (1989). Affordances and the body: An intentional analysis of Gibson's ecological approach to visual perception. *Journal for the Theory of Social Behaviour*, 19(1), 1–30. <https://doi.org/10.1111/j.1468-5914.1989.tb00133.x>.
- Heft, H. (2007). The social constitution of perceiver-environment reciprocity. *Ecological Psychology*, 19(2), 85–105. <https://doi.org/10.1080/10407410701331934>.
- Kiverstein, J., & Rietveld, E. (2015). The primacy of skilled intentionality: On Hutto & Satne's the natural origins of content. *Philosophia*, 43, 701–721. <https://doi.org/10.1007/s11406-015-9645-z>.
- Kiverstein, J. D., & Rietveld, E. (2018). Reconceiving representation-hungry cognition: An ecological-enactive proposal. *Adaptive Behavior*, 26(4), 147–163. <https://doi.org/10.1177/1059712318772778>.
- Mace, W. (2015). Introduction. In J. J. Gibson (Ed.). (1979/2015). *The Ecological Approach to Visual Perception*. New York, NY: Psychology Press.
- Maturana, H. R., & Varela, F. J. (1980). *Autopoiesis and cognition: The realization of the living*. Dordrecht: D. Reidel Pub. Co.
- Maturana, H., & Varela, F. (1992). *The tree of knowledge*. Boston: Shambhala.
- Michaels, C. F., & Carello, C. (1981). *Direct perception*. Englewood Cliffs, NJ: Prentice-Hall.
- Michaels, C. F., & Palatinus, Z. (2014). A ten commandments for ecological psychology. In L. Shapiro (Ed.). *The Routledge handbook of embodied cognition* (pp. 19–28). New York, NY, US: Routledge/Taylor & Francis Group.
- Mossio, M., & Taraborelli, D. (2008). Action-dependent perceptual invariants: From ecological to sensorimotor approaches. *Consciousness and Cognition*, 17(4), 1324–1340. <https://doi.org/10.1016/j.concog.2007.12.003>.

- Neander, K. (2017). *A mark of the mental: In defense of informational teleosemantics*. Cambridge, Mass: MIT Press.
- Norman, D. A. (2013). *The design of everyday things*. New York, New York: Basic Books.
- Pacherie, E. (2008). The phenomenology of action: A conceptual framework. *Cognition*, 107(1), 179–217.
- Pacherie, E. (2015). Conscious intentions: The social creation myth. In T. Metzinger, & J. M. Windt (Eds.). *Open MIND: 29(T)* Frankfurt am Main: MIND Group doi: 10.15502/9783958570122.
- Pulvermüller, F. (2018). Neural reuse of action perception circuits for language, concepts and communication. *Progress in Neurobiology*, 160, 1–44. <https://doi.org/10.1016/j.pneurobio.2017.07.001>.
- Rietveld, E., & Kiverstein, J. (2014). A rich landscape of affordances. *Ecological Psychology*, 26(4), 325–352. <https://doi.org/10.1080/10407413.2014.958035> October 2, 2014.
- Rorty, R. (1979). *Philosophy and the mirror of nature*. Princeton: New Jersey: Princeton University Press.
- Segundo-Ortin, M., Heras-Escribano, M., & Raja, V. (2019). Ecological psychology is radical enough: A reply to radical enactivists. *Philosophical Psychology*. 32(7), 1001–1023.
- Thompson, E., & Varela, F. J. (2001). Radical embodiment: Neural dynamics and consciousness. *Trends in Cognitive Sciences*, 5, 418–425. [https://doi.org/10.1016/S1364-6613\(00\)01750-2](https://doi.org/10.1016/S1364-6613(00)01750-2).
- Turvey, M. T. (2019). *Lectures on perception: An ecological perspective*. New York, NY: Routledge.
- Turvey, M. T., & Carello, C. (2011). Obtaining information by dynamic (effortful) touching. *Philosophical Transactions of the Royal Society, B: Biological Sciences*, 366(1581), 3123–3132.
- Turvey, M. T., Shaw, R. E., Reed, E. S., & Mace, W. M. (1981). Ecological laws of perceiving and acting: In reply to Fodor and Pylyshyn (1981). *Cognition*, 9(3), 237–304. [https://doi.org/10.1016/0010-0277\(81\)90002-0](https://doi.org/10.1016/0010-0277(81)90002-0).
- Van Den Herik, J. C. (2018). Attentional actions – an ecological-enactive account of utterances of concrete words. *Psychology of Language and Communication*, 22(1), 90–123. <https://doi.org/10.2478/plc-2018-0005>.
- van Dijk, L. (2016). Laying down a path in talking. *Philosophical Psychology*, 29, 993–1003. <https://doi.org/10.1080/09515089.2016.1213379>.
- van Dijk, L., & Rietveld, E. (2017). Foregrounding sociomaterial practice in our understanding of affordances: The skilled intentionality framework. *Frontiers in Psychology*, 7, 1969. <https://doi.org/10.3389/fpsyg.2016.01969>.
- van Dijk, L., Rietveld, E. (2018). Situated anticipation. Synthese. Advance online publication. Doi: 10.1007/s11229-018-02013-8.
- Varela, F., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: MIT Press.
- Vygotsky, L. S. (2012). *Thought and language* (rev. ed.). Cambridge, MA: MIT Press.
- Withagen, R., & van der Kamp, J. (2010a). Towards a new ecological conception of perceptual information: Lessons from a developmental systems perspective. *Human Movement Science*, 29(1), 149–163. <https://doi.org/10.1016/j.humov.2009.09.003>.
- Warren, W. H. (1984). Perceiving affordances: Visual guidance of stair climbing. *Journal of Experimental Psychology: Human Perception and Performance*, 10(5), 683–703. <https://doi.org/10.1037/0096-1523.10.5.683>.
- Withagen, R., de Poel, H. J., Araújo, D., & Pepping, G. J. (2012). Affordances can invite behavior: Reconsidering the relationship between affordances and agency. *New Ideas in Psychology*, 30(2), 250–258. <https://doi.org/10.1016/j.newideapsych.2011.12.003>.
- Yang, Y., & Barth, J. M. (2015). Gender differences in STEM undergraduates' vocational interests: People–thing orientation and goal affordances. *Journal of Vocational Behavior*, 91, 65–75. <https://doi.org/10.1016/j.jvb.2015.09.007>.
- Zahnoun, F. (2019). On representation hungry cognition (and why we should stop feeding it). Synthese. Advance online publication. Doi: 10.1007/s11229-019-02277-8.