



Intelligence involves intensionality: An explanatory issue for radical enactivism (again)

Silvano Zipoli Caiani¹

Received: 30 July 2020 / Accepted: 29 November 2021
© The Author(s) 2022, corrected publication 2022

Abstract

How can we explain the intelligence of behaviors? Radical enactivists maintain that intelligent behaviors can be explained without involving the attribution of representational contents. In this paper, I challenge this view by providing arguments showing that the intelligence of a behavior is reliant on *ways of presenting* the relative purpose and the environment in which that behavior is performed. This involves that a behavior is intelligent only if intensional contents are ascribed to the related agent. Importantly, this conclusion also concerns basic behaviors such as those related to the perception of affordances in the environment. Accordingly, either affordance-related behaviors are not instances of intelligent behaviors and can be accounted in a contentless way or affordance-related behaviors are intelligent, but cannot be accounted without involving contents and modes of presentation.

1 Introduction

Behaviors can be said to be intelligent in many ways. There are cases in which a behavior is said to be intelligent because the agent masters sophisticated sociocultural practices involving language use and understanding: playing bridge or writing a philosophy paper are behaviors of this sort. There are also cases in which the agent does not hold language skills and does not master sociocultural practices, but is able to perform behaviors that can be said to be intelligent, as in the case of actions performed by pre-linguistic infants, certain non-human hominids and other animals. Therefore, the question is, what makes a behavior an intelligent thing? Although intelligence is an elusive concept (Legg & Hutter, 2007), it appears that at least two ingredients are needed for a behavior to be intelligent.

✉ Silvano Zipoli Caiani
silvano.zipolicaiani@unifi.it

¹ Università degli Studi di Firenze, Firenze, Italy

The first ingredient of an intelligent behavior is *purposiveness*: if a behavior is intelligent, it *aims at a goal*, that is, it is performed to reach a final condition. There are two main reasons to assume that intelligent behaviors are purposive. First, this is consistent with the common view according to which a behavior is intelligent in relation to the purpose for which it is performed, while it is not intelligent at all if accidentally executed. For example, pressing the light switch is an intelligent behavior if I perform it, say, with the aim to turn on the light or drive a thief out of my home, but it is not intelligent if, leaning against the wall, I inadvertently press the switch. In other words, if an intelligent behavior were not purposive it would not be different from a mere accidental event. Secondly, to see intelligent behaviors as purposive is consistent with the fact that intelligent behaviors can be compared and that a behavior is *more* or *less* intelligent depending on the goal for which it is performed. For example, there is a sense according to which the “Levallois technique” used by our ancestors to make stone flakes is a more intelligent behavior than the “hammer and anvil” technique used for the same purpose. Thus, if an intelligent behavior were not purposive, it would make no sense to compare its intelligence to the intelligence of a different behavior. It seems reasonable, indeed, that to be compared intelligent behaviors must share their goals.

The second ingredient of an intelligent behavior is *flexibility*: if a behavior is intelligent, the way it actualizes is *reliant on the relevant environmental aspects*, that is, it is performed in various ways depending on the properties of the environment. Typically, intelligent behaviors adapt to changes in the environment, so that there is a sense according to which the same intelligent behavior can be performed differently depending on the environmental conditions and the related aim. For example, to pour a liquid from a bottle into a glass can be considered an intelligent behavior based on the way it is executed. Notably, the way to pour a liquid from a bottle into a glass depends on the quantity of liquid contained in the bottle and in the glass. Thus, pouring a liquid from a bottle into a glass requires selecting perceptual variables concerning the amount of the poured liquid and the capacity of the class, but involves ignoring other contextual variables, such as the smell of the liquid. In other words, the execution of flexible behaviors requires the selection of salient stimuli, while ignoring extraneous ones.

In short, it is reasonable to maintain that intelligent behaviors are both *purposive* and *flexible*, and that understanding what makes a behavior intelligent involves explaining its purposiveness and flexibility.¹

¹ There are many definitions of intelligence on the market (Legg & Hutter, 2007; Sternberg, 2000) and is not possible to summarize all of them here. A common tendency is to consider intelligence as part of the natural ability of an agent to adapt to the environment. However, intelligence and adaptability are not synonymous terms. For the sake of this article, it is important to point out that among the many adaptive behaviors, only few are central to the definition of intelligent behaviors, namely, those behaviors for which it makes sense to say that are purposive and flexible. Moreover, it should be noted that this way of conceiving intelligent behaviors is consistent with the idea that intelligence and rationality are two distinct cognitive capacities (Brooks, 1999). Indeed, a behavior can be intelligent without being associated with forms of inferential reasoning. This is because the ability to perform a behavior that is purposeful and flexible does not imply that the agent is able to master rules of syntactic composition or logical inference.

Things are interesting because there are two competing philosophical hypotheses to account for the intelligence of behaviors. In the first view, *purposiveness* and *flexibility* are considered by conceiving agents as vehicles of representational contents, whereas according to the second view, intelligence is explained without ascribing representations to agents. The main difference between the two views can be framed by means of *intensionality*. Notably, intensionality is a category used to grasp the peculiar *mode of presentation* that a representational vehicle has in respect to a certain target. According to a notorious example, although the two representations of Jocasta as “The Queen of Tebe” and “The Mother of Oedipus” have the same target, they differ concerning their intensions as they present Jocasta in different modes.

On the representational account, an explanation of the intelligence of behaviors is intensional since involves the attribution to the agent of *modes of presenting* behavioral targets, as famously exemplified by the tragedy of Oedipus who marries Jocasta according to a particular mode of presentation. In the antirepresentational view, instead, an account of intelligence does not imply modes of presentation of any sort. Interestingly, while the representational view is considered *conservative*, frequently in a detrimental sense, the antirepresentational approach is often viewed as *revolutionary* and *progressive* (e.g., Chemero 2011; Gallagher, 2017; Hutto & Myin, 2012, 2017; Ramsey, 2007; Spivey, 2008).

Among the many versions of the antirepresentational view, the Radical Embodied/Enactive theory of Cognition, also known as REC (Hutto & Myin, 2012, 2017) is currently attracting the attention of scholars from the fields of philosophy, psychology, and neuroscience. REC is peculiar because it involves a twofold level of explanation: it is conservative in accepting that some intelligent behaviors admit explanations based on the attribution of intensional contents if certain *sociocultural conditions* are in order; at the same time, it is revolutionary in assuming that there are genuine instances of intelligent behavior whose explanations do not involve the ascription of contents and intensions to agents (Hutto & Myin, 2017; Hutto & Satne, 2015; Myin & Herik, 2020). According to REC, these cases are well represented by some cases of *affordance-related behaviors* that are intelligent, but that nevertheless can be suitably explained without involving the attribution of intensional contents to agents (Myin, 2020). However, despite the growing interest about this thesis, it remains controversial that the purposiveness and the flexibility of intelligent behaviors can be explained without involving the attribution to an agent of semantic contents and intensions (Colombo, 2014a; Gadsby & Williams, 2018; Zipoli Caiani, 2018; Zipoli Caiani & Ferretti, 2017; Ferretti & Zipoli Caiani, 2021).

As noted by Myin (2020), although it has been shown that many affordance-related behaviors that are intelligent admit explanations in terms of intensional representations (e.g., Zipoli Caiani 2018), this does not indicate that *all* affordance-related behaviors that are intelligent must be explained in this way. As already mentioned, REC admits that the explanation of affordance-related behaviors may involve conservative, representational approaches given certain sociocultural conditions, but this does not exclude that there remain some cases in which affordance-related behaviors that are intelligent can be explained without attributing representational contents to agents. Thus, according to Myin (2020), the only way to challenge REC is to show

that there are not cases of intelligent behaviors that can be accounted without involving the ascription of contents and intensions to agents.

This paper challenges REC by showing that *intelligence involves intensionality* and that accounting for the intelligence of affordance-related behaviors requires attributing intensions and contents to agents. This is mainly because the purposiveness and the flexibility of intelligent behaviors entail modes of presentation that cannot be suitably accounted in terms of the mere interactions between the agent and the environment (see Sects. 3 and 4). If my analysis is correct, therefore, either affordance-related behaviors are not instances of intelligent behaviors or they must be accounted by ascribing intensions to agents.

The paper is structured as follows. Section 2 introduces the REC thesis according to which there are two ways to account for the purposiveness and the flexibility of intelligent behaviors, one involving the attribution of contents given certain sociocultural conditions, and the other based exclusively on the dynamic interaction between the agents and the environment. Then, contrary to REC, Sects. 3 and 4 provide arguments to maintain that the purposiveness and the flexibility that characterize intelligent behaviors cannot be considered without involving the ascription of intensions to agents.

It should be clear that I am not engaged in defending some form of realism about mental representations. To use the REC-ish vocabulary, I maintain that an account of the purposiveness and flexibility of behaviors is *content involving*, but I do not say anything about the fact that purposive and flexible behaviors are *content based* (Myin & Hutto, 2015). The point, rather, is that an account of purposiveness and flexibility which limits itself to considering only relations between the agent and the environment misses something essential to account for the intelligence of our behaviors, that is, the intensionality of cognition. As it will be clear at the end of the paper, the reference to intensional contexts helps to explain the intelligence of behaviors by picking out actual and counterfactual patterns, which allow to differentiate intelligent behaviors from unintelligent ones. Importantly, this claim is more in line with Dennett's intentional stance (e.g., Dennett 1987), than with the realist view to which REC is usually opposed. To be precise, my purpose is to show the methodological indispensability of intensional attributions to account for the intelligence of behaviors. Whether this stance has consequences with regard to the ontology of cognition is at least controversial (Horst, 2009; Shapiro, 1997), and addressing this issue is beyond the intent of this work.

For the purposes of this article, indeed, I am comfortable with an interpretation of content-involving cognition such as that provided by REC (Hutto & Myin, 2017; Myin, 2020). Particularly, I am comfortable with a conception according to which an ascription of content to a vehicle entails a suitable *sociocultural context* (see the next Sect. 2). Thus, if accounting for the intelligence of a behavior involves the attribution of an intensional content to an agent, as I argue in this paper, and if the attribution of a content to an agent entails a sophisticated sociocultural context, as argued by REC, then it follows that to account for the intelligence of a behavior entails a sophisticated

sociocultural context. Indeed, it is precisely within such a sociocultural context that the attribution of intensional contents to agents acquire an explanatory value.²

To resume, my overall conclusion is that the purposiveness and the flexibility of intelligent behaviors cannot be suitably accounted in nonrepresentational terms, that is, without involving the ascription of intensional contents to the agents. This represents an explanatory challenge for the way REC understands affordance-related behaviors: either affordance-related behaviors are not intelligent, and can be accounted in contentless terms, or they are intelligent, and cannot be accounted without involving the ascription of contents and intensions to agents in a suitable sociocultural context.³

Importantly, such a conclusion is beneficial not only because sheds light on the debate between conservative and revolutionary explanations in the cognitive sciences, but also because it provides a grasp of the way we attribute intelligence to agents.

2 Intentions without Intensions

In the previous section, I said that REC is peculiar because admits both conservative and revolutionary explanations. REC is conservative in assuming that, at least in certain cases, the intelligence of behaviors can be accounted in terms of contentful and intensional representations, if certain sociocultural conditions are in play. At the same time, REC is revolutionary in assuming that there are genuine forms of intelligent behavior the explanation of which does not involve representational ascriptions to agents (Hutto & Myin, 2017; Myin 2020). According to REC, these different levels of explanation are secured by two forms of intentionality (Hutto & Myn, chp. 5).

The conservative level is secured by a form of *content-involving intentionality*, namely, intentionality classically defined (Bratman, 1999; Dennett, 1987; Egan, 2013; Fodor, 1990; Horst, 2011; Mele & Moser, 1994; Searle, 1983). At this level, a vehicle is intentional if it can be said to be oriented towards a target by holding a content about that target. Here, a content is conceived in terms of satisfaction conditions; namely, it can be accurate or inaccurate, true or false. Importantly, to have conditions of satisfaction, there are cases in which a content is oriented towards a target according to a *certain mode of presentation*. Therefore, though there are several *modes of presenting* what is intended, a vehicle will only pick up one of those modes. This is the *intensionality* of content-involving intentional vehicles.

² It should be noted that my use of “content-involving representation” is in line with a certain reading of REC, since it recognizes that to be explanatory relevant, the notion of content-involving representation needs to be used within the appropriate sociocultural context (e.g., Hutto & Myin 2017). This allows me to avoid the objection according to which, for REC, there is no way to reconcile an anti-realist position with the view that the ascription of mental contents can play an explanatory function. I thank an anonymous reviewer for having raised this issue.

³ The argument as developed in this paper has a theoretical purpose, therefore, I avoid referring to experimental cases where the role of intensionality in explaining affordance-related behaviors is evident. For an empirically informed discussions of such cases, see Zipoli Caiani (2014; 2018), Zipoli Caiani & Ferretti (2017), Ferretti & Zipoli Caiani (2021).

Interestingly, content-involving intentionality allows for a conservative account of the intelligence of behaviors *by attributing* to the agents the ability to represent things in a certain way. With this view, since an intelligent behavior is purposive, an agent is oriented towards a goal by intensionally presenting a target *as a particular goal*. Similarly, because intelligent behaviors are flexible, an agent selects the available possibilities of action by presenting aspects of the environment according to certain modes, so that different modes of presentation point out different possibilities of action (§3, 4).

It is a central claim of REC that content-involving intentional relations occur *if and only if* certain *sophisticated sociocultural practices* are in play (Hutto & Myin, 2017; Hutto & Satne, 2015; Myin & Hutto, 2015). Such practices are precisely those for which it makes sense to say that an intentional content is true or false, accurate or inaccurate depending on the related intensional mode. Now, since the conservative explanation of intelligent behaviors is based on the ascription of a form of content-involving intentionality to agents, it can be invoked only if the relevant sociocultural practices are in order.

I already stated that according to REC conservative explanations are not the only game in town. For REC, indeed, there is a more revolutionary way to account for the intelligence of behaviors without involving intensional contents and conditions of satisfaction. Such a revolutionary way is secured by a form of *ur-intentionality*, namely, “intentionality without intensionality” (Myin & Hutto, 2015, p. 62). Here, an intentional state can be directed towards a target without involving modes of presenting that target, namely, in a *nonrepresentational* and *contentless* way. Thus, according to REC, there are cases of intelligent behavior that can be accounted by means of *ur-intentional* relations, that is, without involving the ascription of intensions to agents. Importantly, since *ur-intentionality* does not involve intensionality, and since intensionality involves that certain sociocultural practices are in order, one may hypothesize that *ur-intentionality* allows for an explanation of intelligent behaviors regardless of sophisticated sociocultural practices being in order.⁴

To clarify this concept, Hutto & Myin (2017, p. 193) draw on a paradigmatic example. They refer to the ability of our non-linguistic ancestors to build tools and artifacts of impressive complexity, such as making stone flakes through the famous Levallois technique. Importantly, such an ability implies the execution of an intelligent behavior: it requires agents to engage in planning goal-oriented movements apt to produce flakes of stones, as well as requires such movements to fit with environmental changes, such as those concerning the variable features of the available stones. In short, making a stone flake through the Levallois technique involves purposiveness and flexibility, and therefore has the basic ingredients to be an intelligent behavior (§1).

⁴ It should be noted that such a hypothesis is not justified by a deductive inference. Indeed, on the basis of what has been said so far, there is no reason to exclude that certain sociocultural conditions are also relevant in the case of *ur-intentional* explanations. It could be the case that intensional explanations and *ur-intentional* explanations rely only on partially different sociocultural assumptions, so that there could be general assumptions common to both explanatory strategies (see § 3.3, particularly the discussion about considering *ur-intentional* functions as proper functions). What such sociocultural conditions are and which assumptions they involve, however, is not the subject of this essay.

According to REC, the ability of our ancestors to make stone flakes can be suitably explained by referring to *ur-intentional* relationships. Such relationships are identified by the *interactions* between the agent and the environmental target, so that “‘decisions’ and ‘intentions’ of the basic cognitive variety emerge through interacting and engaging with the material over time” (Hutto & Myin, 2017, p. 196). In this view, the *history* of interactions between the agent and the environment explains her present ability to execute such a particular goal-oriented behavior. Given regular co-occurrences of actions and interactions, an organism becomes *attuned* to specific aspects of the environment, responding to such aspects in characteristic ways. Now, since such environmental attunement involves the acquisition of behavioral tendencies towards certain arrangements of the agent-environment system, it can be said that an agent behaves towards specific goals.

Moreover, in this view, it is the history of interactions and associations that explain why an organism’s behavior varies according to the relevant aspects of the environment. As already mentioned, the continuous association between motor acts and aspects of the environment outlines behavioral tendencies towards different ends, so that a variation of the environment can determine a change in the behavioral course of the agent. To put it briefly, according to REC, a behavior is flexible because it is the output of a process of attunement defined as an *ur-intentional* relation between the agent and the relevant variables of the environment.

Interestingly, REC takes that a case of intelligence is represented by certain instances of affordance-related behaviors (Gibson, 1979). In such a view, to perceive an affordance for an agent means to be sensible to variables in the visual array corresponding to certain possibilities of action. According to REC, there are cases of performing affordance-related behaviors that can be conceived as dynamical forms of engagement with salient aspects of the environment that do not require any role for modes of presentation (Hutto & Myin, 2017; Myin & Herik, 2020)⁵. Such cases are, for example, those concerning the affordance-related behaviors of non-human animals, but also those concerning hominids before sociocultural, content-involving practices arrived on the scene (Myin, 2020, p. 7). To put it clearly, according to REC, there are cases of *purposive* and *flexible* affordance-related behaviors the explanations of which is not conditional on the sophisticated sociocultural practices that allow the ascription of contents and intensions to agents. In other words, the explanations of certain cases of affordance-related behavior can be obtained on the basis of *ur-intentional* relations with the environment, rather than on the basis of intensional representations (see Myin, 2020, §5).

To resume, I have said that REC admits accounting for intelligent behaviors by means of two ways of explanation: the conservative one, which is contentful and

⁵ It is relevant to note that the agreement between Gibson’s ecological psychology and REC concerns the non-representational account of internal cognition, while it seems that they diverge regarding environmental information. Notably, according to Myin (2016), ecological psychology cannot be reconciled with REC since Gibson’s view is committed to the thesis that there is informational content in the environmental information. However, though Gibson (1979) and his fellows (e.g., Turvey et al. 1981) assumed that there is information in the ambient array of light which specifies environmental properties, it is highly controversial whether they intended such a notion as involving a content about environmental targets. On this issue, see Segundo-Ortin et al., (2019). I thank a reviewer for a clarification on this point.

intentional, and the revolutionary one, which is contentless and non-intentional. The conservative way is reliant on a sociocultural context being in play, meaning that intentional explanations are suitable if and only if certain sophisticated sociocultural practices are in order. In contrast, the revolutionary way of explanation is appropriate even if those practices that enable the conservative way are not in play. Particularly, according to REC, there are forms of intelligent behavior the explanations of which do not involve the ascription of contents and intentions to agents. This is the case of certain occurrences of affordance-related behaviors, the execution of which can be accounted in terms of ur-intentional relations between the agent and aspects of the sensory environment.

Now, as ur-intentionality deals exclusively with the interactions between vehicles and targets, but not with intentional contents, in order for it to be a viable concept to account for the intelligence of affordance-related behaviors, there should be suitable explanations of the purposiveness and flexibility of these behaviors that do not involve intentionality, that is, modes of presenting the relevant aspects of the environment in a certain way. In the next two sections, however, contrary to REC, I argue that purposiveness and flexibility cannot suitably be accounted without ascribing intentional contents to agents.

3 Purposiveness Involves Intentionality

In Sect. 1, I said that an intelligent behavior has a goal and that understanding what makes a behavior intelligent involves accounting for it having a goal. Then, in Sect. 2, I said that for REC such an account can be suitably provided by means of ur-intentionality, that is, in contentless and non-intentional terms. Now, since in this view an ur-intentional state can be oriented towards a target without implying a way of presenting that target, the question is: can a behavior be ur-intentionally oriented towards a goal without presenting that goal in a certain way?

Before to provide an answer to this question, it should be noted that an explicit definition of what the goal of an intelligent behavior is is not available in the REC literature. However, a notion of goal which is consistent with REC can be inferred according to what has been said in the previous section (§2). Notably, since according to REC an account of the intelligence of behaviors does not require reference to intentional representations, it should be possible for an intelligent behavior to have a goal without involving the attribution of intentional contents to the related agent. Now, for the notion of goal not to imply the attribution of *intentional* contents, it must be defined in *extensional* terms. On this view, therefore, the best way to define the goal of an intelligent behavior is to conceive it as an *extensional* arrangement towards which the agent-environment system is dynamically oriented over time. In other words, the goal of a behavior is a salient configuration of the system that occurs at the end of a continuous dynamical process of interaction between the agent and the environment. This configuration can take on different adaptive meanings, as it happens in the case of autopoietic enactivism, for which certain activities of living beings entail the existence of conditions of the system tied to maintaining the survival and the continuous identity of the agent. This allows thinking about the goal-relatedness

of our intelligent behaviors in terms of *biological norms*, without mentioning prior intentions, conditions of satisfaction or other intensional stuff (on this point see Hutto & Myin 2017, p. 76, 77).

To summarize, I have previously mentioned that an intelligent behavior must have a goal to differentiate from an accidental one and to be considered more or less intelligent than another behavior (§1), then, I have argued that in order for the notion of goal to be consistent with REC, it must be conceived as an extensional arrangement of the agent-environment system endowed with (biological) salience.

For example, consider the case in which a certain agent, say one of our non-linguistic ancestors, picks up stones of a certain shape and dimension that afford to be used in the way L, such as the way required to make stone flakes by means of the Levallois technique. In this view, such a behavior can be said to have a goal, say collecting stones that afford to be used in the way L, if it is dynamically oriented towards the extensional configuration of the system in which the agent holds a stone that affords to be used in the way L.⁶

Suppose now that our ancestor lived in an ambient where all the stones that afford to be used in the way L are white stones, and that all stones that are white afford to be used in the way L. In this case, the configuration in which the agent holds a stone affording to be used in the way L, and the condition in which she holds a white stone are the same state of the agent-environment system. Accordingly, a behavior that is dynamically oriented towards the extensional configuration in which the agent ends up holding a stone affording to be used in the way L is also oriented towards the extensional condition in which the agent ends up holding a white stone. This means that, from an ur-intentional point of view, in this case holding a stone that affords to be used in the way L and holding a white stone are the same goal, because they are the same extensional configuration of the agent-environment system. More generally, an ur-intentional take on the purposiveness of behaviors involves that co-extensional conditions of the agent-environment system must be considered as one and the same goal.

To put it clearly, according to an ur-intentional account of purposiveness:

i) The goal of a behavior is an extensional configuration of the agent-environment system, for example one that is tied to maintaining the survival and the continuous identity of the agent.

Therefore:

ii) Behaviors that are oriented towards the same extensional configuration of the agent-environment system have the same goal.

However, it seems reasonable to maintain that aiming at holding a stone that affords to be used in the way L is not tantamount to holding a white stone, and that two behaviors that are dynamically oriented towards the same configuration of the agent-environment system do not necessarily have the same goal, though such a configuration is tied to maintaining the survival and the continuous identity of the agent.

⁶ It should be noted that for a behavior to be purposive, it is not necessary that it achieves its goal. A behavior can be purposive even if its goal is not presently reached and never will be. The problem of how a behavior can be oriented towards goals that are not reachable is not under scrutiny in this paper (Clark & Toribio, 1994; Degenaar & Myin, 2014).

There are indeed at least two reasons to resist the temptation to assume that co-extensional states of the agent-environment system are the same goal.

3.1 The First Reason

The first reason is that two goals that are identical to the same condition of the agent-environment system given certain extensional circumstances can be different given other circumstances, so that two behaviors that have the same goal if certain environmental conditions occur may have different goals if such conditions change. For example, although in certain cases a behavior that is dynamically oriented towards holding a stone that affords to be used in the way L and a behavior that is dynamically oriented towards holding a white stone may be oriented towards the same state of the agent-environment system, they may be oriented towards different states in different circumstances. Indeed, if the ambient changed and the stones affording to be used in the way L were no longer all white stones, holding a stone that affords to be used in the way L would be no longer identical to holding a white stone. In other words, *goals have multiple identities*: while in certain environmental circumstances holding a stone affording to be used in the way L is the same state than holding a white stone, in other circumstances holding a stone affording to be used in the way L is a different state than holding a white stone.

How can a goal have multiple identities? This is possible only whether the goal of a behavior is intended according to certain modes of presentation. Indeed, by invoking modes of presentation one can intend a state of the agent-environment system as a certain goal depending on the mode according to which that state is presented. In this way, it makes sense to say that two behaviors have different goals, though in certain cases their goals are the same extensional state of the agent-environment system.

The problem for REC is precisely that, since such multifaceted identity of goals involves modes of presentation, the purposiveness of intelligent behaviors is out of the explanatory reach of REC. Notably, this conclusion contrasts with the assumption that the purposiveness of an intelligent behavior can be suitably accounted in *ur-intentional* terms, that is, by conceiving a goal as a state of the agent-environment system towards which that behavior is dynamically oriented over time, without involving the attribution of intensional contents to the agents (§2). However, since the same state of the agent-environment system can be identical to multiple goals, and since a certain goal can have multiple extensional identities, then, an account of what makes a behavior purposive cannot be provided without involving that a state of the agent-environment system is presented in a particular mode, that is, as a particular goal. Now, since the mode of presenting a target is a typical property of an intensional content, accounting for the purposiveness of a behavior involves the attribution of an intensional content to the agent.

A follower of REC might reply that to avoid this problem it is unnecessary to invoke intensional contexts, rather, it is sufficient that goal-oriented behaviors are guided by nomological patterns governing the agent-environment interactions. For example, one may say that, if there are laws governing behaviors oriented toward collecting and manipulating stones, it is irrelevant whether a goal is presented according to a certain intensional description instead of another. However, although examples

of stable patterns of behavioral coordination have been offered (e.g. Haken et al., 1985), no nomological explanations of intelligent behaviors such as those described in the previous example are currently available. The problem is that many goal-oriented behaviors do not fit into *universal patterns*: there are no laws that apply to every instance of collecting and manipulating stones that afford to be used in the way L for example. Furthermore, many behaviors of the same type do not fit into *special patterns* either, so that there are no *ceteris paribus* non-intensional laws governing specific instances of collecting and manipulating stones.

Moreover, it must be said that, even if such laws were available, our initial problem would not be solved anyway. Indeed, two behaviors can have different goals although, given certain conditions, they are guided towards the same final configuration of the agent-environment system by means of natural laws. If having a goal is an ingredient of behaviors that are intelligent, then a suitable account of the intelligence of behaviors involves explaining how two behaviors that are dynamically oriented towards the same configuration of the agent-environment system can have different goals, regardless of whether such behaviors are guided by some law. In the absence of a better solution, we are forced to accept that the best way to account for the purposiveness of intelligent behaviors involves intensional contexts (more on this in Sect. 3.3).

3.2 The Second Reason

The second reason to resist the temptation to assume that two co-extensional states of the agent-environment system are the same goal is that for a behavior having a goal involves that there are certain ways by means of which that behavior reaches its goal, while there are other ways in which it does not. In other words, purposive behaviors, as well as intelligent behaviors, have *ways of succeeding* and *ways of failing*. Thus, if a behavior is dynamically oriented towards the extensional state of the agent-environment system in which the agent finally holds a stone affording to be used in the way L, and it ends causing the agent holding a stone that affords the way L, it will have succeeded in achieving its goal. Now, if in certain circumstances holding a stone that affords to be manipulated in the way L and holding a white stone are the same goal because they are the same extensional arrangement of the agent-environment system, they must have a common way to be achieved. On this reading, it makes sense to say that, if in a circumstance a behavior aiming at the state in which the agent holds a stone affording to be used in the way L ends with the state in which the agent holds a white stone, it will have reached its goal, since holding a stone that affords the way L and holding a white stone are here the same extensional state of the agent-environment system.

However, in the same circumstance, it also makes sense to say that a behavior aiming at the condition in which the agent holds a stone affording to be used in the way L has reached its goal *because* the agent holds a stone that affords the way L, and *not because* she holds a white stone. Indeed, a behavior aiming at holding a stone affording the way L has proper ways of succeeding that are different from the ways of succeeding of a behavior aiming at holding a white stone, this although in certain cases holding a stone affording a to be used in the way L can be the same state of

the agent-environment system as holding a white stone. If the ambient changed and holding a stone affording to be used in the way L were no longer the same extensional state of the agent-environment system as holding a white stone, a behavior aiming at holding a stone that affords the way L and a behavior aiming at holding a white stone will have different ways of succeeding.

Now, how can a purposive behavior have a way of succeeding that is different from a way of succeeding of another purposive behavior, though these ways of succeeding are sometimes the same way? This is possible only if goals are intended according to a certain mode of presentation. In this view, indeed, the mode of presentation according to which a purposive behavior is oriented towards a target has a relevance in establishing the different ways of succeeding of that behavior, that is, the various conditions of the agent-environment system that are its goal. Thus, by invoking modes of presentation, two behaviors can be said to have different goals and different ways of succeeding, though in certain cases they are dynamically oriented towards the same state of the agent-environment system.

The problem for REC is that a purposive behavior can have different ways of succeeding, but the identification of those ways is beyond the reach of an account such as that provided by invoking *ur-intentionality*. Again, this conclusion contrasts with the assumption according to which there are intelligent behaviors whose explanation is suitable without involving the ascription of contents and intensions to agents (§2). Indeed, since accounting for the intelligence of a behavior involves accounting for its purposiveness, and since a purposive behavior admits different modes of presenting its ways of succeeding, then an account of the purposiveness of behaviors cannot be provided without involving modes of presenting the ways of succeeding of that behavior.

3.3 Possible Objections and Replies

In light of the above, a supporter of REC could object that presenting goals and ways of achieving such goals belongs to a sophisticated sociocultural context involving language use and understanding, while REC aims at accounting for the intelligence of behaviors on a more basic ground. On this view, one could end up accepting that a behavior can be purposive without being available the conceptual resources that make it possible to present its goal and the ways of achieving that goal in certain modes. Although this is a high price to pay, as it moves away from the common notion of goal, a supporter of REC may however maintain that for a certain behavior to be purposive, a suitable history of attunement with the environment is enough.⁷ Notably, the history of the natural attunements between organisms and their environments can be said to “normatively fix what is intentionally targeted by the behavior” (Hutto & Myin, 2017, p. 116). Thus, an agent who is collecting stones performs a *purposive* behavior if such a picking up is caused by her own history of past interac-

⁷ What an environmental attunement is, and when an agent is or is not attuned with the environment, are not clear-cut concepts in the REC account. It should be noted, however, that since according to REC the notion of content cannot perform any explanatory work if not well defined (Hutto & Myin, 2017), the notion of environmental attunement needs a more precise definition in order to be explanatory relevant.

tions with stones, this regardless of whether the collected stones are intended according to a mode of presentation.

If so, in an ambient where all stones affording to be used in the way L have always been white, and where all stones that are white have always afforded to be used in the way L, the agent's history of interactions is characterized by the fact that collecting stones that afford to be used in the way L has always coincided with collecting stones that are white. In this case, the history of associations between stones affording the way L and stones that are white makes superfluous the mode according to which goals are presented, as well as it makes presenting their ways of succeeding unnecessary, as collecting stones affording the way L has always been identical of collecting white stones. In other words, the history of interactions is sufficient to explain the purposiveness of behaviors.

It should be noted, however, that accounting for the purposiveness of a behavior by drawing on the purposiveness of previous behaviors is a *circular* move. More precisely, the history of interactions between the agent and the environment allows one to say that a present behavior is ur-intentionally oriented towards a certain goal, if there were past behaviors which, being ur-intentionally oriented towards that goal, have guided the present behavior. Thus, an agent is performing a behavior that is oriented towards a certain extensional state of the body-environment system if there were previous behaviors which, being oriented towards that state, have presently caused the agent to perform that behavior. In this way, a behavior has a goal if it is caused by previous behaviors that have the same goal. Now, since the problem is understanding how a present behavior has a goal, this is an unsuitable solution. The trouble is that invoking the history of purposive interactions between the agent and the environment to account for the purposiveness of present behaviors makes the purposiveness of a behavior reliant on the purposiveness of other behaviors, running so into a circular explanation.

Another possible objection might concern my assumption that, according to a non-intentional notion of goal (§3), in the circumstance in which all stones affording to be used in the way L are white, and in which all white stones afford the way L, taking a stone that afford to be used in way L and taking a white stone are behaviors aiming towards the same extensional arrangement of the agent-environment system, namely, toward the same goal. To question this point, supporters of REC might invoke the notion of visual array as used within an ecological approach to visual perception (Gibson, 1979). According to a certain reading of the theory of affordances, which also REC accepts (for a pertinent discussion, see Segundo-Ortin et al., 2019), to perceive affordances an agent has to detect the variables in the visual array that are specific for the relevant properties of the environment. Thus, when taking a stone that can be used in the way L and when taking a white stone, it could be assumed that an agent is responding to variables of the array which specify different properties of the environment, such as the shape and the color of the stone. Therefore, one might conclude, it would be not true that both behaviors are oriented toward the same goal, but to different aspects of the environment as specified by the related visual array.

The problem with this view is that, from an extensional point of view, the visual array that specifies the shape of the stone is the same as the visual array that specifies the color of the stone. Let me be more precise about this. In normal cases, indeed,

when we visually perceive the shape of an object, we also perceive the color of that object. Notably, visually perceiving the shape of a stone without visually perceiving the color of that stone is not something allowed by our visual apparatus (at least in normal conditions). To put it differently, there is not a visual array that specifies the shape of an object in the environment that is not *ipso facto* a visual array that specifies the color of that object. This is because, the same rays of light that are associated with, and specify the shape of the stone, also are associated with, and specify the color of that stone. From an extensional point of view, therefore, the visual array relative to the shape of a target and the visual array relative to the color of that target entail the same configuration of the agent-environment system.

Importantly, it might be argued that, although there is only one visual array, the agent might be able to *pay attention* to different variables that are present in this array, so to detect more specific aspects of the array that are related to different properties of the target. However, there are relevant cases in which, for these variables to be *univocally* associated with *specific* properties of the target, they must be intended according to suitable modes of presentation. Indeed, for an agent to be able to focus on one particular variable rather than another, she must be able to spot one variable independently of the other. For example, in the previous case, the agent must be able to detect in the visual array the variable related to the color of a stone as something independent of the variable related to the shape of the same stone. This can be achieved by assuming that the agent has developed a visual sensitivity for certain patterns of sensorimotor variation in the visual array which are associated to the color of the stone, and an independent sensitivity for the patterns of sensorimotor variation that are associated to its shape. However, the mere sensitivity to the patterns of variations in the visual array is not sufficient to account for relevant cases in which a behavior is oriented toward a particular condition of the agent-environment system. Consider again the ambient in which stones that afford to be used in the way L and stones that are white are the same extensional collection of stones. In this case, the pattern of variation associated to the shape of the stone, which specifies the property of being able to be used in the way L, is invariably associated also to the color of that stone, so it can be said that the same pattern of variation in the visual array specifies both the property of being able to be used in the way L and the property of being white. Indeed, in these circumstances, it never happens that the pattern of variation associated to the property of the stone of being able to be used in the way L is not also associated to the property of being white, so that the detection of such a variable does not say anything about whether the focus of the agent's attention is about the first or the second property. In other words, the mere sensitivity to particular variables of the visual array is not sufficient to establish on which property of the visual target the agent has paid attention. Accordingly, in this case, invoking the sensitivity of the agent to the variables of the visual array does not let us to distinguish between a behavior oriented towards taking a stone that afford to be used in the way L and a behavior oriented towards taking a white stone. However, it makes sense to say that taking stones that afford to be used in the way L and taking white stones are behaviors with different goals (§§3.1, 3.2).

Another possible way out for REC is to assume that purposive behaviors have goals as *proper functions*. A proper function can be conceived as the function for

which an organism's trait has been *selected for* (Millikan, 1989), and traits are selected if their function contributes to the inclusive fitness of the organism. Accordingly, the effect of a certain agent's behavior is the proper function of such a behavior if that effect contributes to the inclusive fitness of the agent. On this reading, a certain agent's behavior has a goal if has been selected for having a certain function and that function contributes to the agent's inclusive fitness. Importantly, invoking functions allows REC to save the purposiveness of behaviors in a biologically respectable way,⁸ without running into the previously encountered problem of circularity. In this view, indeed, having a goal for a behavior does not depend on other behaviors having that goal, but on the fact that having that goal contributes to the agent's inclusive fitness.

However, the problem is that it is highly controversial that biological traits have functions regardless of epistemic practices and sophisticated methodological norms involving the ascription of contents to agents. In the present debate about functional explanations in biology, many compelling arguments can be used to show that to ascribe a function to a trait, a suitable epistemic context must be at work. For example, Huneman (2013) states that scientists have to choose specific methods to establish the nature of functions and that they may yield functional ascriptions only by relying on adequate epistemic hypotheses. Cash (2008) maintains that function attribution is a normative practice and that "there is no such thing as the function of a biological mechanism, *simpliciter*, independent of human judgments, questions and explanatory interests" (p. 116). Moreover, Germain et al., (2014), have argued that there might legitimate functional explanations in the life sciences that are not based on natural selection, and that there might be naturalistic contexts where one is interested in different forms of functional understanding given certain sophisticated research purposes, such as in the case of biomedical research (see also, Cummins 1975 for an seminal work on this topic).

Thus, since it is reasonable to assume that the attribution of biological functions to traits is reliant on epistemic assumptions which involve the ascription of contents to agents⁹, then an account of the purposiveness of behaviors in terms of functions requires a sophisticated sociocultural context, being epistemic assumptions possible only if suitable sociocultural practices are in play. However, this conclusion contrasts with REC according to which there are intelligent behaviors that can be accounted regardless of content-involving sophisticated sociocultural practices (§2). Indeed, if accounting for the intelligence of a behavior involves accounting for its purposiveness by ascribing biological functions to it, and if attributing functions involves sophisticated sociocultural practices which allow the attribution of contents to agents, then an account of the intelligence of that behavior cannot be provided without involving

⁸ This is, in short, the idea of teleosemiotics, that is, teleosemantics without semantics (Hutto & Myin, 2017, Chp. 5; Hutto & Satne 2015).

⁹ It must be considered that there is no other way to define the epistemic assumptions of an agent than attributing adequate contents to that agent. Therefore, if it is true that the attribution of a proper function to a biological entity depends on the relative epistemic assumptions of a community of agents and varies with them (e.g., Bedau 1991; Cash, 2008; Germain et al., 2014; Huneman, 2013), given that the definition of epistemic assumptions implies the attribution of adequate contents to agents, then it makes sense to say that the attribution of a proper function to a biological entity implies the attribution of adequate contents to a relative community of agents.

the suitable sociocultural context, which in turn allows for the attribution of contents and intentions to agents.¹⁰

Taking stock: in this section I have showed that there are cogent reasons to be skeptical about the attempt to account for the purposiveness of intelligent behaviors in terms of ur-intentional relations. My argument has two premises concerning the need to invoke intensional modes of presentation to account for the purposiveness of behaviors:

1. Purposive behaviors may have the same extensional goal given certain circumstances, despite having different extensional goals in other circumstances.
2. Purposive behaviors may have the same extensional way of succeeding given certain circumstances, despite having different extensional ways of succeeding in other circumstances.

Premises 1 and 2 make reasonable that:

3. Since an ur-intentional account is based on an extensional approach, an ur-intentional account is not suitable to deal with the different goals and ways of succeeding of a purposive behavior.

Then, if my analysis is correct:

4. The best way to account for condition 1 and 2 is to invoke modes of presentation: purposive behaviors have goals and ways of succeeding that can be presented according to different modes given different circumstances.

I have also showed that, although one can renounce ascribing intensional contents to agents, an ur-intentional account of purposiveness is still on a bad path. My analysis for why ur-intentional relations are not suitable to account for the purposiveness of behaviors has indeed three more reasons (§3.1):

5. If an ur-intentional account of purposiveness is based on the agent history of purposive interactions with the environment, it makes the purposiveness of a behavior reliant on the purposiveness of other behaviors, thus running into a circular explanation.
6. If an ur-intentional account of purposiveness assumes that agents respond to different variables in the visual array, since in relevant cases different variables are associated to the same properties, there are relevant cases in which such an

¹⁰ This analysis may have consequences on a general theory of biological function, inasmuch as it can be used to question the possibility of grounding the functions of natural traits in some feature of the mind-independent world. For more complete accounts that are in line with the present analysis see, for example, Bedau 1991; Ratcliffe, 2000; Searle, 1995, p. 15. It should be noted, however, that it is a controversial question whether this analysis leads to endorse a form of radical interpretationism, according to which no functions exist in nature, or to a more cautious form of epistemic naturalism, according to which functional explanations fit with the methodological practices of natural sciences and are useful to discover real patterns in nature. Anyway, the solution of this issue is outside the scope of this article.

ur-intentional account of purposiveness is not suitable to distinguish between different targets of the agent's attention.

7. If an ur-intentional account of purposiveness is based on the ascription of biological functions to behavioral traits, since the ascription of functions to traits is reliant on the adoption of suitable epistemic assumptions which entail the ascription of contents to agents, then the ur-intentional account of purposiveness must be considered as reliant on a sophisticated sociocultural context in which intentional explanations are allowed, contrary to what previously established by REC.

If my analysis is correct, it poses a dilemma to REC: either the intelligence of behavior does not have purposiveness as an ingredient, or intelligent behaviors cannot be suitably accounted without involving the ascription of intensions to agents. In the first case, REC should provide a conception of intelligent behavior that does not entail goals; in the second case, REC should renounce the assumption according to which there are forms of intelligent behavior that can be accounted regardless of the ascription of intensions to agent.

4 Flexibility involves intensionality

In Sect. 1, I said that intelligent behaviors have flexibility as one of their ingredients and that understanding what makes a behavior intelligent involves accounting for it having flexibility. I also said that a behavior is flexible if its way of actualizing depends on the environmental context. There are, however, two senses according to which the actualization of a behavior may *depend* on the environmental context. First, a behavior can actualize as a *disposition* of the agent-environment system. Behaviors of this sort are nothing but dynamical states of the agent-environment system that *invariably* occur if certain conditions of the agent's body and certain conditions of the environment are given. A behavior of this sort is, for example, the snapping of the leg after a tap. This sense of dependence, however, is not the most interesting on the table. Second, a behavior can actualize depending on *relevant* aspects of the environment. Behaviors that are flexible in this sense actualize even if certain salient aspects of the environment vary. For example, common skills such as walking through different paths, grasping handles with different shapes or collecting different types of stones are behaviors of this sort.

It is an assumption of REC that the explanations provided in terms of ur-intentional relations can account for the flexibility of behaviors in this latter sense. REC very explicitly holds that behaviors can be context-sensitive while doing without the attribution of intensional contents to agents (e.g., Hutto & Myin 2017, pp. 118–119). On this view, the history of natural attunements with the ambient shapes the profile of an organism's current tendency for response to relevant aspects of the environment (Hutto & Myin, 2017, p. 116). This allows REC to say that relevance is a property of the agent-environment system, so that the explanation of how behaviors can actualize depending on *relevant* aspects of the environment does not involve the attribution of intensional representations to agents (§2).

To illustrate how a flexible behavior can be considered in non-intensional terms, Myin (2020) draws on the case in which *sensory imaging* plays a pivotal role in allowing our non-linguistic ancestors to collect stones. Notably, according to Myin (2020) sensory imaging of a stone orients the agent on how to behave given variable environmental features, for it may guide the agent to “select those stones most similar to previously encountered stones” (p. 20). Importantly, although sensory imaging of a target has a role in guiding intelligent behaviors, “there is, in this context, no question of whether the imaginary episode was right or wrong, accurate or inaccurate in any semantic sense” (Myin, 2020, p.6). Thus, imaging a target, say a certain stone, is *specific without specifying* that target in a certain way, so the target of an imaging can be different from the target of another imaging, without that “representational contents play any role in understanding or explaining the functionally important properties of basic sensory imaginings” (Hutto & Myin, 2017, 199–200). In other words, sensory imaging is (ur-)intentional without being intensional (§2).

This view poses a question: how can the sensory imaging of a stone explain the ability to select stones that are similar to other stones without specifying in which respect those stones are similar stones? The problem is that all stones are similar stones according to a certain presentation, while they are different stones according to another presentation. For example, a stone affording to be used in the way L that is white and a stone affording to be used in the same way that is black are similar stones because they afford the same use, while they are different stones because they have different colors. Accordingly, for a certain agent’s imaging to account for her ability to select stones most similar to previously encountered stones, such imaging must specify according to which presentation previously encountered stones are similar to presently encountered stones.

Consider the environmental circumstance in which, at time t_1 , stones affording to be used in the way L are white stones and white stones afford to be used in the way L. In this circumstance, selecting a stone that affords the way L and selecting a stone that is white involve the same extensional arrangement of the agent-environment system, so that at time t_1 an agent selecting a stone of the former type is selecting a stone of the latter type. Now, suppose that at the subsequent time t_2 the environment changes and that all stones affording to be used in way L are no longer white stones. In this new circumstance, selecting a stone that affords the way L and selecting a white stone are not the same extensional state of the agent-environment system, so that at time t_2 an agent selecting a stone affording to be used in the way L is not selecting a white stone.

Now, for imaging a stone to play a pivotal role in allowing our ancestors to collect stones that afford to be manipulated in way L at t_2 , the imaging should present a stone collected at t_1 as affording to be used in the way L rather than as a white stone; namely, it must be oriented towards its target according to a certain mode of presentation. If it were not so, that is, if the agent imagines the stone without presenting it in a certain mode, the agent’s imaging a stone would not explain why, at t_2 , she selects stones that are not white, whereas at time t_1 , she selected white stones. To put it differently, if sensory imaging a stone would be an ur-intentional state, it would not present the stone according to a mode, so that it would not explain why at t_1 the agent selects

white stones that afford to be manipulated in the way L, while at t_2 the agent selects stones affording to be manipulated in the way L that are not white.

4.1 Possible Objections and Replies

In light of the above, a supporter of REC could object that since the way an agent images a stone is based on the agent's past experience, such experience can form a reliable base for an inductive reasoning. In this way, one may say that if an agent images a stone that has been the target of a certain type of her past behaviors, it is possible to inductively predict that imaging that stone will lead the agent to perform the same type of behaviors. In other words, past behaviors can account for the flexibility of a present behavior since form a suitable base for predicting how an agent behaves in different environmental conditions. This amounts to identifying flexible patterns of the body-environment system that vary in line with what the changing environment demands or solicits (Bruineberg and Rietveld 2014, p. 10).

The problem for REC is that for past cases to be a suitable base for predicting present cases, they must be similar in a certain respect to the predicted cases. However, as previously said, two behaviors are similar only if certain modes of presentation are considered. Thus, selecting stones affording to be used in the way L that are white at time t_1 is similar to selecting stones affording the way L that are not white at time t_2 only if these behaviors are considered instances of selecting stones affording the same use, but not if they are considered instances of selecting stones of the same color. Accordingly, for past behaviors to account for the flexibility of present behaviors, they must be presented according to a certain mode.

To put this point clearly, if we want to make predictions about the flexibility of a certain agent's behavior from her past interactions with the environment, we must be able to distinguish between merely interacting with an aspect of the environment and interacting with that aspect according to a certain mode of presentation. More precisely, since having selected white stones and having selected stones affording manipulation in the way L may have different behavioral consequences, one must distinguish the mode according to which the stones have been presented in the past in order to make predictions from previous behaviors to present ones.

The point is, then, that to account for the flexibility of behaviors, one must know not just that there is a history of variable interactions between the agent and the environment, but according to which mode such interactions have been presented in that history. This move, however, is out of the reach of an *ur-intentional* take such as that supported by REC.

Importantly, this conclusion contrasts with the assumption according to which there are intelligent behaviors the explanation of which is suitable without involving the ascription of intensions to agents (§2). Indeed, if accounting for the intelligence of a behavior involves an account of its flexibility (§1), and accounting for the flexibility of a behavior involves that certain states of the agent-environment system can be similar according to a mode of presentation, then an account of the intelligence of behaviors cannot be provided without involving an intensional context.

To summarize, in this section I showed that there are reasons to be skeptical about the attempt to account for the flexibility of intelligent behaviors in terms of the agent's

imaging based on the history of interactions with the environment. My argument for why ur-intentional relations are not suitable to account for the flexibility of behaviors has the following premise:

8. For the history of past interactions between the agent and the environment to account for the flexibility of present interactions, such interactions must be similar in a certain respect, that is, they must be presented according to a common mode.

If my analysis is correct, it poses a further dilemma to REC: either the intelligence of a behavior has not flexibility as an ingredient or the intelligence of a behavior cannot be suitably accounted without involving the ascription of modes of presentation. In the first case, REC should provide a definition of intelligent behavior that does not imply flexibility; in the second case, REC should renounce assuming that there are forms of intelligent behavior that can be accounted regardless of the ascription of intensions to agents (§2). This, of course, does not mean that there are not behaviors that can be accounted in contentless and merely extensional terms, but only that such behaviors are not intelligent behaviors.

5 Conclusions

In this article, I provided arguments to show that an explanation of the purposiveness and flexibility of behaviors cannot be adequately offered in ur-intentional terms, that is, without attributing intensional contents to agents. The consequence of this conclusion is that intelligent behaviors typically involve intensionality. This inference is required because purposiveness and flexibility are two fundamental ingredients of intelligence, so that an account of what makes a behavior intelligent cannot be suitably provided without involving modes of presentation.

Importantly, this conclusion does not entail a form of realism about mental representations (Colombo, 2014b; Zipoli Caiani, 2018). The point is, rather, that an account of the purposiveness and flexibility of behaviors that limits itself to considering only ur-intentional relations between the agent and the environment misses something that appears to be very relevant for understanding the intelligence of behaviors, that is, the intensionality of cognition.

Interestingly, this conclusion can be applied to both human and non-human cognitive agents. Indeed, if we admit that certain behaviors performed by non-human animals are intelligent, in the same sense that certain human behaviors are, then there are no reasons to maintain that only the explanation of the intelligent behaviors of humans, but not the explanation of the intelligent behaviors of non-humans, involve an intensional context for the attribution of purposiveness and flexibility. This is because an intelligent behavior has purposiveness and flexibility as ingredients, and an account of the purposiveness and flexibility of a behavior involves intensional modes of presentation as argued in the previous sections. Thus, if for a reason non-human behaviors cannot be the target of intensional modes of presentation (Myin & Herik, 2020), then such behaviors cannot be considered as intelligent. In response,

one may say that human intelligence and non-human intelligence are different types of intelligences, and that only human intelligent behaviors have purposiveness and flexibility as ingredients. In this case, however, the intelligence of human behaviors would be something special, different from other instances of intelligent behaviors performed by other natural agents. A consequence, this one, that is not so easy to accept from a naturalistic point of view.

This conclusion is also interesting because according to REC, ur-intentional relations are suitable to account for affordance-related behaviors. However, since ur-intentional relations are ways of intending targets in a non-intentional way, ur-intentional relations are not suitable to account for the modes of presentation that are involved by the purposiveness and flexibility of intelligent behaviors. Accordingly, if my analysis is correct, either affordance-related behaviors are not instances of intelligent behaviors and can be considered in a ur-intentional way or they are intelligent behaviors but, in this case, cannot be accounted in terms of ur-intentional relations.

Importantly, addressing this dilemma has significant consequences. If one considers affordance-related behaviors as unintelligent behaviors, then she will find it difficult to explain why such behaviors are modulated by linguistic and cultural contexts (Zipoli Caiani, 2018). Differently, if one considers affordance-related behaviors as intelligent behaviors, then she will have the burden of explaining how a behavior can be purposive and flexible without involving modes of presentation and the related sociocultural context.

Finally, as a last move, a follower of REC might reject the idea that intelligent behaviors are purposive and flexible. However, in this case the risk is that of not having a criterion to distinguish typical cases of intelligent behaviors from cases of unintelligent ones. If a behavior were intelligent even if it has no purpose and is not flexible, then virtually all behaviors would be intelligent, the rolling of a stone down a hill included.

Funding Open access funding provided by Università degli Studi di Firenze within the CRUI-CARE Agreement.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Bedau, M. (1991). Can Biological Teleology be Naturalized? *The Journal of Philosophy*, 88(11), 647–655. <https://doi.org/10.2307/2027025>
- Bratman, M. E. (1999). *Intention, Plans, and Practical Reason*. Center for the Study of Language and Information

- Brooks, R. A. (1999). *Cambrian Intelligence: The Early History of the New Ai*. New edizione). Bradford Books
- Bruineberg J., Rietveld E. (2014). Self-organization free energy minimization and optimal grip on a field of affordances. *Frontiers in Human Neuroscience*, 8. <https://doi.org/10.3389/fnhum.2014.00599>
- Cash, M. (2008). The normativity problem: Evolution and naturalized semantics. *Journal of Mind and Behavior*, 29, 99–137
- Chemero, A. (2011). *Radical Embodied Cognitive Science*. Bradford
- Clark, A., & Toribio, J. (1994). Doing without representing? *Synthese*, 101(3), 401–431. <https://doi.org/10.1007/BF01063896>
- Colombo, M. (2014a). Explaining Social Norm Compliance. A Plea for Neural Representations. *Phenomenology and the Cognitive Sciences*, 13(2), 217–238. <https://doi.org/10.1007/s11097-013-9296-0>
- Colombo, M. (2014b). Neural Representationalism, the Hard Problem of Content and Vitiating Verdicts. A Reply to Hutto & Myin. *Phenomenology and the Cognitive Sciences*, 13(2), 257–274
- Cummins, R. (1975). Functional Analysis. *Journal of Philosophy*, 72(November), 741–764. <https://doi.org/10.2307/2024640>
- Degenaar, J., & Myin, E. (2014). Representation-hunger reconsidered. *Synthese*, 191(15), 3639–3648. <https://doi.org/10.1007/s11229-014-0484-4>
- Dennett, D. C. (1987). *The Intentional Stance*. MIT Press
- Egan, F. (2013). How to Think About Mental Content. *Philosophical Studies*, 1, 1–21
- Ferretti, G., & Zipoli Caiani, S. (2021). How Knowing-That and Knowing-How Interface in Action: The Intelligence of Motor Representations. *Erkenntnis*. <https://doi.org/10.1007/s10670-021-00395-9>
- Fodor, J. A. (1990). *A Theory of Content and Other Essays*. MIT Press
- Gadsby, S., & Williams, D. (2018). Action, affordances, and anorexia: Body representation and basic cognition. *Synthese*, 195(12), 5297–5317. <https://doi.org/10.1007/s11229-018-1843-3>
- Gallagher, S. (2017). *Enactivist Interventions: Rethinking the Mind* (1 edition). Oxford University Press
- Germain, P. L., Ratti, E., & Boem, F. (2014). Junk or functional DNA? ENCODE and the function controversy. *Biology & Philosophy*, 29(6), 807–831. <https://doi.org/10.1007/s10539-014-9441-3>
- Gibson, J. J. (1979). *The Ecological Approach to Visual Perception: Classic Edition*. Psychology Press
- Haken, H., Kelso, J. S., & Bunz, H. (1985). A theoretical model of phase transitions in human hand movements. *Biological Cybernetics*, 51(5), 347–356. <https://doi.org/10.1007/BF00336922>
- Horst, S. (2009). Naturalisms in Philosophy of Mind. *Philosophy Compass*, 4(1), 219–254. <https://doi.org/10.1111/j.1747-9991.2008.00191.x>
- Horst, S. (2011). *Symbols, Computation, and Intentionality*. Steven Horst
- Huneman, P. (2013). Weak Realism in the Etiological Theory of Functions. In P. Huneman (A. C. Di), *Functions: Selection and mechanisms* (page. 105–130). Springer Netherlands. https://doi.org/10.1007/978-94-007-5304-4_7
- Hutto, D. D., & Myin, E. (2012). *Radicalizing Enactivism: Basic Minds Without Content*. MIT Press
- Hutto, D., & Myin, E. (2017). *Evolving Enactivism: Basic Minds Meet Content*. MIT Press
- Hutto, D. D., & Satne, G. (2015). The Natural Origins of Content. *Philosophia*, 43(3), 521–536. <https://doi.org/10.1007/s11406-015-9644-0>
- Legg, S., & Hutter, M. (2007). A Collection of Definitions of Intelligence. *Proceedings of the 2007 conference on Advances in Artificial General Intelligence: Concepts, Architectures and Algorithms: Proceedings of the AGI Workshop 2006*, 17–24
- Mele, A. R., & Moser, P. K. (1994). Intentional Action. *Noûs*, 28(1), 39–68. <https://doi.org/10.2307/2215919>
- Millikan, R. G. (1989). In Defense of Proper Functions. *Philosophy of Science*, 56(June), 288–302
- Myin, E. (2016). Perception as Something We Do. *Journal of Consciousness Studies*, 23(5–6), 80–104
- Myin, E. (2020). On the importance of correctly locating content: Why and how REC can afford affordance perception. *Synthese*, 198, 25–39 (2021). <https://doi.org/10.1007/s11229-020-02607-1>
- Myin, E., & Herik, J. C. V. (2020). den. A Twofold Tale of One Mind: Revisiting REC's Multi-Storey Story. *Synthese*, 1–19. <https://doi.org/10.1007/s11229-020-02857-z>
- Myin, E., & Hutto, D. D. (2015). REC: Just Radical Enough. *Studies in Logic, Grammar and Rhetoric*, 41(1), 61–71. <https://doi.org/10.1515/slgr-2015-0020>
- Ramsey, W. M. (2007). *Representation Reconsidered*. Cambridge University Press
- Ratcliffe, M. (2000). The function of function. *Studies in History and Philosophy of Science Part C: Studies in History and Philosophy of Biological and Biomedical Sciences*, 31(1), 113–133. [https://doi.org/10.1016/S1369-8486\(99\)00039-4](https://doi.org/10.1016/S1369-8486(99)00039-4)
- Searle, J. R. (1983). *Intentionality: An Essay in the Philosophy of Mind*. Cambridge University Press

- Searle, J. R. (1995). *The Construction of Social Reality*. Simon and Schuster
- 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. <https://doi.org/10.1080/09515089.2019.1668238>
- Shapiro, L. A. (1997). The nature of nature: Rethinking naturalistic theories of intentionality. *Philosophical Psychology*, 10(3), 309–322. <https://doi.org/10.1080/09515089708573222>
- Spivey, M. (2008). *The Continuity of Mind*. Oxford University Press
- Sternberg, R. J. (2000). The Concept of intelligence. In R. J. Sternberg (A c. Di), *Handbook of Intelligence* (pagg. 3–15). Cambridge University Press. <https://doi.org/10.1017/CBO9780511807947.002>
- 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)
- Zipoli Caiani, S. (2018). Intensional biases in affordance perception: An explanatory issue for radical enactivism. *Synthese*, 198, 4183–4203 (2021). <https://doi.org/10.1007/s11229-018-02049-w>
- Zipoli Caiani, S., & Ferretti, G. (2017). Semantic and pragmatic integration in vision for action. *Consciousness and Cognition*, 48, 40–54. <https://doi.org/10.1016/j.concog.2016.10.009>
- Zipoli Caiani, S. (2014). Extending the notion of affordance. *Phenomenology and the Cognitive Sciences*, 13(2), 275–293. <https://doi.org/10.1007/s11097-013-9295-1>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.