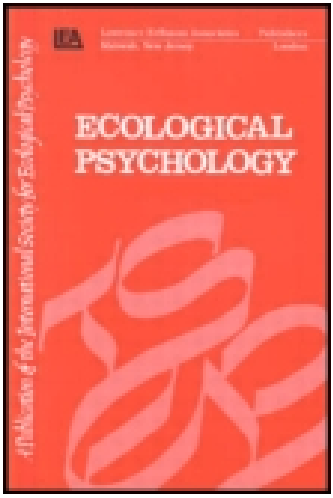

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Laws and Conventions in Language-Related Behaviors

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Laws and Conventions in Language-Related Behaviors

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The goal of this article is to look at language-related behaviors in light of a strict definition of direct perception. I highlight a key dimension, conventionality, which discriminates between behaviors that are coordinated with respect to law-based information and those that are not (and, therefore, do not qualify as direct perception according to the definition used in this article). The difference between conventional and law-based information does not break down clearly along obvious lines such as natural versus human-made, social versus nonsocial, or linguistic versus nonlinguistic. Therefore, it is necessary to take a task-specific approach to deciding whether a behavior is organized with respect to conventional or law-based information. A tacit assumption in ecological psychology seems to be that anything that has an effect on behavior must be grounded in the perception of an affordance and, therefore, must be guided by law-based information. In this article, I question this assumption. I suggest, instead, that ecological information can be based on both laws and conventions. This move allows us to maintain rigorous definitions of affordances and direct perception, suitable for underpinning action-control, while still expanding the ecological study of behaviors into those that rely on conventional information.

In his seminal book *The Ecological Approach to Visual Perception*, Gibson (1979/1986) said, "Perhaps if [so-called higher mental processes] are reconsidered in relation to ecological perceiving they will begin to sort

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themselves out in a new and reasonable way that fits with the evidence" (p. 255). In line with this recommendation, the goal of this article is to look at language-related behaviors in light of a strict definition direct perception. I argue that direct perception only occurs when behavior is organized with respect to law-based information. I highlight a key dimension, conventionality, which discriminates between behaviors that are coordinated with respect to law-based information (and, therefore, qualify as direct perception) and those that are not (and, therefore, do not qualify as direct perception according to the definition used in this article). Information based on affordances is a particularly important subset of lawful information and so this article focuses primarily on the question of discriminating between law-based information about affordances and nonlawful, convention-based information. After introducing this distinction, I work through several examples to illustrate how conventionality can help advance an ecological approach to language-related and other social behaviors.

As I show, the difference between conventional and law-based information does not break down clearly along obvious lines such as natural versus human-made, social versus nonsocial, or linguistic versus nonlinguistic. Therefore, it is necessary to take a task-specific approach (Bingham, 1988; A. Wilson & Golonka, 2013) to deciding whether a behavior is organized with respect to conventional or law-based information. I also argue that conventional information does not present a special learning problem to the organism; from the first-person perspective, there is no difference between conventional and law-based information. A tacit assumption in ecological psychology seems to be that anything that has an effect on behavior must be grounded in the perception of an affordance and, therefore, must be guided by law-based information. In this article, I question this assumption. I suggest, instead, that ecological information can be based on both laws and conventions. This move allows us to maintain rigorous definitions of affordances and direct perception, suitable for underpinning action-control, while still expanding the ecological study of behaviors into those that rely on conventional information.

WHAT AFFORDANCES ARE AND WHAT AFFORDANCES ARE FOR

Affordances are a key theoretical entity in Gibson's ecological approach to perception (Gibson, 1979/1986). Organisms' actions occur with respect to the world—you walk on a surface, you navigate around obstacles. Gibson reasoned that there must be information available to enable organisms to organize their behavior with respect to properties of the environment. Some properties uniquely structure light or other forms of energy so that they can be perceived by organisms with the proper receptors (e.g., eyes). And some properties of objects and events are dispositions that provide opportunities for action to

complementary organisms. These are affordances. Affordances are dispositional properties that are perceivable and that provide opportunities for action to complementary organisms (Turvey, 1992; Turvey, Shaw, Reed, & Mace, 1981).

Some researchers argue that affordances are relations, not dispositional properties (see Chemero, 2003, 2009; Stoffregen, 2000, 2003). I argue that an affordance is not a relation between organism and environment but the perception of information that specifies an affordance is relational because perception occurs in organism-relevant units (e.g., with respect to their ability to act; Cesari, Formenti, & Olivato, 2003; Snapp-Childs & Bingham, 2009). Thus, in my view, conceptualizing affordances as relations is unnecessary. We do need to enter into relations with affordance properties (this is how we know whether a behavior is possible), but this relation happens via information. In other words, although an affordance might not be a relation between the world and an organism, the act of perceiving information specifying that affordance is relational.

To illustrate this point further, the properties that constrain possible actions reside entirely within a given object. The properties that determine the walkability of a surface are the physical properties of the surface alone, even though the properties that afford walking in one animal may not afford walking in another. This means that different sets of properties can support similar behaviors in different organisms. The properties of a liquid that dissolve salt are not the same properties that dissolve plastic. But, this does not require us to construe the properties as relations. The "behavior-ability" shorthand for affordances (e.g., catchability, walkability) invites a relational conceptualization because whether a behavior is possible (e.g., whether the ball is catchable) depends on both the properties of the environment and the properties of the organism. But, according to a dispositional account, an affordance's job is not to characterize whether a behavior is possible. An affordance's job is to support a given behavior in the context of the right effectivities; perceiving *information about* an affordance tells us whether a behavior is possible.

Affordances are a partial solution to a key problem in ecological psychology—"how organisms can 'come into psychological contact' with objects with which they are not in … mechanical contact" (Turvey et al., 1981, p. 242). The other part of the solution is information—structures in energy arrays that are specific to certain environmental properties or events. Some information specifies affordance properties. This enables organisms to organize their behavior according to action-relevant properties of the environment by virtue of the lawful relationship between these properties and specifying information. In combination, information and affordances provide a mechanism to directly link the coordination of behavior with the environment. To see how, consider obstacle avoidance during locomotion. An object is an obstacle for a person if it has a dispositional property that makes it unsuitable for walking through by that person. If this dispositional property is projected in an energy array (e.g., if it

structures light), then it is an affordance property. A person who perceives the optical information created by the affordance property perceives that object does not afford walking through (because perception of information happens in organism-relevant units) and can take action to avoid the obstacle. This means that coordinating behavior with respect to the information is equivalent to coordinating behavior with respect to the world. Perceiving–acting organisms can control their behavior with respect to properties of the environment because these properties lawfully structure energy (e.g., light, sound, magnetic fields, olfactory molecules). Thus, perceiving–acting organisms can directly perceive their environment via information that specifies environmental properties (Turvey et al., 1981). Turvey et al. (1981) explicitly reserved use of the term "direct perception" for situations underpinned by ecological laws: "Our strategy ... is to argue for a conception of natural law that allows meaningful relations between organism and environment to hold. Further, we constrain our use of the term 'perception' (and thus, of course, 'direct perception') to relations governed by such laws" (p. 244).

DIRECT PERCEPTION, AFFORDANCES, AND CONVENTIONS

Direct perception is one form of nonrepresentational account for functional behavior, but it might not be the appropriate nonrepresentational account to explain all functional behavior. The key point is that, if we follow through on the strict definition outlined earlier, then the term applies only to cases where an organism's behaviors are coordinated with respect to an affordance property in the environment achieved via perceiving an information variable specifying that property. However, not everything that has a consequence on behavior is underpinned by law-based information about affordances. Some behaviors are explained by organizing behavior with respect to information variables related to properties of the environment by convention.

Conventional information is being used any time behavior is organized with respect to a property that is different from the one causing the information. This type of ecological information is not restricted to human culture and language. Even honeybees can be trained to associate colored cards with the location of food (von Frisch, 1956). In this case, visual information specifying card color has become linked by convention to the presence of food at that location. To a bee with the right learning history, this information guides the bee's exploratory foraging behavior. More specifically, visual information for card color participates in selecting the action of flying to that location (although the flight itself is controlled via law-based information about affordances). Contrast this to a human learning that yellow bananas are ripe and sweet, whereas green bananas are sour. Visual information about fruit color can participate in selecting the

action of reaching for the yellow banana. Unlike the bee example, though, visual information for fruit color is causally linked to the property of interest—the fruit's ripeness, which is an action-relevant property related to edibility. In the bee example, action selecting is controlled by conventional information, whereas in the banana example action selecting is controlled by law-based information (see Chemero, 2009, for a useful initial discussion of law-based vs. conventional constraints).

It might be tempting to gloss over the distinction between conventional and law-based information. After all, within the niche of the trained bee, the colored card means food in the same way that yellow skin means ripe for a banana. But, there are at least two reasons that drawing a distinction between conventional and law-based information is important. The first reason has to do with the validity and reliability of the link between the information and the world. The second reason has to do with what types of behaviors conventional and law-based information are able to support.

For information about affordances, there is a lawful relation between the task-relevant property and the information. This relationship has a scope (i.e., it is true when certain conditions are met), but within that scope the relationship is lawful (Turvey et al., 1981). This means that the information–world link is valid. When you detect the information, the property is present. As long as it is operating within its scope, the relationship between the information and the world is also reliable—the information doesn't blink into and out of existence, whereas the property persists. This lawful relation between the task-relevant property and the information means that information about affordances is more valid and reliable than conventional information.

Conventional information must have some validity and reliability, otherwise organisms could not learn to use it, but this is not lawfully constrained. Instead, validity and reliability of conventions are underpinned by factors such as evolution, accident, culture, or, as with the bee example, experimenter goals. The relationship between conventional information and the property or event in the world that causes the information is lawful (i.e., the visual information about the colored card is lawfully related to the physical properties of the colored card). But, behavior is not organized with respect to this property or event. It is organized with respect to some other property or event (e.g., the presence of food) that is correlated with the information, subject to the constraints listed earlier. Chemero (2009) extended the situation semantics of Barwise and Perry (1981) as a potential solution to how conventional information can guide functional behavior despite not being based on natural laws. This lack of a lawful basis has consequences for the validity and reliability of conventional information. Drawing on another bee example, visual information about the honeybee waggle dance (von Frisch, 1967) is an evolutionarily constrained source of conventional information (to the bees observing the dance) about food location. The

relationship between the waggle dance and food location is very valid and reliable, but it is also subject to change (e.g., evolutionary pressures on honeybees selected for a different relation between waggling and food). Unlike law-based information, detecting a conventional information variable is no guarantee that some state of affairs in the world is true. The honeybee can see a blue card, but the experimenter hasn't put out any food. This means that there is not a lawfully defined scope within which conventional information is valid. It is also possible for conventional information to persist while some state of affairs in the world blinks in and out of existence (the experimenter puts out some food but then takes it away). Being subject to change is a key characteristic of conventional information. This is both a feature—as when a word can acquire a new function—and a bug—as when a rat trained to make a key press to receive food is no longer rewarded for his efforts.

The second reason that it is important to draw a distinction between law-based and conventional information is that the validity and reliability of information about affordances is necessary for the continuous control of action. Action-control requires real-time information about properties or events in the world. Information that meets this high bar will be lawfully related to the properties or events in the sense outlined by Turvey et al. (1981). An exception to this is an artificially contrived situation that mimics the reliability and stability of the law-based information. Sensory substitution devices, such as those that substitute tactile vibrations for sight (Cancar, Diaz, Barrientos, Travieso, & Jacobs, 2013), are examples of this. These devices are programmed such that the intensity of vibration is proportional to the distance of an object the device is pointed toward. The vibrations mimic law-based information about affordances typically provided via vision. Because they capture the relevant relation between this law-based information and the environmental property it specifies, the vibrations can be used in action-control. The vibrations of the device, in and of themselves, cannot be used to control locomotion. The vibrations are only useful to the person because of their conventional connection with distance to objects. Under normal, noncontrived situations, conventional information will not support action-control.

Conventional information (unless artificially contrived to mimic law-based information) can only play a role in action selecting. This means that conventional information can tip the balance between one similar action and another, influence the manner in which an action unfolds, or prepare an organism to perform a different action than the one it is currently doing. This is illustrated by the two bee examples provided earlier. The color card tips the balance between one similar action (flying to the blue card) and another (flying to the grey card). The waggle dance prepares the organism to perform a different action (flying) than the one it is currently doing (observing the dance) and influences the manner in which that action unfolds (direction, distance). In both

cases, flight is controlled by law-based information variables that provide accurate, stable, and reliable contact with properties of the environment relevant to that action.

The difference between law-based and conventional information is real and important in that it exposes the line between behaviors that qualify as direct perception (according to a strict definition) and those that do not. It is important to note, though, this distinction does not present a "two-systems" problem to perceiving–acting organisms. This is because the distinction is only apparent from a third-person analysis of the situation. From the first-person perspective, all there is, in both cases, is information (see Barrett, 2011, for an extended discussion of the importance of recognizing a first-person/third-person distinction). There is no qualitative difference between a honeybee learning the relationship between a blue card and food and a human learning the relationship between yellow skin and a ripe banana. Therefore, conventions don't present a special learning problem to be overcome. The differential stability and reliability of conventional versus law-based information can affect the learning trajectory, but this is a difference in degree, not kind. In fact, some conventions, like the relationship between the honeybee waggle dance and food location, are constrained by evolution, not learning. The similarity from a first-person analysis is the reason conventional information doesn't necessitate a representational account—the process of learning to use information is the same in both cases.

AFFORDANCES, CONVENTIONS, AND LANGUAGE-RELATED BEHAVIORS

When an organism uses law-based information about affordances, it organizes its behavior with respect to the property in the world that causes the information. When an organism uses conventional information, it organizes its behavior with respect to evolutionarily, experimentally, ecologically, or socioculturally maintained conventions that link the information to properties or events. The key to telling whether information is underpinned by affordances, then, is to identify the properties in the world that behavior is organized with respect to.

This is the strategy I adopt in determining whether a given language-related behavior is underpinned by affordances or conventions. It would be impossible to provide an exhaustive list of types of language-related behaviors. Rather than attempt to classify every type as conventional or law based, I provide a few examples, which should serve to illustrate the process. The starting point is to identify both the information you wish to classify and the behavior that occurs as a consequence of that information (henceforth, information-behavior relation). To understand why, consider the following example. Depending on my behavior, a stop sign may be a source of conventional or law-based information. It is a

source of conventional information when it participates in selecting a braking action as I approach an intersection (there is no lawful relation between the visual information "STOP" and situations that require stopping a vehicle). It is a source of law-based information about an affordance if I navigate around the sign when I walk down the sidewalk (there is a lawful relation between the visual information for the sign and the presence of an obstacle that requires maneuvering around). Thus, information and behavior must be considered side by side.

Responding to instructions: Let's first take the example of a person responding to verbal instructions. Let's say that a person next to a table is asked to "pick up the glass from the table." In response, the person executes an arm movement toward the table, prepares a grip, and then picks up the glass from the tabletop. The behavior of interest is the initiation of the arm movement and grip preparation. Auditory information containing the words "Pick up the glass from the table" plays a role in selecting these actions (other information would also contribute such as the speaker's gaze direction and posture to indicate that the speaker was speaking to the person in question). Is the information-behavior relation based on conventions or laws? The event that caused the information is air being forced through the speaker's moving vocal tract. There is no inherent quality of these actions that mean that a listener must or should pick up a glass. This means that the initiation of the arm movement is not being organized with respect to vocal cord movements themselves. It is organized with respect to information caused by these movements, which has a certain sociolinguistically constrained function related to other properties and events. To a trained English speaker, these words, in this form, in this context, participate in selecting the action "reaching to pick up a glass from the table." The conventional function of these words in this type of declaration best explains the initiation of the action in question. If we want to explain the behavior of the person picking up the glass, then we have to appeal to properties different from those directly responsible for the acoustic structure of the utterance.

Giving instructions (speaking the words): The first example evaluated the case where a person initiates a reach as a result of verbal instructions. Let's now focus on the speaker giving the instructions "Pick up the glass from the table." Let's look first at the action of speaking the words (not selecting which words to say). Producing a word is a trained action. The unfolding auditory information containing those words, as well as proprioceptive information about producing the actions involved in saying those words, plays a role in the ongoing coordination of this speech act. Is this information-behavior relation based on conventions or laws? The speaker needs to control her actions with respect to his position in the speech event. His place in the event is defined according to what has come before—the prior actions of the speaker. Structure

in the auditory and proprioceptive arrays is informative about these actions. The relation between this behavior and this information is based on laws.

Giving instructions (selecting the words): Now let's turn our attention to the simultaneous problem of the speaker selecting which word to produce in the utterance "Pick up the glass from the table." The behavior of interest is selecting the action of preparing to produce the word "glass" as opposed to some other word. The auditory information containing the unfolding utterance "Pick up the . . . " plays a role in selecting the action of saying "glass." As with the first example, the event that caused this information is air being forced through the speaker's moving vocal tract. There is no inherent quality of these actions that means that the speaker must or should produce the word "glass." What does explain the production of the word is the sociolinguistically constrained functions of the words in the sentence in a context in which the speaker wants the glass removed from the table. The relation between this behavior and this information is based on convention. It is worth briefly noting the similarity between the simultaneous use of law-based and conventional information and Gibson's (1971) and Kennedy's (1974) ecological analysis of picture perception. Pictures are dual sources of information—at one level, they provide information about a surface, its color, and texture; at another level, they provide information about the things depicted.

Entrainment during conversation: This example involves the well-known phenomenon of entrainment during conversation, whereby conversation partners synchronize behaviors like speech rate and turn taking (M. Wilson & Wilson, 2005). Let's focus on a case where conversation partners (partner A and partner B) entrain their turn-taking behavior such that partners hand off turns smoothly with few long pauses or conversational overlaps. And let's say that the behavior of interest is initiation of an utterance by partner A. M. Wilson and Wilson (2005) described how conversational turn taking is periodic with a cycle corresponding to the speaker's syllable rate (although the speech rate between conversation partners converges as the conversation continues). The auditory information containing the syllables plays a role in the ongoing coordination of turn initiation during the conversation. Is the relation between this behavior and this information based on conventions or affordances? In this case, the behavior is organized with respect to the property or event that caused the information; the turn-initiating behavior is coordinated with the movements of the speaker's articulatory tract, which produces auditory information for syllable rates. The relation between this information and this behavior is grounded in law-based information about affordances.

The preceding examples are all quite simple: initiating an arm movement, selecting a single word to say. In real life, behavior is much more complex. The

aforementioned four examples represent different aspects of a single linguistic context, which, in real life, would unfold in a few seconds. However, the analysis presented in the preceding examples can provide a road map for understanding more complex scenarios as well. This is because the analysis needs to be task specific (Bingham, 1988; A. Wilson & Golonka, 2013) and consider single behaviors at a time (word selection, postural entrainment, pitch entrainment, gaze direction, reach initiation, etc). The resultant picture of linguistic behavior is likely to reveal that some of these behaviors are interdependent. For example, word selection might constrain gaze direction and gaze direction might influence postural entrainment. Gaze direction might also influence reach initiation. Furthermore, a given behavior may be selected or controlled by multiple sources of information. Word selection might be one of several sources of information that influences gaze direction. Hearing the word "glass," a source of conventional information, may interact with conventional information from earlier in the conversation—for example, if the speaker stated that she was referring to one glass rather than another. In other words, prior conventional information can have a consequence on the action selected by conventional information in the present. A potential mechanism for this prior influence is that the prior information caused a change in the state of the action system governing eye movements that affects action selection in the present moment. Hearing the word "glass" might also interact with law-based information. For example, if the conversation was taking place in a room with lots of visual distractions, then this might affect the ability of the word "glass" to select an eye movement (and subsequent reach) in the direction of the glass on the table. In other words, law-based information about the visual layout of the room can have a consequence on the action selected by the conventional information. A possible mechanism for this interaction is that the action system governing eye gaze is strongly coupled to visual information about the room layout in a way that affects the ability of the word "glass" to select an eye movement in the direction of the glass on the table. The result of this interaction might be that the change in gaze direction selected by the word "glass" is slower in a visually distracting (cf. visually sparse) environment.

Real-language contexts will likely involve many interdependencies in the way multiple sources of information affect behavior. One method to reveal these interdependencies is to follow the four-step embodied cognition research program described by A. Wilson and Golonka (2013). Step one is to carefully define the specific task in question. Step two is to create a list of resources that could be used to perform the task. Step three is to hypothesize about how these resources could be assembled, online, during task performance. Step four is to test whether this is, in fact, what the organism is doing. Carrying on from the aforementioned example, let's say the task is initiating an eye movement toward a glass on the table as a precursor to initiating a reach. The word "glass,"

embedded in an ongoing conversation, is one resource that might explain the initiation of the eye movement. Information variables specifying the visual layout of the environment are other resources that might influence the eye movement toward the glass. The listener's experience in the room (whether she just arrived or has had an opportunity to visually scan the environment) might also influence the initiation of the eye movement. How might these resources be assembled during task performance? The listener's experience in the room might determine whether the action selected is the initiation of a gaze in the direction of the glass or the initiation of a visual search for the glass. Having previous experience in the room changes the state of the action system controlling gaze—that is, previous experience with law-based information about the visual layout of the room would cause changes to the listener's brain and body that might affect the consequences of hearing the word "glass" on the initiation of a change in gaze direction. If the listener has previously seen where the glass is located, then hearing the word "glass" might select a change in gaze in the direction of the glass. If the listener has not previously seen where the glass is located, then hearing "glass" might select a change in gaze direction consistent with a visual scan of the environment. Whether this is, in fact, what happens during the task can be tested using perturbation experiments, where different candidate sources of information are removed to see what consequence this has on task performance.

These examples illustrate the process of deciding, from a third-person perspective, whether the information supporting a given language-related behavior is grounded in laws or in conventions. The final example also illustrates how this process might fit within an embodied task analysis. This description is meant to capture the spirit of something that can be tackled more formally by building dynamic field models. These models are well suited to describing the joint influences of many different sources of information that evolve on different timescales. An excellent example of this type of work is Thelen and colleagues' dynamic model of the A not B error (Thelen, Schöner, Scheier, & Smith, 2001).

As mentioned earlier, the law/convention divide does not fall neatly along obvious divisions like linguistic/nonlinguistic; some language-related behaviors are controlled via law-based information about affordances, whereas other behaviors are selected by conventional information. As a general rule, behaviors requiring the continuous control of action, like entrainment during conversation, will be based on information grounded in ecological laws because this information supports direct perception (although, as previously noted, it is possible to create conventional mimics of law-based information in sensory substitution devices). Action-selecting information may be grounded in either laws or conventions; telling the difference requires a careful analysis of the behavior to be explained and the information available to support that behavior.

It is fair to ask how drawing a distinction between convention-based and law-based information might affect research on language-related behaviors. Given that the difference between conventions and laws is only apparent from a third-person perspective, does this have practical consequences for research on language? I think the answer to this question is an emphatic "yes." First, I think the distinction clarifies part of what's special about language. Human language requires organizing behavior according to a vast and complex network of conventional information. These conventions are constrained by culture, which means that speakers and listeners must *learn* to produce and use these conventions and that these conventions can change within the time course of an individual life span. No other animal communication system possesses this degree of flexibility. First, many animal communication systems are constrained by evolution in terms of both producing and using the information (e.g., ants, honeybees). These conventions are highly reliable and valid and are not subject to change within an individual's lifetime. This means that the job the brain has to do to link the information to behavior is much simpler than in the case of human language. Other animal communication systems have flexibility on one side (production or function) but not the other. For example, Vervet monkeys produce a fixed repertoire of calls, but the function of these calls appears to be somewhat context dependent (Ducheminsky, Henzi, & Barrett, 2014). Songbirds, in contrast, must learn to produce their native calls (and the calls they produce depend on the calls they are exposed to; Nordby, Campbell, Burt, & Beecher, 2000), but the function of these calls is fixed. Human language, which is flexible in both production and function, places comparably higher demands on the brain to link this conventional information with behavior.

Second, the distinction provides the basis for conducting a thorough task analysis of linguistic behavior. A task analysis is impossible without a clear idea of what the relation is between linguistic resources and behavior. Being able to conduct a task analysis of language-related behaviors enables researchers to apply additional tools from ecological psychology to the study of language. This includes being able to create formal models of the coeffects of law-based and conventional information, allowing these contributions to behavior to be represented by a single model. The preceding analysis also makes a hypothesis about what types of behaviors can be supported by conventional versus law-based information, that is, that conventional information can only play a role in action selecting, whereas law-based information can also guide the continuous control of action. This suggests that anyone wishing to model how conventional information contributes to a given behavior should focus specifically on how this information participates in action selecting (i.e., in choosing between alternatives, in influencing the manner in which an action unfolds, or in changing from one task to another).

CONCLUSION

When psychologists began applying ecological theories outside the domain of perception–action they had to decide how to extend or revise details of Gibson's (1979) theory to apply to new types of behaviors. A central goal of much of this work has been to argue that linguistic events and other social events are directly perceived (e.g., Charles, 2009; Chemero, 2009; Fowler, 1986, 1996; Schmidt, 2007) and have affordances (Chemero, 2009; Heft, 2007; Kono, 2009; Schmidt, 2007). The analysis presented in this article suggests that many language-related behaviors (e.g., entrainment) are directly perceived. But, language-related behaviors based on conventional information are not. Instead of adopting a definition of affordances that accommodates conventions-based information, I extend the notion of ecological information. This strategy allows us to maintain the theoretical rigor of a dispositional definition of affordances while providing a method for an ecological approach to conventional information-behavior relations.

Gibson (1979/1986) first proposed direct perception as a counter to indirect, mediated theories that dominated the study of perception. The theory of direct perception is, at its heart, a theory that perception–action does not need to be cognitively enriched by representations; that is, there is sufficient information "out there" to support functional behavior (see Port, 2010, for an excellent application of this idea to language). Since then, the concept has been extended and formalized, most meticulously by Turvey et al. (1981). This formalization rests on a very specific, lawful relationship between affordances and information—a relationship that is not always met by language-related or other social behaviors or even ordinary instances of conditioned learning. This fact does not doom these behaviors to require representational mediation; it is important not to conflate "direct perception" with "nonrepresentational." Direct perception is one mechanism by which functional behavior can emerge from nonrepresentational systems, but it is not the only one. Arguing that some language-related behaviors are not instances of direct perception does not entail that these behaviors are underpinned by representations (although we need a good argument for why this is so).

For now, it is worth reiterating that the difference between law-based and conventional information does not present a special learning problem. From the first-person perspective of the organism, all we have access to is information. For a human language user responding to the phrase "Pick up the glass from the table," functional outcomes only arise when behavior is organized with respect to socioculturally constrained conventions linked to the utterance. Thus, in the normal exploration of the environment, human language users will learn to coordinate their behavior according to these conventions.

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