

The Amodality of Language

Abstract Concepts and Core Cognition

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ABSTRACT Amodality is the thesis that concepts are not constituted by modal-specific representations. In this paper I assess the prospects for uncovering support for this claim in language by two different means. First, I examine the question of the amodal character of abstract concepts, but find it to be inconclusive pending a clearer account of the role of sensorimotor representations in language processing. Second, I evaluate the possibility of there being amodal primitive concepts in the context of Carey's account of representational primitives in core cognition. Despite their alleged iconicity, which seems to favor a modal view, I contend that there are grounds for regarding them as amodal in nature. I also challenge the discontinuity thesis that regards early primitives as being unrelated to mature, newly linguistically created primitives.

KEYWORDS amodality; abstractness; language; primitives; core cognition; discontinuity

1. INTRODUCTION

For many years, the orthodoxy in cognitive science has been to assume that concepts are amodal: i.e. mental representations whose format is not tied to any particular perceptual modality. Concepts were conceived as abstract symbols fit to be processed by computational means. However, an increasing interest in the embodied aspects of cognition has led to such a view being questioned. Experimental results have found that conceptual abilities, such as categorization and reasoning, are affected by the perceptual modality in which a task is presented, while neuroscientific evidence has shown that conceptual tasks activate regions typically involved in perceptual processing of a certain modality (Barsalou et al. 2003). Championed by psychologists such as Barsalou (1999) and philosophers such as Prinz (2002), some theories of concepts have rejected the idea that there could actually be any amodal concepts at all. A look at the literature reveals a consensus about the thesis that conceptual activity is linked to sensorimotor representations, but the thesis that concepts are actually *constituted* by these representations remains controversial (Mahon and Hickok 2016). It is more readily accepted for concepts pertaining to concrete, easily imaginable entities: for instance, thinking of dogs may involve redeploying visual representations like those deployed in our previous encounters with dogs. Yet it is strongly disputed when it comes to accounting for abstract concepts—i.e. concepts such as CAUSATION or DEMOCRACY, which for Prinz (2002, 165ff.) constitute the “hard cases.” Consequently, some of the positions can be characterized as amounting to a sort of representational pluralism (Dove 2009), in which the concrete concepts are viewed as modal and the abstract ones as amodal.

The modal vs. amodal debate is related to classical issues in the philosophy of language and epistemology at large. For instance, Sellars’ arguments against sense data (Sellars 1956) can be understood as offering a rejection of perceptual-based representations as the foundation of knowledge. In parallel to this, his insistence on the role of language in giving shape to our conceptual understanding in the space of reasons tells in favor of a view of concepts as amodal symbols connected through inferential relations. However, the role of language in the current debate about amodality is controversial. On the one hand, the arbitrariness of linguistic representation, in the sense of the lack of relation between form and meaning, seems to support an amodal system of representation. On the other hand, the way language is actually acquired and processed shows some of the properties of grounded or embodied cognition (Reggin et al. 2023). My aim in this paper is to show how the question can be

perspicuously addressed by critically examining two routes to linguistic amodality. The first has to do with the question of the amodal character of abstract concepts. Paradoxically, its partially linguistic nature permits their rehabilitation as modal concepts grounded in modal properties in language. However, I find this path inconclusive pending a clearer account of the role of sensorimotor representations in language processing. The second route comes from theories of core cognition—in particular, the view of concepts advanced by Carey (2009), who posits a set of primitive concepts as part of our innate endowment, such as OBJECT, AGENT, or APPROXIMATE NUMBER. I will furnish reasons for questioning two properties that she attributes to these concepts: their iconicity and their discontinuity with mature, newly created primitives. As these new primitives are typically linguistic, inasmuch as we can regard them as functionally continuous with early primitives, we can discern a basis for endorsing amodality for a repertoire of innate fundamental categories. In short, I contend that this second route is in a better position to motivate the thesis that language sustains amodality. Before I examine these two routes, I will present Barsalou's account of the challenge of amodality, which will lay the groundwork for the ensuing discussion.

2. THE CHALLENGE OF AMODALITY

The debate over the amodality of concepts turns on the question of whether concepts are constituted by the same kinds of representations as those delivered by perceptual systems, sometimes referred to as “sensorimotor representations.”¹ These systems are typically in charge of registering a world event, informing about it in the format of a specific sensory modality, and anticipating motor reactions. Different perceptual systems reflect different modes of engaging with the world, so that roughly the same piece of information—say, that there is a predator over there—can be delivered by mechanisms that detect different types of properties: visual, auditive, verbal, olfactory, and so on. Given that perceptual systems play a prominent role in the acquisition of many concepts, modal-specificity is tantamount to the thesis that concepts preserve the format in which they

1. It is obvious that as it has been framed, the debate proceeds on the basis of representationalist assumptions: i.e. by treating concepts as mental representations. If concepts are taken as abstract objects (Margolis and Laurence 2007), or as abilities, the debate itself mostly disappears. However, there might be ways to reframe it in terms of those alternative views: in the abstract object case the debate would hinge on whether the mental states necessary for accessing a given concept involve perceptual modalities, while in the abilities case it would be a debate over whether the abilities constitutive of a concept require perceptual processes or not.

were acquired, so conceptual representations are themselves visual, auditory, verbal, and the like.²

Now, amodality is typically defined in a negative way, i.e. as the reverse of modality, so a representation is amodal if it is not constituted by any perceptual modality. This way of proceeding leads Barsalou to complain about the lack of clarity of the amodal position in general, in that it “never provides concrete descriptions of what amodal concepts are or how they are supposed to work” (2016, 1127). Instead of having a well-defined independent characterization of amodality, this just shows up as being the default thesis whenever research does not provide clear modal results. Barsalou assumes that two properties are relevant to treating representations as genuinely amodal symbols: “(1) they are arbitrarily related to their corresponding categories in the world and experience; and (2) they can stand alone without grounding to perform the basic computations underlying conceptual processing” (2016, 1125).

About (1), however, it is not entirely clear what Barsalou understands by “arbitrarily related” that would be such as to help discriminate between modal and amodal representations. At first blush, it seems that one could have modal-specific representations arbitrarily related to their categories and, more importantly, one could have amodal representations non-arbitrarily related to theirs. As regards the first of these points, consider exemplar theories of concepts, in which stored exemplars are taken as representative of the whole category they belong to. Exemplars could be cashed out in modal-specific ways, and yet be arbitrary in an important sense: viz., that many other exemplars could have been selected for the same purpose. On the second point, consider an atomistic theory of concepts (Fodor 1998). In this view concepts are mental representations that are nomologically tied to a certain causally-related property. There is no arbitrariness about which symbol represents which property, inasmuch as nomological causal links are in place. And yet, Fodor’s atomic concepts are as amodal as anything can get. On the other hand, it seems that (2)—which I will call the requirement of “stand-alone computational capability”—is a fair demand, in that if we were to drop this requirement the amodality thesis would be much less interesting and would play a weaker role in theories of concepts. To explain why, I will propose a distinction between

2. This point is often made in terms of concepts being simulations of perceptual processes. But it is perhaps less misleading to state that concepts are the representations obtained by means of those simulations.

stored and deployed concepts—a distinction that, in my view, any representational theory of concepts must grant.³

On the one hand, concepts must be stored somehow in long-term memory. This is something that even Barsalou's model, which regards concepts as constructed "ad hoc" for a given task, must accept: you cannot construct an ad hoc concept out of thin air, but only from whatever components are stored in memory. On the other hand, these components are accessed for a certain cognitive task and deployed in working memory. This opens the door to two different ways in which concepts could be regarded as modality-specific. First, a concept may be tied to a particular modality if the representational format in which it is stored is common to the format of some modality—typically, the perceptual modality in which it was acquired. For instance, the representation of horse could retain the specific format of the shapes of encountered horses. Second, a concept can be tied to a particular modality if the representational format in which it is deployed in a certain task is common to the format of some modality. So it is only when I use the concept horse that my mind resorts to a specific modal format. In other words, there exists the possibility that concepts were stored in a certain format and yet deployed in a different one. For instance, it could be the case that horse was stored as an amodal representation—e.g., an amodal prototype that abstracts away from particular perceptual information—and yet that the processes necessary for deploying this concept in working memory were modality specific.

Now, if the amodality theorist were to contend that concepts are amodal only in the stored sense, the thesis would be inconsequential. In such a scenario, the amodal concept horse would be something like a mere node that is activated so as to elicit perceptually-based simulations. The real processing would occur within these simulations. For amodal concepts to play a relevant role in cognition, they should be deployed in the computational processes that are actually engaged in the cognitive task. This is where the requirement of "stand-alone computational capability" enters the picture: what one needs to show is that amodal concepts are functionally relevant in mental processes in a way that is independent from perceptual representations and processes. For instance, one should show that there are computational processes operating on the amodal concept horse in a way

3. The distinction is particularly relevant for views of concepts as rich structured bodies of information, as I defend in Vicente and Martínez Manrique (2016). There we distinguish between the activation of the whole body and the subsequent task-dependent selection of a part of the whole for further processing. By "deployment" I am referring here to the latter.

that is not necessarily linked to any perceptual modality. If the perceptual modalities are a necessary part—and not a mere dispensable add-on—of the processing of horse, then this concept would never “stand alone” in cognition. In this case, amodality would play a lesser role in characterizing concepts.

The debate over amodality is a rich and complex one, and I cannot do justice to it in this paper. Part of it is concerned with the neural basis of conceptual processing, with arguments in favor of a supramodal view of the brain (Calzavarini 2021) and others seeking to defend a more thorough modality-based view (Borghi et al. 2023). Still other authors contend that the modal/amodal dichotomy is unsustainable, and promote a graded account (Michel 2021). I will leave these debates aside in order to focus on the relation between amodality and language, as seen through the lens of the problem of abstractness.

3. AMODALITY THROUGH ABSTRACTNESS: THE ROLE OF LANGUAGE

The modality of concepts is sometimes presented as a question of whether the abstraction of information from sensory input retains part of the modalities of this input. However, as Dove (2016) points out, abstraction and abstractness pose different problems. As he puts it, abstraction is associated with the problem of generalization—i.e. how to represent information that goes beyond immediate experience—while abstractness is associated with the problem of disembodiment: i.e. how to represent information for which there is no perceptual experience available. Abstraction can be understood as a generic way to refer to the processes involved in extracting the properties relevant when categorizing a class of objects. Hence, all acquired concepts will eventually be subject to one abstraction process or another. Indeed, research shows that even abstract concepts such as ODD NUMBER exhibit prototypicality effects (Geeraerts 1989), so its acquisition must share at least some basic principles with other non-abstract concepts. Abstractness, on the other hand, seems to tell kinds of concepts apart, or at least suggests a gradation of them, with concepts such as RED or BIRD at one extreme, and DEMOCRACY or TRUTH at the other. In addition, Dove points out that “a longstanding and diverse body of evidence suggests that abstract concepts are processed in a functionally and neuroanatomically different way than other concepts” (2016, 1114).

Abstractness is typically regarded as the hallmark of amodality. After all, if a concept cannot be linked to any particular perceptual experience, then it is implausible that it would be related to a perceptual modality. However, defenders of the modal thesis have a typical resource in their explanatory

tool bag: linguistic intervention. It is obvious that a large amount of our conceptual repertoire is acquired by linguistic means, and this is particularly the case with abstract concepts. Resorting to language may initially appear to favor the amodal theorist, and one might even regard language's combinatorial capacities for linking information together from diverse domains as being the quintessential marker of amodal cognition. Yet language is a double-pronged phenomenon: after all, linguistic items are delivered by modal means, be it auditory, graphic, or by signs. So if abstract concepts are linguistically acquired and stored, but linguistic acquisition is modal-specific itself, then one can find reasons to undermine the view that those concepts are amodal. Let us have a look at this question.

It comes as no surprise that many authors have turned their eyes to language when seeking the mechanism that makes a difference in adult concepts. This position is epitomized by Gauker's statement that "conceptual thought can be identified with the use of the very languages we speak, and concept formation can be equated with language acquisition" (2011, 1). Likewise, Lupyan argues that human cognition is language-augmented cognition, rejecting "the deeply entrenched assumption that words simply map onto preexisting concepts—an assumption that tends to undercut the potential import of language in cognition" (2016, 541). However, the centrality of language plays out in a different way for modal theorists, who put the emphasis on the external nature of linguistic items as a system of perceptible symbols with which subjects can interact in an embodied manner.

There are various ways to substantiate this thesis so as to provide a modal basis for abstractness. For instance, Borghi et al. (2017) regard words as tools that are socially wielded and that account for the grounding of abstract concepts. This view can be extended to interactions with symbols in general, such as mathematical and logical ones (Landy et al. 2014). Csibra and Shamsudheen (2015) review research that shows that a particular object, just like a word, can play the role of a symbol that stands for something other than itself. They hypothesize that this rudimentary symbolic capacity can underlie the development of symbolic understanding. In short, just as modal theorists regard the concept of a concrete entity as the reenactment of the sensorimotor representations associated with the perception of the entity, they can regard an abstract concept as the reenactment of the sensorimotor representations of linguistic items.

Indeed, modal theorists typically allege that linguistic and nonlinguistic representations interact in the formation of abstract representation (Lupyan & Bergen 2016). In contrast, a defender of amodality such as Dove (2011) contends that language is built on disembodied sensorimotor representations

associated with our experience of language, so that linguistic processing could still be amodal. One can also find midway positions, such as Zwaan (2014), who attempts to develop a pluralistic view of cognition with a view to breaking the impasse between both kinds of views, distinguishing levels of embeddedness in the environment.

The question of the relation between concepts and language looms large in the literature about concepts, and doing justice to it would exceed the limits of this paper. I will limit myself to concluding that abstractness will not count as a decisive argument against the modal specificity of concepts until we have a clearer account of the role of sensorimotor representations in language processing. It is therefore now time to turn our attention to a different place in which support for amodal representations can be found: namely, the study of representational capabilities in the early stages of the development of the human mind.

4. THE CASE FOR AMODAL PRIMITIVE CONCEPTS

The debate about the format of concepts is partially related to the debate about their origin. Defenders of the modality thesis are typically neo-empiricists (Prinz 2002). This is not surprising: if one holds that concepts are cashed out in a certain perceptual modality, then it will be part of the explanation that they were acquired through perceptual experiences of that modality. Conversely, concept innatism seems to be a natural ally of the amodal view (Spelke et al. 1992): if there are creatures that were born with conceptual representations, then the fact that these representations cannot be derived from any perceptual experience militates against the idea that they are cashed out in perception-like formats.

Nevertheless, the relation between the two debates, as I said, is only partial. It is possible to hold a radically empiricist view of concepts, to the effect that all of them are perceptually acquired, and yet maintain that the endpoint of this acquisition process is an amodal representation, obtained by means of some abstraction process. The classical empiricist Lockean theory of concepts is an instance of this view, which I referred to above as amodality through abstraction. I contended that this path to amodality is inconclusive, it being unable to distinguish genuine amodality from closely related possibilities, particularly cross-modality. This section is thus devoted to examining an innatist path to amodality. The path is not a direct one because, just as one can be an empiricist amodal theorist, one can also be an innatist modal theorist. In other words, one may hold a version of concept innatism in which the innate representations draw on the same resources as perceptual modalities, so that their formats are

of the same kinds. Indeed, it is possible to arrive at this position starting from Carey's (2009) influential innatist account of the origin of concepts. Carey draws on decades of research in developmental psychology to make a powerful case for the existence of primitive conceptual representations. In particular, she contends that there are primitive representations of objects, agents and numbers (or numerosity). However, as I will explain in due course, she claims that such representations are iconic, and this claim seems to lie in the way of the amodal view: iconic representations have an analog format, so there is a correspondence between parts of the representation and parts of the represented entity. They are similar to perceptual representations, in which the representation of HORSE represents parts of the (say, visually) represented horse. So to defend a route to amodality based on Carey's primitive representations, I need to question their iconic character. I will address this issue first by examining how the iconic primitive representation thesis could be exploited by the modality view, and then by providing reasons to question the property of iconicity while retaining the primitive character.

4.1. Iconic Primitive Representations

As I have already stated, innate representations are good candidates for amodality, given that they are not derived from any perceptual experience. Such representations are biologically hardwired to respond to certain properties of the world. For instance, new-born babies would have representations that respond to the relative numerosity of small collections of items, e.g., allowing them to discriminate between a group of two and a group of three. This capacity would be independent from their experiences with groups of items, so the representations involved could not retain modality-specific properties of those experiences. However, concluding from this that innate primitive representations are amodal is too hasty: the modal-specificity thesis states that concepts are couched in sensorimotor formats, not necessarily that they are acquired through them, and it may be the case that innate representations have the same format as perceptually acquired ones. One could even supply an evolutionary rationale for this: one might think that evolution has provided the species with structures that recapitulate the kinds of perceptual experiences our ancestors had, so that today's individuals can be expected to have the same kinds of perceptual experiences during their development. For instance, Simmons and Barsalou (2003) contend that feature and association areas in the brain have been shaped by evolution to anticipate important categories—such as foods, tools and agents—even though those areas perform modality-based

processing. So, rather than being taken for granted, the amodality of innate representations is something that has to be argued for.

A classical source of arguments for innate amodality is the seminal work by Spelke et al. (1992). Through a series of experiments in different domains they lend support to the hypothesis that representational and reasoning abilities arise early in development, and that they cannot be accounted for in terms of previous experiences involving perception and/or action. This central-origins thesis about cognition divides into two claims: the active representations thesis claims that young infants are capable of reasoning that operates on representations of states of the world that they have never perceived, while the core knowledge thesis claims that infants' reasoning principles accord with those found in mature cognition.

However, defenders of the modality thesis can still insist that even if core knowledge is not derived from sensory-motor mechanisms, it may share the same fundamental structure as knowledge obtained through these mechanisms. Indeed the modality theorist could resort to work by another influential innatist supporter, Susan Carey, to frame an alternative picture. Carey holds that core cognition resembles perception:

the representations in core cognition resemble perceptual representations. Like representations of depth, the representations of objects, agents and number are the output of evolutionarily ancient, innate, modular input analyzers. Like the perceptual processes that compute depth, those that create representations of objects, agents and number continue to function continuously throughout the life span. And like representations of depth, their format is most likely iconic (Carey 2011, 114).

Yet core representations also “differ from sensory and perceptual representations in having a rich, conceptual, inferential role to play in thought” (2009, 11). Actually, Carey contends that core representations would constitute a third type along with perceptual representations and fully explicit theoretical conceptual representations. However, note that this does not amount to saying that they constitute a third type along with modal and amodal representations. The amodality debate turns on the question of whether concepts are cashed out in formats that are like those found in perception. In this regard, the properties that Carey attributes to core representations clearly place them alongside perceptual ones. The fact that core representations could have richer inferential roles would not undermine the view that they are modality-based. On the contrary, it would provide some support to the thesis that perceptual-like representations are able to

engage in inferential processes, a thesis that modality theorists are eager to endorse. Carey's picture would simply show how those inferential but modality-based processes can take place right from the early stages of our mental lives.⁴

4.2. *Questioning Iconicity*

The existence of iconic primitive representations may sustain the promise of reconciling modality-based accounts of concepts with innatist considerations, showing that the mind's initial state is already in the right format for sensory-motor concept-building resources to act on it: namely, the iconic one. Iconic representations are analog, in the sense that their parts represent parts of the represented entities. Carey focuses on three domains: objects, agents and numbers. For instance, primitive number representations provide analog magnitude representations of the approximate cardinal values of sets.

Now, a number of authors provide reasons for rejecting iconic representations as the right way to characterize the properties of core cognition in either of those domains. With respect to number, Ball (2017) argues that the representation of cardinal numbers, one of Carey's flagship cases, requires being able to represent individuals, and this cannot be achieved in a non-iconic format. To give a particularly significant example, there is evidence that there are numerical correspondences across modalities in newborn human infants (Izard et al. 2009). For instance, they are able to associate visual-spatial arrays of 4–18 objects with auditory sequences of events. This matching cannot be achieved by directly relating the corresponding modalities. To recognize the numerical correspondence, newborn infants must employ abstract numerical representations. If this is the case, it provides some evidence for there being early non-iconic representations that play an active role in cognition. With respect to objects, Green and Quilty-Dunn (2017) argue that object files cannot be iconic, because they involve explicit indexes, which are syntactically separate from feature representations of the object. Meanwhile, Quilty-Dunn (2016) offers reasons for rejecting the iconicity of those feature representations generally, given that they are not capable by themselves of binding features in such a way

4. Xu (2016) contends that the fact that primitive representations may play an inferential role is not enough to regard them as concepts, given that perceptually derived representations can often play that role too. On her view, early representations are amodal—but, given that they share properties with perceptual ones, they are pre-conceptual rather than fully conceptual. However, it seems that the basis for this thesis is the fact that Xu takes it for granted that “perceptual” amounts to “non-conceptual,” which is precisely what is at stake in the debate.

as to be attributed to an object: hence, object representations “function like labels that segment the perceptual field” (2016, 262). Finally, with respect to agents, there is evidence that very young babies are capable of making transitive inferences in various social domains, like others’ preferences (Mou et al. 2014) and social dominance (Gazes et al. 2017), and this is an ability for which iconic representations do not seem appropriate.

In general, the reasons that support the idea that core representations are conceptual—the fact that they play rich inferential roles—militate against the thesis that they can be perceptual-like. As Shea (2011) puts it, if the concept of agent were represented explicitly, so as to act as a middle term in inferences, it should be able to represent analogically people images as well as agency. But it is difficult to envisage an icon that can encompass both types of analog. In contrast, it seems that those inferential abilities are better supported by amodal representations.

One might contend that this prejudices the issue in favor of amodality, because what is at stake is precisely whether perceptual-like representations are capable of providing inferential abilities. So, from the fact that a child can have those abilities one should not immediately conclude that they are based on amodal representations. However, there is an important factor to take into account: it should be noted that the domains in question—numbers, objects and agency—involve representations of abstract properties. And now recall that the typical strategy for the modal theorist to deal with abstractness is to resort to language: linguistic items would provide the modal-specific resources needed to give flesh to abstract representations. But this resource is not available in the case of the infant’s preverbal mind. The modal theorist cannot allege that the representation of, say, objecthood is based on an auditory simulation of a corresponding word, because there are no words to begin with.

To sum up, if there are rich inferential abilities in the infant’s core cognitive processes, and if these abilities require representations of abstract properties, then there will be prospects for characterizing those representations as amodal. Moreover, there must be a number of processes that are sensitive to those representations alone: i.e. processes that work on those representations prior to the establishment of simulations of perceptual representations. This means that core amodal representations would satisfy the stand-alone computational capability demanded by Barsalou, as explained above. However, this “victory” for the amodal theorist may come at a price: the use of amodal representations might be much more limited than originally hypothesized.

4.3. *The Discontinuity Thesis*

Let us suppose there are core amodal concepts. The problem now is: what is their weight in mental life? The answer may be “not much” if we take into account a second influential thesis put forward by Carey: the discontinuity thesis. The idea is basically that human adults have two different decks of conceptual primitives—on the one hand, primitives provided by innate endowment, and on the other, primitives created along with experience: “discontinuities involve creation of new representational primitives and new systems of concepts articulated in terms of those primitives” (2011, 157). The discontinuity thesis contends that both decks are constitutionally unrelated: the format of created primitive representations is different from the format of innate primitives. So processes that operate on the former are different from processes that operate on the latter.

Carey (2009) regards language as the main bootstrapping mechanism for creating new concept primitives. It furnishes the mind with placeholders, i.e. symbols that get their meanings from their interrelations with other symbols.⁵ Now, the way in which this is treated is mostly as if language acquisition followed its own course and eventually, at some point in childhood, began to be exploited for conceptual acquisition. However, even if it is true that language often appears as independent of other cognitive abilities, with double dissociations between cognitive and linguistic impairments, it is implausible to treat it as unrelated to core knowledge. For one thing, there are arguments to the effect that syntactic categories are innately specified (Valian 2009; 2014). For another, if innate core processes are capable of making transitive inferences between abstract representations, this suggests some primitive syntax. If, later on in development, both innate systems are destined to interact, then it is likely that they will have characteristics drawn from each other from the beginning.

This is not a conclusive argument against the discontinuity thesis,⁶ but it does suggest that to defend that thesis one must hold a view of early cognition that makes it excessively isolated from linguistically acquired conceptual processes, and that renders difficult explanation of how linguistic and nonlinguistic cognition interact. It remains to be shown that there are stand-alone computational processes that work on those amodal concepts

5. This does not mean that what is created is a system of amodal representation, because, as we saw above, the possibility of linguistic concepts may be made compatible with a modal approach based on the perceptual properties of linguistic entities.

6. To be sure, not everyone agrees with the discontinuity thesis to begin with. Spelke is among those who maintain that new concepts are constructed from, and thus continuous with, representations found in core cognition.

independently of modality-specific mechanisms. If there are amodal core representations, and there are processes—such as inferential transitions—that work on them, then we have at least a case where Barsalou's challenge is met. However, we still do not have a strong basis for the claim that amodal representations operate separately in the adult's mind, so further work would be needed to sustain a general amodality claim.

5. CONCLUSION

This paper has examined two routes to amodality, one based on abstractness and the other on properties of core cognition. At first blush, it seems that the crucial role that language plays in the acquisition of abstract concepts might provide a basis for endorsing the amodality of such concepts at least. However, while abstract concepts are typically acquired through language, linguistic input itself is delivered via perceptual modes (e.g., sounds, visual symbols), which modal theorists argue ties even abstract concepts to sensory experiences. Hence, all the while the role of modal properties of language in language processing is not properly understood, this route to amodality will remain inconclusive. The second route starts from positing amodal conceptual representations in early cognition, and contends that if mature, language-based concept acquisition is continuous with them, there can be amodality across our conceptual repertoire and not only in abstract concepts. Even though it was not my aim to provide a full defense of this route, I provisionally conclude that it holds the promise of a more robust grounding of amodality. This would be an amodality based on broad categories—number, agent, object, and possibly others, too—that play a leading role in directing the learner's mind towards relevant ways of grouping features, and thus performing the active computational role demanded by the stand-alone computational capability demand. Even though new concepts might reflect modal properties inherited from the particular experiences through which they have been acquired, including the modal properties of the particular language of the learner, they would never lose their connection with fundamental amodal categories entrenched in our innate epistemic resources.⁷

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