



Emergence unleashed: An interactivist ontology for implicit versus explicit theory of mind

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Abstract

Much ongoing debate concerns the development of social understanding from infancy through preschool. In developmental cognitive science, this has played out most recently in terms of the nature of, and the relationship between, so-called implicit versus explicit Theory of Mind (ToM). However, notions of implicit, explicit, and their relationship, involve underlying assumptions about the nature of representation, knowing, and learning. These assumptions tend to preclude emergence and, thus, do not allow for an adequate notion of implicitness in the first place. A critical survey of different perspectives from developmental cognitive science will be used to illustrate the rich plurality of explanations. The outcome of this survey will be to argue that only action-based approaches can explain the emergence of new forms of knowing and, in so doing, provide the best ontology in town for understanding implicit versus explicit representation. While there are a variety of action-based approaches in the literature, interactivism is the specific action-based approach used for this argument. After presenting the models of interactive knowing, epistemic reflection, and situation convention, the notions of implicit and explicit ToM will be reinterpreted within the interactivist framework. This reinterpretation will then be used to consider some of the replication problems for early-development ToM studies as well as how to rethink the role of folk psychology for (culturally constituted) ToM development.

Keywords Implicit ToM · Explicit ToM · Interactivism · Emergent constructivism · Action-based approaches

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1 The theory of mind puzzle

The actions of another person are meaningful in a way that is different from the movement of a rock. What is the nature of this difference, and to what extent does understanding the meaningful actions of others involve development? For many researchers, it has been assumed that action is socially meaningful through the ascription of mental states (i.e., mindreading). Your action is intentional and, hence, meaningful because I attribute to you a mental goal. Since the late 1990s, there has been growing recognition that not all social understanding involves mental-state attributions, but the basic split between deep underlying mentality and surface behavior remains for most researchers. With that split taken for granted, much of the intellectual energy for explaining the development of social understanding has gone into constructing innovative paradigms that could be used with preverbal children (or non-human primates). The *modus operandi* was to demonstrate that infants/toddlers were not responding to mere *surface behavior* but something more (socially) meaningful. Since social meaning is understood as mindreading, if surface behavior is ruled out, *mindreading* is concluded (e.g., Meltzoff, 1995).

However, for every experiment that purported to demonstrate mindreading for young children, there were counterarguments suggesting a failure to control for relevant non-mindreading interpretations (Allen, 2015; Heyes, 2014a; Huang et al., 2002; Sirois & Jackson, 2007; Sodian & Thoermer, 2008). This methodological dynamic gave way to two camps: the majority camp (i.e., researchers that tended to provide rich interpretations) in which infants could mind-read the goals and intentions of others during their first and second years, respectively, and the minority camp (i.e., researchers that tended to provide lean interpretations) in which infants were using less sophisticated mechanisms to understand others. While the empirical results from these counter studies often suggested that the lean camp made valid points about the failure to adequately control, they had little in the way of explanation for how to understand social meaning without mindreading (i.e., when sociality was reduced to behavioral rules it seemed lacking). What emerged from the lean camp in the literature was a trade-off between methodological rigor and explanatory poverty. Lean-camp studies were rigorous but had little to give in terms of developmental explanation. To enrich the theoretical explanations with more social meaning required loosening the methodological criteria for drawing the mindreading conclusions. Consequently, the empirical results from these studies were not really the bases for differentiating between rich and lean interpretations; instead, theoretical approaches guided interpretations and debate swung like a pendulum between rigorous and loose criteria for methodology. This highlights a sense in which experimental research is often saturated with theoretical considerations that are typically taken for granted in the design and interpretation of the studies themselves (Allen & Bickhard, 2013a, 2022). In turn, this suggests that theoretical explanation is at the core of what have been assumed to be empirical debates between rich and lean interpretations of social-cognition data, and yet another new study at either end of the pendulum is not going to resolve the issue.

In the second half of the 2000s came new methodologies that sought to put an end to the ambiguity of the data from earlier paradigms. The first of these new methodologies applied the structure of the classic change of location False-Belief (FB) task¹ to a type of looking paradigm (i.e., Violation of Expectation – VoE; Onishi & Baillargeon, 2005). The VoE paradigm had itself originated in infant object and number research from the 80s and 90s but was now being used for a new domain, social-cognition.² In the new VoE task, 15-month-old infants watched an adult reach inside a box for an object. In the adult's absence, the object moved to a second box. When the adult returned, one group of children saw the adult reach to the previous location while a second group saw the adult reach to the new (unexpected) location. Infants in the unexpected-location group looked longer than those in the other group (Onishi & Baillargeon, 2005). Additional new tasks that did not depend on looking times were also developed to demonstrate FB understanding in infancy (Buttelmann et al., 2009; Southgate et al., 2007). Despite the validity and reliability issues for all of these new tasks (Allen, 2015; Allen & Bickhard, 2022; Heyes, 2014a; Kulke et al., 2018; Paulus, 2022; Perner et al., 2018), the results would seem to present a problem in that FB understanding was not claimed by most researchers as developing before age 3 or 4, and now it seems to be present at 15 months.³ This difference in age for the two tasks that are claimed to measure the same ability created a procedural decalage (Carpendale et al., 2018).

2 Accounts of early and later theory of mind in the literature

There is a plurality of positions on how to interpret the claimed procedural decalage, the difference between early versus later ToM, and what the meaning of implicit and explicit is supposed to be. These now range from lean to rich on something closer to a continuum rather than two camps. However, posing the problem of knowing others in terms of knowing their minds presupposes a split between behavior and underlying mentality. This split raises the issue of how we come to know minds while only having experience with bodies (*inference problem*). Further, in development, questions about the origins of the mental-state concepts used in any such inferences (i.e., that give meaning to the behaviors) are central and can be referred to as the *emergence problem*. The standard options concerning issues of origins and emergence

¹ In the context of implicit versus explicit ToM discussions, these classic tasks are now called “Elicited-Response” (ER) tasks because they elicit a verbal response from the child participant (e.g., “where will Maxi look for the chocolate”). In contrast, the non-verbal false-belief tasks are referred to as “Spontaneous-Response” (SR) tasks because children “spontaneously” look at an unfolding event, point to a location, or help the experimenter, etc.

² Consequently, most of the problems from that earlier research carried over to social-cognition research as well. These include: problems with the VoE interpretive logic, the competence-performance distinction, representational foundationalism, encodingism, and perception as passive input processing (Allen & Bickhard, 2013b).

³ Even if one does not assume that the VoE results show false-belief understanding per se, they have been replicated, so perhaps they suggest some sort of change in social understanding.

have been nativism and empiricism with action-based (emergent) constructivist positions being a more recent historical development (Mead, 1934; Piaget, 1954).

In Section 2, we review several developmental positions that are united in terms of the assumption that we know others' minds through their behaviors. These positions have been organized largely in terms of their core ontology for the origins of ToM development. These core ontologies include: *behavioral rules* (e.g., Perner & Ruffman, 2005; Povinelli & Vonk, 2003), *innateness* (e.g., Leslie, 1994; Scott & Baillargeon, 2009), *learning as hypothesis-testing* (e.g., Gopnik, 1996; Gopnik & Wellman, 1992), and *socio-cultural interaction* (e.g., Fernyhough, 2008; Tomasello, 2018). We suggest that each grouping of positions has captured something important about ToM development/research but that they all encounter fundamental challenges for the emergence and/or inference problem(s). To avoid these problems, action-based approaches will be introduced to transcend the lean-rich continuum by rejecting the basic metaphysical assumption that the origins of understanding others lay in understanding their minds. Instead, for an action-based approach, understanding others originates in successfully interacting with them, and an understanding of their minds is a developmental outcome that is not possible without reflection and culture. Therefore, the overall aim of Section 2 is to transcend the suggested limitations of the different positions in the literature while taking lessons from each for how to fully construct an adequate account of ToM development that includes implicitness. This will be done through the specific action-based approach called *interactivism* that will be presented in Section 3 (Bickhard, 2024; Bickhard & Terveen, 1995).

2.1 Lean interpretation accounts – developmental behaviorism

For a developmental behaviorist perspective on *early* ToM (i.e., ages 0–3), there is no social meaning beyond the observed patterns of behavior themselves. This is a type of *eliminativist* position in the sense that knowing minds is reduced to knowing observable behavioral patterns. Accordingly, behavior-reading is assumed to be *enough* to explain infant (and non-human animal) ToM abilities as demonstrated on various tasks (Heyes, 2014a; Penn & Povinelli, 2007; Perner, 2010; Perner & Ruffman, 2005; Povinelli & Vonk, 2003; Ruffman & Perner, 2005). For example, Povinelli and colleagues (Penn & Povinelli, 2007; Povinelli & Vonk, 2003) challenge rich interpretations of infant and animal ToM studies, suggesting that behavioral rules suffice in place of more elaborate mindreading abilities. They propose that chimpanzees and humans share mental structures for forming behavioral abstractions that enable complex social responses on non-verbal tasks. Later, ToM abilities in humans are believed to build upon this behavior-reading foundation through a relational reinterpretation process (Penn et al., 2008).

Perner and Ruffman (2005) have also argued that behavior-reading can explain early ToM results and that they constitute a meaningful sense of implicit ToM (Low & Perner, 2012). The basic idea is that behavioral rules capture *causal dependencies* between the situational inputs and the predicted actions because they are mediated by an actual mind; and therefore, behavioral rules are not “mind-blind” (Perner, 2010). Regardless of whether we accept the idea that there is an implicit mindedness

for behavioral rules, one concern for behavior-reading approaches is that the rules are somewhat ad hoc and specific to a given study (Fletcher & Carruthers, 2012; Leslie, 2005).⁴ The second problem for behavioral-reading approaches is to explain the specific process that enables the *implicit* mindedness of the causal dependency to become *explicit*.

Ruffman and colleagues (2012, 2023) propose a comprehensive perspective on early and later ToM development that addresses both the ad hocness issue and specifies the process through which the implicit mindedness of behavior-reading becomes explicit (i.e., the development of mental-state concepts). With respect to ad hocness, the learning of contingencies between situational inputs and predicted actions leads to complex statistical regularities that capture early ToM abilities. The learning of complex regularities has been demonstrated in other domains (e.g., language) and provides probabilistic expectations for certain actions over others and, when violated, induce the sorts of curiosity manifest in longer looking times.

For the development of explicit ToM, language is argued to build on the statistical regularities that constitute implicit ToM. Specifically, mental-state concepts and an understanding of their verbal referents are thought to emerge from a combination of children's recognition of internal experiences, and their ability to identify behavioral patterns through statistical learning. That is, mental-state words are supposed to be *mapped* onto the representations of the mental-state experiences that correspond to the behavioral regularities (Ruffman et al., 2012). The main support for this proposal seems to be the empirical literature in which maternal mental-state language is related to later ToM development (including explicit FB understanding). For example, mothers often talk about children's current mental states, and so maternal talk might help children map their own salient internal experiences onto the appropriate mental-state term that capture the behavioral regularities (Ruffman, 2023; Ruffman et al., 2012).

However, the general problem for this explanation is that *mapping* is the core of an empiricist approach to language development which has been shown to have both theoretical and empirical problems (Tomasello, 2001a, b). Even for concrete nouns, researchers have had to add innate constraints to adequately explain the details of word-learning development (Markman et al., 2003). The difficulty for a "mapping" approach is even more apparent for abstract concepts like beliefs, because their referents cannot be directly observed. Further, there is nothing unitary about the pattern of behaviors that can explain the acquisition of belief concepts (Gleitman, 1990). That is, behaviors related to belief concepts like "think" and "know" are unbounded in that they lack stable observational correlates (Montgomery, 2002), and so it would seem like you need to already have the concepts in order to map the linguistic labels (Papafragou et al., 2007).

⁴ Heyes (2014a, 2014b) also criticizes infant ToM studies for engaging in rich interpretations in that they do not adequately control for non-mentalistic alternatives. The critique is principled in that it is grounded in processes adopted by behaviorism and the explanation for "implicit" ToM does not appeal to behavioral-rules per se. Instead, the concept of a "submentalizing" process is proposed that involves domain-general mechanisms such as automatic attentional orienting and spatial coding.

Finally, learning the meaning of words by mapping internal experiences onto labels has been argued to involve an in-principle problem as well (Racine & Müller, 2009). Wittgenstein's (1953) private language argument suggests that the meaning of (mental state) words cannot be learned through their correspondence to the experiences that they are meant to represent. This implies that verbal expressions of experiences (e.g., pain) do not correctly identify those experiences but merely replace observable behaviors that are associated with them (e.g., crying). This means that experience is "private" and others can only infer these experiences from the corresponding behaviors. Therefore, the meaning of mental-state words *must* be embedded in shared social and linguistic practices, rather than in private access to experience (Wittgenstein, 1953).

Developmental behaviorist perspectives are quite detailed and well justified in their methodological critique of infant/animal methodology. In many cases, new studies are conducted with adequate control conditions that undermine the empirical ground for the original rich interpretations (Allen, 2015; Heyes, 2014a); Huang et al., 2002; Povinelli & Vonk, 2003; Sirois & Jackson, 2007; Sodian & Thoermer, 2008). However, developmental behaviorist approaches are less robust with respect to explaining the origins and development of ToM. There are good empirical reasons to think that behavior-reading is not enough to exhaust the social meaning of early ToM (Tomasello, 2018). Further, with such an austere view of the social meaning for early ToM, an explanation for the development of later ToM seems to involve an unbridgeable gap. Historically, domain-general associationist learning has never been enough to explain the origins of concepts, let alone concepts that are considered to involve *unobservable* mental states. Accordingly, the standard alternative to learning concepts through experience is to assume that they are innate (Fodor, 1998; Leslie, 1987).

2.2 Rich-interpretation accounts – epiphenomenal development

Nativism is generally motivated by the inability of empiricist approaches to explain how learning alone could account for developmental outcomes. As Fodor (1998) so nicely states the issue "that there is generally more in the content of a concept than there is in the experiences that prompt us to form it is the burden of the traditional rationalist critique of empiricism" (p. 150). In the case of mental-state concepts, the charge is even more clear in that we do not have direct experience with mental states in the first place. Nativism is out of fashion these days, but perhaps *epiphenomenal* development is a more apt description in that the core knowledge/concept/representation (i.e., competence) is not thought to develop through learning. Accordingly, these accounts incorporate belief attribution into early ToM but have little to say about its developmental history. The most salient examples are one-system (Scott & Baillargeon, 2009) and two-systems accounts (Apperly & Butterfill, 2009).

The one-system accounts suggests that children have a ToM system consisting of two subsystems (Leslie, 1994; Scott & Baillargeon, 2009). The first subsystem becomes available in the first months of infancy and enables infants to ascribe reality-congruent informational and motivational states to others. This

allows them to attribute states of ignorance by masking information unavailable to another agent. The second subsystem becomes operational in infancy at around 15 months and utilizes a decoupling mechanism. This decoupling enables infants to represent two different versions of a situation simultaneously. Thus, it allows for the attribution of reality-incongruent informational states to others in which the infant's representation of the situation is incompatible with that of another agent (i.e., FB and pretend belief). Since infants have difficulty in response selection and inhibition (i.e., performance factors), they are unsuccessful on developmentally later ToM tasks, although they can pass earlier ToM tasks (Baillargeon et al., 2010; Scott & Baillargeon, 2009).

Conversely, the two-systems account claims that children have two independent systems (Apperly & Butterfill, 2009). The first system is efficient, fast, and automatic but not flexible and becomes operational around the first year of age. This system is likely to be innate (Low et al., 2016) and allows humans and non-human animals to track registrations that are "belief-like" states with truth value but not propositional content (Apperly & Butterfill, 2009; Butterfill & Apperly, 2013). The registrations used by this first system are relations to an object and its location, enabling one to determine the direction of another's actions and pass developmentally earlier tasks. The second system, which is flexible but inefficient and slow, becomes operational years after the first system and enables agents to represent beliefs as propositional attitudes and succeed in developmentally later tasks (Apperly & Butterfill, 2009).

The general drawback of these approaches is that they do not provide an explanation for the origins of ToM itself. In particular, the one-system account makes a theoretical commitment to the distinction between competence and performance (Baillargeon et al., 2010) and this creates two theoretical problems (Allen & Bickhard, 2013a). First, competence models reify descriptions of task performances into explanations of what was being described (Campbell & Bickhard, 1986). In the current context, this means that the "development" of ToM is explained by changes in *performance* factors relative to the mental-state attribution *competence*. The competence does not itself develop, but rather comes online at different ages and is then "unmasked" through a process of changing performance factors (Surian & Leslie, 1999; Westra, 2017). Second, the competence-performance assumption of the one-system account relegates interaction to the performance side of the distinction and precludes action-based approaches a priori (Allen & Bickhard, 2013a). This means that social interaction is independent of ToM ability and is, therefore, not considered as a possible source for the origins of such abilities. Learning through social interaction is relegated to a "triggering" or "parameter-setting" role in ToM development. This leaves a developmental account for the emergence of mental-state concepts themselves entirely taken for granted (i.e., they are innate and emerge through ad hoc maturation processes). At best, innateness claims do not explain the origins of the phenomenon we are studying (mental-state concepts). At worst, innateness claims are incoherent and systematically misguide experimental design and interpretation of data through dogmatic assumptions like the competence performance distinction

(Allen & Bickhard, 2013a; Mirski & Gut, 2020; Müller & Giesbrecht, 2008; Paulus, 2022).⁵

2.3 Rich-interpretation accounts – developmental empiricism

While most developmental empiricist researchers accept the claim that innate representations are necessary to get development started, they differ from nativist researchers in terms of the amount and type of representations (Allen & Bickhard, 2013a). Generally, there is a more limited innate foundation for empiricists such that they still require learning to do some heavy lifting to explain the developmental emergence of an adult-level ToM. For many developmental empiricists, the starting point of this heavy lifting was to characterize ToM as a domain of knowledge with a theory-like structure (Wellman et al., 1990). This starting point gave way to the label “Theory-Theory” (TT) of mind (Morton, 1980).

The most comprehensive advocacy for a TT framework has come from Wellman and Gopnik and their decades of empirical research (Gopnik, 1996; Gopnik & Wellman, 1992; Wellman et al., 1990).⁶ According to those researchers, there are qualitative changes in all developmental domains in terms of a theory-revision process that draws parallels with science. Although starting theories are innate,⁷ they undergo a revision process that is responsive to the child’s ongoing experiences with the world. The child is thought to be akin to a little scientist who formulates hypotheses and tests them through the collection of data (i.e., experience). For ToM development, children construct qualitatively new ways of understanding other people’s minds that differ in terms of the types of mental-state concepts that are involved (e.g., desire versus belief).⁸

The TT account pursues the laudable goal of attempting to address both the *inference* problem and the *emergence* problem for knowing other minds. The inference problem is addressed by using the *theory* construct and is widespread in the literature. Accordingly, most of the criticism of the TT approach has focused on the theory construct. Either in terms of the fact that TT assumes developmental primacy of a 3rd-person perspective over 2nd-person interaction (De Jaegher et al., 2010; Gallagher, 2001; Nelson, 1996; Reddy, 2008) and/or in terms of the different frame problems that arise (Heal, 1996; Mirski & Bickhard, 2021). The emergence problem

⁵ The two-systems account seems to assume the innateness of the earlier system (Low et al., 2016) and is subject to the same problem because mental-state concepts are already required for this system to function. Further, the second system seems to just come online around age 4 which may be a correct description but that does not seem to provide a developmental explanation.

⁶ Although nativists and modularity theorist are also theory-theorists, they do not agree that the basic ToM competence involves qualitative development through learning. Instead, they perceive development as a matter of changes in various performance factors such as executive functions, language, or pragmatics (Surian & Leslie, 1999; Westra, 2017).

⁷ Hence the term “starting-state nativism” (Gopnik, 2003).

⁸ As a type of constructivism, hypothesis-testing is always happening in the context of what the child already knows (i.e., prior theories/concepts). This feature of the model fits well with the technological update to hypothesis-testing in terms of Bayesian decision rules (Gopnik, & Wellman, 2012).

is addressed by TT through the use of the *hypothesis-testing/theory-revision* construct; however, this solution involves a logical incoherence (Bickhard, 1991). Hypothesis-testing can only confirm/disconfirm the application of concepts that already exist. The concepts used to create the hypotheses must already be available to construct the hypothesis in the first place. Any genuinely new hypothesis would need genuinely new concepts, and the testing/decision process cannot provide new concepts (Fodor, 1975).

A very different TT perspective comes from Perner. This perspective is also developmental in the sense of attempting to account for qualitative changes (i.e., emergence problem). Over the years, Perner has proposed three different constructs regarding how one understands and predicts the behavior of others: *behavioral rules* (Perner, 2010), *mental files* (Perner & Leahy, 2016), and *teleology-in-perspective* (Perner et al., 2018). These constructs appear to reflect aspects of a general framework (Perner, 1991). Mental files can track and store information pertaining to either an object (i.e., regular file) or another agent's perspective of that object (i.e., vicarious file; Doherty & Perner, 2020). Vicarious files may contain necessary information about the epistemic access of an agent, which is composed of causal regularities (i.e., behavioral rules) along with the to-be-predicted behaviors (Perner, 2010). With the development of meta-representational abilities around age 4, children can link vicarious and regular files with the same referent. This linking is what allows for understanding diverse (Perner & Leahy, 2016) that then facilitates counterfactual reasoning.⁹ Counterfactual reasoning, in turn, is required for explicit understanding through teleology-in-perspective which refers to understanding what other agents ought to do given their perspective (Perner et al., 2018).¹⁰

As a clear example of encoded structures, Perner's account in terms of object files will have an emergence problem (Bickhard, 1992). In addition, and shared by all versions of TT, is that these accounts are overly cognitivist in the sense of children's cognition being autonomous from the social (cultural) surround. This is the case for Perner in that one does not need to interact with others for registering their perspective, rather, attending to the object that others attend, and taking that information into the vicarious file, is enough for understanding others' mind. For Gopnik and Wellman, social agents provide data but there is nothing ontologically social about it (i.e., as data, it is not different in kind from data about the physical world). Further, there is no co-construction of the hypotheses which is supposed to be the core of a TT explanation for social-cognitive development (Ilgaz & Allen, 2021). One implication of this lack of social (cultural) connection was the claim of a universal ToM sequence for development (Wellman & Liu, 2004; Wellman et al.,

⁹ See Perner et al. (2021) for convergent brain correlates of these abilities.

¹⁰ Moll et al. (2022) extends Perner's work by suggesting that, around age 4, children transition from practical to theoretical reasoning through reflective awareness. Practical reasoning involves anticipating outcomes within social contexts, while theoretical reasoning entails making predictions independent of the social situation. This shift leads to theoretical belief understanding that is emergent within early practical social interactions. Despite emphasizing the role of social interaction in belief understanding, Moll and colleagues' (2022) perspective neglects the socio-cultural influences on early and later belief development.

2011). Despite some early convergent for that sequence, an accumulation of empirical evidence suggests that cultural variability in ToM development is the norm (Gut & Mirski, 2016; Ilgaz et al., 2022). Cultural variability also fits with remembering where ToM comes from (at least in the broad sense). ToM is supposed to be a reflection of the folk psychologies that are manifest in discourse practices. These practices differ widely across cultures (Lillard, 1998), and so any account of ToM development would benefit from being able to explain how culture can play a constitutive role.

2.4 Rich interpretation accounts – socio-cultural development

Socio-cultural approaches are united by the assumption that culture plays a constitutive role in development (Vygotsky, 1978). This means that social interactions in general and language interactions in particular are the proper loci for the emergence of human social understanding. One subgroup of socio-culturalists still assumes a foundational role for mindreading in the development of knowing others, but they differ in the extent to which social and cultural aspects play a constitutive role in that development.

Socio-cultural approaches often focus on language as it is one of the most important artefacts through which culture is supposed to mediate development (Vygotsky, 1981). For a weak version of a socio-cultural approach, San Juan and Astington (2012) argue that language is the mechanism that enables the development of later ToM abilities. There are two core features of language that are supposed to enable these developments. The first is labelling, which is supposed to distinguish perspectives by making them more salient. The second is syntactic frames, such as complement syntax, which can be used to represent different perspectives simultaneously (de Villiers, 2000). Thus, attention-directing and structural aspects of language are thought to make perspectives more concrete, salient, and easier to explain. Further, language is claimed to contribute to children's development of meta-representational ability. In turn, meta-representation contributes to the verbal responses in developmentally later tasks by facilitating the abstraction of inferential patterns and their generalization to various contexts.

Tomasello's account is a stronger version of a socio-cultural approach that is based on shared intentionality (Tomasello et al., 2005) and argues that infants in developmentally earlier tasks do not require an understanding of FB (Tomasello, 2018). Instead, it is sufficient to pass those early tasks if infants can *track* the epistemic access of the other agent by understanding what others want (a goal) and what they perceive (or know). These tracking skills are evolutionarily ancient and become operational in infancy without any particular need for experience. In addition, humans are capable of utilizing beliefs to understand others owing to their species-unique skills for coordinating mental states and their motivation for joint attention. Understanding beliefs in the later tasks involves the child representing their own perspective, the perspective of the other agent, and the objective situation in order to coordinate the three. This ability is argued to be a developmental result of

coordinating interactions with others, and it emerges in ontogeny through the representation of triangular relationships and joint attentional activity.

Fernyhough (2008) also draws on language as the mechanism through which culture mediates development; however, Fernyhough differs from San Juan and Astington (2012) in that the importance of language is in terms of its role in social interaction (i.e., pragmatic rather than structural). Further, language is characterized as a culturally constituted semiotic system that is used to develop an understanding of others. In this way, Fernyhough draws directly on the Vygotskian concept of mediation and the process of internalization to explain development. Fernyhough (2008) suggests that infants begin to internalize dialogues after gaining an understanding of the intentional actions of agents. The internalization of dialogues results in an indirect and, hence, implicit internalization of perspectives within the dialogues. Dialogical *thinking* is the process of using these internalized dialogues and the perspectives “in” them. With development, children begin to abbreviate the dialogues until multiple perspectives can be accommodated simultaneously. At this point, children begin to represent multiple perspectives and, thus, have something like an explicit ToM (Fernyhough, 2008).

From a certain level of abstraction, these accounts all incorporate socio-cultural interaction into the developmental process meant to explain how we understand others. However, the first two are still *cognitivist* (i.e., not fully socio-cultural) and all three appear incomplete in ways that presuppose *emergence* issues in terms of how they account for mental-state representations. San Juan and Astington’s (2012) account is socio-cultural in the sense that they assume that language is a socio-cultural construct; however, they focus on language as a cognitive tool. Syntax provides cognitive structuring for thinking about perspective, and vocabulary increases salience which is relevant for social interaction. The emergence of mental-state representing per se is basically that of other developmental empiricists and they encounter similar difficulties (Ilgaz & Allen, 2021; Mirski & Gut, 2020).

For Tomasello (1999), language does not play a foundational role in ToM development because basic mindreading is necessary to get language development started. Instead, the focus is largely on how basic ToM (i.e., joint attention, knowing, seeing, and goals) manifests in young children’s social interactions, but the social interactions themselves are not primary (Carpendale et al., 2013; Racine et al., 2007). This seems to be part of why Tomasello and his colleagues sometimes ignore the context-dependence of social understanding and use methodologies that presupposes a rich interpretation (Allen, 2015; Allen & Bickhard, 2022; Perner et al., 2018). Further, to explain the emergence of intention-reading, Tomasello relies on a nativist assumption about neo-natal imitation (Meltzoff & Moore, 1977) as well as an assumption about what follows from the means-end differentiation during the sensorimotor period (Piaget, 1954). While the empirical foundation for the nativist assumption has been largely overturned (Oostenbroek et al., 2016), the conclusion that the functional differentiation of means and ends for the infant entails knowing about that differentiation does not seem to follow (Perner, 2012). Just as my body may function such that it differentiates those things that give it a rash from those that don’t (without knowledge of what has been differentiated), reorganizing multiple means with different outcomes, need not involve explicitly representing them as such.

Finally, for dialogical thinking, Fernyhough (2008) argues that social interaction takes place through semiotic mediation (i.e., language exchange) and constitutes the origins of understanding others. While this perspective is more clearly socio-cultural in the strong sense of linguistic interaction constituting the origins for ToM development (i.e., it is not cognitivist), the process of how the dialogues are internalized is underspecified such that it lends itself to a construal as a passive empiricist transfer of perspectives into the child's mind (Mirski & Bickhard, 2021).

2.5 Underlying problem: how do we develop an understanding of others?

All the accounts mentioned so far have produced productive research programs and have important points to make about the development of social understanding. However, these account also all assume that understanding others as social agents means understanding either their behaviors or their minds. This framing of the issue arises from the shared *scientific* dualism perspective in which cognition is the underlying cause of behavior, and remains ontologically separate from it (Carpendale et al., 2013).¹¹ Since they are separate, and only behaviors are directly observable, minds are private and, hence, inaccessible to others (Carpendale et al., 2013). Accordingly, within this framework, the only way to know about these private minds is by somehow inferring them from observed behavior (the *inference* problem; Müller & Newman, 2008). Whether inferring mental states is *necessary* to understand others seems to create the basic partition in the developmental literature between lean- and rich-interpretation accounts of early ToM performance.

For lean-interpretation accounts, understanding surface behavior without any additional social meaning is enough for infants to understand others to some extent. However, it implies that infants' understanding of others is not different in *kind* from that of physical objects. But infant/toddler performance across the empirical literature strongly implies that their understanding of others cannot be reduced to "agents as *just* complex physical objects". This opens the door for rich-interpretation accounts to fill the social meaning void with some form of mindreading as mental-state attribution (i.e., inference from behavior). However, inferences about minds require mental-state concepts, and so developmentalists have endeavored to explain the origins of such concepts and at which ages they can be demonstrated (the *emergence* problem).

So, where does one's knowledge about *any* concept come from, let alone mental-state concepts? The split of scientific dualism implies that action is *instrumental* for cognition, and hence, the emergence of cognition from action is not a relevant possibility. But action-based approaches suggest themselves as the only viable proposal

¹¹ It is not obvious whether this assumption is valid for Fernyhough's account as well. His account seems to be more convergent with action-based emergent constructivist approaches, but his internalization process pulls his account toward the underlying assumptions of the dualist perspective. If action is not constitutive of cognition, internalization implies the passive transfer of what is external, and such transfer requires knowledge of what is transferred as a premise to form the correspondence between external phenomenon and internal representation (Bickhard, 2024). Either way, the details of how the internalization process works in the dialogical thinking model are not specified in any detail.

for emergent knowing. Accordingly, without emergent knowing, there must be some innate knowledge to get the whole process started. Thus, accounts that assume scientific dualism must ultimately presuppose an innate epistemic base to explain the development of knowledge (i.e., foundationalism) because knowledge cannot emerge from a non-epistemic source (Allen & Bickhard, 2013a; Mirski & Gut, 2020). However, since emergence from a non-epistemic source is not logically possible, an innate base cannot emerge in evolution either and, hence, cannot exist (Bickhard, 1991).¹² In turn, the absence of emergence and the assumed need for innate concepts creates general theoretical limitations for any explanation of learning and development (Allen & Bickhard, 2013a, 2022).

For ToM, any approach that is unable to solve the emergence problem will be rendered incapable of solving the inference problem. An action-based framework has been argued to provide a coherent account for the emergence problem through the *constitutive* role of action for cognition (Allen & Bickhard, 2013a; Mirski & Bickhard, 2021; Mirski & Gut, 2020). Further, action-based approaches side-step the inference problem by rejecting the metaphysical split between behavior and mind in the first place. Without the split, understanding others is neither understanding behavior nor mind, but interacting with them. This redefines the problem of knowing others as the problem of getting interaction with others off the ground (Carpendale et al., 2013; Stone et al., 2012). An explanation for how interaction can serve as the foundation for human forms of social meaning is a formidable task; however, if an action-based framework can resolve the general issue of emergent knowing, then it would seem to be well-placed to be the best framework in town for explaining the nature of, and the relationship between, implicit/early and explicit/late ToM.

2.6 Action-based emergent constructivism

Action-based emergent constructivist approaches are all united in their pragmatist orientation (Mead, 1934; Piaget, 1954). For these perspectives, knowledge is constituted by competent interaction, and social knowing is in terms of anticipations for the interactive potentialities with others (Carpendale & Lewis, 2004, 2006; Fenici, 2015, 2017; Fenici & Zawidzki, 2021; Mirski & Bickhard, 2021; Mirski & Gut, 2020; Stone et al., 2012). This makes all knowing a relationship between the agent and the environment and so knowing the social environment will be a co-constructivist process (Ilgaz & Allen, 2021). When this co-constructed interactive knowing incorporates language, children will be fully embedded in the culturally constituted community of minds (Nelson, 1996).

Carpendale, Lewis, and their colleagues stand out as important figures for an action-based emergent constructivist approach to social understanding. Social understanding is argued to emerge from the interpersonal relatedness that constitutes social interactions and is saturated with emotions (Carpendale & Lewis, 2004, 2006, 2015; Stone et al., 2012). In the beginning, infants have a relatively undifferentiated

¹² Further, to the extent that evolutionary processes could address emergence, there is no argument for why those processes cannot be operative in development.

understanding of the world and interact with others without conceptions of self, others, or the meaning of the interaction as such. This means that while the social interactions are meaningful for the adult, they only become meaningful for the infant through learning. For example, infant crying is (communicatively) meaningful for the adult before the infant has any understanding of it (Carpendale & Lewis, 2004). Through the reactions of social agents, the infant develops an understanding of how crying has meaning. With learning, infants will come to understand the different meanings for the different types of crying (e.g., hunger vs. the need for a diaper change) and may come to use these “cries” according to their goals. To be clear, this understanding is strictly interactive in that infants come to anticipate certain sorts of reactions given certain sorts of cries.

An anticipatory understanding of how interactions proceed is what it means to have interactive competence. While something like peek-a-boo is a well-structured and specific type of interaction, infants will be learning about all sorts of everyday practices that are centered around eating, hygiene, bathroom activities, mood regulation, sleep, play, and so on. These interactions become shared practices involving social agents that have been co-constructed between the adult and infant over time (Racine & Carpendale, 2007). As objects are increasingly incorporated into shared practices, the communicative meaning will increasingly involve directing attention. This creates a triadic relationship between the infant, agent, and object that eventuates in an understanding of communicative intentions.

For example, initially infants point to objects they are exploring without communicative intent. However, adults still respond to pointing as though it is a meaningful act of communication, and infants come to learn that pointing can serve different purposes (Carpendale & Carpendale, 2010). Toward the end of the first year, a basic distinction in pointing can be drawn between sharing (i.e., declarative pointing) and requesting (i.e., imperative pointing), but all communicative meaning is still embedded in the shared practices themselves (i.e., no mindreading). This capacity to engage with social agents through intentional communication embedded in shared practices lays the foundation for the development of language. In time, pointing gives way to the use of words like “want” or “look”. While language starts as an extension of gestures, it ultimately replaces the original meaning with that of the linguistic concept (Canfield, 2007; Carpendale & Lewis, 2004, 2006). Through the triadic social activity in which both action and language are used to coordinate and direct others, infants develop an understanding of others’ attention and referential intention. As a result of such developmental processes, mental state representations and mental state words are learned in triadic interactions in terms of patterns of interactions that are context dependent. As language development progresses, there is a progressive decontextualization from the shared practices in terms of reflective knowing. Through reflection, children can talk and think about the perspective of others in terms of explicit mental states (Carpendale et al., 2013; Stone et al., 2012).

From the current perspective, the biggest issue for the approach by Carpendale, Lewis, and their colleagues concerns incompleteness. In particular, the incorporation of language into shared practices (i.e., interactive knowing) is supposed to enable reflection (i.e., qualitatively new knowing) and provide content for mental-state concepts (i.e., qualitatively new content). However, with respect to reflection,

why does the incorporation of words into an interactive knowing process change the nature of that knowing? While language could make interactive knowing more efficient (e.g., using the word ‘dog’ may replace the need to physically locate a *dog* during an interactive communication), it is not clear why the use of words makes the knowing reflective. Further, how is reflection supposed to provide additional content to the shared practices? That is, reflection on shared practices will just be explicit representations of shared practices. Is there not more to the meaning of mental-state concepts than the shared practices that give rise to them? That is, once mental-state words like “want” get mapped to the appropriate shared practices involving wanting, why does that bestow additional meaning beyond that of the shared practice?

We argue below that there is more to the content of an anticipation than the interactive potentiality that it indicates. That is, anticipations about social agents are not mind-blind, and a full developmental account of social understanding will need some way to reflect on the *mindedness* of these anticipatory processes. An implication of this is that there is more social meaning in the activity of toddlers than suggested by the action-based account above. Accordingly, we suggest some elaboration using a specific action-based model of representation and reflection called interactivism.

3 Interactivism as an action-based ontology for development

We now introduce the interactivist account that is intended to include the advantages of each area discussed in Section 2 without the challenges or incompleteness that seems to follow for other accounts. In particular:

2.1) The lean-interpretation arguments may be valid in that much of the literature does not unambiguously demonstrate mindreading; but behavior-reading is not the only alternative. Action-based approaches provide another account of social meaning. Competent social interaction *is* what it means to know others such that the emergence of new social meaning is a matter of learning new patterns of interaction.

2.2) Nativism may be in a strong position about the inability of empiricist learning processes to account for emergence; but (representational) foundationalism is ultimately incoherent and is not the only alternative for the origins of mental-state concepts. Emergent constructivist approaches provide an alternative account for the origins of social meaning.

2.3) Empiricist may be correct that a developmental approach means being open to qualitative change and the emergence of new concepts must somehow be a matter of experience. However, the inability of empiricism to transcend the need for some amount of innate representations means that foundational emergence is impossible and this ultimately dooms any account of subsequent emergence (Allen et al., 2024).

2.4) Socio-cultural approaches may be correct that social interaction (culture) should be the locus for the developmental origins of social understanding; but, without an action-based foundation, it does not seem possible for social inter-

action to be *constitutive* of social understanding (i.e., without an action bases, knowing and interacting will ultimately be independent in their ontology and thus in development).

Finally, 2.6) while an action-based emergent constructivism may be optimal with respect to issues of emergence, subsequent development of new content through reflection seems underspecified, and further, there seems to be no sense in which early ToM involves some sort of mindedness (i.e., implicit ToM).

Accordingly, in addition to the theoretical benefits of existing action-based emergent constructivist approaches, interactivism provides specific models of implicit representing, epistemic reflection, and situation convention that enable a coherent sense of implicit and explicit mental-state representing and the developmental relationship between them. Finally, this approach enables language and culture to have a constitutive role in the development of ToM.

3.1 Interactive knowing: Explicit vs. implicit representational content

Interactivism is a process-oriented action-based ontology for the development of persons (Bickhard, 2024). As with all action-based models, foundational forms of knowing are in terms of the potential for competent interaction. At the core of interactivism is the anticipatory model of representing (Bickhard & Terveen, 1995). Anticipations are functional indications of potential interaction. These anticipations are representational in the sense that they involve two essential features: truth-value and aboutness. The truth-value is in terms of whether the anticipation is correct or not, and the aboutness is both implicit and explicit. To illustrate, anticipating that a cup may be lifted presupposes a certain range of conditions regarding the environment (e.g., that the cup is resting and not glued to the table, that the cup is made of ceramics and not lead, that the cup is empty and not full, etc.). If any of these presuppositions are false, the interaction will fail, and the anticipation will be incorrect. The anticipation being correct or incorrect captures the truth-value, and the presuppositions concerning environmental conditions captures the implicit aboutness. Importantly, the presuppositions capture the implicit aboutness (environmental conditions) of the anticipation while the explicit aboutness is in terms of the potential interactions (i.e., what is indicated by the anticipation). This is in contrast to information-processing approaches in which the aboutness of the representation can only be in terms of its (explicit) content (Fodor, 1998).

In actual cognition, anticipations do not exist in isolation but are aspects of interconnected webs that involve broader organization. These organizations of anticipatory process constitute the cognitive ontology of interactive knowing (i.e., situation knowledge; Bickhard, 2009). An important developmental example comes from Piaget's model of representing small objects throughout the two years of the sensorimotor period. Objects are represented in terms of their potential interactions, but it is not until around age two that the anticipations involve a particular organization that means they *interactively* know objects as being permanent (Piaget, 1954). This organization is constituted by a web of anticipations that remains stable despite

other sorts of changes in the world (i.e., the web stays the same despite relocation, occlusion, covering, containment, etc.). From this perspective, the “permanence” of objects for the toddler is not explicitly represented; instead, permanence is a *property* of interactively knowing objects – it is implicit in the functional organization of anticipations. How, then, do we come to explicitly represent the permanence of objects? Further, not all knowing is interactive (i.e., constituted by direct interactions with the world), and so how do we represent unobservable entities like unicorns or invisible properties like mental-states? Even more broadly, how do we represent anything in the world explicitly for interactivism, given that the environment is only represented implicitly in terms of the presuppositions? That is, if anticipations are explicitly about interactive possibilities, how do we explicitly represent what those interactions are with (i.e., the specific environmental conditions)? For example, an interactive representation of an object is not explicitly about the object per se. So how do we come to represent objects explicitly, how do we represent objects as objects, not just representing them as an organization of interactive potentials?¹³ The general answer to the above questions about representing explicitly (unobservables or otherwise) is the knowing levels model (Campbell & Bickhard, 1986).

3.2 Epistemic reflection through knowing levels

The knowing levels model proposes an architectural development that enables a second-level knowing process to directly interact with the first-level (interactive) knowing process in a fashion similar to how the first-level knowing process directly interacts with the environment (Bickhard, 1978). This architectural change in knowing is thought to involve a brain maturational development that unfolds around 3.5 years of age. This age is set by empirical findings in which several domain-general abilities seem to change around age 4 in ways that would involve level-2 knowing (Bickhard, 1992). This new capacity for interaction/knowing constitutes the interactivist model of reflection. Knowing through reflection enables a qualitative change in representing that goes beyond the webs of interaction potentialities (Allen et al., 2024). Children are no longer restricted to the “thought-in-action” constraint of interactive knowing. They can now plan, rehearse, and *explicitly* represent a world that was previously implicit in the presuppositions. For the representation of objects, this means that permanence can be explicitly represented through reflection of the second-level knowing process interacting with the organization of first-level knowing (i.e., permanence is a property implicit in that organization).

¹³ Of course, this issue only makes sense within an action-based framework where an ontological notion of implicit and explicit representing can be made. For information-processing perspectives that are used by most of the literature, the distinction between implicit and explicit cannot be a difference in representation per se (Allen et al., 2024). This is the bases for Fodor’s criticism (1998) of implicit representation developed by Karmiloff-Smith (1992). As put by Fodor “Every representation is explicit about *something*...”, and since the content of the symbols that represent objects are the objects themselves (or their properties, etc.), there is no possibility of implicit content about the objects/environment in the sense of presupposition.

To be clear, reflection is an enabling constraint in the sense that qualitatively new forms of knowing are possible, but any specific new ability will require additional learning. Evidence for epistemic reflection (i.e., level 2 knowing) as a domain-general explanation for the age 4 transition for a plurality of abilities comes from the leaning blocks task (Allen & Bickhard, 2018). In this task, 3-year-olds (but not 4- and 5-year-olds) are unable to correctly answer what will happen to two blocks that are leaning against each other for mutual support. Interactive knowing does not allow children to represent the unobservable relationship between the blocks. Instead, the blocks afford the potential to fall, and, reflection is needed to explicitly represent the support *relationship* such that the blocks will stay up. A follow-up study has sought to rule out alternative domain-general explanations related to executive functions (Allen et al., 2021).

3.3 Situation conventions: Knowing social agents

If 3-year-olds cannot represent objects explicitly or their unobservable properties (i.e., relations), then neither can they represent the unobservable mental states of social agents. What then is the ontology of interactively knowing social agents? In contrast to other action-based approaches (Carpendale & Lewis, 2004, 2006; Fenici, 2015, 2017; Fenici & Zawidzki, 2021), we suggest that anticipations (and organizations of anticipations) are not sufficient. Agents are not like rocks in that their interactive potentialities also depend on how they characterize you. That is, my interactive characterization of you depends on your characterization of me, which depends on my characterization of your characterization of my characterization of you, and so on.¹⁴ To explain why the unbounded iteration problem (Bickhard, 2001) does not plague social-agent interactions, Bickhard (2008) has developed a model for the emergence of situation conventions. Situation conventions are mutually held interactive characterizations of the situation. Therefore, the basic task for the development of social understanding is to learn about how to differentiate types of *social situations* (i.e., situation conventions) and the interactive potentials that they engender. Take, for example, peek-a-boo or an imitation game. Once learned,¹⁵ these social situations may be initiated/differentiated through cues like the starting actions of the game or perhaps some of the language used when previously playing the game. Even just your appearance could initiate an imitation game as part of an attempt at “(re)identification” (Meltzoff & Moore, 1992). However, it is important to note that

¹⁴ This unboundedness is also present for mindreading approaches. My mental representation of us involves a representation of you and your representation of us, which involves a representation of me and my representation of us which involves you and your representation of my representation of us, and so on.

¹⁵ Such learning will certainly involve all sorts of developmental complexity and the reciprocal nature of the roles in activities like imitation are probably essential for human forms of perspective-taking (Müller & Carpendale, 2004). Further, without the development of such complexity, the interactive “environment” for level two reflection (i.e., the underlying organization of anticipations that constitute level 1 knowing) would be missing much of the implicit content that is normally rendered explicit.

differentiation of a situation as an opportunity to play the imitation game, does not require explicit representation of what is differentiated.

For us as adults, imitation games are explicit both in terms of the interactions and in terms of situation conventions. In contrast, for infants, only the interactions are explicit while the situation conventions are implicit in the presuppositions of the interactive characterizations (i.e., the shared practices related to imitation games). Further, just as the representation of objects involves presuppositions about object properties, like permanence, so too does the representation of social agents involve presuppositions about social agent properties. One of the most eloquent examples of this concerns equifinality. Csibra et al. (1999) demonstrated some time ago that infants treat any object that displays multiple means to a salient outcome as goal-directed. From the current perspective, goal-directedness is a social agent property that is implicitly represented – the goal-directedness is implicit in the infants' interactive understanding of entities that display equifinality.

4 An action-based account of implicit versus explicit ToM

To be sure, infants can always be described “as-if” they *believe* that you have the *goal* to get the ball, but such ascriptions are superfluous for what is explicitly known by the infant. This is what led Gergely and Csibra (2003) to (temporarily) abate in rich interpretations. They rejected the assumption that the only way for an infant to see others as goal-directed is for the infant to mind-read a mental goal. While we agree with rejecting such an assumption, we are now in a position to claim that there are, in fact, implicitly represented mental states involved in these sorts of social situations. It would seem then that Perner was on to something when he claimed that behavior rules are not “mind-blind”. However, we may amend it to say that *mentality* is implicit in the shared practices of infants and their caregivers but requires reflection to be rendered explicit (Allen et al., 2024). Shared practices will certainly involve all sorts of developmental complexity and the reciprocal nature of the roles in activities like imitation are probably essential for human forms of perspective-taking (Müller & Carpendale, 2004). Further, without the development of such social complexity, the interactive “environment” for level two reflection (i.e., the underlying organization of anticipations that constitute level 1 knowing) would be missing much of the implicit content that is normally part of culturally constituted ToM development. While as adults capable of reflection, we may explicitly represent what are only presuppositions for the infant, it is not until around age 4 will children also be able to explicitly represent those presuppositions (i.e., explicit ToM).

Alternative action-based explanations for some of the complexities of early social-cognition studies have been provided by others (Carpendale & Lewis, 2004, 2006; Carpendale et al., 2024; Fenici, 2015, 2017; Fenici & Zawidzki, 2016; Mirski & Bickhard, 2021; Mirski & Gut, 2020; Müller & Carpendale, 2004). Accordingly, the current action-based perspective will elaborate on two other issues: the *replication* crises of developmentally early tasks and the status of *folk psychology*.

The current approach offers a novel perspective on the replication crises affecting certain developmentally early tasks (Mirski & Bickhard, 2021). If early

social-cognition is constituted by the development of situation conventions, there will be several layers of variability grounded in the nature of the interactive characterizations. Thus, developmental variability in situation conventions would suggest a starting point for thinking about alternative reasons for some of the replication problems on these early tasks (i.e., situation convention variability). Cross-cultural studies have demonstrated that cultures vary in the frequency and dynamics of caregiver-infant interactions (Bozicevic et al., 2021), the emphasis on verbal and non-verbal communication (Little et al., 2016), and the types of objects and activities provided for infant exploration (Bjorklund & Gardiner, 2011). These culturally constituted parenting practices and socialization goals will then determine *what* sorts of conventions develop, when they develop, and *how*. Further, while the culturally constituted practices will involve conventions shared by most members of the culture, idiosyncratic conventions will also be established between infants and their caregivers (e.g., the conventions governing diaper changes; Rossmanith & Reddy, 2016). Situation conventions will also involve different degrees of detail with respect to the corresponding interactive characterizations, and development will generally involve increasing detail (e.g., diaper changes get easier as the infant learns more details of the interactive characterization). Finally, as language gets incorporated into the already meaningful social situations, there should again be variability. This variability should be a consequence of the cultural specificity of both the social and linguistic practices (Farran et al., 2016). For the latter, the focus returns us to folk psychology.

In general, folk psychologies involve explicit characterizations of implicit presuppositional contents related to shared practices (e.g., describing an infant in a relevant social situation as *wanting* an apple or *believing* that you have disappeared because you are out of sight). These characterizations are necessarily partial because the presuppositions are unbounded (Bickhard, 2004). While the development of reflection through knowing levels will provide a universal explanation for how mental-state concepts *can* emerge, folk psychology discourse practices provide normative/cultural guidance for how specific mental states are reflected and their appropriate applications. For example, the extent to which mental-state terms should be used to explain other people's actions differs across cultures (Lillard, 1998).

While folk psychology characterizations can be useful for social purposes (e.g., coordination, cooperation, evaluation, etc.), they are problematic as an ontology for cognition. Folk psychology characterizations are dispositional: describing a person as having a belief means that they are prepared to act in the world in ways that presuppose that the content of that belief is true (Bickhard, 2004). Being described as having a belief that the marble is in the basket means acting as if that is the case. Such a *description* may even refer to something real about the actual cognitive processes involved in the behavior. However, correct reference does not entail correct explanation/ontology. For example, a description of the sun as *rising* each morning makes a correct reference/description to the sun, but is false in terms of an explanation of the relationship between the earth and the sun. As an ontology for the science of (social) cognition, folk psychology is problematic (Churchland, 1981; Ratcliffe, 2007). However, such problems as a scientific ontology do not undermine the explanatory relevance of folk psychology for the folk as used in everyday life

(Ratcliffe, 2007; Van Cleave & Gauker, 2010). That is, folk psychology may have a reality at the social level of discourse practices; but to *reify* such activity into the (social) cognitions that enables participation in such practices is to conflate description with explanation (Campbell & Bickhard, 1986).

From the current perspective, the development of social understanding is a matter of learning how to participate in social situations as defined by situation conventions. Social situations are constituted in the mutually held interactive characterizations of situations. Such commonality of characterization is sufficient to account for the richness of social understanding without an appeal to mindreading. In fact, society is saturated with shared knowledge that makes mindreading generally superfluous in everyday life (Ratcliffe, 2007). For some examples, the conventions about how to drive, ride on the subway, or hail a taxi, are all learned through participation in such activities and guide subsequent social interaction. Many of these conventions do not involve explicit instruction and are not explicitly represented as such (a general exception occurs when traveling to different cultures since many of the conventions do become explicit through reflection on the new experiences). In addition to conventions, interactive knowledge about social roles (e.g., the secretary is supposed to answer the office phone) and artifact functions (e.g., a saw is for cutting) provide sufficient guidance for most of our everyday social navigation and any additional mindreading is unnecessary (Allen, 2015). As pointed out by other (Andrews, 2012; Bruner, 1990; Hutto, 2007), reflection on potential reasons for action, in terms of mental states, happens when the normative structuring of society is violated (e.g., the phone rings and the secretary *doesn't* answer it). However, interactive knowing means that learning about the normative structuring of society need not involve mindreading at all. While it will be useful to have reflective capabilities to help reconcile violations of such structuring, to assume mindreading from the beginning is to put the cart before the horse.

5 Conclusion

The interactivist model of implicit versus explicit representing frees us from the need to over- (or under-) interpret infant social understanding studies (Onishi & Baillargeon, 2005; Perner & Ruffman, 2005). This perspective also provides an account of the emergence of mental-state concepts that avoids the known problems of other approaches. Although folk psychology discourse practices are functional in social life, their reification into ToM cognition does not provide an adequate ontology for the developmental origins of understanding others (Ratcliffe, 2007). Action-based approaches have been argued to be a necessary starting point to account for developmental emergence in general (Allen & Bickhard, 2013a, 2022). This means that the foundational problem for understanding all development is to understand how infants learn to interact with the world. Knowing others' minds through mental state attribution is ontologically and developmentally derivative from knowing others through (socio-cultural) interactions (Carpendale & Lewis, 2004, 2006; Ilgaz & Allen, 2021). Finally, language development provides interactive possibilities for the guidance of reflection to abstract implicit presuppositions from shared practices and

constitutes a major aspect of the enculturation process (Mirski & Bickhard, 2021). This means that language and culture are universal for the developmental emergence of ToM, but also that variability through situation conventions will be the norm rather than the exception (Ilgaz et al., 2022).

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