European Journal of Developmental Psychology

ISSN: 1740-5629 (Print) 1740-5610 (Online) Journal homepage: www.tandfonline.com/journals/pedp20

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To cite this article: Leon Li & Jared Vasil (29 Dec 2025): Phylogenetic, ontogenetic, and logical critiques of mental state minimalism, European Journal of Developmental Psychology, DOI: 10.1080/17405629.2025.2607730

To link to this article: https://doi.org/10.1080/17405629.2025.2607730

Published online: 29 Dec 2025.

EUROPEAN JOURNAL OF DEVELOPMENTAL PSYCHOLOGY
https://doi.org/10.1080/17405629.2025.2607730

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COMMENTARY

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Phylogenetic, ontogenetic, and logical critiques of mental state minimalism

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ABSTRACT

This commentary critiques recent arguments for mental state minimalism, the view that infants initially understand only behaviours and not mental states. The minimalist evolutionary claim that animals in general evolved to track behaviours may be true, but it does not address whether human infants in particular evolved to additionally track mental states, which plausibly occurred given the selection pressures of hominin cooperative breeding. Minimalist critiques of theory of mind tasks as a source of evidence for the mentalist view that infants do understand mental states may have merit, but there is abundant evidence that infants understand mental states other than those assessed by traditional theory of mind tasks, such as affective and attentional states. Proposed minimalist mechanisms for the transition from behaviour understanding to mental state understanding are inadequate because they presuppose mental state understanding, occur too late in ontogeny, or do not challenge the central claim of mentalism. Overall, future research should proceed on the assumption that infants do understand something about mental states and that this knowledge is not based solely on learning from the observed behaviour of others.

ARTICLE HISTORY Received 29 April 2025; Accepted 9 December 2025

KEYWORDS infancy; theory of mind; mentalism; joint attention; social cognition

A recent review by Ruffman (2023) presents a number of arguments defending mental state *minimalism*, the view that 'infants initially understand others' behaviors but not their mental states' (Ruffman et al., 2023, p. 2), and critiquing *mentalism*, the view that infants understand mental states 'within the first few months of life' (ibid.). This commentary presents six arguments against Ruffman's minimalist theory. To be clear, although we dispute Ruffman's theory of minimalism, this is not because we endorse 'mentalism' as Ruffman has described it. Instead, we reject the false dichotomy between minimalism and mentalism with which Ruffman has framed current debates

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on infant mental state understanding. We argue that (i) Ruffman critiques a straw man version of mentalism, (ii) the main empirical evidence for minimalism raises no substantial challenge against mentalism, (iii) evolutionary arguments do not favour minimalism, (iv) there is abundant evidence of infant mental state understanding apart from the particular evidence that Ruffman critiques, (v) minimalist accounts of infant mental state understanding are post hoc and unfalsifiable, and (vi) minimalist mechanisms for the transition from behaviour understanding to mental state understanding are inadequate.

Straw man mentalism

Ruffman's framing of the debate between minimalism and mentalism characterizes mentalism as a radical nativist position that grants no role to learning. According to Ruffman et al. (2023), 'mentalists argue that children's theory of mind is innate and that exposure to regularities plays no role, either because ToM [theory of mind] appears too early for experience to play a role, because regularities are not sufficient in the environment, or because they could not be tracked even if they were' (p. 8). This assertion glosses over the diversity in nativist positions, which range from Neo-Cartesian theories of innate ideas to faculty theories of innate mechanisms (Fodor, 1983; Laurence & Margolis, 2024). Furthermore, the claim that exposure to regularities plays *no* role – that there is *zero* learning from experience – is a hyperbolic exaggeration of current nativist accounts. To our knowledge, this position is not seriously endorsed in current debates.

The predominant nativist stance concerning infant knowledge – regarding not just mental states but also other domains such as objects, quantities, and causality – is that infants have innate biological mechanisms or conceptual knowledge that facilitate rapid learning from sparse input. These innate mechanisms or knowledge are referred to by a variety of terms (e.g., conceptual primitives, core knowledge structures, Bayesian priors, learning constraints), depending on one's theoretical background. Yet, they all refer to essentially the same idea of inborn 'head-starts' that are functionally geared towards helping infants *learn* from sparse input (Carey, 2011; Spelke, 2024). For example, Laurence and Margolis (2024) state that 'while . . . a considerable number of concepts across a wide range of conceptual domains [are innate], we want to make it absolutely clear that . . . most concepts are not innate and that relatively general-purpose learning mechanisms play an important role' (p. 7). Though just one example, this quote highlights the balance that nativist theories try to strike between the amount and kind(s) of head-starts relative to what can be learned *de novo*.

In light of the fact that major nativist theories grant a substantive role to learning, we question the usefulness of the definition of 'mentalism' given by

Ruffman and colleagues and the validity of their proposed dichotomy between radical minimalism and radical 'zero-learning' mentalism. An examination of the theoretical landscape concerning how infants come to understand mental states reveals that it is much more complex than Ruffman and colleagues suggest, spanning a diversity of accounts from neo-Vygotskian (Tomasello, 2018, 2019) to neoconstructivist theories (Gopnik & Wellman, 2012; Newcombe, 2011).

Rich input does not challenge mentalism

The main evidence given by Ruffman and colleagues *for* minimalism raises no substantial challenge *against* mentalism's central claim. Ruffman et al. (2023) found that infants observe vast quantities of repeated behaviours in their everyday lives, a rich source of input for learning about why agents act in various ways. The quantity of repeated behaviours that infants observed predicted their mental state vocabulary, although explaining only a small portion of variance, $\Delta R^2 = 0.045$. These data constitute evidence against the claim, which Ruffman et al. (2023) attribute to mentalists, that 'regularities are not sufficient in the environment' (p. 8) to afford learning. Yet, as noted above, the claim that infants engage in zero learning from the environment is only a straw man version of mentalism. As such, Ruffman et al.'s data only falsify a straw man version of mentalism; they do not challenge mentalism's central claim, which is that infants innately understand mental states.

The mentalist view regarding regularities in the environment may be formally stated as an 'if P, then Q' argument: *If* the environment lacks sufficient regularities to afford learning about mental states (P), then infants *must* have an innate understanding of mental states (Q). This argument is valid because, in the absence of learning from the environment, there would indeed be no alternative explanation other than innate knowledge for why infants understand mental states. Based on this 'if P, then Q' argument, two further valid arguments are possible: the *modus ponens* argument (P is true, therefore Q is true) and the *modus tollens* argument (Q is not true, therefore P is not true).

Ruffman et al. (2023) provided evidence that P is not true. But the fact that P is not true does not entail that Q is not true (to say so would be to commit the logical fallacy of *denying the antecedent*). That is, infants may innately understand something about mental states even despite the fact that the environment is a rich source of input for learning about mental states. Analogously, the environment is also a rich source of visual and auditory input, but few would doubt that seeing and hearing are innate capacities, albeit ones fine-tuned by learning and experience. Ultimately, the question of

whether infants would plausibly need an innate understanding of mental states is an evolutionary question, to which we turn next.

Infants evolved to understand mental states

Ruffman (2023) states the evolutionary claim that there is a 'need for a wide variety of species to predict the behaviors of other animals . . . human infants are not unique in this regard' (p. 106). We agree with this claim. However, Ruffman's claim about animals in general does not address the key question of whether human infants in particular may have an additional or different kind of need, over and above that of other primates, to understand mental states and not just behaviours – and thus a corresponding set of uniquely human psychological capacities for mental state understanding. Assessing the plausibility of human infants having such capacities would require looking at the selection pressures faced by human infants specifically, not the selection pressures faced by animals (or even great apes) generally.

In other words, Ruffman's argument that 'many animals, including human infants, track behaviours; therefore, human infants do not also track mental states' is comparable to the argument that 'many animals, including bats, use vision to perceive the spatial environment; therefore, bats do not also use echolocation to perceive the spatial environment.' The argument is logically invalid because the premise (that an animal has some baseline capacity) does not entail the conclusion (that the animal therefore lacks additional capacities beyond the baseline).

Furthermore, human infants do in fact inhabit a niche in which it would have been adaptive to have evolved capacities to track others' mental states. In contrast to the typical mammalian breeding context in which a singular generation of offspring is raised by the offspring's own biological parent(s), hominins have engaged in cooperative breeding arguably since *Homo erectus* (O'Connell et al., 1999). In this cooperative breeding context of being reared by multiple parental and non-kin caregivers (as described in Betzig et al., 1988), human infants effectively had to 'compete' with each other for provisioning of care by adults, including non-kin alloparents who presumably would not have been as intrinsically motivated to care for the infants compared to the infants' own parents. This plausibly generated selection pressures for skills and motivations for mental state understanding such as joint attention, perhaps as a means to enhance social bonding with (Wolf & Tomasello, 2020) – and thus curry provisions from – caregivers (Hrdy, 2009). Engaging in joint attention to things of shared interest would have been an excellent means for infants, with their limited motor and verbal abilities, to bond with caregivers (Li, 2023; Tomasello & Gonzalez-Cabrera, 2017).

Alternatively, even if one were to reject the plausible evolutionary scenario above, frameworks such as the developmental systems

approach (Oyama, 2000) provide another route for an innate understanding of mental states to coexist with rich environmental input. The developmental systems approach suggests that species-typical developmental trajectories emerge out of cyclical interactions between the organism and its (constructed) environment and that both genetic and non-genetic material (e.g., the constructed environment) are required for high-fidelity reproduction of the life cycle in each generation (relatedly, Bonner, 1974). In other words, the entire developmental system – the organism and relevant aspects of its environment – is selected for based on its ability to effectuate species-typical development. For humans, this opens up the possibility for selection to favour a developmental system for mentalizing, one that leverages organism-internal head-starts (e.g., selection for innate mechanisms or knowledge) as well as organism-external head-starts (e.g., selection for informative behavioural cues from others). Thus, developmental systems theory suggests a possible means for the coevolution of rich internal *and* external structures supporting mentalizing.

Infants understand affect and attention

We now turn to the empirical side of the debate. Ruffman (2023) raises three critiques of the empirical research literature on infant theory of mind (ToM). First, 'efforts to replicate the early success of infants on ToM tasks have failed repeatedly' (p. 106). Second, performance on different ToM tasks 'frequently does not correlate either within a single time point . . . or, with a few exceptions, across time' (p. 107). Third, 'even if infants' success on ToM tasks correlated and could be replicated, infants could succeed on ToM tasks by understanding behavior' (p. 107).

To begin, Ruffman's second critique is only a challenge to versions of mentalism that assume that different kinds of mental state understanding are necessarily correlated. This assumption need not be shared by all versions of mentalism. A mentalist may posit, for instance, that infants have multiple forms of mental state understanding that are neurodevelopmentally dissociable and thus do not correlate at a given timepoint. Relevant to this, neuroscientific evidence suggests that neural substrates for 'cognitive' versus 'affective' ToM are partly dissociable in the prefrontal cortex (Shamay-Tsoory & Aharon-Peretz, 2007).

More importantly, even if Ruffman's three critiques are valid criticisms of the ToM literature, they do not suffice to prove the broader minimalist claim that infants do not understand mental states. This is because the ToM tasks critiqued by Ruffman (2023) 'tap an understanding of goals, knowledge, and beliefs' (p. 106), but goals, knowledge, and beliefs are not the only kinds of mental states there are (Bloom & German, 2000). Suppose for the sake of

argument that we discount all empirical evidence to date of infants' understanding of goals, knowledge, and beliefs. Even then, minimalism would still be untenable because there is abundant evidence that infants understand *affective* and *attentional* mental states (Bradley et al., 2023; Ruba & Repacholi, 2020; White et al., 2019).

To give a few examples of affect understanding: By 5 to 7 months of age, infants discriminate the facial expressions of different emotions (Bornstein & Arterberry, 2003; Flom & Bahrick, 2007; Leppänen et al., 2009; Miguel et al., 2019). By 7 to 9 months, infants categorize emotions, i.e., infer that different instances of a given emotion are part of the same category (Cong et al., 2019; Lee et al., 2015; Safar & Moulson, 2017). By 8 to 10 months, infants expect agents' emotions to be congruent in valence to actions and events associated with the agents (Hepach & Westermann, 2013; Skerry & Spelke, 2014).

To give a few examples of attention understanding: By 9 months, infants engage with partners in triadic joint attention, which presupposes the ability to track partners' attentional states (Carpenter et al., 1998; Tomasello, 2018). By 10 to 11 months, infants point to direct partners' attention, not just their behaviours, to referents of interest (Liszkowski et al., 2012; Rüther & Liszkowski, 2024). By 12 months, infants infer what a partner would want to have or know based on what the partner had previously attended to (e.g., expecting that partners would be more interested in novel information). For example, infants in a study by Tomasello and Haberl (2003) played with two novel toys with a partner, who then left. In the meantime, a third novel toy was introduced. When the partner returned and expressed excitement in the general direction of the three toys, infants tended to give her the third toy. In another study, infants saw that a partner either did or did not see an object fall off a table. Infants pointed out the object's new location more often in the latter case (Liszkowski et al., 2008).

Minimalism is unfalsifiable and post hoc

In response to the above studies, a minimalist might argue that the studies only show that infants have 'behaviour understanding' of the 'behavioural cues' associated with affective and attentional mental states, not an understanding of mental states as such. For example, regarding affect understanding, a minimalist might argue that infants track the 'facial muscle movement behaviours' associated with emotions but do not understand emotions as such. Regarding attention understanding, a minimalist might argue that infants recognize that others 'behave excitedly' towards particular objects depending on whether they have 'behaviourally gazed at' the objects previously but do not understand excitement and attention as such.

We acknowledge that a minimalist interpretation could be given for any behaviour suggestive of mental state understanding. However, this is not

a strength of the minimalist position but rather a weakness – a reflection of its unfalsifiability. Related to this point is the lack of predictive power of minimalism. Whereas the mentalist view that infants evolved to engage with others' mental states as an adaption for soliciting care would straightforwardly motivate the prediction that infants have early-emerging understanding of others' emotional and attentional states, it is not clear how a minimalist view could have motivated the same prediction. Why, in the absence of the understanding that facial expressions and gaze reflect mental states, would infants have evolved to track something like mere 'facial muscle movement behaviours' or 'gaze behaviours,' which are often (i) quite visually subtle and (ii) not paired with any instrumental behaviours that would be of interest to the infants? Moreover, as shown by Brooks and Meltzoff (2002), 12- to 14-month-old infants not only track others' lines of sight (i.e., head direction) but also track whether those lines of sight are obstructed or unobstructed (e.g., by closed eyes or a blindfold).

A minimalist might reply that infants track facial and gaze behaviours because they are predictive cues of subsequent instrumental behaviours that are indeed of interest to the child (i.e., a behaviour-to-behaviour mapping). However, such minimalist interpretations are fundamentally post hoc. They can always be invoked to explain results from studies that were designed to test mentalist predictions, such as the above studies that tested the hypothesis that 12-month-olds expect that partners will show more interest in things that the partners did not previously know about (Liszkowski et al., 2008; Tomasello & Haberl, 2003). A critical question here is: Would the minimalist view have also predicted these results a priori? We do not believe so.

Consider, for example, 12-month-olds' behaviour in Tomasello and Haberl (2003). A minimalist might claim that infants make a purely 'behavioural inference' that another person will show more signs of 'behavioural excitement' towards an object that the person has not yet 'behaviourally gazed at.' Yet, an explanatory gap would still remain in the minimalist interpretation. Namely, what is the connection between the infant's 'behavioural inference' that an object was previously unobserved by another person (i.e., is novel to the other person) and the infant's subsequent act of handing over the object? The mentalist account, conversely, naturally motivates the connection between the infant's observations and the infant's subsequent act of handing over the specific object that they did. This is because, in between the infant's observations and their subsequent act of handing over the novel object, the infant makes an inference as to the mental state of the other person. Expressed in natural language, the infant's inference about the other's mental state might be something along the lines of: 'This object is novel or exciting to the other person, and people tend to desire novel or exciting objects, all else equal.' Coupled with humans' evolved motivation to be helpful (e.g., Li &

Tomasello, 2021), this inference about the other person's mental state (i.e., of desire based on novelty or excitement) naturally motivates the infant's decision to hand over the novel object. Thus, a mentalist view is better able to predict the results of Tomasello and Haberl (2003) compared to the minimalist view.

Communication

While it may be ambiguous whether the capabilities reviewed above would qualify as 'within the first few months of life' (Ruffman et al., 2023, p. 2), what is clear is that such capabilities emerge well before the mechanisms that Ruffman (2023) claims underlie the 'transition from an understanding of behavior to an understanding of mental states' (p. 109). Specifically, Ruffman (2023) claims that 'Two environmental factors (repeated behaviors and maternal talk) and two developing insights (a sense of self and of language) likely help children transition from an understanding of behavior to a ToM' (p. 109). Having already discussed the inadequacy of 'repeated behaviours' as a source of evidence for the minimalist view, we now discuss in turn the inadequacies of language and self-understanding as potential mechanisms for the emergence of mental state understanding.

To begin, the claim that mental state understanding emerges as a result of linguistic experience construes knowledge about mental states as just another form of content knowledge that children acquire through language, in the same way they might acquire content knowledge about addition or skyscrapers by means of linguistic descriptions. This may or may not be true for certain forms of more sophisticated mentalizing. However, it is patently false for key, basic forms of mentalizing, such as joint attention and inferring the communicative intentions of others (Bruner, 1983). These forms of mentalizing are *requisite* for language; they do not owe their emergence to language.

Indeed, the kinds of mental state inferences that underlie language usage and acquisition are already operative *even before* children communicate via linguistic symbols such as words. Children's earlier-emerging communicative acts by means of *gestures*, such as pointing, already require the understanding that one can direct others' attention towards external referents, which as a result become referents of joint attention and shared knowledge (Tomasello, 2008). In two illustrative studies on infants' gestural communication, 12-month-old infants attempted to point out an interesting referent to a partner and produced more *additional* points, indicating dissatisfaction, if the partner expressed excitement about a different nearby object or simply expressed excitement without looking at the referent, as opposed to in the paradigmatic case where the partner shared the infant's excitement about the same object (Liszkowski et al., 2004, 2007).

These results do not readily afford a minimalist interpretation. A minimalist might argue that infants enjoy seeing others 'behave excitedly' and use pointing to elicit this behaviour. But if infants had only wanted to elicit a 'behavioural excitement response' from their partners, then they would have been equally satisfied in all three conditions. To fully explain the results on purely minimalist grounds would require positing that infants desired a combined 'behavioural excitement + behaviourally aligned unobstructed line of sight' response from partners and were dissatisfied with anything less, a prediction that is considerably implausible. The natural reading of Liszkowski et al.'s (2004, 2007) findings is the simpler mentalist interpretation that infants had the goal of *sharing* excitement with partners about jointly attended referents. Infants then communicated gesturally to achieve this goal and attended to partners' behavioural cues to infer the efficacy of their communicative acts for achieving this goal.

Research on the informativeness of toddlers' linguistic reference is also at odds with the minimalist view. A review of the experimental research by Vasil (2023) suggests an inverse relation between cues that signal common ground, such as joint visual attention to an intended referent, and the informativeness of 2-year-olds' linguistic reference. For example, toddlers tend to produce relatively informative terms (e.g., 'the red car') when a listener's line of sight to a referent is obstructed compared to when it is not (in which case they tend to use less informative terms, e.g., 'it'). These data, similar to the data of Tomasello and Haberl (2003), are difficult to reconcile with a minimalist account. It is unclear why particular behavioural cues would be systematically associated with toddlers' referential informativeness unless the infants understood the causal link between their own capacity to influence partners' mental states via communicative acts and the (inferred) knowledge of those partners, such that less partner knowledge requires greater informativeness and vice versa.

Thus, pre-linguistic gestural communication and early linguistic reference rely squarely on infants and toddlers already having some conception of others' mental states as well as their own ability to influence others' mental states. As such, Ruffman's highlighted mechanisms of maternal talk and linguistic insight cannot be the impetus for a *de novo* understanding of mental states because linguistic communication already presupposes understanding something about mental states. Additional indirect evidence that linguistic communication is not necessary for mental state understanding is that nonhuman (and non-linguistic) great apes are able to track others' attention and knowledge (Hare et al., 2001; Karg et al., 2015).

Self-understanding

Concerning the sense of self, Ruffman (2023) states that 'Children's understanding of self evolves at around 24 months as they begin to succeed at mirror self-recognition tasks and use self-referential pronouns' (p. 110). This claim is problematic for several reasons. Firstly, it is implausible that children have no understanding of mental states prior to 24 months, given that children help others achieve goals and comfort distressed others prior to this age (Warneken & Tomasello, 2009), which respectively presuppose an understanding of the 'goal' and 'distress' mental states. Secondly, children's use of self-referential pronouns actually emerges as early as 12 months of age (Saylor et al., 2011). Third, mirror self-recognition at 24 months is a relatively late-emerging form of self-understanding compared to other operationalizations of self-understanding in the literature (for recent discussions of this complicated research area, see Rochat, 2024; Southgate, 2024).

Notably, many of these alternative operationalizations of self-understanding are wholly incompatible with the minimalist view. For example, proto-conversations (Trevarthen's 'primary intersubjectivity'), which emerge in the first few months of life (Rochat et al., 1999) and have long been argued to be unique to the human species (but see Ferrari et al., 2009), arguably reflect an understanding of the self as a locus of others' attention (Reddy, 2003). Another proposal, the 'social self first' hypothesis (Grossmann, 2025; building on proposals by Mead, 2015; Vygotsky, 1978), turns the minimalist position on its head by positing that an understanding of self – rather than developing independently of and being prerequisite to language – actually emerges *out of* interpersonal communication and intersubjective engagement. Our point here is not to endorse one of these alternative views but rather to highlight that self-understanding is a nuanced construct, one that is not simply reducible to passing mirror self-recognition tasks at 24 months.

Conclusion

Although Ruffman and colleagues have contributed interesting data and hypotheses about early infant social cognition, their minimalist view that infants have no understanding of mental states is untenable. Infants understand affective and attentional states in their first year of life, consistent with the evolutionary proposal that infants evolved to engage in joint attention with (non-kin) caregivers as a means of bonding and soliciting care. Accordingly, future research should proceed on the assumption that infants do have at least some forms of early mental state understanding resulting from a combination of biologically innate learning capacities and environmentally informative learning inputs. Our task, then, as developmental researchers is to find ways to illuminate and describe this understanding.

Acknowledgements

We thank Ulf Liszkowski, Evan Westra, Michael Tomasello, Serban Negoita, Rohan Ahuja, Matthew Gentzel, Luke Harsel, and Glenn Fawcett for helpful feedback. Leon Li was supported by the Alexander von Humboldt-Stiftung.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

Leon Li was supported by the Alexander von Humboldt-Stiftung.

Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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