els of both competence and performance are critical to evaluating the basis of correlations between variations in social interaction and performance on mental state reasoning tasks.

Carpendale & Lewis (C&L) offer a theory of the acquisition of an understanding of mind where varieties in the structure, amount, and types of social interaction play a pivotal role. Part of their argument is that other theoretical accounts underestimate, and indeed are inconsistent with, evidence for correlations between indexes of social interaction and the development of an understanding of mind. The authors single out theories that posit an innate modular basis to the capacity to acquire a "theory of mind," saying that such theories "[live] uneasily with the accumulating evidence, such as the sibling effect . . ., showing that the nature of the social interaction children experience is closely related to the development of their social understanding" (target article, sect. 2.2, para. 5).

Though common, the authors' view misrepresents the modular theory as claiming that "the solution to this problem of understanding the mind" is somehow "innately given" (sect. 2.2, para. 5). The authors even contrast the modular view with the view that the capacity to acquire an understanding of mind is innate. But it is precisely this latter claim that is endorsed in the modular framework: "theory of mind" is described as having an innate and possibly modular *basis,* not as consisting in its entirety as either innate or as a module (Leslie 2000; Scholl & Leslie 1999; 2001). The modular view is also commonly accused – and the target article is no exception – of being inconsistent with demonstrations that there is "development" in the domain of understanding mind. Yet, roles for both known developmental mechanisms, namely, maturation and learning, are described in the modular theory that the authors attack: Maturation of hardwired mechanisms enables the child to make appropriate sense of social inputs and *hence* to learn about the social and mental worlds (see German & Leslie 2000).

In a section on future research directions, the authors bemoan the imprecision of what the term "understanding" might mean in this domain (sect. 5, para. 6). Here we agree, and we draw their attention to the fact that in the modular approach they reject, intuitions about what should constitute having or not having "understanding" have been replaced by attempts to specify underlying cognitive mechanisms, to delineate what their inputs are, to characterize the representations they deploy, and to study how they interact with domain-general processing mechanisms in solving "theory of mind" problems (e.g., German & Leslie 2001; Leslie 1987; 2000; Leslie & Polizzi 1998).

Throughout this same section, the authors themselves call for research to "move from the intriguing findings relating individual differences in the social experiences of infants and their social understanding to research that explores the processes involved" (sect. 5, para. 4). But, despite a laudable insistence on the importance of models of process, they offer not a single proposal about how "construction of understanding of mental states from social interaction" is supposed to work. Instead, it is left to "future research" to answer questions such as: "how . . . mothers' tendency to talk about their infants in psychological terms is positively associated with their child's understanding of false beliefs almost four years later?" (sect. 5, para. 4).

What is instructive about these gaps is that the modular framework, far from "living uneasily" with the importance of social input, is the *only* approach that has concrete proposals about how social factors play their role. As Roth and Leslie (1998) put it, "the emergence of [the "theory of mind" mechanism] solves a critical but limited problem. It allows the young brain to *attend* to . . . mental states despite the fact that such states cannot be seen, heard, felt, or otherwise sensed . . . [and] being able to attend to mental states is a prerequisite for learning about those states" (p. 27; emphasis in original). The ability to attend to mental state properties, such as pretending and believing, is a critical part of what makes the social world the world it is and a critical part of what makes *experience* of that world into *social* experience. Without this ability, though he or she may be constantly surrounded by playful laughter, a child develops in social isolation; such is the lot of the child with autism. Beyond this basic ability lies the later success in answering questions about false beliefs. Here again, the modular theory has made concrete proposals about how the child learns about these social situations, learning things like "beliefs tend to be false under systematic circumstances, surprise occurs when a false belief is relieved, false beliefs can be induced in opponents . . . [and] how to achieve the latter and get away with it."(Roth & Leslie 1998, p. 28).

C&L rightly remind us of the danger of "neurotic task fixation" (sect. 4.1, para. 4; see Bloom & German 2000), and rightly acknowledge that meta-analysis cannot resolve the question of whether there is conceptual change (see Scholl & Leslie 2001). Yet they make the very mistakes they warn against by implicitly assuming that "understanding" the concept of belief is just the same thing as passing a false belief task. In particular, the authors fail to distinguish competence and performance in their interpretation of the false belief task, and, hence, in their interpretation of its correlation with indexes of social interaction.

Positive associations between indexes of social interaction (number of siblings, security of attachment, maternal mind-mindedness, parenting style, etc.) and mental state "understanding" may be the result of many different factors in many different mixes. Plausibly, some of these factors reflect shared genotypes, some the structure and richness of inputs to relevant learning mechanisms, and of course, let us not forget good old-fashioned *practice* – in this case, practice with social cognizing. The studies reviewed by the authors under this heading have invariably demonstrated correlations with performance on a false belief task. There is already good evidence for a strong heritable component to false belief performance (Hughes & Cutting 1999). There is also mounting evidence suggesting that an important, and perhaps critical, factor in performance on false belief reflects inhibitory processes that develop across the early years (Carlson et al. 1998). Curiously, there is also at least one demonstration of a sibling effect on executive tasks *without* replication of the sibling effect on false belief (Cole & Mitchell 2000). It is even possible that correlations between various social indexes and "theory of mind" are mediated by domain-general processes.

In conclusion, it is only by developing models of successful performance on various component "theory of mind" skills, such as recognition of agency in infancy (e.g., Johnson 2003), pretend play (Leslie 1987; 1994), belief-desire reasoning (Leslie & Polizzi 1998), and recall of the contents of one's own past mental states (Barreau & Morton 1999), and by studying their specific neurocognitive basis (Frith & Frith 1999; Gallagher & Frith 2003) that we can hope to understand how the brain has been organized to acquire this important knowledge base.

Individualism and cognitive development

Philip Gerrans

Department of Philosophy, University of Adelaide, Adelaide, SA 5005, Australia. **philip.gerrans@adelaide.edu.au**
http://www.adelaide.edu.au/philosophy/people/pgerrans/

Abstract: Individualism is not inconsistent with social interaction; it is required to explain it. Social exchanges, evidenced in gaze monitoring, social referencing, emotional responses, protodeclarative and imperative pointing, pretence, play, and conversation all play a role in development, but the nature of that role is opaque without an understanding of the cognitive mechanisms on which they depend.

The normal child is confronted not by an intentionally inert world of moving objects but by one of animate bodies, facial expressions, gestures, vocalizations, and emotions. In order to cognise the world in this way, the child does not need to possess a fully fledged

https://doi.org/10.1017/S0140525X04340033 Published online by Cambridge University Press

intentional psychology; rather, she possesses a set of cognitive mechanisms whose proper function is to sensitise her to possibilities for intentional engagement with her surroundings. As a result of this engagement, the normal child will develop the concepts of intentional psychology.

I take it Carpendale & Lewis (C&L) would agree with this characterisation; however, their approach does not lead to any deeper understanding of either the mechanisms which initially sensitise the child to her social environment, or those which subsequently lead to the type of conceptual understanding tested in false belief and other "theory of mind" (TOM) tasks. There are two reasons. First, they endorse Wittgenstein's argument that cognitive competence is mastery of a practice best understood as a skill rather than an intellectual or theoretical achievement. Second, the authors do not connect their account of social understanding to the understanding of autism. The two issues are related.

Wittgenstein gives no explanation of the way social interaction produces social understanding. This is because he regards it as an essentially unanalysable skill which, once acquired, allows the subject to perceive mental states directly. His reasons for rejecting intellectualist accounts of skill acquisition (fast, fluent, and flexible responses cannot be governed by rules understood as algorithmic reductions of theoretical inferences) combine with his conceptual analysis of the concept of an intentional state. The *folk concept,* properly analysed, of an intentional state is not that of a covert cause of overt behaviour. Social understanding *feels* like immediate and non-theoretical recognition of mental states exhibited in overt behaviour, and that is because the cognitive process involved is a skill and not a theoretical inference (Wittgenstein 1953/1968).

This may be so, but this is no recipe for developmental psychology, which is, quite rightly, concerned with the neurocognitive processes involved in concept acquisition. For example, it would not do simply to say that after a period of social interaction certain aspects of the child's linguistic environment (prosody, changes in amplitude) become "criterial" for language understanding. Some explanatory hypothesis is required about the nature of the cognitive processes implemented in developing neural architecture. Is the child processing phonology or syntax? How is the relevant information represented and manipulated? It seems uninformative to say that as a result of social interaction children acquire the ability to hear sentences as meaningful, but that is precisely what Wittgenstein said. The best way to comprehend the process is via a metaphor "Light dawns over the whole." But it is simply not true that the psychological explanation of concept acquisition is exhausted by analysis of its phenomenology. And it is doubtful that the philosophical understanding is, either.

Early cognitivists reconstructed these questions as questions about the construction and confirmation by the developing child of theories of the linguistic domain, implemented ultimately in neural architectures. Perhaps this is slightly over-intellectual, but the issue of what information is relevant to cognition of a particular domain and how it is computed is still essential. Furthermore, that is a question about what is going on *in the mind of the individual* who acquires a language. Putting it this way does not exclude social interaction but it allows us to say why certain aspects of social interaction are more significant than others and why some children rather than others develop the relevant concepts in response to that interaction.

Without such a theory, a linguist would be forced to say that children with, say, Specific Language Impairment (SLI) do not acquire language normally because their linguistic interactions are abnormal. True, but is this because they lack acoustic or phonological information? The ability to process it? Or do they lack some form of grammatical processing? One cannot say that one is concerned only with normal development, because the adequacy of a model of normal development is evidenced by its ability to predict and explain characteristic developmental abnormalities. Similarly for other psychological capacities: much, if not most, of our knowledge of normal function depends on abnormal cases.

The same is true of social understanding. Indeed, the TOM hypothesis was originally advanced to explain the difference between normal and autistic children. Perhaps the TOM idea is overly intellectual and perhaps (as the authors argue persuasively) TOM is not a cognitive monolith. In that case autism is unlikely to be a monolith either. But we are then left with the idea that there is a multiplicity of cognitive mechanisms involved in social understanding that reciprocally interact in a developmental cascade in both normal and abnormal cases. Such a view seems entirely consistent with methodological individualism, which is just the attempt to find out what it is about cognitive architecture that enables the normally developing child, first, to become embedded in her social world and, second, to scaffold her development using social interaction. Social exchanges, evidenced in gaze monitoring, social referencing, emotional responses, protodeclarative and imperative pointing, pretence, play, and conversation, all play a role, but the nature of that role is opaque without an understanding of the cognitive mechanisms on which it depends.

The rejection of methodological individualism reflects a debate in cognitive science over the explanation of skills (of which intentional understanding certainly is one). Some argue that "know-hows," the fundamental capacities on which skills depend, should be identified with socially acquired dispositions. Others argue that the acquisition of those dispositions itself depends on some fundamental capacities that are essentially computational and internal to the mind of the individual acquiring the skill. For almost any skill, it turns out that its ultimate explanation is the computational one: Think of recognising faces, catching a ball, learning a language, or playing at dressing up. Furthermore, the phenomenology of skill acquisition is a poor guide to the nature of those computational processes. For this reason, we should be sceptical of any account that is essentially nothing more than an elaboration of phenomenological insights.

The role of executive function in constructing an understanding of mind

Suzanne Hala

Department of Psychology, University of Calgary, Calgary, Alberta T2N1N4, Canada. **hala@ucalgary.ca**
http://www.psych.ucalgary.ca/People/Faculty/hala/

Abstract: Adopting a constructivist stance is not irreconcilable with executive function accounts of emerging social understanding. The executive function view allows for a gradual transition in theory of mind, while specifying the underlying cognitive processes that push that development forward. Executive function abilities can be seen as an important interactional component in the epistemic triangle.

Carpendale & Lewis (C&L) have done the field a great service in reminding us that the development of social understanding does not take place in a social vacuum. They point out, quite rightly, that the question of importance should not be whether early competence in social understanding exists; rather, the central focus should be turned towards the processes that allow for the emergence of social understanding. The authors propose an alternative constructivist account that promises to bridge the current dichotomy that exists between those who adopt an individualistic developmental approach versus those who subscribe to an enculturation view. The inclusion of Chapman's (1991) "epistemic triangle" helps to further extend Piaget's constructivist theory to the social realm.

Although C&L's proposal is highly laudable, nevertheless, as was the case with Piaget's original account, important aspects of the developmental process remain underspecified. That is, saying that development is a constructive process tells us little about the exact nature of the cognitive functions that also contribute to development of social understanding. The authors offer coherent objections against three prominent theories that seek to explain

https://doi.org/10.1017/S0140525X04340033 Published online by Cambridge University Press