



## Opinion piece

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# Why developmental psychology is incomplete without comparative and cross-cultural perspectives

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As a discipline, developmental psychology has a long history of relying on animal models and data collected among distinct cultural groups to enrich and inform theories of the ways social and cognitive processes unfold through the lifespan. However, approaches that draw together developmental, cross-cultural and comparative perspectives remain rare. The need for such an approach is reflected in the papers by Heyes (2015 *Phil. Trans. R. Soc. B* **371**, 20150069. (doi:10.1098/rstb.2015.0069)), Schmelz & Call (2015 *Phil. Trans. R. Soc. B* **371**, 20150067. (doi:10.1098/rstb.2015.0067)) and Keller (2015 *Phil. Trans. R. Soc. B* **371**, 20150070. (doi:10.1098/rstb.2015.0070)) in this theme issue. Here, we incorporate these papers into a review of recent research endeavours covering a range of core aspects of social cognition, including social learning, cooperation and collaboration, prosociality, and theory of mind. In so doing, we aim to highlight how input from comparative and cross-cultural empiricism has altered our perspectives of human development and, in particular, led to a deeper understanding of the evolution of the human cultural mind.

... the origins of humans' social nature and cognition are found in infancy and childhood, placing social cognitive development at center stage in understanding the evolution of the human mind. [1, p. 27]

## 1. Introduction

Once considered the sole domain of humans, the notion that other animals engage in behaviours that are culturally determined has gained increasing traction in the last decade [2–13]. Among the debate that has sprung from new assertions surrounding animal culture is the characterization of humans as not just cultural but 'ultra' cultural. In contrast to non-human culture, human culture is: (i) cumulative, i.e. innovations are progressively incorporated into a population's stock of skills and knowledge, generating ever more sophisticated repertoires; (ii) more distinctly variable across communities; and (iii) to a larger extent shaped through social learning [14–16].

Conveniently setting aside the damage human cultural behaviour has caused the planet and the unconscionable extinction we have brought to those with whom we once shared it, our capacity for cumulative innovation of highly diverse and contextually adaptive social and physical ways of doing things is remarkable and unparalleled in any other species. This success is not so much a product of any change in our mental capacities to understand the physical world, but rather in our capacities and strategies to navigate our social world [17–20]. The key to understanding humans, both as individuals and as a species, thus lies in understanding how we create and navigate culture—the constructed social and physical environment that hosts each of us. Here, we argue that identifying the foundations of this cultural capacity relies on investigating the differences between human and non-human social

capacities and strategies, the ontogeny of those strategies and abilities *and* their local instantiations across different cultural settings. Only the combination of those perspectives will enable us to understand the roots of human culture.

Critically, while the comparison of children's performance across ages is part of the standard toolset of psychology, comparison between human and non-human performance and comparisons across human cultures remain relatively rare, and the combination of both all but absent [21]. The papers contributed by Heyes [22], Schmelz & Call [23] and Keller [24] as a collective, demonstrate the inordinate value accrued to attempts at understanding the evolution of the human mind by collating research endeavours from developmental, comparative and cross-cultural psychology. Our aim here is to build on this triadic approach, to argue for its value and to provide insight into some of the key elements that make us who we are: social learning, cooperation, prosociality and understanding of other minds.

## 2. Social learning

It appears intuitive that any search for an account of human (as opposed to non-human) culture would include a model of human (as opposed to non-human) social learning. Humans are profoundly adept at acquiring information from others, and do so habitually when confronted with the need or desire to acquire new skills or behaviours. Our social learning skills are established early in life, as exemplified by demonstrations that infants as young as six months can learn new actions, and by 12 months can learn to construct simple tools, just by observing others [25]. The capacity and tendency for social learning only increases from this age, so much in fact that children engage in what has come to be known as overimitation [26].

When children overimitate, they copy all elements an adult used when engaging with a novel object, including actions that are obviously causally unrelated to any potential outcome. In the first study to chart its emergence, 12-, 18- and 24-month-old children watched an adult retrieve a toy from a closed box by disengaging a latch located on the front of it [27]. Although the box could be easily opened by hand, the adult complicated the demonstration by using a miscellaneous object. After observing the adult demonstrator, 12-month-old infants ignored the demonstrated method and attempted to open the box by hand. In stark contrast, 24-month-olds overwhelmingly attempted to open the box using the object, commonly persisting in this comparatively inefficient approach to such an extent that they failed to successfully open the box.

Subsequent studies have documented overimitation across multiple laboratories [28–32] and in an increasing number of cultural groups [33–35]. Indeed, the inclination to overimitate becomes so extreme that as they enter their preschool years, children will replicate novel, modelled actions for a naive adult, in the absence of the model (i.e. where one can assume motivation to appease a teacher has been reduced) and, perhaps most critically, including actions occurring after the ostensive goal has been achieved (e.g. wiping a stick across the top of a box after the box has been opened and a toy inside is easily available for retrieval) [36].

Cultural differences in social learning proclivities and processes have been documented (e.g. [37,38]). It nevertheless appears that overimitation is a widely shared feature of human social learning, transcending contexts (for an exception, see [39]). Given the cross-culturally common, stable

early onset of overimitation in social learning, it is conceivable that it is an enabling species-specific condition for human culture. Developmental and cross-cultural data alone, however, are not sufficient to make such a case. Overimitation would also have to be specific to human social learning. That is, be less pronounced or absent in other closely related species, such as for example the non-human great apes.

In their now seminal work, Horner & Whiten [40] had an adult demonstrator show 3- to 4-year-old human children and young, wild-born, captive chimpanzees how to obtain a reward from a novel box by first poking a stick into a hole on top and then into a hole at the bottom of the box. Because the box was opaque, the participants could not see how the actions occurring inside the box were causally related to the outcome. When given their own turn with the box, both chimpanzees and children copied all of the demonstrated actions. Next, the opaque box was swapped with a transparent version, whereby the effect of each internal action could be identified, rendering it obvious that as the stick was inserted into the top hole it struck a barrier and made no contact with that part of the box from which the reward could be retrieved. That is, the action involving the top hole had no causal relation to the outcome. Under this new circumstance, the chimpanzees ignored the initial action which was now visibly, causally irrelevant. In contrast, the children replicated the model's entire sequence of actions, including the obviously irrelevant insertion of the stick into the top hole (see also [41]). These data further support the account that overimitation is a species-specific enabling condition for human culture. In this way, the triadic approach combining developmental, cross-cultural and comparative comparisons has provided part of the puzzle of human culture that was unattainable in the absence of any of the three.

The natural next question is how this difference in overimitation comes about. Does the apparent lack of overimitation in non-human animals suggest a fundamental, heritable discontinuity between human and non-human social learning abilities? Attempting an answer to this question brings us to Heyes's [22] review of the debate between active intermodal matching and associative sequence learning accounts of imitation. As Heyes notes, one of the key points of contention between these perspectives is whether there is a species-specific genetically inherited 'module' for imitation or if there is continuity, with our 'prodigious imitative capacity . . . due primarily to the rich resources provided by our sociocultural environments'?

Again, the triadic approach can provide insight. First, Horner and Whiten's comparison between humans and chimpanzees amply show that our closest living relatives have the ability to learn from others, but the approach of *Pan troglodytes* to social learning is more pragmatic than *Homo sapiens*. Put simply, information provided by others is no more or less relevant than individually acquired information [42] and causally irrelevant actions are treated as that: irrelevant. If there is no functional purpose to copying an action it would not be copied. Human children, in contrast, consider information provided by others more readily [42] and attach significance to non-functional details of a demonstration. Hence, difference in social learning might not be primarily due to a discontinuity in the ability to learn from others, but a difference in the motivations underlying human and chimpanzee social learning. While chimpanzees learn from others with a focus on functionality, humans learn from others with an added focus on the social

consequences of social learning [17,18,43–47]. Approaching the same question from a developmental perspective, as already noted above, children do not overimitate until their second year, and growing evidence suggests they indeed do so because of social and/or normative reasons [29,43–54]. Finally, the fact that overimitation occurs across multiple contrasting cultural contexts [33–35] indicates that the socio-cultural environment serving as a resource for acquiring human-specific overimitation in social learning is shared across most human communities.

A similar pattern of evidence can be found in another aspect of social learning: the influence of the majority on individuals' social learning. A recent study in chimpanzees and human children showed that if individuals have no prior information available, they copy the behaviour of the majority over alternatives, even if the alternatives are equally frequent, equally familiar and equally productive [55]. Humans however will even abandon a behaviour or judgement they know to be effective or correct to one that others have demonstrated, an effect dubbed 'conformity' [56–58]. Although some researchers have claimed to demonstrate human-like conformity in non-human primates [59–62], these studies have, as yet, failed to exclude a variety of alternative explanations that are independent of a majority effect such as primacy effects, conservatism, incomplete sampling and random copying [63–65]. Similar to the case of overimitation, this difference is likely not due to a fundamental discontinuity in the consideration of majority information in social learning, but to a difference in motivational focus. While chimpanzees copy the majority when acquiring a new skill, a highly adaptive strategy [66], they will not follow the majority if they have a different but equally productive strategy available to them [67,68]. Humans follow the majority even in the latter scenario, but, and this is crucial, only if they are under public scrutiny—if they are allowed to act in private, without being observed by the majority, rates of conformity decline [56,67,69]. Hence, again, social considerations appear to drive the difference between human and non-human social learning. Similar to overimitation, conformity is, although variable in extent, pervasive across cultures [70] and occurs early in development [67,69,71,72]. Taken together, in contrast to chimpanzees, human children appear to integrate social consideration into their social learning strategies, increasingly as they grow up, creating a rift between human and non-human social learning and, in consequence, human and non-human culture.

### 3. Cooperation and collaboration

Another key component in the emergence of human culture has been the evolution of shared intentionality which arises in collaborative interactions where participants have a collective goal and coordinated action roles for pursuing that goal [73,74]. It is argued that these characteristics have been core in the 'socio-cognitive niche' that underwrote the evolutionary shaping of our species [20]. Indeed, from early in life children seek joint activity with others [75] and learn through the interactions that arise, and in this way they develop the skills and proclivities for collaborating that are core features of human culture [76,77]. For example, Brownell *et al.* [78] presented 18- and 30-month-olds with a task that required

collaboration to work together in operating separate handles embedded in an apparatus that were too far apart for one child to operate alone. Pulling the handles together activated an animated musical toy. Whereas coordinated activity in the younger children was sparse, the 30-month-olds monitored and accommodated their partner's activity and location, working together to achieve the joint goal. More recently, Dean *et al.* [79] reported that, when presented with a task requiring multiple steps to solve, children were far more cooperative than chimpanzees. They worked together, shared solutions and achieved better outcomes.

Across different human populations, children's early cooperative abilities are often described as highly similar. While children in different cultures might differ when and to what extent they choose to be cooperative [80,81], and what rules of conduct apply within a given cooperative scenario [82], children appear to show similar cooperative abilities at similar ages across cultures. Callaghan *et al.* [38] for example report highly similar performance across distinct cultures in various collaborative tasks in early childhood.

Thus, given the relevance of cooperation for human culture and the early onset and the absence of cross-cultural variation, should we consider collaboration to be an enabling condition for uniquely human culture? If so, might we expect it to be in parts a human autopomorphy, something unique to our species? As Schmelz & Call [23] detail, the answer to the above question is a qualified 'no'. The qualification is that there needs to be a reward or incentive of some kind to motivate collaboration in chimpanzees. Children, on the other hand, can be sufficiently motivated by opportunities for social interaction [75]. As already alluded to, this inclination to collaborate can differ depending on the child's cultural background [35,80,83]. The triangulation, in this case specifically the detailed analysis of the comparison between human and non-human cooperation, forces us into a more nuanced interpretation of the relevance of human cooperation for explaining uniquely human culture—and again, it appears a difference in motivation rather than a fundamental difference in capacity.

### 4. Prosociality

The differences between chimpanzees and children in their approach to collaborative tasks also extend to prosocial acts. Indeed, the prosocial proclivity of infants and young children has been well documented [84]. By 12 months of age, infants begin to provide helpful information to others [85], at 15 months they will share a toy with an unfamiliar adult [86], and by 18 months they are capable of providing instrumental help; that is, helping another achieve a goal [87]. Moving further into childhood, Brownell *et al.* [88] presented 18- and 25-month-old infants with a task requiring them to pull one of two handles attached to a pair of trays in order to obtain a reward. Pulling one of the handles delivered a loaded tray to the child and to an adult confederate, whereas pulling the alternative handle delivered a loaded tray to the child only. The 25-month-old children chose the prosocial option, delivering food to themselves and the adult, significantly more than the 18-month-olds, with the latter needing more verbal cues from the adult to recognize the joint goal available. House *et al.* [89] used a similar design with 3- to 8-year-olds, finding high levels of prosocial

behaviour with the younger children performing at similar levels to the older children, suggesting that spontaneous prosocial behaviour becomes firmly established through the childhood period. Moreover, there is growing evidence that children will help others when it comes at a personal cost [90,91].

Adding a cross-cultural comparison to this developmental data however, forces us to assume a more refined position. The ontogenetic affirmation of prosocial behaviour is culture-specific. In a comparison across a diverse set of communities, House *et al.* [92] found that, while children in all communities enter society with a similar prosocial tendency, they will, as they grow older, adjust their behaviour to the cross-culturally variable prosocial norms of their community. Reflecting this, in an intriguing study, Blake *et al.* [93] probed reactions to disadvantageous inequity aversion (DI—the avoidance of receiving less than a peer) and advantageous inequity aversion (AI—the avoidance of receiving more than a peer) in children aged 4–9 years across seven distinct cultures (Canada, India, Mexico, Peru, Senegal, Uganda and the US). DI was present in all societies, with cultural variance in its age of emergence, appearing earliest in the US and Canada, latest in Mexico. Moreover, AI emerged only in the US, Canada and Uganda, and in these societies increased with age as children approached adolescence.

These culture-specific pathways in children's prosocial behaviour and reactions to unfairness are likely the result of variable socialization strategies that aim to support different culture-specific goals. In this issue, the paper by Keller [24] lays this point out in compelling detail. Children, socialized into societies with a high appreciation of relatedness, instil in their children an urgency of sharing with others in ways in which societies with a strong emphasis on autonomy will not.

Nonetheless, as of today, the human tendency to help stands in stark contrast to the behaviour of chimpanzees who, as detailed by Schmelz & Call [23], require some kind of incentive to aid others. In comparison to human children, even those that grow up in cultures with less emphasis on prosocial norms, chimpanzees appear limited in their tendency to help others. As is the case with their imitative proclivities, in chimpanzees social factors are not a driving motivation to cooperate. What is missing is any kind of shared intentionality as expressed in truly collaborative and joint attentional activities where participants have a joint goal and joint attention [94]. According to Moll & Tomasello [95] interactions involving shared intentionality transform human cognition in fundamental ways. First and most fundamentally, it creates the notion of perspective. Consider how infants might come to understand that another person might see the same situation as they do, but from a different perspective. This in turn paves the way for what may be called, very generally, collective intentionality [96] and from these foundations spring a core human capacity for understanding others and for the development of what is known as a theory of mind.

## 5. Theory of mind

The term 'theory of mind' refers to a kind of 'common sense understanding' of the world [97,98] that involves the appreciation that oneself and others are beings who possess a range

of mental states such as thoughts, beliefs and desires, and that it is these mental states that determine behaviour [99]. People act towards the world not as it really is, but how they perceive or believe it to be. To gain a comprehensive theory of mind, a child needs to understand that people's mental states can be different from their own, from others and from reality. That is, the mental states of others are partly derived from their knowledge of events and this knowledge is gained through different sources.

Based on this reasoning, tasks used to assess understanding of 'false-beliefs' in others have become the standard tool used to index the child's developing 'theory of mind'. In a typical task, children are introduced to an Agent X, placing his/her favourite toy inside Box 1 and then leaving the test environment. Agent Y is then introduced, who takes the toy from Box 1, plays with it and then leaves after putting it in Box 2. Agent X then returns and children are asked where he/she will first look for the toy. In Western societies children from around 4 years of age give a correct response (Box 1), while younger children typically respond incorrectly that Agent X will first look in Box 2, i.e. where the object is 'now'. In non-Western societies, some studies report synchrony in the onset of false belief [100,101], whereas other studies have found considerable variation [102].

More important than the question of variation in the onset of false belief reasoning is the insight that theory of mind does not just emerge suddenly at around 4 years with the onset of success on false belief tasks. Wellman & Liu [103] showed that between the ages of around 2 and 6 years, Western children go through a developmental progression in which they master different mental state concepts via a sequence of steps. These steps include understanding that people can like or dislike similar things (Diverse Desires) and have different opinions and beliefs about the same situation (Diverse Beliefs), appreciation that others might not have access to the right information (Knowledge Access), a grasp of false belief, and knowing that they can deliberately hide how they feel (Hidden Emotions). Critically, application of the Wellman and Liu scale has revealed cross-cultural differences in the sequence in which each of these steps is mastered. For example, Shahaiean *et al.* [104] found that Iranian children outperformed their Australian peers with regard to understanding knowledge access while lagging in their understanding of diverse belief (see also [105]). A similar developmental pattern was reported in comparisons of Chinese versus American children [106]. Hence, while undoubtedly humans acquire the skill to understand others' false beliefs, they get there via a variable, and as of yet poorly understood, trajectory. If we were to consider false belief understanding as a species-specific enabling condition for human culture, we would predict the absence of such abilities in other closely related species.

In their engaging paper, Schmelz & Call [23] provide an excellent review of the research endeavours expended in attempting to find evidence of theory of mind in non-human primates. Their review leads them to conclude: '... it remains possible that chimpanzees simply have not been confronted with the appropriate context in which they might pass a false belief test yet. It is also possible that this specific skill is unique to humans'. In this context, we reiterate the need for continued cross-pollination between disciplines. To the best of our knowledge, a primate version of the Wellman and Liu scale is yet to be developed. There are obvious



challenges to this, but if achievable, it would shed considerable light on the mind-reading capacities of our closest living relatives, simultaneously promising to yield insight into human capacities.

## 6. Conclusion

Our aim here has been to highlight how a deeper understanding of the human cultural mind can best be derived from approaches that incorporate investigation of the differences between human and non-human social capacities and strategies, the ontogeny of those strategies and abilities *and* their local instantiations across different cultural settings. We hope the message is deeper than this though: the ever-growing corpus of literature devoted to charting our psychological development through the lifespan continues to expand our knowledge of how nature and nurture interact to make us who we are, from the individual to the species. This literature provides firm footing for identifying patterns of atypical development and how interventions may work to ameliorate

associated symptoms. However, this literature also frequently operates isolated from research undertaken in related disciplines, and does so at its own detriment. Failure to understand what is species and/or culturally specific leaves a possibly skewed, potentially inaccurate and certainly incomplete picture. It is time for a new approach to developmental psychology that fully integrates contemporary research efforts spanning WEIRD (Western, educated, industrialized, rich and democratic) populations [107,108], non-WEIRD populations and non-human animals (primate or otherwise). This approach is powerful for many reasons: adopting it will help ameliorate rising concerns over the lack of stability and reproducibility of findings in psychology generally [109] and developmental psychology specifically [110], will enrich all disciplines and provide a critical pathway broadening insight into how we have become who we are and will ultimately yield unique insights into the evolution of the mind.

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