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Research

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Young children readily act on information from adults, setting aside their own prior convictions and even continuing to trust informants who make claims that are manifestly false. Such credulity is consistent with a long-standing philosophical and scientific conception of young children as prone to indiscriminate trust. Against this conception, we argue that children trust some informants more than others. In particular, they use two major heuristics. First, they keep track of the history of potential informants. Faced with conflicting claims, they endorse claims made by someone who has provided reliable care or reliable information in the past. Second, they monitor the cultural standing of potential informants. Faced with conflicting claims, children endorse claims made by someone who belongs to a consensus and whose behaviour abides by, rather than deviating from, the norms of their group. The first heuristic is likely to promote receptivity to information offered by familiar caregivers, whereas the second heuristic is likely to promote a broader receptivity to informants from the same culture.

Keywords: credulity; trust; epistemic reliability; consensus

1. INTRODUCTION

Young children are trusting disciples. They are ready to learn from adult caregivers [1,2]. When presented with a demonstration or claim that conflicts with their own knowledge, they are willing to set aside that knowledge. For example, in solving practical problems, they are prone to reject their own accurate and efficient causal understanding so as to more closely imitate the actions of a model [3–5]. Similarly, in classifying objects and in drawing inferences about the objects' properties, they are prepared to abandon their own initial classification if they hear a different classification proposed by an adult [6]. When informed (via pointing or words) about simple matters of fact—for example, the location of an object—they act on that information even in the face of repeated evidence of its falsity [7,8]. Young children also endorse and extrapolate from demonstrations and claims that they have no way to check for themselves. Introduced to a new practice, for example, they treat it as a generalized prescriptive norm, not just as a local behavioural regularity [9]. Told about unobservable processes and entities in domains such as religion and science, they incorporate them into their explanations and predictions [10].

Taken together, these empirical findings imply that human children are receptive pupils who trust adult models or informants. They rarely express doubt even when the information supplied runs counter to

their own understanding or judgement. This emphasis on early credulity has a distinguished history in philosophy. Reid [11], a leading member of the Scottish Enlightenment, argued that an original principle implanted in us: 'is a disposition to confide in the veracity of others and to believe what they tell us ... It is unlimited in children'. Twentieth-century philosophers were in agreement with this argument. Russell [12] wrote: 'Doubt, suspense of judgement and disbelief all seem later and more complex than a wholly unreflecting assent'. Similarly, Wittgenstein [13] claimed that: 'A child learns there are reliable and unreliable informants much later than it learns the facts which are told it'. The same emphasis on early credulity and the absence of doubt can be found among contemporary psychologists and biologists. Gilbert [14], for example, proposed that: 'Children are especially credulous, especially gullible, especially prone toward acceptance and belief', and Dawkins [15] called attention to the alleged biological advantages of such credulity: 'Theoretically, children might learn from personal experience not to go too near a cliff edge, not to eat untried berries, not to swim in crocodile-infested waters. But, to say the least, there will be a selective advantage to child brains that possess the rule of thumb: believe, without question, whatever your grown-ups tell you'.

We argue, nevertheless, that any implication of early, indiscriminate credulity is implausible, both biologically and psychologically. The body of findings just reviewed concerns information that is provided to a child by a single informant. In such cases, children may indeed set aside what they know to be the case or take on trust claims that they cannot verify. However,

evolutionary approaches to cultural transmission [16,17] have led to the plausible conclusion that a variety of selection principles are likely to bias children to learn from particular models or informants. In this paper, we present a large set of recent experimental findings showing that children do, in fact, select whom to approach for information and whom to believe. One set of findings shows that young children trust informants to varying degrees depending on their history of interaction with those informants. A second set of findings shows that they assess unfamiliar informants for their cultural typicality, preferring those who conform to local norms. In short, we argue that even if children are surprisingly indiscriminate in choosing *what* to believe, they are nonetheless quite selective in choosing *whom* to believe.

2. ATTACHMENT

The history of research on attachment has long suggested that any assumption of indiscriminate trust in early childhood is likely to be misplaced. Human infants are equipped with a non-verbal repertoire (eye contact, crying and facial expressions) that they use to engage potential caregivers. Following an initial period when they indiscriminately 'court' all potential caregivers, infants become increasingly selective in whom they trust to supply reassurance and a secure base [18–20]. Such selectivity is more or less universal among children who grow up under normal rearing conditions. Only after prolonged and severe neglect—of the kind observed in Romanian orphanages during the Ceausescu regime—do children display persistent signs of indiscriminate trust (so-called disinhibited attachment) towards unfamiliar as well as familiar adults [21].

Granted this near-universal selectivity in the socio-emotional sphere, young children are likely to display the same type of selectivity in choosing which informant to trust. More specifically, a straightforward prediction from attachment theory is that young children will be more receptive to information offered by a familiar caregiver than to that offered by a stranger. With the help of two preschool caregivers, one working in preschool A, the other in preschool B, we obtained support for this prediction [22].

Children from each preschool watched a film in which the two caregivers proposed conflicting names or functions for novel objects. Children could indicate which caregiver they wanted to ask about the novel objects. In addition, once the two caregivers had proposed conflicting names or functions, children were invited to endorse one or the other. The experimenter said, for example: 'C. in the pink shirt said it's a snegg and S. in the black shirt said it's a hoon. What do you think it's called—a snegg or a hoon?' Children attending preschool A placed more trust—as indexed by their choice of whom to ask and endorse—in the information provided by caregiver A than in that provided by unfamiliar caregiver B, whereas children attending preschool B placed more trust in familiar caregiver B than in unfamiliar caregiver A. Figure 1 confirms children's preference for the familiar caregiver at 3, 4 and 5 years (the data have been averaged across each preschool).
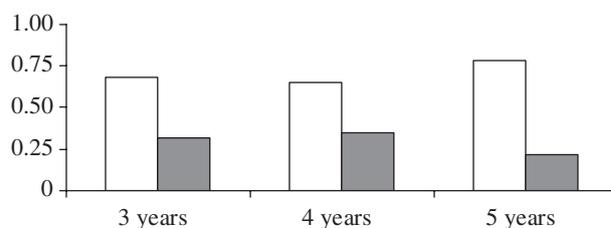

Figure 1. Proportion of choices directed at familiar (white bar) and unfamiliar (grey bar) caregiver by 3-, 4- and 5-year olds (averaged across preschools A and B) [22].
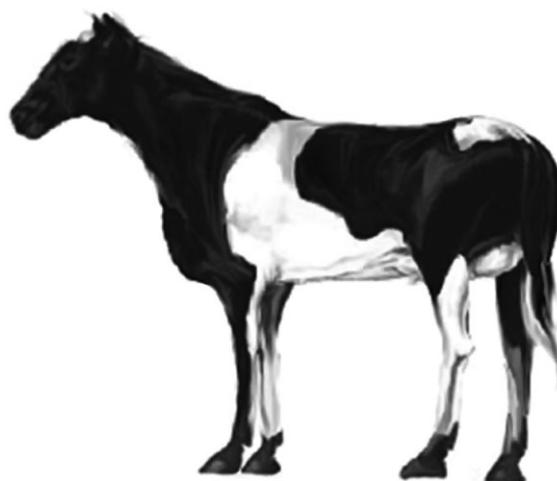

Figure 2. Example of an animal hybrid—a cow-horse [23].

Attachment theory implies that familiarity is not in itself sufficient to evoke trust. A history of responsive caregiving is needed. By implication, children might not invariably prefer information from a familiar informant. Their receptivity should be undermined if the familiar person is consistently unavailable or unresponsive. We tested this prediction in a longitudinal study [23]. Based on the standard strange situation procedure, children were identified at 15 months as having a secure, avoidant or ambivalent relationship with their mother. We returned approximately 4 years later when children had just turned 5 years of age to assess their trust in their mother as an informant. Children were shown pictures of animal hybrids. Figure 2 illustrates an example. The mothers categorized these hybrids in one way—for example, as a horse—whereas an unfamiliar adult whom the child had just met categorized them differently—for example, as a cow. Children were invited to say which person they wanted to ask for information about the hybrids—and when they offered conflicting information, which person they agreed with.

Figure 3 shows how often children with each type of attachment trusted the information supplied by their mother as compared to that supplied by the stranger. If children invariably preferred information from a familiar caregiver, such as their mother, we should observe that preference in all three attachment groups. However, if children are guided by their prior attachment, we would expect any preference for the mother's claims to be evident in secure and ambivalent children but to be attenuated or even absent among avoidant
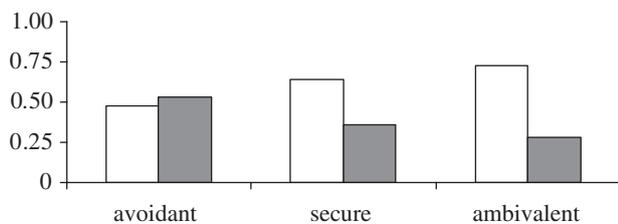
Figure 3. Proportion of choices directed at the mother (white bar) versus a stranger (grey bar) by attachment classification [23].

children. That is, in fact, the pattern that emerged. Children with an avoidant attachment to their mother treated her no differently from a stranger, whereas the other two groups trusted the claims made by their mother over those made by the stranger.

A plausible way to conceptualize the findings presented so far is to propose a theoretical marriage. Children are trusting disciples—in line with the findings on cultural learning reviewed earlier. However, their trust is selective in just the way that attachment theory would predict. More specifically, children are especially receptive to information provided by a familiar caregiver rather than to that provided by a stranger, so long as they do not have an avoidant relationship with that caregiver. Based on this analysis, young children select among potential informants on socio-emotional grounds. A person who has provided responsive and reassuring caregiving is regarded as trustworthy in the epistemic as well as the emotional domain.

3. MONITORING FOR ACCURACY

However, recent findings show that such an arranged marriage between attachment theory and cultural learning will not work. In the first place, there is evidence that children monitor potential informants for their epistemic history and not just for their caregiving history. Even more problematically, children increasingly weigh an informant's epistemic history more heavily than his or her caregiving history when selecting whose information to trust. We document these two claims below, starting with evidence for children's attention to an informant's epistemic history.

In an initial study, 3- and 4-year-old children were introduced to two unfamiliar adults [24]. In an induction phase, children were given an opportunity to assess the comparative reliability of these two potential informants by watching them name a series of four familiar objects. One informant named all the four objects in the series correctly. Presented with a ball, for example, she said: 'That's a ball'. The other informant, by contrast, named all the four objects incorrectly. Presented with a ball, for example, she said: 'That's a cup'. Because children knew the names of these objects, they were in a position to conclude that one informant was an accurate source of information, whereas the other was not. In a subsequent test phase, we checked whether children had, in fact, drawn this conclusion and also whether they used it to guide their subsequent trust in the

claims made by the two informants. We found that children in both age groups appropriately judged one informant to be more accurate than the other. Moreover, their willingness to make that judgement predicted their trust. When unfamiliar objects were presented—whose names were not known to the children—they preferred to ask for information from the accurate as opposed to the inaccurate informant. Moreover, when the two informants supplied conflicting names for any given unfamiliar object, children were likely to endorse the name supplied by the hitherto accurate informant.

Subsequent research has clarified and consolidated several aspects of this basic result [25]. First, on the basis of the initial findings, children's sensitivity to informant accuracy might operate in only a circumscribed domain, namely the domain of object names. However, when tested in a similar procedure, namely an induction phase with two informants followed by a test phase, children also selected between accurate and inaccurate informants when the test domain concerned factual information about objects rather than objects' names [26]. Second, children's selective trust might not reflect a spontaneous tendency to engage in accuracy monitoring but a response to leading questions on the part of the experimenter about the accuracy of the two informants. Based on this argument, selective trust should evaporate if children are not prompted by questions about the relative accuracy of the informants. However, in two follow-up studies, conducted in different laboratories, removal or postponement of such questions did not undermine the basic pattern. Children continued to trust the accurate informant rather than the inaccurate informant [27,28]. Third, the induction phase involved a somewhat unnatural contrast in informant accuracy. One informant named objects correctly and the other named them incorrectly in each of the four trials. In subsequent research, this contrast between the informants has been attenuated. For example, children watched one informant who was predominantly correct (75% of the trials) and another who was predominantly incorrect (75% of the trials) during induction. Even though both informants had been sometimes right and sometimes wrong, children still went on to invest greater trust in the more accurate of the two [29]. Indeed, 4-year olds monitor apparent differences in accuracy even when no obvious errors are involved. Having watched one informant name objects accurately and another informant make either non-committal remarks about them (e.g. 'Let me look at that') or express ignorance, children subsequently invested more trust in the accurate as opposed to the non-committal [30] or ignorant informant [31]. Fourth, accuracy monitoring can reverse a pre-existing pattern of trust. Although preschoolers typically trust an adult informant over a peer, this preference is reversed if the peer proves more accurate [32]. Finally, selective trust in particular informants is not transient. When a second test phase was administered, either 3–4 days or indeed an entire week after the induction and initial test phases, 3- and 4-year olds still invested more trust in the previously accurate informant [28].

Summing up, these studies offer persuasive evidence that young children monitor informants for their epistemic reliability. More precisely, children rapidly and spontaneously assess the comparative accuracy of two unfamiliar informants and use that assessment over a protracted period to guide their judgments about which informant to ask for information and whose claims to endorse. We may now turn to the second obstacle to any straightforward marriage between attachment theory and theories of early cultural learning. Do children weigh an informant's accuracy more heavily than his or her history of caregiving?

4. WEIGHING ACCURACY AGAINST FAMILIARITY

In all the experiments just reviewed, the two adults who differed in their apparent accuracy were initially unfamiliar to the children. They formed an impression of the comparative reliability of the adults during the induction phase that lasted only a few minutes. Arguably, in the absence of an established caregiving relationship, children use this brief exposure to the epistemic reliability of the two informants as a proxy for longer term indices of their trustworthiness. More specifically, it could be argued that children ordinarily accumulate sustained evidence for the trustworthiness of a familiar informant in the context of the child–caregiver relationship. Faced with two unfamiliar informants, their monitoring of accuracy might be a back-up strategy, one used only in the absence of a prior relationship. Based on this hypothesis, children's sensitivity to informant's accuracy would be a supplement to, or substitute for, the trust that is ordinarily grounded in a long-standing attachment. In that case, we would not expect recent evidence of inaccuracy to undermine the cumulative trust that is established on the basis of a long history of caregiving.

However, an alternative hypothesis is that children's sensitivity to accuracy is distinct from their sensitivity to the pattern of caregiving they have received. Their monitoring of epistemic reliability is not just a substitute for the safeguards ordinarily provided by a prior history of caregiving. Instead, accuracy monitoring is a distinct mode of appraisal, one that is critically important for a species that relies so heavily on cultural learning, especially learning that is transmitted obliquely to the child by less familiar informants rather than vertically by long-standing caregivers. If this view is correct, we would expect that even when an informant is a familiar caregiver, children will continue to check on his or her accuracy. In fact, faced with a choice of whom to trust, they might prefer to learn from an evidently accurate but hitherto unfamiliar informant than from someone who has cared for them over a long period but has proven inaccurate in the recent past.

To assess these competing possibilities, we extended the testing session that was conducted in preschools A and B as described earlier [22]. Recall that 3-, 4-, and 5-year olds first watched as two preschool caregivers proposed conflicting names and functions for unfamiliar objects. During this pre-test, all the three age groups displayed a preference for the caregiver with whom they were familiar. In the subsequent induction
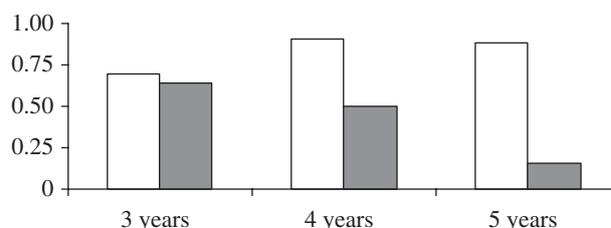

Figure 4. Proportion of choices directed at the familiar caregiver in the post-test depending on whether children had observed her being accurate (white bar) or inaccurate (grey bar) in naming well-known objects during the preceding induction phase [22].

phase, half the children in each age group saw their familiar caregiver name familiar objects accurately, whereas the unfamiliar caregiver named them inaccurately. The remaining children saw the reverse arrangement: the familiar caregiver named familiar objects inaccurately, whereas the unfamiliar caregiver named them accurately. In the succeeding post-test, the two caregivers again supplied conflicting information about novel objects just as they had in the pre-test. The key experimental question was how far children would continue to display trust in the familiar caregiver rather than in the unfamiliar caregiver—as they had done in the pre-test phase (figure 1). Figure 4 shows the proportion of post-test trials in which children in each age group displayed trust in the familiar caregiver following the induction phase.

Inspection of figure 4 shows that 3-year olds were unaffected by the induction phase: whether they had witnessed the familiar caregiver being accurate or inaccurate in the induction phase, they continued to favour the information that she provided in the test phase. Thus, their familiarity with one of the two caregivers trumped any evidence of inaccuracy that children may have registered during the induction phase. By contrast, the two older groups were affected by the induction phase. If the more familiar caregiver had proven to be accurate, they displayed a marked preference for the information that she supplied. By contrast, if she had proven to be inaccurate, they abandoned the preference for her that they had shown in the initial test. Indeed, 5-year olds now switched their preference to the less familiar caregiver, granted that she had proven to be the more accurate during the induction phase.

Why did the induction phase not lead to a shift in the pattern of selective trust among 3-year olds? It is worth noting that two initially plausible explanations are inadequate. Arguably, 3-year olds are unable to notice and remember an informant's errors. Hence, any selection that they make among informants can only be based on familiarity rather than on accuracy. However, the solid body of evidence described earlier shows that this explanation cannot be correct. When faced with two unfamiliar informants, 3-year olds do keep track of their relative accuracy and distribute their trust accordingly [24,28,30]. Apparently, it is only when they are confronted with a familiar informant who makes mistakes that they 'forgive' those errors and continue to invest more trust in her.

A second possible explanation is that granted their history of interaction with a familiar caregiver, 3-year olds set aside or overlook any recent evidence of inaccuracy because it counts for little when set alongside a cumulative history of reliable information from the same caregiver. However, there is also a clear objection to the second explanation. If anything, 4- and 5-year olds are likely to have had a longer or more intense interaction with their preschool caregiver than 3-year olds. Therefore, if children were weighing recent inaccuracy against a cumulative prior history of accuracy, we would expect the exact opposite of the pattern of results illustrated in figure 4. We would expect 3-year olds to be more troubled by recent inaccuracy than 4- and 5-year olds, given that 4- and 5-year olds are likely to have accumulated a longer history of accuracy on the part of a familiar caregiver.

Granted these two points, the most plausible explanation is that there is a major shift in the weight that children attach to two indices of trustworthiness: a prior history of caregiving and epistemic reliability. Three-year olds are sensitive to both but they favour prior caregiving even in the face of evidence for epistemic unreliability. By contrast, 4-year olds and particularly 5-year olds favour epistemic reliability even when this means rejecting information from a familiar caregiver.

A key implication of these results is that although attachment theory can help to explain selective trust, it cannot explain the overall developmental pattern. Children attend to an informant's epistemic record, and in the case of older children, this focus is pre-emptive. When the epistemic record proves unsatisfactory, they mistrust the information supplied, even if the person is familiar to them. More broadly, these results imply that in the course of early development, children's selective trust is increasingly guided by epistemic factors rather than by socio-emotional factors. In acquiring new information, they trust accurate informants rather than familiar caregivers.

In terms of the broader pattern of cultural learning, these experimental findings confirm the expectation that there is likely to be an initial disposition towards vertical trust—a preference for seeking and accepting information from those familiar adults and older children who provide care. However, in the course of development, trust in what others demonstrate and claim is likely to be increasingly oblique or horizontal—extended to those outside the circle of caregiving, especially when they have a demonstrable record of accuracy in a given domain.

5. GROUP MEMBERSHIP

In learning from other people, it is plausible that children seek true information rather than false information. The fact that they monitor informants for the accuracy of their claims is likely to increase the probability that they learn from truthful informants. However, certain cultural practices are not true or false in any straightforward, factual sense. Nevertheless, they are likely to be favoured by members of a given culture. How do children maximize the likelihood that what they learn is representative of the cultural group to which they belong? One strategy that young children might adopt is to trust informants who are culturally prototypical—who act or talk in ways that reflect the surrounding culture. If this hypothesis is correct, we can expect children to favour learning from cultural conformists rather than from cultural misfits. Several recent findings indicate that children display exactly this strategy. For example, they endorse claims made by informants who respect rather than deviate from the morphological rules of their language. They endorse demonstrations of tool use by models who speak with a native as opposed to a foreign accent. They endorse claims made by informants who elicit bystander approval rather than disapproval. Finally, they endorse claims made by members of a consensus rather than those made by lone dissenters. We briefly describe these findings and then consider their implications.

In many of the experiments described so far, the two informants differed in terms of accuracy. One correctly identified a series of objects, whereas the other misidentified the same objects. We have found that such errors of fact are not needed to trigger selective trust. Four-year olds listened to two informants who varied in terms of their morphological production [33]. In the induction phase, one speaker produced minor morphological errors (e.g. she said 'a shoes' or 'some shoe'), whereas the other speaker produced these morphological forms correctly (e.g. she said 'a shoe' or 'some shoes'). In the subsequent test phase, these two speakers made conflicting claims about the names of unfamiliar objects as well as the past tense forms of unfamiliar verbs. Children preferred to seek and endorse information from the good morphologist in both the semantic domain (i.e. learning new names) and the morphological domain (i.e. learning new past tense forms).

Children are also sensitive to other markers that an informant belongs to the same linguistic community as themselves. Having briefly listened to two speakers similar in age, appearance and gender but differing in accent, infants and young children prefer to interact with the person who has a native rather than a foreign accent [34]. We tested if children also use accent in deciding which speaker to trust for new information [35]. One group of 3-, 4- and 5-year olds watched and listened as two speakers narrated a short passage from the story of 'Curious George'. One spoke English with a native (North-American) accent. The other spoke English with a foreign (Spanish) accent. A second group of children of the same age watched and listened as the two speakers narrated a short passage from 'Jabberwocky'—the nonsense poem by Lewis Carroll. Although syntactically well-formed, the sentences in this passage were not meaningful so that any differences in trust following this induction could not be attributed to differential comprehension of the two speakers. Following both types of induction, children were given an opportunity to seek and endorse information about the use of four unfamiliar artefacts from the two speakers. They offered conflicting demonstrations of how to use any given artefact. For example, one speaker looked through a plastic sprinkler attachment as if it were a telescope, whereas the other speaker held it to her mouth and blew in it.

Children preferred to seek and endorse information from the native-accented speaker. This preference was equally strong in all three age groups and equally strong following the meaningful, 'Curious George' induction and the meaningless, 'Jaberwocky' induction. Note that the induction phase and the test phase of this experiment differed in both modality and domain. The induction phase involved audible differences in accent. The test phase involved visible differences in tool use. Nevertheless, children used the audible cues of group membership to guide their learning about tool use.

In both of the studies just described—the study of morphology and accent—children could appraise the two speakers in terms of their conformity to practices that they—the children themselves—subscribed to and knew about. Because the children were native speakers of English, they were sensitive to departures from standard practice. Yet, there are often occasions when children encounter informants who profess beliefs or engage in practices that are quite unfamiliar to them—practices that children cannot gauge for cultural representativeness. In these circumstances, how can young children optimize the likelihood that a potential informant is providing information that is culturally typical rather than marginal or deviant? One strategy that children might adopt is to behave like sociologists—to look for signs of consensus or dissent among a group of potential informants.

In more concrete terms, suppose that children encounter two informants who make conflicting claims that are novel and therefore impossible for children to adjudicate themselves. However, the claims made by one informant elicit approval from bystanders, whereas the claims made by the other elicit disapproval. Do children use such bystanders' reactions to moderate their trust in the novel claims made by each informant? To examine this possibility, we had 4-year olds watch as two speakers produced conflicting names for a series of unfamiliar objects [36]. For example, faced with the sprinkler attachment, one speaker might call it a 'feppin' and the other might call it a 'merval'. The two bystanders reacted differently to the two speakers. Having listened to one, they nodded and smiled. Having listened to the other, they shook their head and frowned. Subsequently, children were asked for their judgement. They were reminded that one speaker had called it a feppin and the other had called it a merval—what did they think? Children overwhelmingly endorsed the speaker who had attracted bystanders' approval rather than disapproval.

In the next stage of the experiment, we tested if children would continue to regard the speaker who had received bystanders' approval as more trustworthy even in the absence of any feedback from the bystanders. To assess this possibility, the two bystanders left the room, and testing continued as before with the two informants making conflicting claims about unfamiliar objects. Children continued to display selective trust in the two speakers—they were more likely to endorse the names supplied by the speaker who had received bystanders' approval even though,

at this point in the experiment, the bystanders were no longer present and could supply no cues. By implication, the cultural typicality of the two speakers—the extent to which their claims had met with approval versus disapproval—led children to regard one of them as a more trustworthy informant.

However, an alternative interpretation of these results is that children did not conclude that the two informants differed in terms of cultural typicality but in terms of likeability. After all, in expressing their approval, the bystanders had smiled at one informant, and in expressing their disapproval, they had frowned at the other. Arguably, children preferred to endorse the speaker whom they inferred to be more likeable, as indexed by the bystanders' reactions.

In a follow-up study, we again had two informants as well as an additional pair of adults who sided with one informant and not with the other ([37]; study 1). However, we altered the way in which this endorsement was expressed. Several unfamiliar objects were set out on a table and the experimenter asked the adults to say which of them was, for example, 'a slod'. Three of the adults pointed to the same object, whereas the fourth—the lone dissenter—pointed to a different object. This pattern was repeated for four trials with the same person always in the role of a lone dissenter. After watching the adults' responses, children were invited to express their view. As in the previous study, children strongly favoured the majority view, effectively endorsed by three of the adults, as opposed to the minority view endorsed by only a single adult.

The next stage of the experiment resembled what had happened in the previously described bystanders' study. Two of the three adults who had formed a consensus left, leaving only one member of the consensus behind, together with the so-called lone dissenter. These two adults now supplied conflicting names for unfamiliar objects, and children were invited to seek and endorse information from either of them. As expected, children displayed greater trust in the informant who had been part of the consensus as opposed to the lone dissenter. Note that in this study, no signs of liking or disliking had been expressed towards either informant. In the initial induction phase, the four adults had simply pointed wordlessly and with a neutral facial expression. Therefore, if the member of the consensus elicited more trust in the second stage of the study, it was because children had noted that her behaviour was more typical.

Two additional studies have lent further support to the hypothesis that children are actively looking for cultural conformists—people who represent the norms of their group. First, we repeated the study just described but with three adults, two who formed a consensus and one who was the lone dissenter ([37]; study 2). As before, in the induction phase, children were more likely to endorse information provided by the informants who were in agreement. In addition, when one of the two left, children were more likely to trust the remaining member of the pair than the lone dissenter. By implication, children's sensitivity to a consensus is acute. Two persons in agreement override a single other.

Finally, we tested whether the composition of the consensus was important to children. We found that in both Boston and Taipei, it did make a difference [38,39]. When children were faced with a consensus composed of women from their own race (i.e. women with a European-American appearance in Boston and an East Asian appearance in Taipei), we replicated previous findings. In the induction phase, children trusted the consensus over the lone dissenter. Subsequently, in the test phase, they trusted a single member of the consensus over the lone dissenter. However, when we altered the cultural identity of the consensus—substituting three East Asian women in Boston and three European-American women in Taipei, the preference for the consensus over the lone dissenter was attenuated in the induction phase, and there was no preference for the consensus member over the lone dissenter in the test phase. By implication, when children meet informants who come from a different group, they are less attentive to any consensus that they form. This makes sense if children look to members of a consensus for guidance about the norms that prevail in their own group.

6. CONCLUSIONS

We started this paper with a brief review of evidence showing that young children are credulous. They are guided by other people's claims and demonstrations even when they run counter to what children would say and do if left to their own devices. In some cases, children's acceptance of guidance from others can even lead them to adopt a less efficient rather than a more efficient strategy. Granted children's hyper-receptivity, it is tempting to endorse the long-standing assumption, voiced in both philosophical and biological analyses, that children are indiscriminate in their cultural learning.

The evidence in this paper shows that such a conclusion would be mistaken. No matter how non-selective children are in *what* they learn from others, they are selective in *whom* they learn from. We have identified two broad classes of heuristics—one class helps children to select among informants with whom they have had previous interactions, and the second class helps children to differentiate among relatively unfamiliar informants whom they have just met.

Within the first class, children display two biases. First, they display a preference for the information supplied by a familiar caregiver versus a stranger (provided that they have not developed an avoidant relationship with that caregiver). Second, children prefer information supplied by someone who has proven to be a reliable source of information in the past. Taken together, these two biases are likely to converge on a proclivity for vertical cultural learning—a bias to endorse and imitate the claims and demonstrations of adults who have a record of providing reliable care, accurate information, or both.

Consider, for example, the ethnographic data reported by Hewlett *et al*. [40]. In early childhood, hunter–gatherer children are within the reach of their mother or father for 40–50% of each day, and it is their parents who provide them with miniaturized

cultural artefacts (baskets, axes, digging sticks and spears). Insofar as children prefer to learn from people who have provided reliable care and accurate information, we may expect them to trust information provided by their parents. Consistent with this expectation, Baka hunter–gatherers reported that almost all of their knowledge about the use of plants came from their parents, not from other people [41].

Note, however, that the bias towards attachment figures and the bias towards those who have proven accurate will not always converge on the same informant. Children may notice that in some epistemic domains, an attachment figure is less accurate than someone with whom they have no history of attachment. Our findings suggest that in such cases, children will increasingly opt for the more accurate informant. Indeed, observation of cultural transmission networks in small-scale societies by Henrich & Broesch [42] lends support to the proposal that vertical transmission is increasingly supplemented by the oblique or horizontal transmission of information and expertise.

The second class of biases enables children to differentiate among informants with whom they have had no protracted interaction. As noted, this class leads children to prefer informants who appear to be culturally typical, either in the sense that the informants signal that they belong to the same group as the children (because of the way that they speak or look) or in the sense that other potential informants assent to, rather than dissent from, the information offered by the informant. These biases are likely to promote oblique and horizontal cultural learning that is relatively conservative. When children encounter someone who is not a familiar caregiver, they will be more inclined to accept guidance from that person if he or she appears to belong to, and receives endorsement from, the children's cultural group. Stated differently, children's receptivity to both oblique and horizontal learning does not extend to all-comers. They are less likely to trust information that is provided by members of another cultural group or by deviants from within their own group.

In future research, it will be important to test how children weigh both what they learn and from whom they learn. By way of illustration, consider recent findings illustrating children's deference to a model in the domain of tool use. Young children overimitate inefficient and irrelevant actions that are included in the demonstration of a tool or apparatus—despite various prompts not to do so [3–5]. Such deference is striking but, arguably, it may be displayed only in conditions which, from a cultural learning perspective, are impoverished. In overimitation experiments, children are typically offered a single demonstration by a single informant, whereas in everyday life, they are likely to have access to multiple demonstrations by multiple informants.

How might children respond when they have access to multiple informants? Two different possibilities warrant investigation. One possibility is that—particularly in 'opaque' domains such as tool use where the possibilities for exhaustive and autonomous analysis are limited—children defer more or less automatically to

any apparently effective demonstration that they encounter. Based on this hypothesis, the selectivity among informants that has been described in this paper would not be in evidence. An alternative possibility, however, is that children might deploy either of the two classes of heuristics so as to be more selective about what they imitate. For example, faced with conflicting demonstrations by informants with a different attachment status or a different history of accuracy, children might copy in a selective fashion rather than in an indiscriminate fashion, copying and indeed overimitating one model rather than the other. Similarly, having observed ingroup and outgroup members model different tool-based procedures, children might engage in more sedulous imitation of ingroup members.

Finally, it is important to remember that developmental psychology has long demonstrated children's capacity for autonomous observation and interpretation. There are occasions when children use that cognitive capacity—including the distinctively human capacity for asking questions—to query the cultural information that they receive, even from familiar sources [10,43,44]. Indeed, children are especially likely to direct their sustained—and sometimes sceptical questions—at trusted caregivers [45].

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