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Copy me or copy you? The effect of prior experience on social learning ☆

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ABSTRACT

The current study investigated children's solution choice and imitation of causally-irrelevant actions by using a controlled design to mirror naturalistic learning contexts in which children receive social information for tasks about which they have some degree of prior knowledge. Five-year-old children ($N = 167$) were presented with a reward retrieval task and either given a social demonstration of a solution or no information, thus potentially acquiring a solution through personal exploration. Fifty-three children who acquired a solution either socially or asocially were then presented with an alternative solution that included irrelevant actions. Rather than remaining polarised to their initial solution like non-human animals, these children attempted the newly presented solution, incorporating both solutions into their repertoire. Such an adaptive and flexible learning strategy could increase task knowledge, provide generalizable knowledge in our tool-abundant culture and facilitate cumulative culture. Furthermore, children who acquired a solution through personally acquired information omitted subsequently demonstrated irrelevant actions to a greater extent than did children with prior social information. However, as some children with successful personally acquired information did copy the demonstrated irrelevant actions, we suggest that copying irrelevant actions may be influenced by social and causal cognition, resulting in an effective strategy which may facilitate acquisition of cultural norms when used discerningly.

1. Introduction

Children are prolific social learners and the extent of their faithful imitation of a model's behaviour is matched by no other species including other great apes (Dean, Kendal, Schapiro, Thierry, & Laland, 2012; Tennie, Greve, Gretscher, & Call, 2010; Whiten, McGuigan, Marshall-Pescini, & Hopper, 2009). A wealth of previous research demonstrates that providing children with social information about a novel artefact can lead to the canalisation of behaviour, whereby children faithfully reproduce an observed behaviour without attempting possible alternatives (Flynn & Whiten, 2008a; Hopper, Flynn, Wood, & Whiten, 2010; Horner, Whiten, Flynn, & de Waal, 2006), sometimes leading to the copying of clearly causally irrelevant actions (Horner & Whiten, 2005; Wood, Kendal, & Flynn, 2012). Children's copying of irrelevant actions appears in different cultures (e.g. Kalahari Bushmen, Nielsen & Tomaselli, 2010 and western society, Horner & Whiten, 2005), increases with age (McGuigan, Whiten, Flynn, & Horner, 2007; Nielsen, 2006) into adulthood (Flynn & Smith, 2012; McGuigan, Makinson, & Whiten, 2011), and persists despite many forms of intervention (Lyons, Damrosch, Lin, Macris, & Keil, 2011; Lyons, Young, & Keil, 2007).

As children often receive social information regarding artefacts about which they have some degree of prior

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knowledge, the overarching aim of the current study was to understand how children's imitation of socially demonstrated solutions and causally irrelevant actions are influenced by experiencing multiple solutions to a problem.

When new social information contrasts with prior information children may draw upon 'social learning strategies', heuristics guiding their use of social information (Laland, 2004). Boyd and Richerson (1985) suggest that learning one solution can inhibit further exploration of a problem, with such conservatism common in non-human animals. Chimpanzees that discover one solution for food retrieval are unlikely to try a more efficient solution and when one solution is precluded, those expert in the blocked solution do not adopt an alternative solution (Hrubesch, Preuschoft, & van Schaik, 2009). Similarly, Hopper, Schapiro, Lambeth, and Brosnan (2011) found conservatism to initial social information even when an alternative behaviour, which was similar in difficulty, produced a higher value reward. Conservatism to personally acquired information continues in the face of equally beneficial alternate social information in a number of species (starlings, Templeton & Giraldeau, 1996; guppies, Kendal, Coolen, & Laland, 2004; sticklebacks, van Bergen, Coolen, & Laland, 2004; see Kendal, Coolen, van Bergen, & Laland, 2005 for a review). This reluctance to weight social information over personally acquired information can be overcome with sufficiently persuasive social information (nutmeg manikins, Rieucau & Giraldeau, 2009), costs to using personal information (fish, Kendal et al., 2004; orangutans, Lehner, Burkart, & van Schaik, 2011), or when individuals are allowed continued attempts to retrieve a reward (capuchin monkeys, Dindo, Thierry, de Waal, & Whiten, 2010).

We address children's use of these strategies by investigating children's behaviour after prior task experience and subsequent demonstrations of alternate task solutions which included causally irrelevant actions. Specifically, relating to differing solutions of an artificial-fruit task, we investigate: (1) how children weigh an initial socially demonstrated task solution with a subsequent socially demonstrated task solution, (2) whether personally acquired information affects children's copying of subsequent socially demonstrated solutions, (3) solution choice over time and (4) the influence of prior experience on the often prevalent reproduction of irrelevant actions.

1.1. Demonstrations of alternative solutions

Our first research question investigated how children weigh an initial socially demonstrated task solution with a subsequent socially demonstrated task solution. Traditionally, social learning studies have presented social information in the form of one or multiple demonstrations of the same solution, resulting in children faithfully copying the demonstrated solution in subsequent trials (Flynn & Whiten, 2008a, 2008b; Hopper et al., 2010; Horner et al., 2006). For example, Flynn and Whiten (2008a) found that only one child out of 80 attempted a solution that was different to the one witnessed. Similarly, in infancy use of a familiar tool is inflexible relative to a novel tool (Barrett, Davis, & Needham, 2007). Further, in studies of normativity children protest when an individual subsequently performs a behaviour that the child associates with a different, previously socially learnt behaviour (Rakoczy, Warneken, & Tomasello, 2008), suggesting that once a model demonstrates a solution children are quick to establish how something 'ought' to be done and do not accept the more recently demonstrated behaviour.

In contrast, Siegler and Opfer (2003) found that when working through mathematical problems children possess multiple numerical representations, such that a single child could utilise different methods to obtain the correct answer to similar problems. They suggested that children are motivated to acquire multiple strategies to solve a problem and that when similar problems are presented close in time children may use different solution strategies in their repertoire. In the current study, where some children were provided with social demonstrations of alternative solutions, we predicted that children would imitate the model's first demonstration we made no clear predictions about what children would do upon witnessing a second, alternative solution. Such an investigation, however, is important as it reflects real-life learning and reveals the relative prevalence of solution canalisation and multiple strategy acquisition.

1.2. Personally acquired information

The relation between children's acquisition of knowledge through their own experience (personal learning) and through their interactions with others (social learning) has been of interest since the beginning of the empirical study of developmental psychology (e.g. Piaget, reviewed by DeVries (1997)). Adults can demonstrate an inherent resistance to changing their opinion (Ehrlich & Levin, 2005) and although the number of, consensus among, and performance of demonstrators can result in adults disregarding their personal choice, participant confidence, success rate and non-public answers increase the probability of maintaining one's own choice (Asch, 1951, 1956; Morgan, Rendell, Ehn, Hoppitt, & Laland, 2012). Children with divergent personal information, regarding solutions to a reward extraction task, tend to converge upon a single solution in a social setting (Flynn & Whiten, 2010) suggesting children have some degree of social conventionality. If, however, social information is inaccurate (Clément, Koenig, & Harris, 2004), if the model is demonstrating an inefficient (Pinkham & Jaswal, 2011) or non-affordant method (DiYanni & Kelemen, 2008), or if the model has an 'unreliable' reputation (Ma & Ganea, 2010), children are more likely to rely upon their personally acquired information. Equally, when children are presented with a difficult experience of retrieving a reward, they copy an alternative technique (Williamson & Meltzoff, 2011; Williamson, Meltzoff, & Markman, 2008). Likewise, when a child's personally-acquired easy solution to a task becomes ineffective s/he defers to a model's task actions (Williamson et al., 2008). In the current study the difficulty or effectiveness of the solution was not manipulated. Therefore, the current study makes a significant contribution to previous research by addressing children's relative weighting of prior, personally-acquired information against subsequent