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The role of testimony in young children's solution of a gravity-driven invisible displacement task

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ABSTRACT

Previous research has shown that young children make a perseverative, gravity-oriented, error when asked to predict the final location of a ball dropped down an S-shaped opaque tube (Hood, 1995). We asked if providing children with verbal information concerning the role that the tubes play, in determining the ball's trajectory would improve their performance. Experiment 1 showed that performance of 3.5-year-olds improved after hearing testimony about the movement of the ball. Experiment 2 showed that the specific content of the testimony – rather than any accompanying nonverbal cues – helped children improve. These findings suggest that other people's testimony can be a valuable source of information when young children learn about the physical world. Indeed, under some circumstances children seem to benefit more from verbal than visual information. An educational implication is that it may sometimes be ineffective to focus on the impact of first-hand experience while marginalizing the role of verbal information.

Young children seem to have entrenched misconceptions about the movement of objects. One such misconception is that objects always fall downward in a straight line. A task that reveals this bias is the tubes task, in which children are asked to predict the final location of a ball dropped down an S-shaped opaque tube (see Fig. 1). Hood (1995) has shown that when presented with the task of finding a ball dropped down one of the opaque tubes connecting the three chimneys above with the three containers below, 2- and 3-year-olds repeatedly search directly below the place where they have seen the ball dropped (Fig. 1). Furthermore, children

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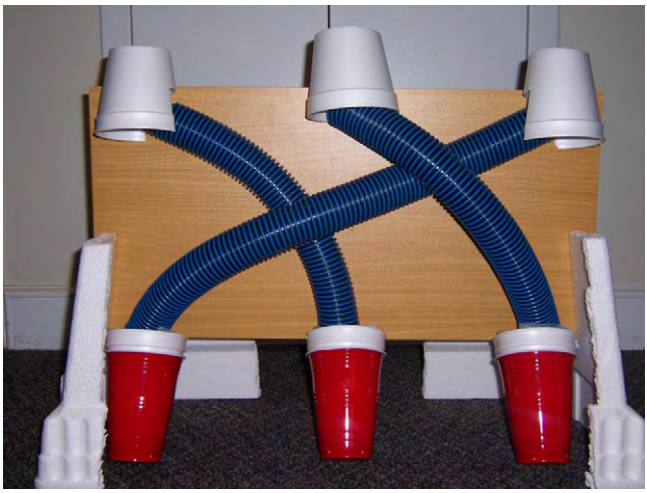

Fig. 1. Picture of the apparatus for the tubes task.

continue to make this error despite the negative feedback provided by many trials of incorrect search.

Children's perseverative behavior on this task has been thought to index a naïve theory of gravity acquired through extensive experience with falling objects. A characteristic of theory-driven behavior is the ignoring of counter-evidence (Hood, 1998; Karmiloff-Smith & Inhelder, 1975). Thus, according to this account, when faced with the tubes task, young children have difficulty inhibiting their prepotent response to objects that fall downward in a straight vertical line. They therefore repeatedly commit the "gravity error" in spite of the negative feedback on many trials (Hood, Santos, & Fieselman, 2000; Hood, Wilson, & Dyson, 2006; Hood, 1995, 1998). Indeed, children's resistance to counter-evidence in this task is consistent with the finding that some misconceptions about the motion of objects persist into adulthood even after formal education in physics (McCloskey, Caramazza, & Green, 1980; McCloskey, Washburn, & Felch, 1983).

The counter-evidence given to children in all such studies was either visual feedback about the correct final location of the ball or visual evidence about the non-vertical trajectory of the ball as it traveled through the transparent tubes (Hood et al., 2000; Hood, 1995, 1998). However, in addition to learning from first-hand experience, young children also learn about the world from other people's testimony (Gelman, 2009; Harris & Koenig, 2006). Indeed, in some domains, children's knowledge is critically dependent on information acquired through testimony, since they do not ordinarily have access to the relevant visual information (e.g., understanding the existence and causal powers of germs and oxygen; understanding the role of the brain in mental processes; and understanding the shape of the Earth; Harris & Koenig, 2006; Harris, Pasquini, Duke, Asscher, & Pons, 2006). In the set of studies reported here, we asked if children would continue showing the typical resistance to counter-evidence if they were provided with verbal information about the role that the tubes play in guiding the ball's trajectory.

The inhibitory account proposed by Hood (1995) hinges on the assumption that children have a good understanding of the tubes mechanism despite their gravity errors. According to this view, as children get older, they gradually become better at inhibiting the prepotent response and start to search correctly. By implication, this account predicts that children should search correctly in circumstances in which the task does not elicit a prepotent response. However, previous studies provide only mixed evidence to support this prediction. Thus, an alternative hypothesis is that in addition to children's inhibitory control capacity, their understanding of the tubes mechanism is an important aspect of their solution to the tubes task.