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Brief Report

Influences of credibility of testimony and strength of statistical evidence on children's and adolescents' reasoning

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ABSTRACT

According to dual-process models that include analytic and heuristic modes of processing, analytic processing is often expected to become more common with development. Consistent with this view, on reasoning problems, adolescents are more likely than children to select alternatives that are backed by statistical evidence. It is shown here that this pattern depends on the quality of the statistical evidence and the quality of the testimonial that is the typical alternative to statistical evidence. In Experiment 1, 9- and 13-year-olds ($N = 64$) were presented with scenarios in which solid statistical evidence was contrasted with casual or expert testimonial evidence. When testimony was casual, children relied on it but adolescents did not; when testimony was expert, both children and adolescents relied on it. In Experiment 2, 9- and 13-year-olds ($N = 83$) were presented with scenarios in which casual testimonial evidence was contrasted with weak or strong statistical evidence. When statistical evidence was weak, children and adolescents relied on both testimonial and statistical evidence; when statistical evidence was strong, most children and adolescents relied on it. Results are discussed in terms of their implications for dual-process accounts of cognitive development.

Introduction

In dual-process theories of cognitive development, age differences in reasoning and decision making have been attributed to developmental changes in use of different kinds of processing. For

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example, several theorists (e.g., Evans, 2008; Stanovich, 2011) distinguish two forms of processing. Heuristic processing (also called System 1 or Type 1 processing) is fast and automatic, whereas analytic processing (also called System 2 or Type 2 processing) is slower and controlled. The critical development prediction has been that analytic processing should be more common in older children and adolescents (e.g., Klaczynski, 2004, 2009).

The predicted developmental outcome has been tested on several tasks. Consider, for example, reasoning problems in which participants must choose between two options, with statistical evidence favoring one option but personal experience or testimony favoring the other (Fong, Krantz, & Nisbett, 1986). In one illustrative problem (from Kokis, Macpherson, Toplak, West, & Stanovich, 2002), a child is going to a baseball game and wants to sit where she can catch a fly ball. She learns from team officials that most fly balls are caught in one section of the park but that her friend recently caught two fly balls in another section. Relying on the statistical information is thought to reflect analytic processing, whereas relying on a friend's testimony is thought to reflect heuristic processing.

Consistent with the prediction that analytic processing increases with development, several investigators have reported an age-related increase in reliance on statistical information in problems like these (Jacobs & Potenza, 1991; Klaczynski, 2001; Kokis et al., 2002). This same developmental pattern has emerged on other tasks in which participants choose between solutions thought to reflect either heuristic or analytic processing such as sunk cost decisions and gambler's fallacy problems (Klaczynski, 2001; Klaczynski & Cottrell, 2004). For example, if tossing a coin 10 times has yielded eight heads, 16-year-olds are more likely than 12-year-olds to predict that the probability of a head on the next toss is .50; children are more likely to predict that the toss will yield a tail, reflecting an averaging heuristic.

Nonetheless, it may be premature to draw strong conclusions from these findings for two reasons. The first is empirical. Not all findings are consistent with the prediction that analytic processing increases with age. For example, across four kinds of reasoning and decision-making tasks, Morsanyi and Handley (2008) found that analytic processing actually decreased between 6 and 10 years of age, whereas heuristic processing increased. Similarly, although analytic processing on inductive reasoning problems increased with age in studies by Jacobs and Potenza (1991), Klaczynski (2001) and Kokis et al. (2002), overall levels of performance varied considerably; use of statistical evidence at 11 and 12 years of age was 65%, 18%, and 49% in the three studies, respectively.

A second reason is theoretical. In fact, there are several different dual-process accounts that differ in the names of the two broad categories, the processes subsumed under each category, and specific hypotheses regarding development (Evans, 2011; Stanovich, West, & Toplak, 2011). Most accounts would hold that the different processes that comprise analytic processing typically improve with age, but predictions regarding developmental trajectories for different forms of heuristic processing are more varied. Consequently, many theorists (e.g., Stanovich et al., 2011) have argued for a more nuanced view of dual-process accounts with respect to the processes that comprise the two categories and the predictions concerning developmental change.

Against this backdrop, the research reported here was conducted to reconsider performance on the reasoning problems described earlier in which participants choose options associated with statistical or testimonial evidence. In the problems used previously (e.g., Klaczynski, 2001; Kokis et al., 2002), the statistical evidence was usually credible but the testimonial evidence was not. In the example with the baseball game, for instance, the statistical evidence comes from a credible source (the team itself) and is definitive (most balls are caught in a specific section). In contrast, the testimonial evidence comes from a friend who has no special expertise and attended only one game.

In reality, however, both kinds of evidence can range from worthless to valuable. Statistical evidence, for example, may vary in quality (e.g., based on small or unrepresentative samples) and strength (e.g., "everyone prefers Option A" vs. "many prefer Option A"). Similarly, testimonial evidence may range in value. The individual providing testimony may be someone (a) whose advice should be ignored (e.g., because his or her advice has been wrong previously), (b) who has relevant but limited experience, or (c) who has special expertise that would make his or her advice particularly valuable.

The impact of such variations in the strength of statistical and testimonial evidence was examined in two experiments. In Experiment 1, the expertise of the individual providing personal evidence was