

USE OF DECISION FRAMES BY ELEMENTARY SCHOOL CHILDREN

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Summary.—This study evaluated Tversky and Kahneman's model of decision framing among 90 children, 30 each from Grades 1, 3, and 6. Students were first tested to determine their level of cognitive development. They then responded to two sets of decision tasks to determine the extent to which they corresponded to Tversky and Kahneman's predicted departures from rationality. Analyses showed that older children utilized mechanisms similar to those described for adults, while first and third graders did not. There was no effect as a function of cognitive level. The implications of these findings for theory and research are discussed.

Traditionally, decision-making has been described as a problem-solving process using mechanisms of rational choice. According to traditional models, individuals will examine alternatives in terms of their probability, utility, and value, then choose the outcome which provides maximal gains and/or minimal losses (Raiffa, 1968; Slovic, Fischhoff, & Lichtenstein, 1977). The recent work of Tversky and Kahneman (1974, 1981) has demonstrated that choices made by individuals often do not follow a strict rational approach. Through their investigations, they have identified and described several biases in reasoning which may account for these departures from rational choice. For example, people frequently fail to consider base rate frequencies of events thus predicting outcomes with insufficient data. Tversky and Kahneman (1974, 1981) have described other cognitive biases in decision making which reflect people's over-reliance on familiar or recent events and their preferences based on personally valued factors.

The majority of Tversky and Kahneman's research has examined the effects of "decision frames" on choice behavior. They have identified predictable shifts of preferences when the same problem is presented from slightly different perspectives. The decision frame is defined as the manner in which a problem is presented and affects the understanding of acts, outcomes, and contingencies associated with certain choices. One's conception of the decision frame is influenced by the formulation of the problem as well as through personal values, practices, and individual qualities. Traditional decision theory emphasizes rational choice irrespective of changes in the frame or vantage point of the problem. Alterations in the perspective of a decision, however, often do affect perceptions regarding relative value of each option (Kahneman & Tversky, 1984).

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Framing of Outcomes

An example of the effect of outcome framing on decision making is illustrated in the following set of problems. Outcomes are judged by an individual to be either of positive or negative value in relation to a neutral reference point. Individual differences concerning choice of this reference point can influence whether an outcome is perceived as a gain or a loss. Differences in responses can be affected by what Tversky and Kahneman (1981) refer to as "psychological accounting." This phenomenon is illustrated in the following problem set.

Problem 1: ($N = 183$) — Imagine that you have decided to see a play where admission is \$10 per ticket. As you enter the theater you discover that you have lost a \$10 bill. Would you still pay \$10 for a ticket to the play?

Yes (88%) No (12%)

Problem 2: ($N = 200$) — Imagine that you have decided to see a play and paid the admission price of \$10 per ticket. As you enter the theater you discover that you have lost the ticket. The seat was not marked and the ticket cannot be recovered. Would you pay \$10 for another ticket?

Yes (46%) No (54%) (p. 457)

The purchase of a new ticket is charged to a "psychological account." According to this principle, if a previous ticket has been purchased, the net price of admission to the play is \$20, sufficient to cause a majority of people to reject the option. The loss of money, however, is not specifically linked to the ticket price and so has little effect on the decision. A new ticket then is more likely to be purchased when money is lost rather than when an original ticket is lost, providing a good example of the framing of outcomes (Tversky & Kahneman, 1981).

Cognitive Development

These departures from rational choice have been well documented in adults, however this phenomenon has not been evaluated in children. It is not known whether young children utilize these same processes in their choice behavior, and if so, at what age they begin to develop. Cognitive processing may play a role in decision-making behavior in children. According to Piaget and Inhelder (1975) children in the preoperational period confuse caused and chance occurrences. They tend to perceive causal relationships between events even when none are present. By the concrete operational period, children demonstrate a more accurate conception of the laws of cause and effect. There is ability to discriminate between predictable events and those that are random or subject to chance. Due to these fundamental differences in the way children at different levels of cognitive development perceive and process information on choice and probability, one might expect to find variations in responses to the Tversky and Kahneman tasks of outcome framing with respect to cognition.

In this study I attempted to further develop Tversky and Kahneman's model of decision making through evaluating its usefulness and accuracy in children. Two primary null hypotheses addressed questions relating to the effects of educational and development level on responses to tasks of outcome framing: (1) there will be no differences in response to decision problems among first, third, and sixth graders; (2) there will be no differences in response to these same problems among low, medium, and high conservers defined by scores on a psychometric instrument of conservation. The present investigation was done to clarify these issues.

METHOD

In a sample of 90 elementary school children were three groups of 30 students each from Grades 1, 3, and 6. The first 30 students at each grade to return their signed consent forms and who met sample requirements were included. There were 48 boys and 42 girls in the total sample with a similar distribution of age and sex at each grade.

A brief demographic questionnaire was included with the consent form and completed by consenting parents. The instrument used to measure cognitive level within Piagetian theory was the Concept Assessment Kit—Conservation (Goldschmid & Bentler, 1968). This tool assesses the child's ability to judge and explain the relative quantity of two objects. Based on their total test scores, subjects were classified as either low, medium, or high conservers. Low conservers were students scoring 0—3 on the instrument. Medium conservers scored between 4 and 8, and high conservers scored from 9 to 12. The three levels of conservation, low, medium, and high used to classify students in this study are described by Brainerd (1978). The final instrument involved two tasks of Tversky and Kahneman, modified for children and designed to elicit responses in specific choice situations.

First, the conservation tool was administered. All responses and explanations were recorded on an answer sheet for later scoring. The child was then asked to answer yes or no to four questions regarding money. The following problems were posed to each child.

Problem 1: Here are two dollars. Pretend you're going to buy an ice cream cone that costs one dollar. At the store you find that you've lost a dollar (takes one away). Would you use your other dollar to buy the ice cream cone?

Problem 2: Here are two dollars. Pretend you spent one (takes one away) to buy an ice cream cone. Right after you've bought the cone you drop it on the ground. Would you use your other dollar to buy another ice cream cone?

Problem 3: Here are two dollar bills. Pretend you're going to the fair. You want to go on your favorite ride. You need to buy a ticket with one of your dollars. When you go to buy the ticket, you find that you've lost one of your dollar bills (take one away). Would you use your other dollar to buy a ticket to go on the ride?

Problem 4: Here are two dollar bills. Pretend you're going to the fair. You want to

go on your favorite ride. You bought a ticket for the ride with one of your dollar bills (takes one away). When you go to the ride, your ticket blows away and you can't get it back. Would you use your other dollar to buy another ticket to go on the ride?

Both questions in each problem set were read to each subject and yes or no responses obtained. Problems 1 and 2 made up Problem Set I and Problems 3 and 4 made up Problem Set II. The order of presentation of each problem set and of the two problems within each set were randomly varied among subjects. The research was conducted at the elementary school in private with individual testing of the children.

RESULTS

Sign tests were applied to compare pairs of problems in each problem set to grade and conservation scores. Analyses showed a significant shift in occurrence of yes and no responses among problems in Problem Set I only for sixth graders. Sixth graders who answered yes to problem 1 were significantly more likely to answer no to Problem 2 ($p < .033$). These shifts in response were not evidenced in first or third graders.

Similar findings occurred in Problem Set II. Only sixth graders showed a significant shift in responses between problems ($p < .011$). These students answered yes to Problem 3 and no to Problem 4 with significant frequency, while children in the other two grades did not.

In addition, conservation scores of low, medium, and high were compared to answers on the Tversky and Kahneman problems. Sign tests did not show significant shifts in occurrence in either problem set.

A Pearson correlation assessed reliability between similarly framed problems (Problems 1 and 3; Problems 2 and 4). The correlation between answers on Problems 1 and 3 was .547 and .499 between Problems 2 and 4. Both correlations were statistically significant ($p < .01$). These significant correlations provided an index of consistency of responses between the two problem sets among children.

DISCUSSION

Present findings showed a significant relationship between children's responses on these tasks of outcome framing and grade in school. Sixth graders consistently gave different responses to the problems in each problem set while these significant findings were not present for first or third graders. Grade 6 students were more likely to purchase the desired item when money was lost rather than when loss occurred after the purchase. No distinction was made by either first or third graders in regard to money and purchased items. Findings for the sixth graders are consistent with those of Tversky and Kahneman (1981) who found that adults were more likely to purchase a theater ticket when money had been lost rather than when an original ticket was lost. They

described their findings using the principle of "psychological accounting" whereby purchase of a second ticket is entered into an already existing account set up for the original purchase of the ticket. On losing the ticket, the expense of viewing the play was perceived by many individuals as being twice the price of the original ticket, apparently too expensive for most respondents. Loss of money, however, was not psychologically tied to a specific purchase and seems to have less of a negative effect on the decision to purchase a ticket.

It appears that a similar process of "psychological accounting" occurs in the minds of sixth graders but is not fully developed at the earlier grades. Several factors may account for the difference: (1) greater experience in making decisions particularly in dealings involving money and purchases, (2) emergence of a value system closer to parental beliefs, and (3) greater peer, teacher, and parental influences on behavior. Although grade in school was significantly related to answers on the Tversky and Kahneman tasks, conservation level was not significant. Differences in responses among the three grades probably reflected a multifaceted phenomenon in which cognitive level plays a role. The investigation of an information-processing model of cognition may be useful in examining the cognitive component of decision making and outcome framing.

This study demonstrated that elementary school children develop similar decision-making behaviors to adults by Grade 6. The investigation contributed to the work of Tversky and Kahneman by indicating that older children respond to choice situations in a manner similar to adults. Younger children did not respond with the same biases as the sixth graders, suggesting developmental and/or educational influences in decision making. A greater understanding of the different strategies and cognitive approaches that children utilize as they mature will contribute to a general conception of decision-making behavior. A longitudinal study of children through Grade 6 would appear to be a useful methodology in further clarifying the development of decision behavior.

Further examination of developmental tasks that change throughout childhood and adolescence will greatly enhance our understanding of the cognitive processes underlying adult behaviors. It is important to consider the impact of other variables on decision making and outcome framing by children, such as development of values, mathematical ability, and information-processing strategies. By examining these various aspects of the decision-making process in both children and adults, researchers can gain a further understanding of the factors which influence our choices.

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