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The Differential Outcome Effect as a Useful Tool to Improve Conditional Discrimination Learning in Children

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The differential outcome effect (DOE) refers to the increase in speed of acquisition and terminal accuracy that occurs in conditional discrimination learning when two or more stimuli are correlated with a particular outcome. Previous studies demonstrated the benefits of the DOE in preschool children. In two experiments we extended the DOE methodology to older children and tasks of different difficulty. Experiment 1 indicated that the DOE procedure improved conditional discrimination performance of 4- to 7-year-old children. However, this effect was not present in children aged 8 years. In Experiment 2, we increased the difficulty of the task and demonstrated that these children in the differential outcome condition performed significantly better on this complex version of the discriminative task than those in the matched control group. It is proposed that the DOE is a general effect that is not limited to early stages of development and that the difficulty of the task is an important variable to consider when a differential outcome procedure is used.

Key Words: differential outcome effect and children.

In a typical conditional discrimination task, each of two cue or ‘‘sample’’ stimuli selectively direct the participant’s choice to the one of two or more

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choice alternative or ''comparison'' stimuli that is associated with the current sample stimulus. In the standard procedure, each correct response is always reinforced with a common outcome. However, in the differential outcome procedure, one reward follows the correct choices made to one comparison stimulus, whereas a different reward follows the correct choices made to the other comparison stimulus. This procedure has been shown in animals to facilitate both (a) initial learning of conditional relationships (Overmier, Bull, & Trapold, 1971; Trapold, 1970) and (b) memory for the conditional stimuli in delayed matching to sample tasks (Brodigan & Peterson, 1976). Faster acquisition and more accurate performance in a conditional discrimination task when stimulus-correlated outcomes are used, are generally termed the differential outcome effect (hereafter DOE). The DOE has become the focus of an expanding series of experiments and has been demonstrated with a considerable range of subjects (e.g., pigeons, rats, or dogs) and with a variety of qualitatively and quantitatively different consequences (e.g., food versus water, or different delays to food delivery) (for a review, see Goeters, Blakely, & Poling, 1992).

Until recently, however, no one had explicitly addressed the issue of whether these findings were applicable to human subjects. The early hints that specific outcomes might play some role in human learning come from Shepp (1962, 1964), who demonstrated that consistent response–reinforcer relations could be arranged to interfere with learning. Later on, an effect was evident in a study that examined acquisition of a two-choice successive conditional discrimination by two mentally retarded children (Saunders & Sailor, 1979). Malanga and Poling (1992) also found the DOE in a study involving four adults with mental handicaps that were taught to discriminate letters by using a two-choice discrimination task. Their terminal accuracy was significantly greater when a correct response to a given letter was consistently followed by a particular outcome than when non differential outcomes were arranged. Dube, Rocco, and McIlvane (1989), in contrast, did not find facilitative effects of the differential outcome methodology in studies with mentally retarded adults in a delayed matching to sample task.

More recently, Maki, Overmier, Delos, and Gutman (1995) obtained a direct support for the DOE in humans. They found that children, ranged in age from 4 years and 6 months to 5 years and 5 months, receiving differential outcomes performed significantly better following conditional discrimination training—a symbolic matching-to-sample—than children receiving nondifferential outcomes. Performance of the latter group remained at chance after training. Furthermore, in an effort to understand the mechanism of DOE facilitation, Maki et al. (1995) demonstrated that children who received differential outcomes following correct responses had expectancies for outcomes, which functioned to guide choice behavior. Joseph, Overmier, and Thompson (1997) extended this research by studying adults with Prader–Willi syndrome who suffer a congenital disorder that is associated with in-

complete physical development, emotional labiality, life-threatening obesity, and mild mental retardation or learning difficulties. They found that participants more readily learned concepts and complicated equivalence relations when taught these by using conditional discrimination training with the differential outcome procedure than with standard common outcome procedures.

Given the scarce number of studies that have demonstrated the benefit of the DOE methodology in human learning, research that isolated the conditions under which this effect does and does not occur warrants further investigation for both theoretical and applied reasons. In the present experiments, we aimed at providing further evidence of the DOE in children varying in age in a conditional discrimination task. We used a delayed symbolic matching-to-sample task similar to that used by Maki et al. (1995). Trials in each phase of these studies consisted of the presentation of a sample pictorial stimulus and the subsequent presentation of two or four other pictorial comparison stimuli. The participants pointed to the sample picture and then, following a brief delay, tried to choose between two (Experiment 1) or four (Experiment 2) alternatives the picture that ''went with'' the sample. In the conditional discrimination phases, the sample and the alternatives bore no predetermined conceptual or physical resemblance to each other. Participants in the differential outcome condition consistently received one reward following correct responses to one discriminative stimulus and a different reward following correct responses to the other discriminative stimulus. Participants in the nondifferential outcome condition also received a reward for each correct response, but the rewards given were randomized with respect to the particular discriminative stimulus.

EXPERIMENT 1

In this experiment, we sought to extend the Maki et al. (1995) results to children with a broader range of age. Children, ranged in age from 4 years and 6 months to 8 years and 6 months, received training on a conditional discrimination task. They served either under differential outcome or under nondifferential outcome conditions. Performances of the two groups as a function of age were contrasted to determine whether children trained under differential outcomes would perform at a higher level.

Method

Participants. Seventy normally capable children (35 boys and 35 girls) were recruited from three schools in Almería, Spain: C.P. Inés Relaño, C.P. Lope de Vega, and C.P. San Indalecio. They ranged in age from 4 years and 6 months to 8 years and 6 months. None had evidenced learning difficulties.

Setting and materials. Each participant sat next to the experimenter in a quiet room. A book containing the stimuli was located on the table between the child and the experimenter. Stimuli, measuring approximately 5×5 cm,

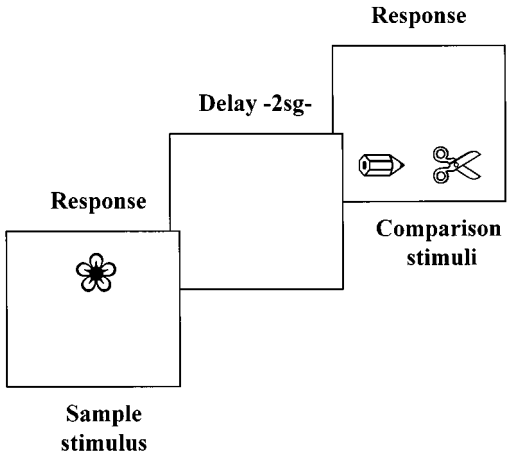

FIG. 1. An illustration of the stimuli sequence used in Experiment 1. The temporal sequence is represented from left to right in the figure. Children were required to point to the sample stimulus and then to the comparison stimulus that went with it.

were on pages contained in a binder. Each trial consisted of four pages. The first page contained the number of the trial written in the lower right corner. The second page had the discrimination cue stimulus, a sample stimulus centered in the upper half of the page. The third page was blank and served as an approximate 2-s delay. Finally, the fourth page contained two comparison or choice stimuli placed equidistant from each other in the lower half of the page below the midline. Figure 1 shows the stimulus sequence.

There were three phases in the experiment, the pretest phase, and two conditional discrimination phases which will be referred to as conditional discrimination phase I and conditional discrimination phase II. Figure 2 shows the stimuli used in each phase. A separate binder held the stimuli for each phase. The pretest phase ensured the participants' ability to discriminate the to-be-used stimuli, and the conditional discrimination phase I was aimed at trying to familiarize them with the matching game.

Two bowls, one red and the other green, were located to the left side of the experimenter. Following a correct choice, children received either a red or a green token and then they placed it in the corresponding red or green bowl. These tokens could be used by the children to ''purchase'' rewards. Food consisting of cookies, triskis and gublins balls, and sweet candies were located in the red bin. Small toy reinforcers including crayons, stickers, masks, and globes were located in the green bin. The bins were located behind the children and out of their immediate sight. The experimenter, who was the same person throughout the experiment (first author) controlled stimulus presentations, data collection, and outcome presentations. For reliability purposes, a second observer, who was naïve concerning the experiment pur-

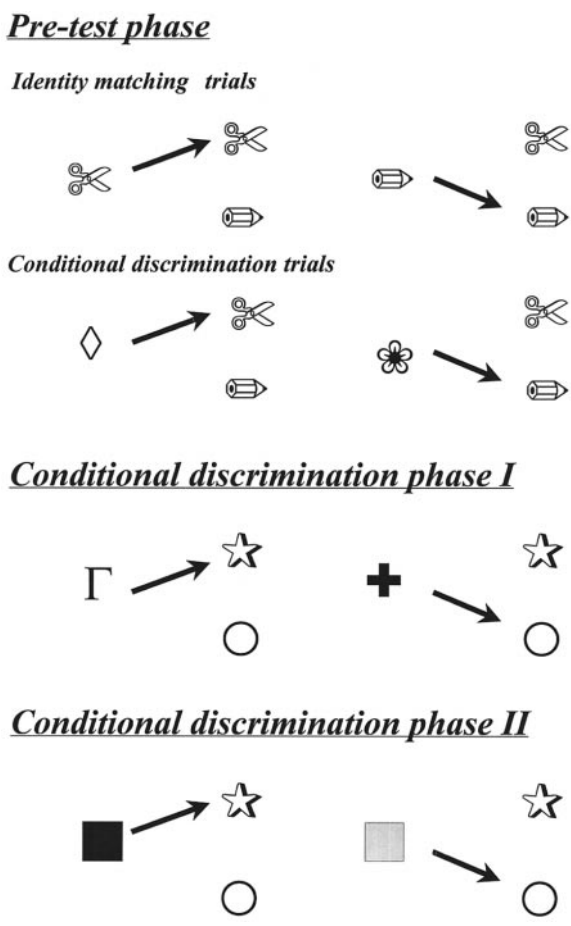

FIG. 2. Stimuli used in each phase of Experiment 1.

poses, also recorded the children's responses and the outcome procedure being used. The observer was seated outside the line of vision of the child, but able to clearly see the child's responses.

Procedure. Participants were assigned to five groups according to age: (1) from 4 years and 6 months to 5 years, (2) from 5 years to 5 years and 6 months, (3) from 5 years and 6 months to 6 years and 6 months, (4) from 6 years and 6 months to 7 years and 6 months, and (5) from 7 years and 6 months to 8 years and 6 months. There were 14 children, 7 boys and 7 girls in each age group. Participants were assigned randomly to one of two experimental treatments such that in each age group 7 children served in the differential outcome condition and the other 7 children, in the nondifferential outcome or control condition. Overall, an equal number of boys and girls participated on each differential outcome condition.

Each child participated in a single session lasting approximately 30 min. The task began with a pretest phase consisting of 4 identity matching trials and 8 conditional discrimination trials. On the first identity trial, the experimenter gave the child verbal instructions. The child saw first a page with a picture of a pencil centered above the midline and two alternative pictures, one of a pencil and the other of a scissors, below the midline. In order to prevent any experimenter bias, all instructions given to the participants were read by the experimenter in the presence of the observer who was previously advised to check and note any significant deviation from the standard procedure. The instructions (translated into English here) were as follows:

> We are going to be playing a memory game. In this game when you respond correctly you will win a token which you could exchange for a prize. (Then, we showed the child the association between red tokens and food and green tokens and toys). When you win a red or green token, you must put them into their respective bowls. In this game, you will see a picture like this on the top of a page. Can you point to the picture? (the child points to the picture of a pencil). Good! Now, do you see the two pictures on the bottom? One of these pictures goes with the first picture you saw. I want you to point to the picture you think goes with the first picture you saw. Can you guess which one goes with the first picture you saw? Please point to it (the child points to the pencil). OK. Let's try another one.

On the first conditional discrimination trial, the participants received additional instructions. They saw a page with a diamond centered above the midline and two alternative pictures, one of a pencil and the other of a scissors, below the midline. The instructions were as follows:

> Now the game is going to change a little. Can you point to the picture on the top of the page? (the child points to the diamond). Good! Note how the picture on the top of the page doesn't look like either of the two pictures on the bottom of the page. There's no way you can know which picture goes with the diamond, so at first you'll have to guess and then you'll have to remember. Can you guess which one goes with the diamond?

At the beginning of the conditional discrimination phase I and II, the experimenter gave each child the following instructions:

> Remember that this is a memory game in which you first have to guess, and then, to remember which of the two pictures on the bottom of a page goes with the first one that you saw previously on the top of the page.

Participants received rewards for correct responses according to group assignment. Those participants in the experimental condition received differential outcomes for correct choices. They received a red token following the choice of one comparison stimulus in response to the presentation of one determined sample stimulus and a green token following the choice of the other comparison stimulus in response to the presentation of the other sample stimulus. Once the experiment was completed, children exchanged green tokens for toys and red tokens for food. In this respect, both the primary and

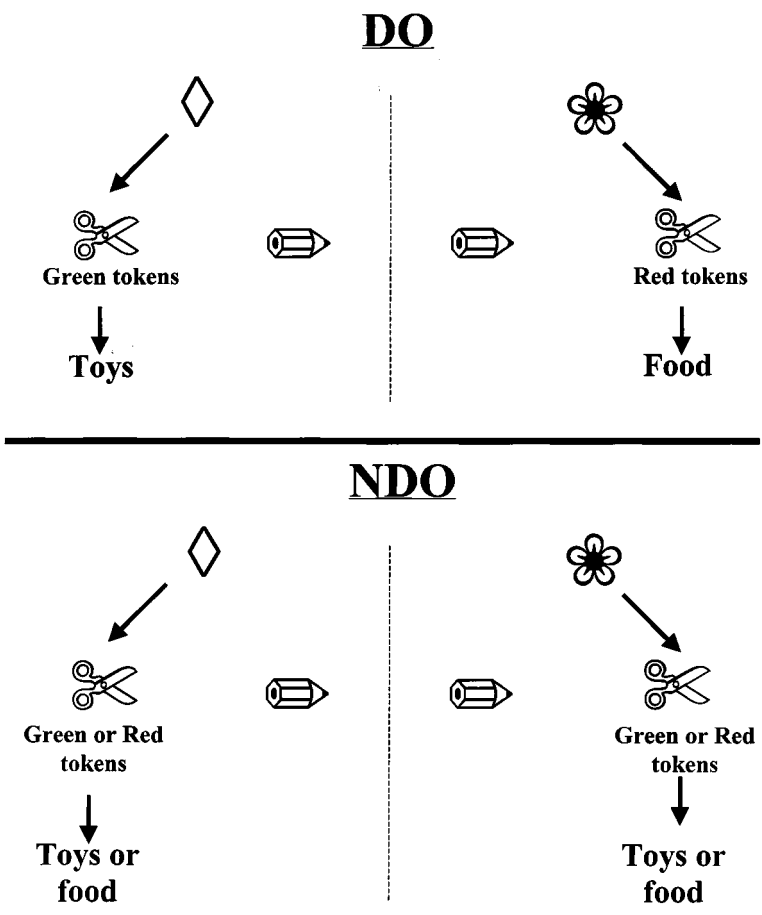

FIG. 3. Conditions used in Experiment 1. DO is the differential outcome condition and NDO is the nondifferential outcome condition.

the secondary reinforcers served as differential outcomes. Two tokens (green and red) served as secondary differential reinforcers and two hedonic reinforcers (toys and food) served as primary differential reinforcers. The secondary differential reinforcers in these conditions had both different stimulus features (color) and distinct associations (green tokens shared a distinct hedonic association with toys and red tokens shared a distinct hedonic association with food). Those participants in the control condition received nondifferential outcomes. Although rewarded for each correct choice, they received random rewards with either red or green tokens for correct choices. Figure 3 shows an example of both conditions. Incorrect choices led to an approximate 3-s intertrial interval, and then, the next trial in a noncorrection procedure took place.

Delays were introduced gradually to the children in the following manner. The first and second identity trials and the first and second conditional discrimination trials included no delay. For these four trials, the sample stimulus and the two comparison pictures were on the same page. The third and fourth identity trials and the third through fifth conditional discrimination trials incorporated a delay of approximately a second. For these trials, the sample stimulus was on one page and the two comparison stimuli were on the next page. The last three conditional discrimination pretest trials incorporated a delay of approximately 2 s. For these trials, a blank page inserted between the sample stimulus page and the comparison stimuli page served as the delay. All the participants met the criterion of at least 75% on the pretest phase previously established to participate in the experiment.

Thirty-two conditional discrimination phase I trials, randomized in blocks of eight trials, followed the pretest phase. Each sample stimulus appeared 4 times per block and correct choice stimuli appeared an equal number of times on the right and left sides. This phase served to teach children the general differential procedures.

The conditional discrimination phase II book consisted of 32 conditional discrimination trials randomized in blocks of 8 trials. As in the conditional discrimination phase I, children in the experimental condition received differential rewards for correct choices. Again children in the nondifferential outcome condition received random rewards for correct choices. The choice stimuli were the same as those used in the above phase, but the sample stimuli were different.

Results

Measures of reliability showed that the experimenter and the observed reached maximal agreement for every child in each condition. Also, no deviation from the standard procedure was registered by the observed concerning the way instructions were given to the participants. Thus, we want to claim the present results were due to the variables being manipulated in the experiment and not to any possible experimenter bias.

Learning curves. Several studies with nonhumans have shown evidence that subjects exposed to differential outcomes learned the discrimination task faster than subject exposed to nondifferential outcomes (Carlson & Wielkiewicz, 1976; DeLong & Wasserman, 1981; Peterson & Trapold, 1980; Peterson, Wheeler, & Armstrong, 1978). To explore whether children in the differential outcome treatment learned the discrimination task faster than those in the nondifferential outcome treatment we analyzed their performance through the different phases, conditional discrimination phase I and II, grouping the trials in 8 blocks of 4 trials each. The data from the conditional discrimination phase I were analyzed, although this phase was arranged to teach children the general differential procedure, to confirm that the DOE procedure was affecting also the acquisition stage in the present conditional

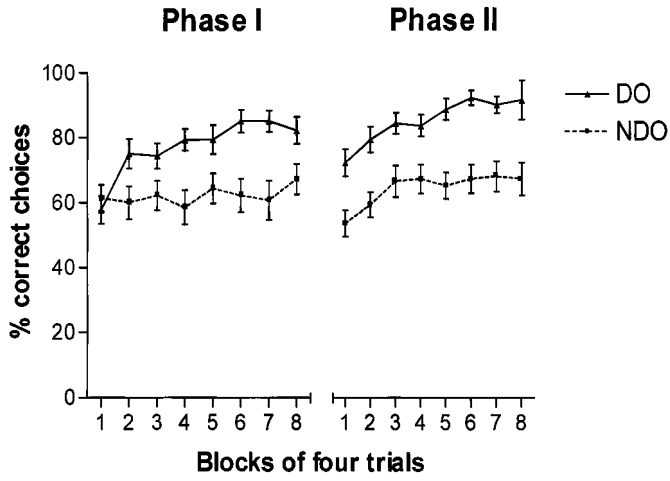

FIG. 4. Mean percentages of correct choice responses as a function of Blocks of 4 trials and Outcome (DO, differential outcomes; NDO, nondifferential outcomes) for conditional discrimination phases I and II in Experiment 1.

discrimination task. Because the pattern of results was similar for boys and girls, data from this factor were collapsed for the statistical analyses. Figure 4 shows the percentage of correct choices in both phases as a function of outcome and block of trials.

Data from conditional discrimination phase I were analyzed through a mixed ANOVA with Outcome as the between-subjects factor and Block of trials as the within-subjects factor. A rejection criterion of $p \leq .05$ was adopted for this and subsequent analyses. There were significant main effects of Outcome and Block of trials ($F(1, 68) = 13.27$ and $F(7, 476) = 3.59$, respectively). The Outcome $\times$ Block interaction was also significant ($F(7, 476) = 2.94$). Analysis of the interaction revealed that there was a main effect of Block only for children in the differential outcome condition ($F(7, 238) = 6.64$), and not for those in the nondifferential outcome condition ($F < 1$). These data indicate that, in general, children learned the conditional discrimination task only when differential outcomes were arranged. The difference in performance between the two groups in the first block of trials was not significant ($F < 1$).

Data from conditional discrimination phase II were also analyzed. Results showed significant main effects of Outcome and Block of trials ($F(1, 68) = 34.99$ and $F(7, 476) = 6.72$). Importantly, the Outcome $\times$ Block interaction was not significant ($F < 1$). However, a significant difference in the first block of trials was found ($F(1, 68) = 10.29$). Children in the differential outcome condition showed better accuracy in these first four trials than those in the nondifferential outcome condition (72 and 54% accuracy, respectively).

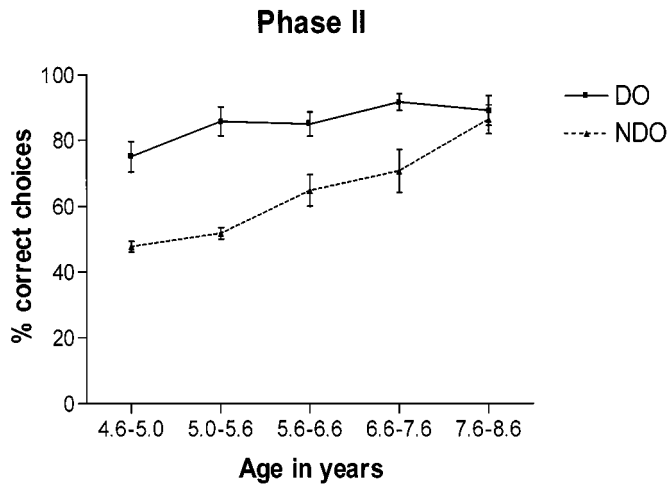

FIG. 5. Mean percentages of correct choice responses as a function of Age (in years) and Outcome (DO, differential outcomes; NDO, nondifferential outcomes) for conditional discrimination phase II in Experiment 1.

Overall accuracy. To explore whether children in the differential outcome treatment exhibited greater terminal accuracy than those in the nondifferential outcome treatment, data from conditional discrimination phase II were analyzed. Correct choices were analyzed through a between-subjects ANOVA with Outcome (differential vs nondifferential) and Age (4 y 6 m to 5 y, 5 y to 5 y 6 m, 5 y 6 m to 6 y 6 m, 6 y 6 m to 7 y 6 m, and 7 y 6 m to 8 y 6 m) as the between-subjects factors. Figure 5 shows the mean percentage correct as a function of age and outcome condition. The main effects of Outcome and Age were both significant ($F(1, 60) = 63.82$ and $F(4, 60) = 12.08$, respectively). Children in the differential outcome condition performed better than those in the nondifferential outcome condition (85 vs 64% accuracy, respectively). The overall performance of children was less accurate for the youngest age group and then increased gradually with age (61, 69, 75, 81, and 87% accuracy, respectively).

Most important, the Outcome $\times$ Age interaction was also significant ($F(4, 60) = 3.93$). The simple main analysis showed that children ranged in aged between 4 years and 6 months to 7 years and 6 months who received differential outcomes performed better that those who received nondifferential outcomes (4 y 6 m to 5 y, $F(1, 12) = 30.84$; 5 y to 5 y 6 m, $F(1, 12) = 50.81$; 5 y 6 m to 6 y 6 m, $F(1, 12) = 10.97$; and 6 y 6 m to 7 y 6 m, $F(1, 12) = 8.97$). However, in the oldest group of age, 7 years and 6 months to 8 years and 6 months, the percentage of correct responses did not differ significantly when differential and nondifferential outcomes were arranged ($F < 1$).

Discussion

In this experiment we found the DOE in children ranged in age from 4 years and 6 months to 7 years and 6 months. That is, children in the differential outcome group learned the discrimination task faster and exhibited greater accuracy than those in the control group, replicating the results of previous studies with younger children (cf. Maki et al., 1995). Going beyond Maki et al., we found that the advantage of the DOE decreased with age and it was not significant in the group of children from 7 years and 6 months to 8 years and 6 months.

It is important to note that in the animal literature the DOE is not found under certain experimental conditions (Brodigan & Peterson, 1976; Kruse & Overmier, 1982; Peterson, Wheeler, & Trapold, 1980; Williams, Butler, & Overmier, 1990). Interestingly, this occurred in all cases under conditions where control subjects exhibited high levels of accuracy, indicating perhaps the presence of a ceiling effect. In the present experiment, we did not find the DOE in children ranged in age from 7 years and 6 months to 8 years and 6 months who performed the best. It is possible that the task used was very easy for these children. A more convincing test would require participants to solve a more difficult task. This issue was addressed in the next experiment.

EXPERIMENT 2

This experiment sought to assess the DOE in children ranged in age from 7 years and 6 months to 8 years and 6 months performing a more difficult task. We used a delayed matching-to-sample task similar to that used in Experiment 1 but now 4 comparison stimuli, instead of 2, followed the sample stimulus. Furthermore, these comparison stimuli were perceptually more similar to each other.

Method

Participants. Ten experimentally naive, normally capable children participated in the study. They were recruited from the C.P. Lope de Vega in Almería, Spain. The participants ranged in age from 7 years and 6 months to 8 years and 6 months. No historical evidence of learning difficulties were found.

Setting and materials. The setting and materials were similar to those in Experiment 1 except that in this case 4 comparison stimuli placed on each corner of the page were used. As in Experiment 1 red and green tokens and bowls were present during the training sessions and these tokens were exchangeable for food and toy reinforcers stored in red and green bins, respectively. The bins were out of the child's immediate sight. Stimuli were located on the pages of a book in the order described in the previous experiment. In this experiment we used the same procedure to check for reliability and experimenter bias.

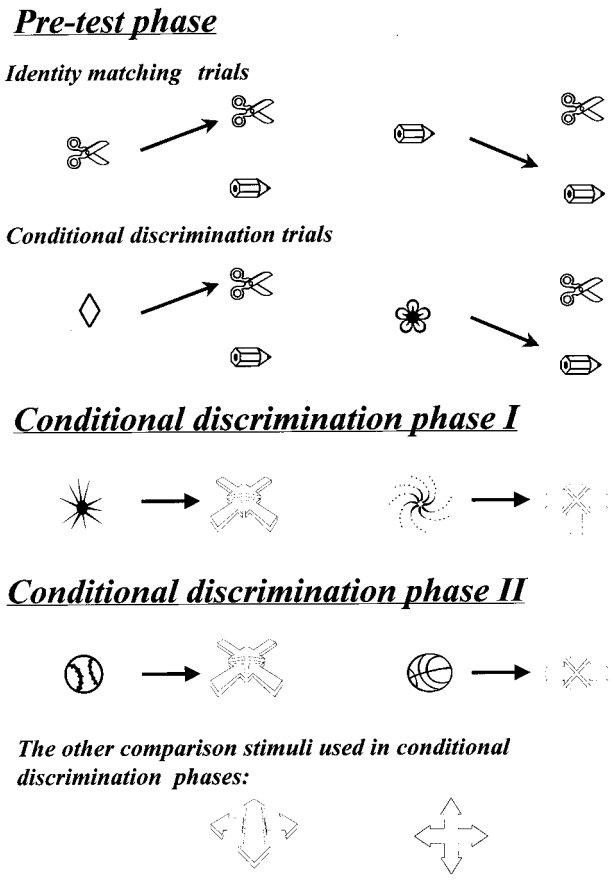

FIG. 6. Stimuli used in each phase of Experiment 2.

Procedure. Participants were assigned randomly to one of two experimental treatments such that 5 children, 3 boys and 2 girls, served in the differential outcome condition and 5 children, 2 boys and 3 girls, served in the nondifferential outcome condition.

Each child participated in a single session lasting approximately 30 min. The specific stimuli used in each phase are presented in Fig. 6.

In the pretest phase, participants received the instructions described in the previous experiment and received training on the 4 identity matching trials and 8 conditional discrimination trials. As in Experiment 1 children in the experimental condition received differential outcomes for correct choices and those in the control condition received nondifferential outcomes for correct choices.

In the conditional discrimination phase I, participants received instructions

on the training task using the stimuli shown in Fig. 6. Children received similar instructions to those of the Experiment 1 except that the choice stimuli in the current game were 4. Thirty-two conditional discrimination trials, randomized in 4 blocks of 8 trials, followed the pretest phase. Stimuli were located on the pages of a book in the order described in the previous experiment. Each sample stimulus appeared 4 times per block and correct comparison stimuli appeared an equal number of times on each corner of the page.

In the conditional discrimination phase II there were 32 trials with the stimuli set randomized in the manner described above. The choice stimuli were the same as those used in the conditional discrimination phase I (just as in the conditional discrimination phases I and II of Experiment 1), but the sample stimuli were different.

Results

As in Experiment 1, reliability data on each subject revealed no disagreement between experimenter and observer on either responses or the outcome procedure used. Also, no deviation from the standard procedure was registered by the observer concerning instructions.

Learning curve data. As in Experiment 1, data from learning curves were analyzed in both phases, conditional discrimination phase I and II, by forming 8 blocks of 4 trials each. Figure 7 shows the mean percentage of correct choices as a function of outcome condition and block of trials. A mixed ANOVA with Outcome as the between-subjects factor and Block of trials

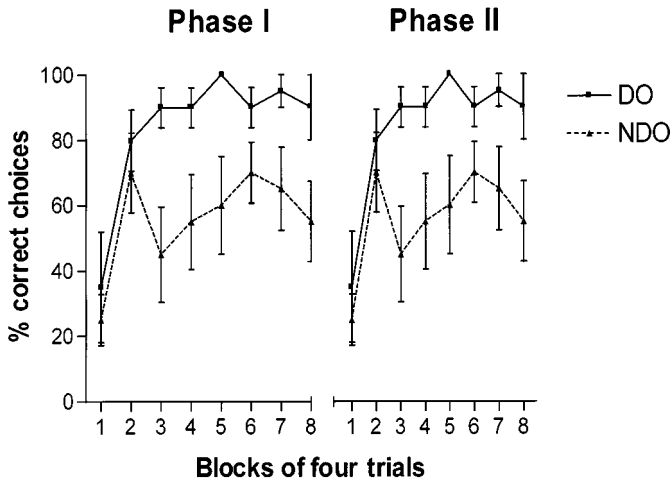

FIG. 7. Mean percentages of correct choice responses as a function of Blocks of 4 trials and Outcome. For conditional discrimination phases I and II in Experiment 2 DO is the differential outcomes, and NDO is the nondifferential outcomes.

as the within-subjects factor was performed on data from the conditional discrimination phase I (sex did not produce any significant difference and data from this factor were collapsed). The results revealed main effects of Outcome ($F(1, 8) = 10.55$) and Block ($F(7, 56) = 3.48$). Performance was better in the differential outcome condition and increased with blocks of trials in both phases. According with the results of the previous experiment, the interaction between Outcome and Block was significant ($F(7, 56) = 2.23$). As in the Experiment 1, the analysis of the interaction revealed that there was a main effect of Block only for children in the differential outcome condition ($F(7, 28) = 5.21$), and not for those in the nondifferential outcome condition ($F < 1$). The performance of the two groups of children in the first block of trials was the same ($F < 1$).

Data from conditional discrimination phase II were also analyzed. Results showed significant main effects of Outcome ($F(1, 8) = 8.92$) and Block of trials ($F(7, 56) = 6.67$). The Outcome × Block interaction was not significant ($p < .05$). As in phase I the difference in performance between the two groups in the first block of trials was not significant ($F < 1$).

Overall accuracy. To explore whether children in the differential outcome treatment exhibited greater terminal accuracy than those in the nondifferential outcome treatment, data from conditional discrimination phase II were analyzed through one-way ANOVA with Outcome as the between-subjects factor. Figure 8 shows the mean percentage of correct choices in this phase. Results showed that children in the differential outcome group performed significantly better than those in the nondifferential outcome group ($F(1, 8) = 9.15$).

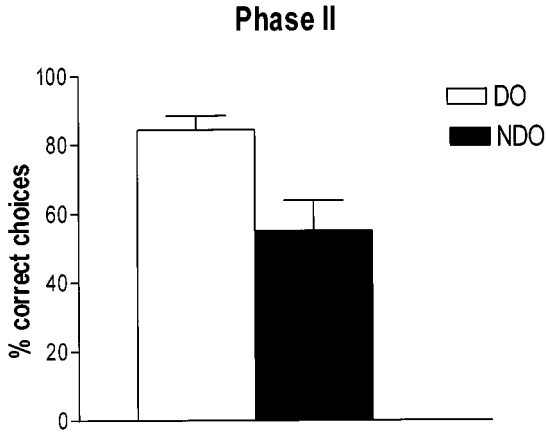

FIG. 8. Mean percentages of correct choice responses on conditional discrimination phase II in Experiment 2 as a function of Outcome (DO, differential outcomes; NDO, nondifferential outcomes).

Discussion

In this experiment we aimed to test the DOE with children from 7 years and 6 months to 8 years and 6 months using a more difficult task: a conditional discriminative task with 4 rather similar comparison stimuli. The results clearly showed that children receiving differential outcomes performed significantly better and learned the task faster than children receiving nondifferential outcomes. These data indicate that to obtain learning benefits from the DOE methodology we must consider the difficulty of the task being used.

GENERAL DISCUSSION

The present study was aimed at examining whether a differential outcome procedure had a facilitatory effect on the learning and performance of conditional relations by children ranged in age between 4 years and 6 months to 8 years and 6 months. This effect was studied in two experiments in which performance on a conditional discrimination task was compared under conditions of differential and nondifferential outcomes.

In Experiment 1 the results of primary interest indicated that children from 4 years and 6 months to 7 years and 6 months learned faster the conditional discrimination task and showed a higher terminal accuracy when differential outcomes were arranged. This result is consistent with a prior study reported by Maki et al. (1995), who found the DOE with children ranged in age between 4 years and 6 months to 5 years and 6 months. However, in our experiment, the results did not show the DOE in the oldest group of age, from 7 years and 6 months to 8 years and 6 months. One possibility was that the differential outcome procedure had a potential application only to early stages of development. Another possibility, however, was that the task used in Experiment 1 was very easy for these children. In Experiment 2 we increased the difficulty of the task and obtained the DOE with children from 7 years and 6 months to 8 years and 6 months. The present findings contribute to the existing literature by demonstrating that: (1) the DOE is a general effect which is not limited to early stages of development and (2) when a task is simple and subjects can easily solve it, there was no benefit of using the differential outcome procedure. The results obtained in these experiments strongly suggest that the DOE may be used as a useful instrument for teaching and training difficult discriminations to children.

One observation of some interest is that in both experiments, children in the differential outcome treatment learned the discrimination task faster than those in the nondifferential outcome only in the conditional discrimination phase I. This might be because the DOE only affects initial acquisition. In contrast, of more theoretical importance, it might be because the same correct choice alternatives and reinforcers were used in the two phases with only the sample stimuli changed. Thus, to master conditional discrimination phase II, the child had only to learn the new sample-reinforcer relation and then,

as Maki et al. (1995) and Kruse and Overmier (1982) suggest, the sample elicited expectation of the outcome can control the choice through the expectation–comparison association already established in the conditional discrimination phase I. This could account for the almost instantaneous mastery of the conditional discrimination phase II in Experiment 1, because the sample-outcome association is a simple Pavlovian-like association. This issue is currently a matter of further research.

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