PREFERENCE FOR DELAYED REWARD AS A FUNCTION OF LENGTH OF DELAY INTERVAL IN PRESCHOOL CHILDREN

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ABSTRACT OF THESIS

This investigation was concerned with the preference behavior of preschool children in choosing between a delayed-larger (DelR) and an immediate-smaller (ImR) reward. Different lengths of delay interval were used. It was proposed that by using delay intervals which were made more meaningful to younger children, a significant negative relationship between preference for delayed reward and length of delay interval, an effect previously found only with older children, could be obtained. It was also proposed, in a second hypothesis, that Ss who chose an ImR would spend less time in making their choice than those who chose DelR.

The second hypothesis was confirmed, supporting theories of thinking and abnormal behavior which have suggested that Ss who cannot delay gratification are more impulsive and less evaluative in a choice situation than Ss who are able to delay. The results failed to confirm the first hypothesis. However, a consistent, although not significant, decrease in the proportion of delayed reward preferences with increasing delay interval was suggested. It was proposed that by using a more sensitive measure, the desired significant relationship could be obtained.

It was concluded that future delayed reward studies with young children should consider the importance of ensuring that all Ss fully understand the concepts involved. It was further concluded that willingness to delay for gratification, rather than predominantly being determined by age, is the product of a complex interaction of reinforcements, delay intervals, personality variables, and perhaps cultural factors.

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CHAPTER I

INTRODUCTION

Several studies (Mischel, 1958; Melikian, 1959; Mischel, 1961; Mischel and Metzner, 1962; Mischel and Staub, 1965; Mischel and Liebert, 1966) have been reported in which delay of reinforcement, a variable characteristically studied with animals, has proved extremely profitable in accounting for differences in human personalities. However, in these studies, delayed reward is not defined in terms of the conventional operational definition, i.e. as the length of the interval between response and presentation of reinforcement, but as the length of one of several intervals preferred with regard to a verbally described or visually presented reinforcement in an actual choice situation.

In this type of study individuals are presented with a choice between a delayed or an immediate reinforcement. As with rats, it has been found that children preferred and responded faster to immediate rewards than to delayed rewards of the same magnitude (Lipsitt and Castaneda, 1958; Lipsitt, Castaneda, and Kemble, 1959). Irwin, Armitt, and Simon (1943) in a study of the effects of temporal proximity upon children's preferences for objects, found that Ss 4 to 9 years of age tended to prefer an object they were to receive immediately over one to be received after a period of time. A later study, (Irwin, Orchinik, and Weiss, 1950), using college students, indicated that a majority of Ss stated a preference for an immediate reward over a delayed reward of a similar value (reprints of famous paintings). In these studies, it appears that the immediate reward is more desirable than the delayed reward of the same magnitude, as suggested by the consistent preference for the former.

The principal concern with personality variables is associated with

preference and subsequent choice of an immediate as opposed to a delayed reward in which the delayed reward is always of greater magnitude than the immediate. Thus, in a choice situation between an immediate-small and a delayed-larger reward, S may benefit by delaying for the larger reward, whereas in conventional preference studies both rewards are of the same magnitude. Evidence has been presented (Mischel, 1962) suggesting that preference for delayed-larger reward may be an acquired behavior that changes with age and with experiences with reinforcing agents.

Mowrer and Ullman (1945) were among the first to give attention to the relevance of delayed reward to abnormal behavior by stressing its importance for neurotic and criminal behavior. Willingness to delay gratification occupies a central role in theories on child development (e.g. Freud, 1959; Rapaport, 1950; Singer, 1955). The importance of delayed reward experiences in their influence on behavior is stressed by Walter Mischel (1958):

> "One may assume that expectancies for reinforcement to follow from certain social agents, in spite of time delay, are learned in a manner fundamentally similar to the learning of any social behaviors, and are governed by similar principles of generalization. It seems probable, then, that a child's expectancies that a delayed reinforcement will issue from new adult social agents are related to his past experiences in which promised reinforcement followed delay from such major adult sources of learning as the parental figures in the home." (Pp. 57-58)

A recent series of studies on preference for delayed reinforcement has been conducted by Mischel (1958; 1961a; 1961b; 1961c; Mischel and Metzner, 1962; Mischel and Staub, 1965; Mischel and Liebert, 1966). Children were provided with a choice between an immediate-small (ImR) or a delayed-larger (DelR) reward. Willingness to delay for the larger gratification was regarded as a sign of maturity and reality contact, while preference for immediate-smaller gratification was interpreted as indicative of a more self-indulgent, impulsive, and immature personality. Mischel (1961c) has found preference

for delayed reward to be positively related to social responsibility.

Mischel and Metzner (1962) have also found willingness to delay gratification to be associated with age and intelligence. The study dealing with age is based on an interpretation of preference for delayed reinforcement as a learned behavior, which is in part, a function of the expectancy that promised reinforcement will issue from the social agent in spite of time delay. With increasing age, the potentiality for developing a strong expectancy of this kind increases if the individual continues to gain reinforcing experiences in this area. Willingness to delay gratification develops, therefore, as a function not of aging per se, but of the building of relevant expectancies.

The same study (Mischel and Metzner, 1962) indicated that willingness to delay gratification was positively related to intelligence. Intelligence scores based on the Lorge-Thorndike and Pintner General Ability Tests showed that the mean I.Qs. of children choosing DelR were significantly higher than those of children choosing ImR. Melikian (1959) obtained similar results. However, in Melikian's study a relation to age different from that of Mischel and Metzner was found. Using children from the Boston area, Mischel and Metzner found that the age at which the change from a majority of ImR choices to DelR choices was 8.5-9 years, whereas in Melikian's study, using children from Palestine, the crucial age was 6 years. While cultural differences might account for this discrepancy, the specific reinforcements employed may be an even more important factor. Mischel and Metzner used candies whereas Melikian used monetary rewards.

It would seem that differences in studies using a choice between an ImR and a DelR are markedly influenced by the effectiveness of various reinforcements at various ages, rather than some personality characteristic of

"ability" to delay. In regard to the "critical age" at which differences in the performance of Ss occur, Mischel and Metzner (1962) state:

> "One might expect that the "critical age" could be located at any desired point on the age scale by appropriate manipulation of reinforcement values." (P. 430)

Without the use of standardized reinforcement values, the statement that willingness to delay gratification is a function of age, is to say the least, rather misleading. Thus, it would seem that research in this type of delayed reward might fruitfully turn to the investigation of methodology, particularly with respect to reinforcements.

Another aspect of the study of Mischel and Metzner was the investigation of preference for delayed reward as a function of length of delay interval. They found that preference for delayed reward was negatively related to delay interval length. Elementary school children ranging in age from 5 to 12 years were used with five different lengths of delay interval (1 day, 5 days, 1 week, 2 weeks, and 5 weeks). However, there was some evidence that the effect of the delay intervals of different lengths was observed only in those Ss above the age of 8.5-9 years. Mischel and Metzner suggested that for younger children (below the age of 9 years), the different lengths of time were meaningless and only the "now-later" contrast was relevant, i.e. for children below the age of 9 years the different lengths of the delay intervals were not a significant factor in determining whether or not the child chose an immediate-small or a delayed-larger reward. All of the delay intervals, it would seem, had the same meaning of merely being "later". Thus, since children below the age of 9 years apparently did not alter their choices with increases in the length of delay intervals, the negative relationship between preference for delayed reward and the length of the delay interval was not found.

Rationale and Statement of the Problem

Mischel and Metzner doubt that 9 years is a "critical age" at which the performance of Ss in a choice situation shows major changes. Melikian, for example, found the ciritical age to be 6 years. It is suggested by Mischel and Metzner that different pairs of reinforcements would probably yield different cutting points, even though the overall trend might remain the same. Thus, the manipulation of reinforcement values may change the "critical age" at which the preponderance of delayed reinforcement choices appear; however, the effect of delay intervals of varying lengths would remain the same regardless of the reinforcements used. If the intervals of different lengths proved meaningless to a group of children, their effect would remain negligible regardless of the reinforcements employed.

It appears that the meaningfulness of the delay intervals is the critical factor in determining the age at which the negative relationship between preference for delayed reward and length of delay interval occurs, just as the values of the reinforcements appears to be the critical factor in determining at which age a preponderance of delayed reward preferences occurs. It is therefore hypothesized that delay intervals made more meaningful to younger children (5 years old) will produce a significant negative relationship between preference for delayed reward and length of delay interval, similar to that noted with children above the age of 8.5-9 years.

The second hypothesis concerns the relation of certain personality traits to preference behavior. While a faster response time to immediate than to delayed rewards has been demonstrated for both rats and children, no studies have examined differences in decision time between the choice of immediate-small and delayed-larger rewards. Rapaport (1950), in his theory

of thinking, notes that learning to delay is intimately bound up with learning to think, i.e. the use of "cognitive reality testing" replaces the use of "uncontrolled motor discharges" in the attainment of needs. It therefore follows that a child who cannot delay immediate gratification will demonstrate the use of these uncontrolled motor responses in the attainment of gratification, while a child who is able to delay for gratification will demonstrate the use of thinking or reality testing in making his choice of reinforcements. According to Mowrer (1950), children who are better able to delay are also better able to...

> "...bring the remote as well as the immediate consequences of a contemplated action into the psychological present and thereby compare and balance the probable (anticipated) rewards and punishments." (P. 454)

In making his choice between an immediate-small and a delayed-larger reward, the more impulsive child will not spend the time in evaluating the situation as will the child who is less impulsive and, therefore, more willing to delay for the larger gratification. It is therefore hypothesized that children who prefer a larger-delayed reward over a smaller-immediate one in a choice situation, will spend more time in making their choice than the more impulsive child who cannot delay for the larger reward.

CHAPTER II

METHOD

Subjects (Ss)

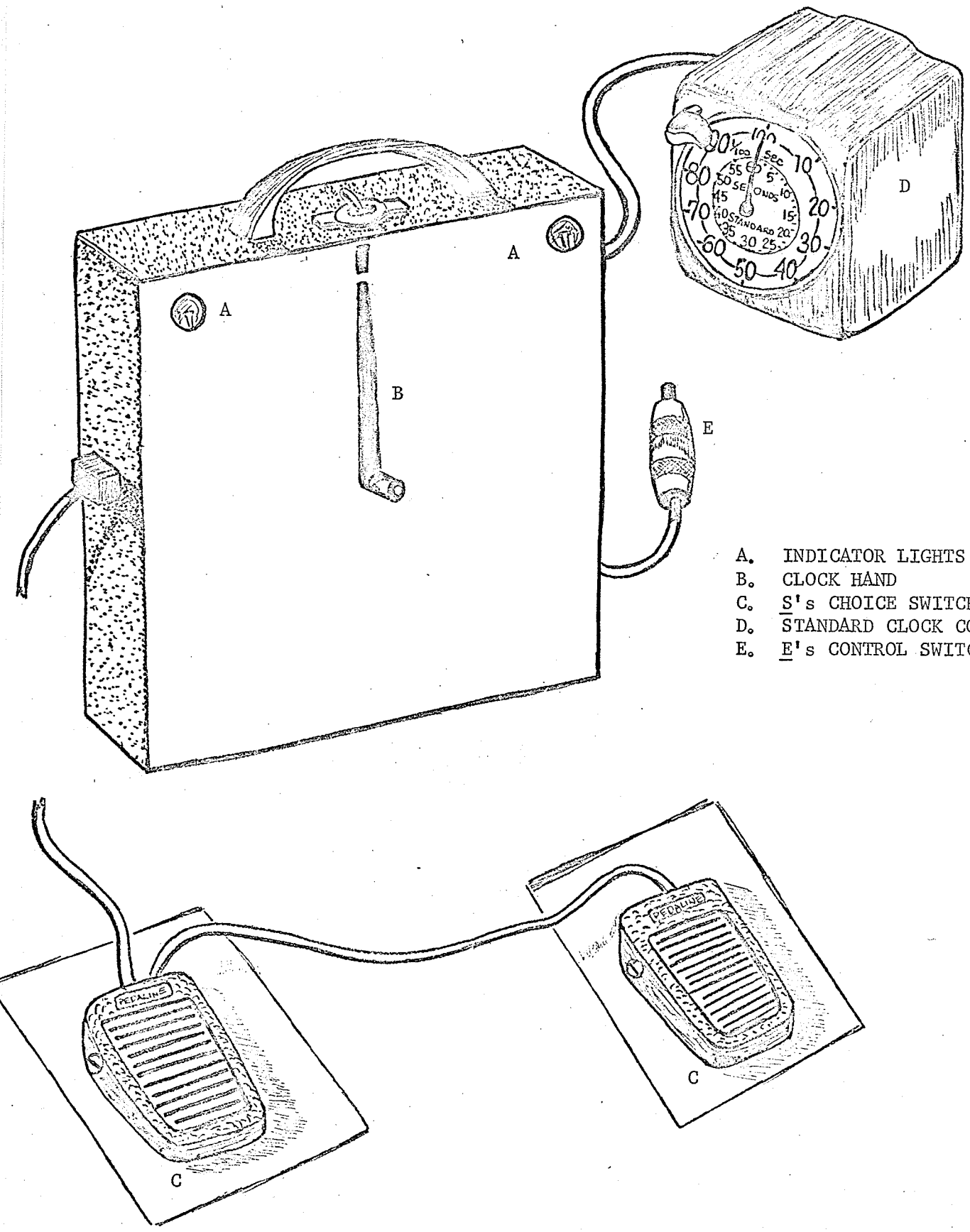
Sixty kindergarten children, 36 females and 24 males ranging in age from 4.2 to 5.8 years with a mean age of 5.2 years, from predominantly middle-class backgrounds, served as Ss. The Ss were pupils in two private kindergarten classes in the Greater Winnipeg area, thirty Ss coming from each kindergarten.

Apparatus

The apparatus consisted of a modified Universal timer 8½ by 8½ by 3 in. (Fig. 1). The face of the timer was blank (aluminum in colour) with a single black mark at the 12 o'clock position. The timer had one hand 3 3/4 in. in length, driven by a 1 r.p.m. electric motor. Holes (½ in. in diameter) in each of the upper corners of the clock face, illuminated from behind by 117-v. pilot lamps, served as indicator lights. The response elements, two Pedaline foot switches (one red and one black) 3 in. apart, were situated approximately 9 in. in front of the apparatus. An electric buzzer, connected to one of the response elements, enabled E to determine which of the switches (S's reward choice) was pressed. On any given trial both stimulus lights and a Standard Electric timer, situated to the back of the apparatus, were activated simultaneously by E by means of a remote switch. Depression of either of the response elements by S broke the circuit to the Standard Electric timer.

Rewards and Conditions

Rewards used in the choice situation were "Smarties", small pellets of chocolate with candy coatings of various colours. The magnitude of these rewards, selected on the basis of pretesting, were 5 Smarties immediately



A. INDICATOR LIGHTS
B. CLOCK HAND
C. S's CHOICE SWITCHES
D. STANDARD CLOCK COUNTER
E. E's CONTROL SWITCH

Fig. 1. The choice apparatus.

(ImR) or 10 Smarties later (DelR), i.e., each S was allowed to choose between a small-immediate reward or a delayed-larger one which would be received after the S had waited the required period of time (delay interval). Ss were allowed to keep the reward which they chose. If S decided upon an ImR, he was given 5 Smarties in an envelope, immediately upon making the decision. If S decided upon a DelR, he was required to wait a period of time. When E indicated that the waiting time had elapsed, the child was given 10 Smarties in an envelope. Ss were told that the rewards were theirs to keep and could take them with them or leave them on the teacher's desk until time of dismissal.

The length of the delay interval was varied by using three different delay periods, i.e. 5, 10, and 15 rotations of the clock hand. While each rotation was equal to 60 seconds, the delay intervals were presented to the children as rotations of the clock hand rather than as minutes. The sixty kindergarten children were randomly assigned to each of the three conditions, as they appeared for testing. Thus, twenty Ss were assigned to each experimental condition. Ss' responses to the choice situation between the ImR and DelR were examined under these three conditions. In addition, length of decision time was recorded to the nearest one-hundredth of a second for each S's choice.

Procedure

All Ss were tested individually by the same E. Prior to the critical choice situation, a familiarization session was conducted to demonstrate the apparatus and general procedure. A further purpose of the familiarization session was a) to ensure that each S was able to distinguish different lengths of delay intervals, and b) to ensure that Ss would associate a larger reward with a longer length of delay interval. Marbles were demon-

strated as rewards rather than Smarties, since Ss were only shown the rewards in the familiarization session and not permitted to keep them.

Ss were met by E in a room adjacent to the kindergarten class, and were seated directly in front of the apparatus. S was told that he would take part in a "waiting game" in which the longer he waited the larger reward he would get. The detailed instructions for the familiarization session are presented in Appendix A. The apparatus was then demonstrated to S. Several delay intervals were demonstrated to S and each time the appropriate "reward" was shown. S was shown how to respond for a DelR and an ImR by pressing the appropriate response element. Several choice situations were then presented in which S was told to make both an ImR and DelR response. When the ImR choice was made the appropriate immediate "reward" was demonstrated. When the DelR choice was made S was required to wait the length of the delay interval and only then was the appropriate reward demonstrated. Following three such demonstrations, S was asked a series of questions concerning the procedure to ensure that he understood the concepts involved and in particular to determine if he understood the differences in lengths of delay intervals and the concept of delaying for a larger reward. The criterion for understanding was attained when S correctly answered all but one of nine questions. While it was intended to discard any Ss who did not meet the criterion, this was not necessary since all Ss sucessfully answered the nine questions. These questions may be found at the end of the familiarization instructions in Appendix A.

After the S successfully answered the questions, E then continued on to the critical testing procedure. S was told that another game was to be played, which differed from the first in that he would be allowed to retain the reward which he chose. The detailed instructions for this testing

procedure may be found in Appendix B. S was instructed that if he pressed one response element he would receive 5 Smarties immediately, and if he pressed the other response element he would receive 10 Smarties, but not immediately; he would have to wait the appropriate interval of time, 5, 10, or 15 rotations of the clock hand, before he would receive the delayed reward. All Ss were given one choice, i.e. tested once. To avoid the effects of a colour or position preference, half the Ss were instructed they would receive the ImR if they pressed the "red" key, and the DelR if they pressed the "black" key; the relationship was reversed for the other half of the Ss. In addition to preference for reward, length of decision time in making the choice was recorded for each S's choice by means of the Standard Electric timer. At the end of the procedure Ss were instructed to refrain from discussing the "game" with the other children as it was to be kept a "secret".

CHAPTER III

RESULTS

The primary dependent variable in this study was Ss' responses to a choice situation between an immediate-small (ImR) and a delayed-larger reward (DelR) at different lengths of delay intervals, i.e., 5, 10, or 15 rotations of the clock hand. The purpose of varying the length of the delay interval was to investigate its effect on the frequency of ImR and DelR choices. Twenty Ss were assigned to each delay interval condition, and each S was given one choice. The frequencies of ImR and DelR choices for each condition are presented in Table 1. The proportion of DelR and ImR choices at each delay interval are graphically represented in Figure 2. It was hypothesized that there would be a decrease in the frequencies of DelR choices with increases in the length of delay interval.

Since the experimental hypothesis suggested a negative relationship between the length of delay interval in receiving DelR and the willingness to delay gratification, a χ^2 test for association of DelR choices and length of delay interval was performed. The overall χ^2 gave a value of 2.946 which, with 2 degrees of freedom, was not significant. Subsequently the χ^2 for linear regression (Maxwell, 1961) of DelR choices on length of delay interval was partialed out of the overall χ^2, but this also failed to reach significance. These results are summarized in Table 2. Thus, the results were not consistent with the hypothesis. It should be noted, however, that there was a progressive decrease of DelR choices with increasing delay interval lengths. In addition, a goodness of fit test of the expectation of chance choice was performed on the overall preference of DelR as opposed to ImR. The results of this χ^2 were significant at the .01 level and it was concluded that there was a greater preference for DelR over ImR.

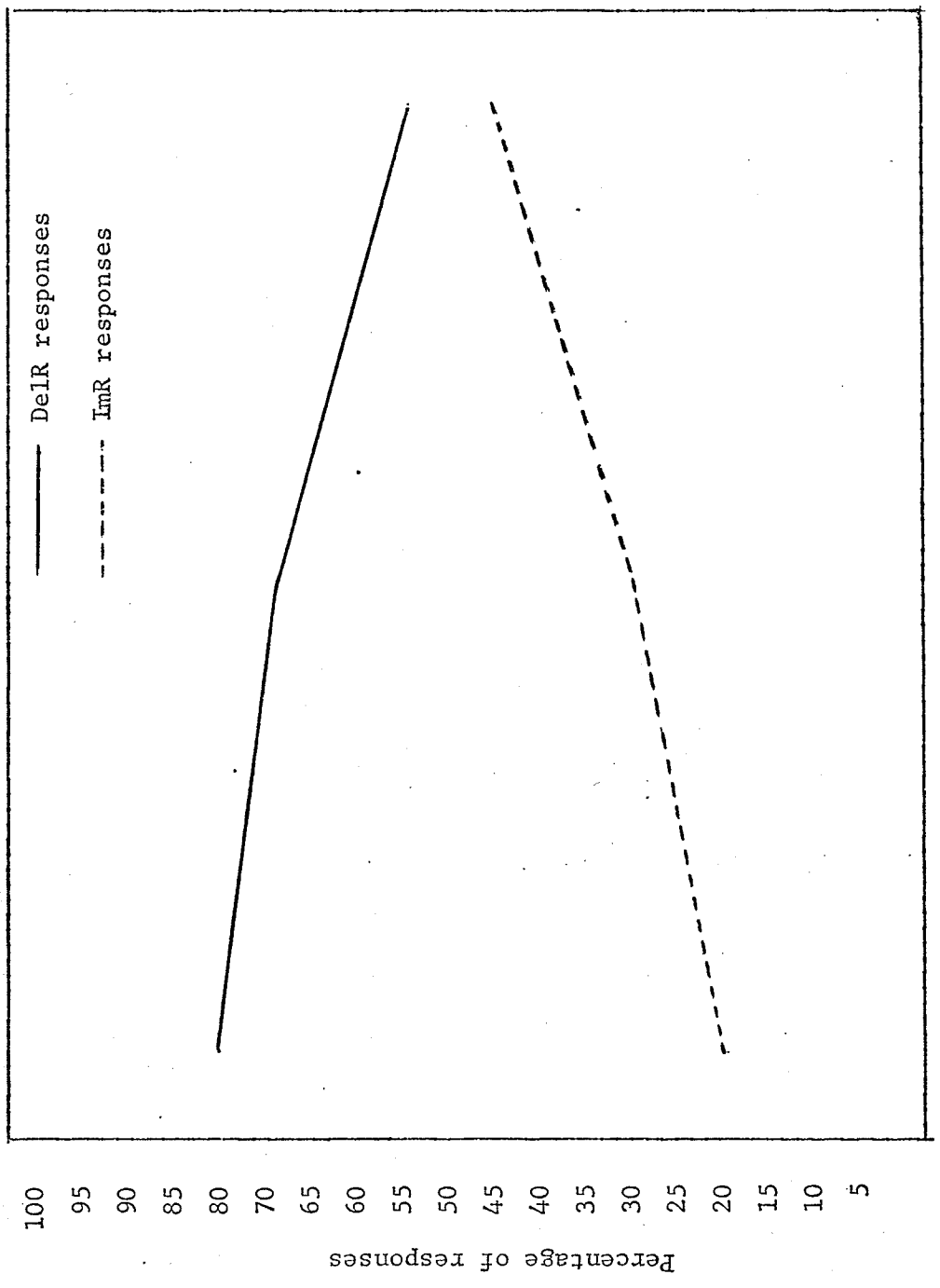


Fig. 2. A comparison of the percentage of DelR and ImR choices over the three delay intervals.

TABLE 1

Comparison of the Frequency of DelR and ImR Responses for Three Delay Intervals

Reward Condition	Length of Delay Interval in Rotations: 5	10	15
ImR	4	6	9
DelR	16	14	11

TABLE 2

Summary Table of χ^2 Analyses for a Negative Relationship between Preference for DelR and Length of Delay Interval

Source of variation	df	χ^2	p
Due to linear regression	1	2.87	N.S.
Departure from regression line by substraction	1	.076	N.S.
Overall value	2	2.946	N.S.

The second dependent variable in this study was length of decision time, to the nearest one-hundredth of a second, in making the DelR-ImR choice. The purpose of investigating the length of decision time was to determine if the latencies of those Ss who chose DelR are longer than those who chose ImR. Since the experimental hypothesis suggested a greater latency in decision time of those Ss choosing DelR than those choosing ImR, it was decided that a t-test would be run on decision times.

The means of decision times and the standard deviations of the two groups are summarized in Table 3. Decision times for the DelR were longer than those for ImR ($t=2.09$, $df=58$, $p<.05$), supporting the hypothesis.

TABLE 3

Means and Standard Deviations of Decision Times of ImR and DelR Ss in Seconds

	$\bar{X}$	SD
ImR	.895	.16
DelR	1.291	.23

Although there is no prior evidence to suggest that the specific length of the delay interval might effect the decision latency, i.e. that the longer delay interval might lead to a greater decision latency or vice versa, it was decided that the possibility of such an effect warranted at least a post hoc analysis. A summary of the mean decision times at each delay interval are presented in Table 4. There was no significant change in decision time with longer intervals ($F<1.00$).

TABLE 4

Mean Decision Times (sec.) of DelR vs. ImR Ss at Each Interval

Reward Condition	Length of Delay Intervals in Rotations: 5	10	15
ImR	.697	1.045	.883
DelR	1.568	1.080	1.155

CHAPTER IV

DISCUSSION

Although Mischel and Metzner found a significant negative relationship between preference for delayed reward and length of delay interval, this effect was found only in those Ss above the age of 9 years. They suggested that the different lengths of delay intervals employed in their study were not meaningful to the younger children who, therefore, did not respond differentially to them. In the present study, delay intervals employed were made more meaningful to children 5 years of age, and it was therefore hypothesized that a significant negative relationship would be obtained. The relationship was not significant although, it is interesting to note a possible tendency for the proportion of delayed reward responses to decrease with increases in the length of delay interval. Mischel and Metzner also found no consistent differentiation between the various time periods employed.

A possible explanation for the absence of a significant relationship in the present study is that the delay intervals employed were of such short duration that the contrast in their lengths was not great enough to produce the desired effect. Thus, the delay intervals may have appeared relatively similar. In addition, the contrast in the magnitudes of the immediate and delayed rewards may have been too great, i.e., 10 Smarties may have appeared disproportionately greater than 5 Smarties. It appears that the rewards may not have produced a sensitive enough discrimination of Ss to reveal a significant relationship. This is supported by the fact that a majority of Ss were willing to delay for the larger reward. It seems probable that by ascertaining the proper combination of delay intervals and reward magnitudes, the desired significant relationship could be attained.

The "critical age" at which the majority of Ss are willing to delay for

a larger reward in a choice situation requires further investigation in terms of the reinforcements employed. Mischel and Metzner have suggested that this age could be manipulated by varying the reinforcement values used in the choice situation. In the present study, the proportion of children accepting the delayed reward was significantly greater than those accepting immediate rewards. These children had a mean age of 5.2 years. In Melikian's study the crucial age at which the majority of Ss delayed was 6 years, while in Mischel and Metzner's study the age was 8.5 - 9 years. Thus, it is doubtful that there is a "critical age" at which the majority of Ss are willing to delay for the larger reward. The present results suggest that the reinforcements employed in future delayed reward studies be standardized so that investigation of variables involved in a choice situation would be more readily compared.

The personality traits of the individual appear to be an integral variable in a choice situation. In the investigation of the personality traits associated with the choice of a delayed-larger over an immediate-smaller reward, the present study found that those Ss who preferred the delayed reward spent a significantly greater period of time in making their choice than Ss who chose the immediate reward. These results are compatible with Rapaport's (1950) theory of thinking which suggests that Ss who cannot delay for gratification display the use of uncontrolled motor responses (impulsivity) in the attainment of needs, while those who delay, demonstrate the use of reality testing or thinking. In addition, these results are consistent with Mowrer's (1950) view that individuals delaying rewards are better able to compare and evaluate the remote as well as the immediate consequences of a contemplated action.

In addition to personality variables, cultural differences may be an

important variable in delay of reward studies. Mischel (1958) has pointed out the importance of experiences with reinforcing agents in determining how an individual will react in a choice situation. It is interesting to note that in the present study two groups of children, a predominantly Jewish and a non-Jewish group, served as Ss. There was a tendency for the Jewish children to show greater DelR frequencies than the non-Jews. There are virtually no investigations which have examined this cultural variable, and further consideration might prove valuable for a better understanding of this type of behavior.

A crucial methodological problem in delayed reward studies with young children is concerned with the question of whether instructions and concepts used are meaningful for them. The observation that preference for delayed reward was positively related to age may have been partially due to younger children not fully understanding the instructions, or not appreciating the concept of delaying for a larger reward, or perhaps not comprehending the delay interval. Future studies of this nature might employ some means of ensuring that all Ss fully comprehend the procedure and concepts involved.

In summary, it might be proposed that there are many variables involved in a choice between an immediate-small and a delayed-larger reward, and that it is misleading to conclude that one particular variable such as age, for example, is alone responsible for the behavior. It is suggested that future studies attempt to investigate these many variables and determine their relative influence on the complex process of delaying for gratification.

CHAPTER V

SUMMARY AND CONCLUSIONS

This investigation was concerned with the preference behavior of preschool children in choosing between a delayed-larger (DelR) and an immediate-smaller (ImR) reward. Different lengths of delay interval were used. The only previous study of this nature found a significant negative relationship between preference for delayed reward and length of delay interval; however, this effect was found only in Ss above the age of 9 years. It was suggested that a probable explanation for a lack of relationship with younger children was that the delay intervals used in the study were meaningless to them. The present study proposed that by using delay intervals which were made more meaningful to younger children, a significant negative relationship between preference for delayed reward and length of delay interval could be obtained.

The second hypothesis was confirmed, indicating that Ss choosing ImR responded more quickly than those who chose DelR. Theories of thinking and abnormal behavior have suggested that Ss who cannot delay for a larger gratification are more impulsive, and less evaluative in a choice situation than Ss who are able to delay. It was proposed in the second hypothesis, therefore, that Ss who choose immediate rewards would spend less time in making their choice than Ss choosing the delayed reward.

Through the use of a familiarization session preceding the choice situation, the present study ensured that delay intervals were made more meaningful to Ss, and that they fully comprehended the concepts involved in the choice situation. All Ss were required to answer a series of "criterion" questions in order to qualify for the critical choice situation. Delay intervals were defined in terms of rotations of a clock hand. In the

present study three delay intervals (5, 10, and 15 rotations of the clock hand) were used in a choice situation involving an ImR and a DelR. Candies were used as rewards for all conditions. Ss ranged in age from 4.2 - 5.8 years, with a mean age of 5.2 years.

The results failed to confirm the first hypothesis in that a significant negative relationship between preference for delayed reward and length of delay interval was not found in young children, even though the delay intervals were made meaningful to these children. However, a consistent decrease in the proportion of delayed reward preferences with increasing delay interval was suggested. It was therefore proposed that by using a more sensitive measure, the desired significant negative relationship could be obtained.

It was concluded that future delayed reward studies with young children should consider the importance of ensuring that all Ss fully understand the concepts involved. It was suggested that future studies turn to the investigation of methodology, particularly with respect to standardizing reinforcements. It was further concluded that willingness to delay for gratification, rather than predominantly being determined by age, is the product of a complex interaction of reinforcements, delay intervals, personality variables, and perhaps cultural factors. It is felt that through the exploration of these many variables, a better understanding of this phenomenon would be obtained.

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APPENDIX A

Familiarization Instructions

and Criterion Questions

"Please sit down. (S was seated directly in front of the apparatus.) We are going to play a waiting game. In this game the longer you wait the bigger prize you would get. Now, do you see this (E indicates apparatus) -- it is like a clock with one hand. I want you to watch carefully as the hand goes around from this point (E indicates point at the 12 o'clock position) goes all around the clock, and comes back to this point again. I want you to see how long it takes for the hand to go around one time. (E then turns on clock and waits for one rotation of the hand) See how long it takes for the hand to go around one time.

"In this game if you would wait for the hand to go around 1 time I would give you 5 marbles (E indicates marbles). If you would wait for the hand to go around 2 times I would give you 10 marbles (E indicates marbles). If you would wait for the hand to go around 3 times I would give you 15 marbles (E indicates marbles). Do you see? -- in this game the longer you would wait the more marbles you would get!

"Now, let's play a game with these marbles. See these two switches -- there is a red one and a black one (E indicates the two foot switches situated directly in front of S). If you press the red switch (E indicates red switch) you would get 2 marbles right away (E indicates marbles). If you press the black switch (E indicates black switch) you would get 5 marbles (E indicates marbles), but you would not get them right away -- you would have to wait to get them, and you would have to wait as long as it would take for the hand on the clock to go around 1 time. Let's play the game. Press the red switch (E waits for S to press the red switch) -- see I would give you these 2 marbles (E indicates marbles) if you would press the red switch, and you

APPENDIX B

would get them as soon as you press the switch. Now, press the black switch -- see you would get 5 marbles if you press the black switch, (E indicates marbles and waits for S to press the black switch) -- but you would not get them right away -- you would have to wait as long as it would take for the hand on the clock to go around 1 time. (E demonstrates 1 rotation of the clock hand and then indicates 5 marbles). See, you would get 2 marbles right away if you would have pressed the red switch, and 5 marbles after the hand had gone around 1 time if you pressed the black switch.

"Now let's play the game a little differently. This time if you press the red switch you would get 2 marbles (E indicates marbles) right away, but if you would press the black switch you would get 10 marbles (E indicates marbles) but you would not get them right away -- you would have to wait as long as it would take for the hand on the clock to go around 2 times. Let's try it -- first press the red switch (E waits for S to press the red switch) see you would get these 2 marbles right away (E indicates marbles). Now, press the black switch -- you would get 10 marbles if you press the black switch (E indicates 10 marbles) but you would not get them right away -- you would have to wait as long as it would take for the hand to go around 2 times before you would get the marbles (E demonstrates 2 rotations of the clock hand). Now that you have waited for the hand to go around 2 times you would get the 10 marbles (E indicates marbles).

"If you would wait for the clock hand to go around 3 times you would get 15 marbles (E indicates marbles).

"Do you see how this game works? If you would have waited for the hand to go around 1 time you would get 5 marbles (E indicates marbles). If you would have waited for the hand to go around 2 times you would get 10 marbles (E indicates marbles) -- and if you would wait for the hand to go around 3 times

you would get 15 marbles (E indicates marbles). But if you did not wait you would have only gotten 2 marbles (E indicates marbles). If you would have pressed the black switch it meant you would have waited -- if you had pressed the red switch it meant you would have not waited. The longer you would wait the more marbles you would get.

"Now I am going to ask you some questions about the game we just played. i) would you get more marbles if you would wait for the clock hand to go around 1 time or 3 times... ii) 2 times or 1 time...iii) 3 times or 2 times... iv) which is a longer time to wait -- for the clock hand to go around 1 time or 3 times... v) 2 times or 3 times ... vi) 2 times or 1 time... vii) do you see these two piles of marbles? -- which pile would you have to wait longer for -- (E indicates) 5 marbles and 15 marbles... viii) 5 marbles and 10 marbles...ix) 10 marbles and 15 marbles."

Critical Choice Instructions

"Now I am going to show you another game. It is different from the first game we played because this time you are going to keep the prize. I want you to watch the clock hand carefully -- we are going to see how long it takes for the hand to go around 1 time. (E demonstrates 1 rotation of the clock hand) See how long it takes for the clock hand to go around 1 time.

"Now we are going to play the game for real. As a prize for playing the game you are going to get some Smarties. In this game you will get more Smarties if you wait than if you do not wait. Now you remember how long it took for the clock hand to go around 1 time -- if you will wait as long as it takes for the hand to go around X times, I will give you 10 Smarties, but if you don't want to wait you will get 5 Smarties right away. Do you see, if you decide to wait you will get more Smarties. When you see these lights come on (E indicates lights on clock face), I want you to press one of these switches -- the black one or the red one. If you press the red switch (E indicates the red switch and presses it) it means you will get 5 Smarties right away (E indicates 5 Smarties) -- but if you press the black switch (E indicates black switch and presses it) you will get 10 Smarties (E indicates 10 Smarties), but you won't get them right away -- you will have to wait as long as it takes for the hand on the clock to go around X times before you get them. Do you understand? Now, as soon as these lights come on I want you to press the switch that you have chosen. Remember, if you press the red switch (E indicates switch) you will get 5 Smarties right away (E indicates 5 Smarties) but if you press the black switch (E indicates switch) you will get 10 Smarties (E indicates 10 Smarties) -- but you won't get them right away -- you will have to wait as long as it takes for the hand on the clock to go around X times before you get them. You remember how long it

took for the hand to go around 1 time -- this time you will have to wait as long as it takes for the hand to go around X times. Now, watch the lights carefully, and place your hand here. (S rests his hand on the table at a point equidistant from both switches) When the lights come on I want you to press the switch you have decided on." (E then turns on indicator lights and Standard chronometer simultaneously, and S responds.)