Developmental Psychology
1990, Vol. 26, No. 6, 978-986

0012-1649/90/$00.75

Predicting Adolescent Cognitive and Self-Regulatory Competencies From Preschool Delay of Gratification: Identifying Diagnostic Conditions

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Variations of the self-imposed delay-of-gratification situation in preschool were compared to determine when individual differences in this situation may predict aspects of cognitive and self-regulatory competence and coping in adolescence. Preschool children from a university community participated in experiments that varied features of the self-imposed delay situation. Experimental analyses of the cognitive–attentional processes that affect waiting in this situation helped identify conditions in which delay behavior would be most likely to reflect relevant cognitive and attentional competencies. As hypothesized, in those conditions, coherent patterns of statistically significant correlations were found between seconds of delay time in such conditions in preschool and cognitive and academic competence and ability to cope with frustration and stress in adolescence.

To be able to delay immediate satisfaction for the sake of future consequences has long been considered an essential achievement of human development. After a series of investigations into the individual differences associated with the choice to delay gratification (e.g., Klineberg, 1968; Mischel, 1958, 1961a, 1961b, 1966; Mischel & Metzner, 1962; Schack & Massari, 1973; Walls & Smith, 1970), research turned to the processes underlying the ability to sustain self-imposed delay of gratification after the initial choice has been made (e.g., Mischel, 1974, 1981; Toner & Smith, 1977). In a recent follow-up study, preschool children who delayed gratification longer in the self-imposed delay paradigm (e.g., Mischel, Ebbesen, & Zeiss, 1972) were described more than 10 years later by their parents as adolescents who were significantly more competent (Mischel, Shoda, & Peake, 1988). Specifically, when these children became adolescents, their parents rated them as more academically and socially competent, verbally fluent, rational, attentive, planful, and able to deal well with frustration and stress. The study suggested that long-term prediction may be possible from the self-imposed delay paradigm, adding to a growing tradition of research devoted to the identification of stability and coherence throughout development (e.g., Block, 1971; Caspi, Elder, & Bem, 1987; Erickson, Sroufe, & Egeland, 1985; Kagan & Moss, 1962). However, the small sample size required combining the different experimental situations in which delay behavior was measured. Therefore, it was not possible to compare major variations of the self-imposed delay situation to examine the characteristics that might render it more or less predictive of the obtained long-term outcomes. The present study is an effort to overcome this constraint.

In the present study, we attempted to identify the particular psychological conditions in which children's delay of gratification behavior is more likely to predict relevant individual differences in developmental outcomes. The identification of these conditions, which may be considered "diagnostic" (Quattrone & Tversky, 1984; Tversky & Hutchinson, 1986), is derived directly from the theoretical and experimental analyses of the cognitive–attentional processes that enable the young child to delay (e.g., Mischel, 1974, 1981, 1984). For this reason, we supplemented the original follow-up sample with a second, larger wave of outcome data collected about 3 years later, and thereby almost doubled the available number of respondents. The new follow-up wave also added expanded rating measures of both cognitive and coping competence, as well as Scholastic Aptitude Test (SAT) scores. These new data allowed us to compare long-term correlates of delay behavior in the major variations of the Mischel et al. (1972) self-imposed delay situations.

An important variation in the original preschool delay situations was whether or not the reward objects were more salient (i.e., exposed vs. obscured) during the delay period. In an extensive series of experiments (Mischel, 1974, 1981) to clarify the basic processes allowing young children to delay gratification, it was found that for children at this age (about 4.5 years old), physically exposing the rewards appears to increase the tendency to have arousing, consumatory thoughts about them.

Preparation of this article and the research were supported in part by Grants MH45994 and MH39349 to Walter Mischel from the National Institute of Mental Health.

We are grateful to Antonette Zeiss for her role in facilitating the follow-up mailing for this study and in compiling and preparing the experimental data for computer analysis; without her generous help, this research would have been much more difficult to conduct. We would also like to acknowledge the essential contributions of the former students of Walter Mischel, who were crucial in conducting the original experiments in which children's preschool delay time was assessed. Finally, we thank the children, parents, and staff of the Bing School, who were both subjects and friends. Without all of these participants, this longitudinal study would not have been possible.

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This tendency could be overcome, however, when children used effective cognitive strategies during the delay period, for example, by distracting themselves from the arousing qualities of the rewards or by transforming them cognitively (e.g., Mischel & Baker, 1975; Mischel & Moore, 1980). Furthermore, although these strategies were suggested as manipulations in the experiments, they also seemed to be used spontaneously by children who delayed longer.

Thus, when the rewards were exposed, preschoolers tended to wait longer when they were given effective strategies, or when they generated their own, for reducing the arousal while sustaining their goal-directed delay. Such strategies seemed to involve "a combination of avoiding excessive frustration by not focusing on the actual rewards or by transforming them to minimize motivational arousal, and attending instead to the symbolic representation of the outcomes" (Mischel, 1974, p. 288). Therefore, when preschoolers were not given these strategies, their behavior in the exposed-rewards situation should have more readily reflected any naturally occurring individual differences in their spontaneous use of such strategies. To the degree that individual differences in the child's ability to generate effective cognitive–attentional strategies to cope with delay of gratification are enduring and have consequences for facilitating adaptation, we expected children's preschool delay time measured with the rewards exposed to predict later outcomes and indices of cognitive and social competence relevant to this ability. On the basis of the experimental analysis and the results from the first follow-up, we expected these outcomes to include such qualities as attentional–cognitive resourcefulness and flexibility and, more generally, academic competencies, as well as more effective, mature coping with frustration and stress (see Mischel et al., 1988).

In comparison with the exposed-rewards condition, when the rewards were obscured, no special strategies seemed to be required for preschoolers to delay (e.g., Mischel, 1974). For example, instructions to "think fun" and to self-distract did not significantly increase delay time when the rewards were already obscured, indicating that children in this condition were able to spontaneously wait without such help (Mischel et al., 1972). We therefore reasoned that children's delay behavior in this situation would be less related to their ability to generate effective strategies for coping with the conflict because the situation did not demand such ability. Observed variance in delay behavior, which was still substantial, might then reflect specific motivational or other situational considerations (e.g., how much they wanted the particular objects) rather than their ability to generate strategies for sustaining self-imposed delay. This expectation is consistent with the view that individual differences in strategies for coping with frustration or stress may be especially visible in situations that strain the coping competencies of the individuals in them (Wright & Mischel, 1987). It is also consistent with a research strategy that has begun to show considerable value in attachment research: Early behavioral antecedents seem more predictive when they are assessed in situations that tax the coping skills of the individual (Ainsworth, 1979; Waters & Sroufe, 1983).

So far, we have considered the diagnosticity of delay behavior when children had to rely on their own coping strategies. The available data also include conditions in which various strategies and self-instructions had been suggested to the children to use during the waiting period (e.g., Mischel & Baker, 1975). In those conditions, children's behavior reflected not just their own spontaneous coping with delay but also their reactions to the suggested strategies—strategies that sometimes were helpful for delay but that sometimes made delay more difficult. For example, when the experimenter suggested an effective strategy (e.g., to self-distract by "thinking fun" while waiting, as in Mischel et al., 1972), children who followed the instruction should have been able to wait even if they had not spontaneously distracted themselves. In contrast, when poor strategies (e.g., to think about rewards) were suggested, children were exposed to a potentially confusing set of strategies (e.g., following the experimenter-suggested strategies vs. those they spontaneously thought would be helpful, such as self-distraction). Thus, their delay time should be less clearly reflective of the ability to generate effective strategies. However, complex and unpredictable interactions may occur between the children's own spontaneous delay strategies and the particular type of strategies suggested to them, making it difficult to predict the potential meaning of the child's delay behavior in those conditions. Our theoretical predictions of greater diagnosticity therefore focused primarily on comparisons between conditions in which the rewards were exposed versus obscured, with no ideation suggested to the children (i.e., their strategies were entirely spontaneous). For the sake of completeness, however, the data for conditions in which strategies were suggested will also be presented.

Method

Overview

Preschool children's delay of gratification behavior was assessed during a period of approximately 6 years (1968–1974) in a series of experiments conducted at the Bing School at Stanford University (e.g., Mischel & Ebbesen, 1970; Mischel, et al., 1972). In those studies, a total of 653 children (316 boys, 337 girls) participated in at least one experiment. About 10 years later (1981–1982), a short questionnaire concerning the coping and cognitive competence of the children and the California Child Q-set (CCQ) were mailed to the 125 parents whose addresses could be located, yielding 95 respondents (see Mischel et al., 1988). To expand the sample of respondents, a second follow-up based on a more extensive address search was conducted in 1984. In the second mailing, all parents were sent a new expanded questionnaire about coping and competence (the Adolescent Coping Questionnaire; ACQ) and a biographical information sheet on which they indicated their children's SAT scores. The CCQs were also sent to those who either did not respond to the previous mailing or did not receive the mailing because their addresses were not available at that time. Materials were mailed to parents of 506 subjects. This yielded responses from parents of 90 subjects whose data were not available in the first-wave follow-up, as well as additional data from the parents who had responded in the first mailing. As a result, the sample for which CCQ was available increased from 67 to 165, and we obtained parental ratings on the new 14-item ACQ for 134 children, as well as reports of 94 children's SAT scores. Together with the first-wave mailing, a sample of 185 children was now available on whom there was at least one follow-up measure.[1]

[1] Of the 653 original subjects, 103 were not tested in a standard self-imposed delay situation and therefore were not used. Of the remaining 550, no address was known for 114, and follow-up materials were re-

Subjects

The subjects of the present study were the 185 children (103 girls, 82 boys) whose preschool delay behavior was observed in a standard self-imposed delay situation as described below and whose parent(s) returned any of the follow-up measures in either of the two waves of follow-up assessments. Although a minority of subjects had more than one delay experience, we used only their first exposure to a delay situation to avoid possible reactive effects (as discussed in Mischel et al., 1988). The mean age of the present sample at the time of experimental assessment of delay of gratification was 4 years, 4 months. The children were preschoolers in the Bing School of Stanford University, a preschool for mostly middle-class children of faculty and students from the Stanford University community. Their mean delay time was 512.8 s, with a standard deviation of 368.7 s. The mean age of those who responded to the first follow-up (conducted in 1981–1982) was 15 years, 9 months, and the mean age at the time of the second follow-up (conducted in 1984) was 18 years, 3 months. Parents of 67 of these children (35 girls, 32 boys) returned the CCQ in the first mailing, and parents of 100 children (58 girls, 42 boys) returned the CCQ in the second mailing. Parents of 2 children received and returned the CCQ in both mailings, making the number of subjects for whom the CCQ was available from either of the mailings a total of 165 (92 girls, 73 boys). Parents of 134 children (78 girls, 56 boys) returned the ACQ (described below), and parents of 94 children reported SAT scores.

Assessment of Delay of Gratification Behavior

Delay of gratification was assessed in various versions of the basic self-imposed delay waiting paradigm described in detail elsewhere (Mischel, 1974; Mischel et al., 1972). Children were escorted individually into an experimental room in the Bing School, played briefly with some toys with the experimenter, and were told they would play with them more later. The child was then seated at a table on which there was a bell, and was shown reward objects determined by pretest to vary in desirability (e.g., one small marshmallow vs. two, one small stick pretzel vs. two, one colored plastic poker chip vs. two). The particular objects in the contingency varied from study to study, but the items in each pair were all pretested to be of age-appropriate interest and to be sufficiently close in value to create a conflict for young children between the temptation to stop the delay and the desire to persist for the preferred outcome when the latter required delay. The experimental room was deliberately stripped of distractors. After asking which of the objects in the choice (e.g., one or two marshmallows) the subject preferred, the experimenter introduced the child to the contingency: The experimenter indicated that she or he had to go out of the room then but that "if you wait until I come back by myself then you can have this one [pointing to the preferred object]. If you don't want to wait you can ring the bell and bring me back any time you want to. But if you ring the bell then you can't have this one [pointing to the preferred object], but you can have that one [pointing to the less preferred object]."

After testing the child's comprehension of the contingency, the experimenter left the room and returned when the subject rang the bell or reached a predetermined criterion time (usually 15 min, but sometimes 20 min, depending on the particular study). The time until the child rang the bell was measured in seconds. In the present data analysis, to allow combining data across studies, delay times exceeding 15 min were truncated at 15 min.

Four Types of Delay Situations

To test the hypotheses described earlier, subjects were divided into four groups, defined by the two major features of the delay situation: whether rewards were exposed or obscured and whether or not any ideation instructions were given suggesting what the child might think about during the delay period. The number of subjects in each of these four groups is shown in Table 1.

Subjects in the four groups should not have differed systematically in sample characteristics observable at the time of the original experiments because they had been assigned randomly into experimental conditions. In fact, the proportion of the sexes in the four groups was not significantly different, $\chi^2(3, N = 185) = 2.87$, $p > .40$, and a Sex × Condition analysis of variance (ANOVA) revealed no significant main effect of sex, $F(1, 174) = 0.45$, $p > .50$, condition, $F(13, 174) = .94$, $p > .40$, or Sex × Condition, $F(3, 174) = 0.47$, $p > .70$, on the age at which delay time was measured. With delay time as the dependent variable, a Sex × Condition ANOVA revealed a significant main effect of condition, $F(3, 174) = 4.3$, $p < .01$, as expected, whereas no other effects were significant. The mean delay times reported in Table 1 confirm that when no cognitive and attentional strategies were suggested, delay was more difficult when the rewards were exposed (e.g., Mischel, 1974). The skewness of the distribution of delay times did not significantly differ from 0 in any of the four conditions.

The Adolescent Coping Questionnaire

To assess the subjects' cognitive and coping competencies and self-control skills in adolescence, a 14-item questionnaire was sent to all of the parents who were contacted in the second wave; it was returned for 134 children. The 14 items are listed verbatim in Table 2; they were given with the following instructions:

> In this section we want you to think about your child in comparison to his or her peers, such as classmates and other same-age friends. We would like to get your impression of how your son or daughter compares to those peers, each time on a rating scale of 1–9. Record your answers in the space provided by writing in the best number from the following scale:
>
> 1 2 3 4 5 6 7 8 9
>
> Not at all Moderately Extremely

California Child Q-Set

The CCQ is an age-appropriate modification of the California Q-set consisting of 100 widely ranging, personality-relevant items. It was included in our research because of its extensive previous use in studies of personality coherence and in the assessment of long-term correlates of various aspects of the young child's delay of gratification (Funder, Block, & Block, 1983). In the first mailing, parents of 67 subjects in the present subsample returned the CCQ (46 subjects were described by both parents, 3 by father only, and 18 by mother only). In the second mailing, parents of 100 subjects returned the CCQ (64 subjects were described by both parents, 9 by father only, and 27 by mother only). When both father and mother returned the CCQ describing their child, a composite CCQ description was formed by averaging the father's and mother's descriptions. With an exception of two cases, there was no overlap of subjects between the first and the second mailing (in the second mailing, we did not send the CCQ to those subjects who returned it in the first mailing). Thus, a total of 165 subjects were

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turned by the post office as undeliverable for an additional 32. Thus, 404 subjects probably received our follow-up material (barring unreported mail loss), of which the present sample of 185 represents a return rate of 46%. The 185 subjects in the present sample delayed an average of 62 s longer than the 219 who did not respond to our mailing (512.8 s vs. 450.7 s), but the difference was not significant at the .05 level, $t(402) = 1.7$, $p = .09$.

Table 1
Composition of the Total Follow-Up Sample of Respondents

Measure	Spontaneous ideation		Suggested ideation	
	Rewards exposed	Rewards obscured	Rewards exposed	Rewards obscured
Sample size[a]				
Female	25	32	22	24
Male	27	26	11	18
Total	52	58	33	42
Age at delay experiment (months)				
M	51.6	51.9	50.8	53.2
SD	6.8	4.9	6.2	4.5
Delay time (s)				
M	365.2	590.4	516.7	585.1
SD	372.9	330.4	424.9	320.6
Skew	.51	−.53	−.28	−.32

[a] Subjects for whom at least one of the follow-up measures was obtained.

described using the CCQ by both parents (110 subjects), by father only (11 subjects), or by mother only (44 subjects).

In the first mailing, parents were sent 100 cards, each printed with one of the CCQ items, and sorted the cards into nine equally sized piles (11 items in each, except for 12 items in the middle pile) according to the items' descriptiveness for their child. Parents then returned the piles of cards in separate envelopes marked Pile 1 to Pile 9. Each child received a score for each of the items according to the pile in which the item was placed (i.e., if Item 25, *uses and responds to reason,* was returned in Envelope 6, the child received a score of 6 for CCQ Item 25). Because this procedure is time-consuming for parents and because we wanted to increase the likelihood of returns in the second follow-up mailing, we presented the 100 items as questionnaire items, and the parents simply rated their children on each item using a scale of 1 to 9, indicating how descriptive each item was for their child, without forcing a predetermined distribution of scores.

This procedural difference created the possibility that, depending on how willing they were to give extreme (e.g., 1 or 9) scores, the parents in the second mailing used more or less of the scale compared with parents who used a forced distribution in the first mailing. Therefore, before combining the Q-sort data on the basis of the two mailings, these data were first standardized within any given "profile" of a child. Specifically, for each CCQ "profile" given by a single rater (i.e., description of a child through ratings given to each of the 100 CCQ items), we calculated the mean and the standard deviation across items. (For example, if the forced distribution had been used, the mean would always be 5.0, and the standard deviation would always be 2.58.) The raw ratings in a profile were then converted into "within-profile" standard scores by subtracting the "profile mean" from each item and dividing the remainder by the "profile standard deviation." Thus, although the shapes of the distributions may have differed across raters, all standardized profiles had the same mean and standard deviations, as did the profiles based on the forced distribution. For the CCQ data obtained in the first follow-up wave, the interrater (mother vs. father) correlations for each of the 100 items ranged from .01 to .70, with a median value of .42, yielding a median Spearman-Brown estimated reliability of .60 for the mother–father composite. For the CCQ data obtained in the second follow-up wave, the interrater (mother vs. father) correlations for each of the 100 items ranged from .02 to .79, with a median value of .40, yielding a median Spearman-Brown estimated reliability of .58 for the mother–father composite.

CCQ Items Judged Relevant

The total of 100 CCQ items included a wide range of personality descriptions, only some of which were expected to be relevant to children's delay behavior in the self-imposed delay situations on the basis of the experimental analysis of the delay process. To specify such items a priori, we were guided by a summary of experimental findings published in Mischel (1974) 7 years before the first wave of the follow-up mailing. Specifically, in the last two paragraphs, Mischel (1974, pp. 287–288) outlined the cognitive and attentional factors that were found to play important roles in determining children's delay behavior. These two paragraphs, slightly edited for readability, were shown in individual sessions to 7 college-educated subjects who were not psychologists, were not in psychology graduate training programs, and had no specific knowledge of the findings of the present study. After reading these paragraphs, they were given the 100 CCQ items printed on separate cards and were asked (with written instructions) to find 15 cards that characterize a person who is able to use the cognitive and attentional strategies described in these two paragraphs to delay gratification. Subjects further divided these 15 cards into three groups of 5 cards each according to their degree of relevance for the processes and strategies described in the paragraphs. We assigned the 5 items they chose as most relevant a score of +3 (or −3, depending on whether the expected relationship to delay ability was positive or negative), the next 5 relevant ones a score of +2 (or −2), the next 5 a score of +1 (or −1), and the remaining 85 items a score of 0. The mean interrater agreement (correlations computed across the 100 CCQ items) was .42, and the Spearman-Brown estimate, based on this mean correlation, for the reliability of the composite of 7 raters was .83. The scores given to each item by the 7 subjects were then averaged, and all items with a mean relevance score of 1.0 or greater (regardless of sign) were chosen as items theoretically expected to be related to the abilities that underlie effective delay of gratification in self-imposed delay situations. There were 11 such items, shown in Table 3 in descending order of their degree of relevance.

SAT Verbal and Quantitative Scores

On the biographical information sheet included in the mailings, parents were asked to provide their children's SAT verbal and quantitative scores, when available. Parents of 94 children reported SAT scores.

To assess the reliability of the parental reports of SAT scores, we also contacted the Educational Testing Service (ETS). On the basis of the names and birth dates, ETS located in its data bases scores for 69 of these 94 subjects. Because of the confidentiality of the SAT scores, scores found by ETS could not be released in ways that allowed matching with the identity of individual children. However, by supplying parent-reported SAT scores to ETS before the data-base search, ETS could match these scores with the scores in the ETS data bases. The parent-reported SAT scores and the corresponding scores found in the data bases were then released without any identifying information and with the order of subjects randomized (but with the correspondence between the parent- and the ETS-supplied scores kept intact). The correlation was .94 between the scores found in the ETS data bases and the ones reported by the parents. Although these 69 subjects located by ETS may include some "false matches" (i.e., different children with the same first and last names and birth dates as our subjects), the high correlation suggests that the parent-supplied SAT scores were generally accurate for the majority of the subjects. To avoid the possibility of including false matches, all SAT results reported here are based on the scores supplied by parents.

Results

Adolescent Coping Questionnaire

The correlations between preschool delay time in the four types of waiting situations and parental ratings of the children as adolescents are shown in Table 2. In the exposed-rewards–spontaneous-ideation condition, 12 of the 14 ratings of the children as adolescents were statistically significant. For example, those who delayed longer in preschool were rated as more likely to exhibit self-control in frustrating situations, less likely to yield to temptation, more intelligent, and less distractable when trying to concentrate. In contrast, in the other conditions, of the 42 correlations calculated with preschool delay time (14 items × 3 conditions), only 3 reached statistical significance ($p < .05$).

California Child Q-Set

Table 3 presents the correlations between preschool delay time and the 11 CCQ items that were judged relevant to the basic cognitive and attentional processes in the self-imposed delay of gratification situation, as described in the Method section.

When the rewards were exposed for attention during the delay period and when ideation was spontaneous, children who delayed longer tended to be rated higher on such relevant CCQ items as *is planful, thinks ahead, is attentive and able to concentrate,* and *uses and responds to reason.* These same long-waiting children tended to be rated lower on such relevant items as *is unable to delay gratification* and *tends to go to pieces under stress, becomes rattled and disorganized.* In contrast, when the rewards were obscured and no ideation was suggested (the condition expected to be unpredictive), none of the 11 relevant items correlated significantly with preschool delay time. In conditions in which ideation was suggested, none of the 11 relevant items were significant.

SAT Scores

The results also allow us to examine potential links between preschool delay time in the various conditions and the children's SAT Verbal and Quantitative scores, as shown in Table 4. Because SAT scores were not available for all subjects, in some conditions the sample sizes became barely sufficient for a meaningful computation of correlations. Nevertheless, the observed differences between the conditions are consistent with the results obtained with the rating measures. As expected, preschool delay time correlated positively with SAT when the rewards were exposed and no strategies were suggested. In contrast, correlations were negative and statistically insignificant in the other conditions.[2]

To more closely assess the nature of the competencies in adolescence predicted by preschool waiting time, and in particular to estimate which of the significant correlations with parental rating measures may reflect such school-related achievements and abilities as assessed by SAT scores, partial correlations between delay time and parental ratings were computed, controlling for both verbal and quantitative SAT scores. After the variance attributable to SAT was partialed out, of the 11 CCQ items judged relevant (see Table 3), the following remained significantly correlated with delay time ($p < .05$, $df = 29$): *uses and responds to reason* ($r = .40$); *is planful, thinks ahead* ($r = .38$); and *tends to go to pieces under stress, becomes rattled and disorganized* ($r = -.36$). The correlation between preschool delay time and the item *is unable to delay gratification* remained virtually unchanged ($r = -.33$). On the ACQ, 2 items remained significant ($p < .05$, $df = 23$): *how likely is your child to exhibit self-control in frustrating situations?* ($r = .47$) and *when trying to concentrate, how distractable is your son or daughter?* ($r = -.54$).

Thus, although the association between preschool delay time and ratings of academically oriented intelligence shares common variance with SAT scores, the correlation with the ratings of children's ability to cope with social and personal problems cannot be attributed entirely to their school-related ability or "intelligence" as assessed by the SAT.

Alternative Analyses

The results reported so far were based on the children's delay times with the rewards exposed or obscured and with or without ideation suggestions. However, beyond these considerations, the experiments also manipulated a number of other factors, for example, varying the types of strategies suggested from those that make delay easier (e.g., mentally transforming the rewards into an abstract, nonarousing representation) to those that make delay more difficult (e.g., thinking about the rewards in a consummatory, arousing way). Although those manipulations were the focus of the initial experiments, in the

[2] The only notable sex difference in the longitudinal correlates on any of the measures occurred for SAT verbal scores. Although preschool delay time did not predict these scores among boys in the exposed-reward–spontaneous-ideation condition ($r = .02$, $N = 17$), it was predictive for girls ($r = .74$, $N = 18$), and the difference was statistically significant ($z = 2.50$, $p < .05$). However, the difference was smaller and insignificant for SAT quantitative scores (boys: $r = .40$; girls: $r = .71$).

Table 2
Correlations Between Preschool Delay Time and the Adolescent Coping Questionnaire

Adolescent Coping Questionnaire items	Spontaneous ideation		Suggested ideation	
	Rewards exposed	Rewards obscured	Rewards exposed	Rewards obscured
How likely is your child to be sidetracked by minor setbacks?	−.30*	−.01	.19	−.09
How likely is your child to exhibit self-control in frustrating situations?	.58***	−.12	.05	.27
How well does your child cope with important problems?	.31*	−.10	−.10	−.09
How capable is your child of doing well academically when motivated?	.37*	.19	.19	.16
How likely is your child to yield to temptation?	−.50***	.09	.39	−.09
Faced with a choice . . . how likely is your child to settle for the immediate [but less desirable] one?	−.32*	.11	.23	−.25
How able is your child to pursue his or her goals when motivated?	.38*	.11	.03	.13
How intelligent is your child?	.42**	.15	−.06	.30
When motivated, how capable is your child of exhibiting self-control in tempting situations?	.36*	−.32*	−.13	.39*
How skilled is your son or daughter at maintaining friendships and getting along with peers?	.10	−.16	.14	.00
When trying to concentrate, how distractible is your son or daughter?	−.41**	.08	.09	−.02
How capable is your child of exhibiting self-control when frustrated?	.40**	.07	−.16	.38*
How effectively does your child typically pursue goals?	.21	−.10	−.03	.31
How well can your child divert attention from the frustrativeness of having to postpone a desired gratification while continuing to pursue it?	.32*	.06	−.08	.37
Sample size	43	42	21	28

* $p < .05$. ** $p < .01$. *** $p < .001$.

present analysis of individual differences they essentially constitute random "noise." Accordingly, as an alternative to using the actual delay times, one could also statistically remove the experimental "noise" by subtracting from each subject's delay time the expected delay time for the type of delay situation in which he or she waited. Such expected delay times can be approximated by averaging the delay times in each distinct type of delay situation, although the number of subjects for many types of situations was very low (e.g., less than 5) after eliminating those subjects who had already participated in other types of delay situations. The results after this procedure were virtually identical to those reported in Tables 2 to 4. The number of significant correlates among the items of the ACQ in each condition remained the same, with the exception of one less significant correlation in the obscured-rewards–spontaneous-ideation condition. With regard to the SAT scores, the results were again virtually identical except that the negative (but not significant) correlations reported in Table 4 became somewhat weaker. For the 11 CCQ items judged to be relevant, the number of significant correlates remained the same in each condition except that in the obscured-rewards–suggested-ideation condition an additional item (*overreacts to minor frustration*) was negatively and significantly correlated with delay time. Thus, both the results using actual delay times and those adjusted for experimental main effects were extremely similar.

Discussion

Identifying the Locus of Predictability

The obtained results help to specify when individual differences in preschool delay of gratification in the present paradigm are predictive of later competence and coping. Expectations for the specific "diagnostic" condition were based on previous experimental analyses of the role of attention and ideation during delay, as discussed earlier. Consistent with these expectations, when no strategies were suggested to the child, ratings of cognitive, self-regulatory, and coping competence, as well as SAT scores obtained years later, were significantly predicted by preschool delay time when the rewards were exposed during the delay period, but not when they were obscured.[3]

[3] This pattern of results is also consistent with an unpublished earlier study (Zeiss & Mischel, 1982) showing that parents' estimates of

Table 3
Correlations Between Preschool Delay Time and the Parent's Q-Sort Ratings on Items Judged Relevant

California Child Q-sort items	Mean relevance	Spontaneous ideation: Rewards exposed	Spontaneous ideation: Rewards obscured	Suggested ideation: Rewards exposed	Suggested ideation: Rewards obscured
Is persistent in activities; does not give up easily.	2.00	.21	−.04	.29	.18
Is planful, thinks ahead.	1.57	.36*	−.01	.19	.09
Is creative in perception, thought, work, or play.	1.43	.03	.03	.14	−.10
Is attentive and able to concentrate.	1.43	.39**	.06	.05	.27
Is reflective; thinks and deliberates before speaking or acting.	1.00	.22	−.15	−.18	.16
Uses and responds to reason.	1.00	.43**	.03	−.05	.27
Is stubborn.	1.00	.02	−.06	−.14	−.04
Is unable to delay gratification, cannot wait for satisfactions.	−2.57	−.34*	.21	.09	−.02
Tends to go to pieces under stress, becomes rattled and disorganized.	−2.00	−.34*	.08	−.14	−.24
Overreacts to minor frustrations; is easily irritated and/or angered.	−1.43	−.25	.06	.03	−.30
Becomes anxious when the environment is unpredictable or poorly structured.	−1.29	.01	−.09	−.15	−.15
Sample size		48	50	32	35

* $p < .05$. ** $p < .01$.

In conditions in which various cognitive strategies had been deliberately suggested to the children for use during the waiting period, their own self-instructions and cognitive activities were not entirely spontaneous, and we expected that their delay time would less clearly reflect their ability to generate such strategies. Indeed, when ideation strategies were suggested, preschool delay time did not strongly or consistently predict later ratings of self-control, SAT scores, or relevant CCQ items.

Comparisons Across Follow-Up Waves

The present findings provided a more specific analysis than was possible in the earlier study that used the first, smaller sample (Mischel et al., 1988). In that study, children's preschool delay behavior was significantly related to adolescent outcomes, without taking specific conditions into account. If "diagnosticity" occurs primarily when rewards are exposed and ideation is spontaneous, as the results of the present study suggest, why was delay time correlated significantly with many items in the earlier study, which collapsed the conditions? When the earlier, smaller sample was examined with regard to conditions, the number of children in each condition became too small, of course, for confident comparisons. With this in mind, consider first the 4-item coping measure available in the first-wave follow-up, a predecessor of the 14-item expanded version used in the present study. On the 4-item measure, the only significant correlation of preschool delay of gratification behavior (with academic competence, $r = .73$, $N = 13$, $p < .01$) was obtained in the exposed-rewards–spontaneous-ideation condition. With regard to the CCQ items, there appeared to be strong relations between delay time and a number of the items in most conditions. As the sample size increased with the second-wave follow-up, however, most of these correlations proved to be insignificant, with the notable exception of the theoretically predicted condition described in the present study.

It is not clear whether the weakening of these correlations in the "nondiagnostic" conditions reflects any systematic differences between those who responded in the first mailing and those who responded only in the second mailing. There are a number of differences between the first and the second follow-up: Children were older at the time of the second follow-up, and therefore the time span from their preschool delay experiment was greater; the mean preschool delay time of the children of the second follow-up sample was somewhat shorter (see Note 1); the 14-item ACQ was introduced for the first time in the second

Table 4
Correlations Between Preschool Delay Time and Scholastic Aptitude Test (SAT) Scores

Measure	Spontaneous ideation: Rewards exposed	Spontaneous ideation: Rewards obscured	Suggested ideation: Rewards exposed	Suggested ideation: Rewards obscured
SAT Verbal	.42*	−.12	−.40	−.21
SAT Quantitative	.57**	−.31	−.26	−.23
Sample size	35	33	14	12

*$p < .05$. ** $p < .001$.

how long their preschool child will wait correlated significantly with the child's concurrent delay time in a exposed-rewards condition ($r = .32$, $N = 59$, $p < .05$) but not in a obscured-rewards condition ($r = -.13$, $N = 29$, $p > .10$).

mailing; and, as mentioned in the Method section, the CCQ was administered without forced distribution in the second mailing. It is possible that these factors reduced the correlations between preschool and adolescence in general. However, there is no reason why any of these factors should be expected to affect longitudinal predictability differently for children who happened to have been in different preschool delay conditions. The findings of theoretical interest, for example, the difference in adolescent correlates of preschool delay in the rewards-exposed and the rewards-obscured conditions when no ideation was suggested, thus do not seem interpretable as due to possible differences in the samples and adolescent measures used in the two follow-up mailings.

Nature of the Long-Term Links

We must emphasize the need for caution in the interpretation of the total findings linking preschool delay to adolescent outcomes. This caution applies especially in the interpretation of the associations between preschool delay in the exposed-rewards–spontaneous-ideation condition and SAT scores. On the one hand, our faith in the validity of the links between preschool delay behavior and later relevant competencies is strengthened because the objective test results were consistent with the parental rating data. On the other hand, even the highest correlations account for only about 25% of the variance. In addition, given the smallness of the sample, the obtained coefficients could very well exaggerate the magnitude of the true association. For example, in the diagnostic condition, the 95% confidence interval for the correlation of preschool delay time with SAT verbal score ranges from .10 to .66, and with SAT quantitative score, the confidence interval ranges from .29 to .76. The value and importance given to SAT scores in our culture make caution essential before generalizing from the present study; at the very least, further replications with other populations, cohorts, and testing conditions seem necessary next steps.

We also do not wish to overgeneralize or overstate the role of reward exposure. Although reward exposure seems to create a more diagnostic condition for assessing the competencies of interest, these results were obtained from a population of middle-class preschool children not selected for any self-regulatory difficulties, in a relatively narrow age span (mean age = 4 years, 4 months; SD = 6 months). As children become older, their delay behavior rapidly becomes less responsive to this manipulation, and it may lose its diagnostic potential early in the course of development. Many children become aware of basic rules to facilitate delay, for example, by distracting their attention from the rewards quite early in development (Mischel & Mischel, 1983), and can purposefully influence their own ideation to overcome the impact of exposed rewards. Consequently, any diagnostic "window" provided by the exposed-reward condition may be fragile and narrow in time. In fact, in children 6 years of age and older, no differences in delay time were found when rewards were exposed versus covered (Rodriguez, Mischel, & Shoda, 1989). It is also possible that the effects of reward exposure interact with the particular characteristics of the subject population, and such interactions will require systematic exploration in future work.

A difficult question that remains is the mechanism underlying the associations found between the delay behavior of the preschool child and the subsequent outcome measures. One contributing source may be stability in the subjects' family-mediated environments (e.g., Greenberger, Steinberg, & Vaux, 1982; Holahan & Moos, 1986; Lefcourt, Martin, & Saleh, 1984). For example, stability in parental child-rearing practices and in the psychosocial environment in the family and the community may be a common factor underlying both preschool children's delay of gratification behavior and their cognitive and self-regulatory competence in adolescence. These commonalities may contribute to the observed long-term correlations.

In our view, the association found between preschool delay behavior and adolescent competencies may reflect at least in part the operation of "cognitive construction competencies" (Mischel, 1973, pp. 265–267). In this view, the qualities that underlie effective self-imposed delay in preschool may be crucial ingredients of an expanded construct of "intelligent social behavior" that encompasses social as well as intellectual knowledge, coping, and problem-solving competencies (e.g., Brown & DeLoache, 1978; Cantor & Kihlstrom, 1987; Flavell, 1982; Sternberg, 1979). The fact that a wide variety of adolescent outcomes was predicted by preschool delay behavior is consistent with this interpretation because competencies are likely to have more diverse, relatively long-term consequences than other person variables (Mischel, 1968, 1973, 1990). These competencies, rather than consisting of a global mental entity, may include relatively specific component skills and processes necessary for effective self-regulation (e.g., Brown & DeLoache, 1978; Cantor & Kihlstrom, 1987). Some clues about their specific nature come from related studies. For example, childrens' metacognitive understanding that they must divert attention from the rewards and generate distracting thoughts or must transform the rewards mentally (Mischel & Mischel, 1983), and their spontaneous execution of such strategies, was correlated with their concurrent delay of gratification behavior (Rodriguez, Mischel, & Shoda, 1989). These are the same components identified as relevant in the experimental studies of the delay process itself (Mischel, 1974, 1981).

Although cognitive and attentional strategies and skills play an important role in the delay situation used in the present study, there is also much evidence that other factors, such as motivational and temporal considerations, expectations, and personality variables are likewise germane for a comprehensive analysis of delay of gratification (Funder & Block, 1989; Mischel, 1958, 1961a, 1961b; Mischel and Gilligan, 1964; Mischel & Patterson, 1978; Schwartz, Schrager, & Lyons, 1983). For example, when offered choices between less desirable but immediate outcomes and more desirable but delayed outcomes, the decision to delay or not to delay hinges, in part, on the individual's values and expectations with regard to the specific contingencies (e.g., Koriat & Nisan, 1978; Mahrer, 1956; Mischel, 1966; Mischel & Metzner, 1962; Mischel & Staub, 1965). In a given situation, therefore, postponing gratification may or may not be a wise or adaptive choice. However, unless children are able to sustain delay for desired goals when they want to do so, their freedom to make that choice risks becoming illusory.

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Received January 12, 1989
Revision received May 27, 1990
Accepted May 30, 1990 ■