

Strategic Attention Deployment for Delay of Gratification in Working and Waiting Situations

Philip K. Peake
Smith College

Michelle Hebl
Rice University

Walter Mischel
Columbia University

Two studies examined whether the detrimental effects of attention to rewards on delay of gratification in waiting situations holds—or reverses—in working situations. In Study 1, preschoolers waited or worked for desired delayed rewards. Delay times increased when children worked in the presence of rewards but, as predicted, this increase was due to the distraction provided by the work itself, not because attention to rewards motivated children to sustain work. Analysis of spontaneous attention deployment showed that attending to rewards reduces delay time regardless of the working or waiting nature of the task. Fixing attention on rewards was a particularly detrimental strategy regardless of the type of task. Study 2 showed that when the work is not engaging, however, attention to rewards can motivate instrumental work and facilitate delay of gratification as long as attention deployment does not become fixed on the rewards.

Delay of gratification, the pursuit of more attractive but temporally distal outcomes in the face of immediately available but less desirable rewards, is a hallmark of effective self-regulation, long occupying a central role in divergent perspectives on adaptive social behavior and development (e.g., Bandura, 1986; Eisenberg, in press; Freud, 1911/1959; Harter, 1983; Logue, 1995; Lowenstein & Prelec, 1993). The ability to wait is commonly implicated in a whole host of self-regulatory behaviors, including violence, eating disorders, drug abuse, suicide, and teen pregnancy, to name but a few. Indeed, both Goleman's (1995) popular review of emotional intelligence and Baumeister, Heatherton, and Tice's (1994) survey of self-regulation failures highlighted delay of gratification as a critical competence for effective functioning and a basic ingredient of willpower (see also Gollwitzer & Moskowitz, 1996; Metcalfe & Mischel, 1999).

Interest in delay of gratification surged recently because of findings that preschool delay of gratification predicts patterns of adaptive functioning into adulthood. Children who waited during preschool were perceived by their parents in adolescence as more cognitively competent, more socially competent, and better able to cope with stress than were their counterparts who did not wait (W. Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990). In ongoing work with this longitudinal sample, this same pattern of self-regulatory connections has now been shown to carry over into early adulthood (Peake, Hebl, Ahrens, Lepper, & Mischel, 2001) and to moderate other developmentally significant relations, such as attenuating the negative effects of being highly anxious about rejection (Ayduk et al., 2000).

It is noteworthy, however, that virtually all of the literature on delay of gratification is based on a paradigm in which the child's exclusive task is to wait for the delay interval to end in order to obtain the preferred rewards. Thus, although a good deal is known about the attention control mechanisms underlying effective delay in this paradigm, remarkably little is known about those processes in the many contexts of life that require instrumental work rather than just waiting in order to obtain the delayed outcomes. In the present studies we directly examined whether the attention deployment strategies known to be effective in passive waiting situations would also facilitate delay in situations requiring instrumental work for goal attainment. We did so using the same age group (4–5-year-old preschoolers) and a modification of the waiting paradigm used in the classic delay studies that produced the intriguing longitudinal correlates.

Philip K. Peake, Department of Psychology, Smith College; Michelle Hebl, Department of Psychology, Rice University; Walter Mischel, Department of Psychology, Columbia University.

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Correspondence concerning this article should be addressed to Philip K. Peake, Department of Psychology, Smith College, Northampton, Massachusetts 01063 or to Walter Mischel, Department of Psychology, Columbia University, 406 Schermerhorn Hall, New York, New York 10027. E-mail: ppeake@smith.edu or wm@psych.columbia.edu

Attention to Rewards While Waiting

Nearly three decades of construct-oriented work on the factors that influence children's delay of gratification in the waiting par-

adigm clearly points to the ability to deploy attention flexibly as a key competence for effective waiting (Ayduk et al., 2000; W. Mischel et al., 1988). When faced with the presence of rewards during a waiting period, long-delaying children divert attention away from rewards. They look around the room, sing songs, or otherwise engage attention in activities and objects that distract them from the stimulus pull of the rewards. In contrast, children who fix attention on the rewards during the delay period are most likely to terminate the wait. This competence is not specific to delay of gratification. Indeed, Baumeister et al. (1994) concluded, "Managing attention is not only the most common technique of self-regulation, it may well be the most generally effective one" (p. 25; see also Derryberry & Rothbart, 1997; Metcalfe & Mischel, 1999; Vallacher & Wegner, 1987).

Support for the view that attentional focus on rewards is detrimental to goal-directed waiting derives first from experiments in which attentional focus is manipulated using variants of the self-imposed delay of gratification paradigm (W. Mischel, Ebbesen, & Zeiss, 1972). In this paradigm, a child is allowed to have a less preferred reward (e.g., one marshmallow, one penny, one poker chip) immediately or to wait for an unspecified period of time in order to receive a more preferred outcome (e.g., three marshmallows, two pennies, two poker chips). A pivotal early finding using this paradigm was that leaving rewards available for viewing during the delay period yields short delay times (W. Mischel & Ebbesen, 1970). In contrast, the removal or covering of the rewards during the delay period lengthens waiting. Subsequent studies focused on the effect of different forms of reward ideation on delay. These studies collectively demonstrated that activities or ideational instructions that distract the child's attention from the rewards and their desirable features facilitate delay (see W. Mischel, Cantor, & Feldman, 1996, and W. Mischel, Shoda, & Rodriguez, 1989, for reviews).

Studies within this experimental tradition have convincingly documented that children can be distracted from desired outcomes and that such experimentally primed distraction strategies increase delay of gratification in the waiting paradigm. Although these experiments did not show that children necessarily use distraction as an effective coping strategy of their own accord, correlational research suggests that differences in waiting derive in part from children's spontaneous use of these strategies. To begin, the provocative longitudinal correlates of ability to delay gratification were the result of individual differences in waiting after controlling for experimental effects (W. Mischel et al., 1988; Shoda et al., 1990). This suggests that spontaneously deployed coping strategies are important mediators of the obtained positive long-term outcomes.

Additional studies suggest that strategic attention deployment is a key component of children's strategies. Rodriguez, Mischel, and Shoda (1989) examined children's eye-gaze patterns during the delay task in a population of 6–12-year-old boys with adjustment problems. The results showed that even after verbal-intellectual ability was controlled, children's spontaneous attention deployment (i.e., looking away from the rewards and self-distraction) was significantly related to longer delay times. Jacobsen, Huss, Fendrich, Kruesi, and Ziegenhain (1997) reported a similar relation among 6-year-old children in Germany. In addition, studies have shown that attention deployment relates to self-control in age-graded waiting tasks with 2–3-year-old children (Cournoyer

& Trudel, 1991; Vaughn, Kopp, Krakow, Johnson, & Schwartz, 1986).

Recently, Sethi, Mischel, Aber, Shoda, and Rodriguez (2000) showed that the attentional precursors of preschool delay ability are visible in toddlers' interactions with their mothers. Sethi et al. observed mother–toddler interactions in a separation situation and coded children's use of distraction as a means of coping with the aversiveness of separation. Children who used distraction as a coping strategy as toddlers were better able to wait over 3 years later in the standard delay paradigm. These findings suggest that waiting is mediated by the spontaneous attention deployment strategies that are expressed as individual differences as early as the 2nd year of life and maintain at least until the end of the preschool years.

Curiously, the only age group in which the relation between spontaneous attention deployment and delay has not been systematically studied is 4–5-year-old preschoolers—the age group on which the original delay experiments manipulating attention had focused. Yet it is this age range that is particularly important from a developmental perspective because it is the age at which children develop an understanding of the basic rules for making delay easier (H. Mischel & Mischel, 1983). Accordingly, it is especially important to examine the relation between spontaneous attention deployment and delay time during this period of development.

Attention to Rewards While Working

As noted initially, virtually all of the literature on delay of gratification is based on passive waiting situations in which the child's task is to sit quietly and wait for the delay interval to end. Thus, although reward-directed attention is detrimental to delay when children can do nothing to hasten the end of the waiting period, the question of whether attention to rewards might serve to motivate instrumental behavior when children are allowed to work to obtain them has not yet been answered. As W. Mischel (1974) noted, "[I]t might be adaptive to ideate about desired or needed but currently unavailable goal objects, but only in situations in which the subject's actions can be potentially instrumental in producing the desired outcome" (p. 273). Given the self-evident importance of understanding the mechanisms that enhance children's ability to persist in instrumental work activities in goal pursuit, research to clarify those mechanisms seems urgently needed.

Theoretically, there are two possible processes that might affect the relationship between attention and delay in working situations. First, attention to rewards might increase delay times because the frustration of having to wait serves to motivate and sustain instrumental behavior toward task completion (motivation hypothesis). Alternatively the contingent work activity may itself provide a distraction that shifts attention away from the rewards, thus decreasing the frustration of delay of gratification and enhancing delay time (distraction hypothesis).

In the present research we asked the following: Does reward-focused attention affect delay time differently in situations that do and do not involve actively working to obtain the desired rewards? To date, remarkably, only one study has addressed this question directly. Patterson and Carter (1979) had 4-year-old preschool children either work or wait to obtain rewards. Those unable to wait or complete the work task received a traditional "Good Player Award." Children who did wait or who completed the work task

received a more desired reward (a "Good Player Award" with an additional star affixed next to the child's name). Patterson and Carter's work task consisted of "feeding" marbles to a colorfully decorated jar made to resemble a baby bird while the experimenter was out of the room. In contrast, children who waited were asked to sit quietly in the presence of the colorful apparatus. For half of the children, the work-wait task occurred with the Good Player Awards available for attention. For the remainder of the children, the rewards were removed from sight during the delay period.

Patterson and Carter (1979) found that whereas children's delay was decreased by the presence of rewards in a waiting situation, reward presence in a working situation enhanced delay time. When rewards were available for attention, preschoolers delayed markedly longer when they worked for them rather than merely waiting. Patterson and Carter (1979) concluded that although an attentional focus on rewards "may be debilitating to subjects in a voluntary waiting condition who can do nothing to hasten their receipt of the preferred reward, frustration resulting from attention to motivational properties of rewards may serve to energize subjects' efforts toward task completion in the working condition" (p. 274). In their analysis, attention to rewards is frustrating in both types of situations. They suggested however, that distinctive motivational mechanisms result from the frustration of attending to rewards in working and waiting situations. In waiting situations, where children can take no action to bring about the desired outcome, attending to rewards leads to termination of delay. In work situations, frustration from attention to rewards is directed toward the contingent, goal-directed behavior and thereby facilitates delay.

Unfortunately, the provocative findings supporting the motivation hypothesis of Patterson and Carter (1979) are clouded because their procedure allowed for an alternative explanation in terms of distraction. Patterson and Carter's design required children who worked to complete an involved and engaging task (feeding the "Baby Bird"), whereas children who waited merely sat quietly with the colorful apparatus. It is thus not clear that the observed increments in delay time when children work (compared with when they wait) in the presence of rewards are due to the enhanced motivation resulting from attending to rewards (motivation hypothesis). Alternatively, it is possible that the work task itself is so engaging that it distracts children from the rewards and thereby facilitates delay (distraction hypothesis). Such a distraction effect would be consistent with the extensive findings from the waiting paradigm, in which distraction from the rewards consistently enhances the ability to continue to delay (W. Mischel et al., 1996). It thus would not require hypothesizing a separate mechanism for understanding the role of attention in working versus waiting delay of gratification situations.

In Study 1, we sought to clarify the role of attention to rewards in working versus waiting delay paradigms with preschool children. We did this using a design that allowed for a clear assessment of the potential motivation and distraction mechanisms that may be involved so that we could discriminate their distinctive effects. In addition, we used a micro-analytic tracking of attention deployment that made it possible to evaluate the extent to which children actually attend to physically present rewards as they complete different working or waiting tasks. This tracking procedure further allowed us for the first time to evaluate the impact of localized shifts of attention or fixing of attention on target objects during the delay period. It thus enabled a more micro-analytic assessment of

strategic attention control than was possible in previous studies in this self-control paradigm (e.g., Jacobsen et al., 1997; Rodriguez et al., 1989).

Study 1

The purpose of Study 1 was to clarify whether having rewards present during work yields extended delay because of enhanced motivation from attending to the rewards or from the distraction provided by the work task itself. To examine this question it was essential to first replicate and then extend the design previously used by Patterson and Carter (1979) to add the essential controls. Recall that their procedure required children to work contingently at an engaging task to obtain a desired reward or to wait quietly in the presence of the colorful work apparatus. For both conditions, Good Player Awards were left available for half of the children and removed for the rest. To the core design of Patterson and Carter's study we added two experimental variants. The first of these allows the child to perform work noncontingently. In this variation, children are first told that receipt of the preferred reward is contingent upon their waiting for the experimenter to return to the room. They are then introduced to the feeding task and told that this is something fun to do "if you want to" while waiting for the experimenter to return. This procedure allows the child to partake in the engaging and potentially distracting activity while making receipt of the preferred reward contingent upon waiting for the return of the experimenter. The second condition added was the standard self-imposed delay situation in which children wait alone, in this case in the absence of the potentially distracting work apparatus.

The addition of these two experimental conditions along with the monitoring of the spontaneous attentional activities allows for the careful comparison of the motivation and distraction hypotheses. If differential motivation accounts for differences in working and waiting situations, then delay times in the presence of desired rewards should be longer only in the condition in which children work contingently to obtain the reward. Delay should be relatively short in the noncontingent work situation and both waiting situations. Moreover, when rewards are not available for attention, delay times are predicted to be shorter when the child is required to work to obtain the reward (see Patterson & Carter, 1979).

In contrast, the distraction interpretation suggests that when rewards are present, length of delay should covary inversely with the amount of attention children devote to the rewards in the different experimental settings. We propose that the four experimental conditions (waiting alone, waiting with work apparatus, noncontingent work, and contingent work) form a continuum varying in the degree of distraction they provide from the desired rewards, ranging from relatively low (waiting alone) to high (contingent work). This view suggests that the four experimental conditions should result in a roughly linear progression of delay times, ordered by level of distraction, when rewards are available for attention. In contrast, because frustration levels are low and distraction is largely irrelevant in all conditions when the rewards are absent, roughly equivalent, lengthy delay times should occur in these conditions.

The inclusion of monitoring the attention deployment of children in this study allows for careful scrutiny of these hypotheses. First, the proposed linear progression of distraction can be evalu-

ated directly by comparing group differences in attentional focus across those conditions in which rewards are available for attention. More important, the monitoring of attention deployment allows us to examine the covariation of different attentional activities with duration of delay within experimental condition. Thus, the differential motivation hypothesis suggests that reward-focused attention should correlate positively with delay time when children can work to attain their goals but should be negatively correlated with delay time when children must passively wait. In contrast, the differential distraction hypothesis suggests that reward-directed attention is detrimental to delay regardless of whether children are actively working or passively waiting during the delay period.

Method

Overview

All conditions were designed in accord with the standard self-imposed delay procedures (W. Mischel et al., 1972) that were adapted to parallel the procedures and instructions used by Patterson and Carter (1979). Because the studies presented here rest completely on being able to replicate and then appropriately extend the original Patterson and Carter study, it was essential to model our specific operations and procedures (e.g., the structure and types of rewards in the delay situation) as closely as possible on those used in their now classic research. Thus, children were asked to choose between two rewards and were then provided standard delay instructions as well as specific instructions relevant to the task they were to perform in order to receive the preferred reward. The experimenter then left the experimental room and the delay period began. Children understood that during this time they were free to terminate the session by ringing a bell signaling the experimenter to return. However, if they chose to terminate the delay period, they received the less preferred of the two rewards; those who did not terminate received the more preferred reward upon the return of the experimenter. This procedure was used in a factorial design that varied type of task (contingent work, noncontingent work, waiting with apparatus, and waiting alone) and whether the rewards were in the child's attentional field during the delay period (rewards present or rewards absent).

Participants

Participants were 44 boys and 38 girls attending the Bing School of Stanford University. Ages ranged from 3 years 8 months to 5 years 7 months, with a median age of 4 years 7 months. To allow the necessary comparisons, this age distribution matched that used previously by Patterson and Carter (1979). Six additional children began to participate in the experiment, but their data were not used because they did not understand the instructions (i.e., did not answer a criterion question properly at the end of the session [see below]). Participants were randomly assigned to each of the eight conditions. Two male and two female undergraduates served as experimenters.

Apparatus

The experimental room contained a table and two chairs placed in front of a one-way observation mirror. In all conditions, a display stand and a desk bell were placed on the table and a box of toys was behind the table and out of the child's view. In all conditions except the wait alone condition, a colorfully decorated Baby Bird apparatus was also placed on the table (as in Patterson & Carter, 1979). The Baby Bird apparatus consisted of a quart jar mounted on plywood. Felt and sequins were used to simulate feet and wings on the jar. A 12-in (305-cm) plastic tube and a

painted tennis ball were attached to the lid of the jar and decorated to resemble a bird's neck and head. A small piece of plastic funnel was used to simulate the bird's beak and mouth. The apparatus was constructed to allow children to feed the bird by placing a marble in the plastic funnel (mouth of the bird). The marble would roll down the plastic tube (neck) and fall into the jar (stomach). Yellow tape was used to place a line near the top of the jar. This line indicated how far the child needed to fill the jar with marbles in order to complete the feeding process. The placement of the line was such that it would require approximately 15 min to complete this task. The marbles for feeding the Baby Bird were contained in a plastic bucket about 8 ft (2.4 m) away from the table. Children were provided with a small scoop to aid in transporting marbles from the bucket to the Baby Bird apparatus.

The rewards consisted of two certificates with the label "Good Player Award" across the top. Each Good Player Award had a large gold seal on it. Beneath the seal was the phrase "This is to certify that _____ has achieved a good player award." The child's name was inserted in the blank space on both rewards, and one of these had an additional gold star located next to the child's name. These rewards were identical to those used previously by Patterson and Carter (1979). Further, they fit the long-standing tradition of using relatively small outcomes, either consumable or symbolic, that are similar enough in value to heighten the conflict and thus increase the aversive frustration for participants during the delay period. Moreover, Patterson and Carter demonstrated empirically (using a time estimation measure) that these Good Player Awards produce frustrating effects that parallel those found with other types of rewards in delay of gratification waiting situations (Metcalf & Mischel, 1999; W. Mischel et al., 1989; W. Mischel et al., 1996).

Procedure

Children in all conditions were given standardized instructions to introduce them to the task they would be required to complete and to the use of a bell to recall the experimenter to the room. Children were asked to select the reward they preferred, and all selected the reward with the extra star. When it was clear that the child understood the task at hand, he or she was informed that the experimenter had to leave the room for a while and that the child could receive the preferred reward by completing a task while the experimenter was gone. These tasks varied in each condition and are summarized as follows:

1. Contingent work: In this condition, modeled directly after the Patterson and Carter (1979) work condition, the experimenter requested the child's help in feeding the Baby Bird. Instructions made it clear that receiving the preferred reward was contingent upon the child feeding marbles to the Baby Bird up to the yellow line on the glass jar.
2. Noncontingent work: In this condition, children were told they would receive the preferred reward for "waiting with Baby Bird until I come back by myself." After this contingency was repeated, the experimenter added,

By the way, while you're waiting, you and Baby Bird can have a little fun if you want to. He's very hungry and while you're waiting, he'd like it a lot if you feed him all the way up to this line.

Thus, receiving the reward was contingent upon waiting, but the child was also given the opportunity to feed the Baby Bird during the delay period.

3. Waiting with apparatus: Children in this condition, which was modeled directly after the Patterson and Carter (1979) wait condition, were given the same instructions as children in the noncontingent work condition except that they were not taught or encouraged to feed the bird during the delay interval. Receipt of the preferred reward was contingent simply upon waiting with Baby Bird until the experimenter returned.

4. Waiting alone: Children in this condition were instructed that they must wait alone until the experimenter returned by himself in order to receive the preferred reward. The Baby Bird was not present in this condition.

If the child was assigned to a rewards-present condition, the experimenter placed both rewards on the display stand and left them there for the duration of the delay period. If the child was assigned to a rewards-absent condition, the experimenter removed the rewards when leaving the room without comment. The delay period began as soon as the experimenter shut the door. In the contingent work condition, the delay period continued until the child filled the Baby Bird with marbles or rang the bell signaling the experimenter to return. In all other conditions, the delay period ended when the child rang the bell for the experimenter to return or, if the child did not signal, when the experimenter returned after 15 min. To determine whether the child remembered and understood the original task contingencies, after returning to the room the experimenter asked the child, "What happens now?" The data for a child were used in the study only if the child was able to answer this question correctly. In all, 6 of the 88 children that began the study did not answer this question correctly and their data were therefore excluded from the analysis.¹

Dependent Measures

The child was continuously observed by a trained observer through a one-way mirror during the delay period. Delay time was measured using both a stopwatch and one channel of a Rustrak (Model 202-8) multichannel event recorder (Gulton Industries, Manchester, NH). For all conditions except the contingent work condition, delay time was recorded until the child rang the bell. If the child did not ring the bell, delay time was recorded as 15 min (the time when the experimenter returned). The contingent work task was designed to last 15 min, but the actual length varied slightly depending on the rate at which the child worked. Following the procedures of Patterson and Carter (1979), to standardize the maximum delay time across conditions, children who completed the work task (e.g., fed the Baby Bird to the designated yellow line) had their delay time set to 15 min.

To monitor the spontaneous attention deployment of children during the delay period, we used different channels of the event recorder to record the object toward which the child was looking at any given moment. The different attentional activities recorded included looking at the rewards, looking at the bell, attempting to ring the bell, looking at the Baby Bird, retrieving marbles from the bucket, feeding marbles to the bird, and attending to other aspects of the situation (e.g., looking around the room, looking at the door, playing with clothing). Two observers were trained in the use of the Rustrak recording unit by having them independently record the attentional activity of children in 10 practice sessions. These training records were also used to assess the reliability of the recording procedure. For each of the Rustrak-derived dependent measures elaborated in the Results section, interrater reliability exceeded .86. During the formal experimental sessions, a single observer was used in each delay session.

Results

Delay Time

Mean delay times (in seconds) for all experimental conditions are shown in the top part of Table 1. In addition to the experimental factors explored in this design, both gender and age were included in the analysis of delay times. Gender differences are not uncommon in some waiting paradigms, and hence we reasoned that this factor should be explored as we extend this to the study of work. Because the age range of children participating in this study approached 2 years, it also seemed reasonable to include age in the core analysis. Accordingly, a $4 \times 2 \times 2$ (Task \times Reward Presence \times Gender) analysis of variance (ANOVA) was conducted on delay times with age as a covariate. In this analysis, neither task,

Table 1
Mean Delay Time (in Seconds) and Standard Deviations
in Rewards-Present and Rewards-Absent
Conditions for Study 1 and Study 2

Task	Rewards present		Rewards absent	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Study 1				
Wait alone	320 _a	384	771 _b	290
Wait with apparatus	567	279	608	381
Noncontingent work	669 _b	317	736	334
Contingent work	764 _b	290	685	332
Study 2				
Wait	352 _b	304	822 _a	166
Nonengaging work	566	374	396 _b	387
Engaging work	735 _a	321	817 _a	190

Note. Within each study, cells containing different subscripts are significantly different from each other (planned comparisons).

reward presence, nor gender yielded significant main effects. Similarly, delay times did not significantly covary with age.

The ANOVA provided statistically significant support for the predicted Task \times Reward Presence interaction, $F(3, 64) = 2.75$, $p < .05$.² Thus, the effect of reward presence is influenced by the type of task the child performs in the delay period. All other two- and three-way interactions were not statistically significant.

To specify the components of the Task \times Reward Presence interaction, we conducted a series of focused comparisons. Delay time tended to be somewhat shorter, albeit not statistically significantly so, when rewards were present (588.05 s) than when they were absent (738.07 s), $F(1, 64) = 1.73$, $p < .19$. Planned comparisons across conditions revealed that the only condition in which reward presence substantively impacted delay was the wait alone condition. Consistent with findings from previous delay studies that used similar waiting conditions (e.g., W. Mischel et al., 1972), self-imposed delay was substantially longer when rewards were not available for attention (771.20 s) than when they were present (320.27 s), $t(19) = 3.12$, $p < .01$. The difference in delay time with rewards present versus absent was not significant for any of the other experimental tasks.

Although the main effect for type of task was not significant, $F(3, 74) = 1.43$, $p < .24$, the four means evidence a significant linear trend in delay time consistent with that predicted by the differential attention hypothesis (wait alone, 535.00 s; wait with apparatus, 587.70 s; noncontingent work, 703.05 s; contingent work, 722.62 s), $F(1, 78) = 4.07$, $p < .05$. As predicted, there were no significant differences in delay time across the four experimental tasks when rewards were absent, $F(3, 37) = 0.44$, $p > .10$. However, substantial differences emerged across tasks when re-

¹ This proportion of incorrect answers is consistent with that typically found in delay of gratification research. The incorrect responses were distributed across conditions, which suggests there was no systematic tendency for children to misunderstand contingencies in any specific condition.

² All statistical tests reported in this article used two-tailed probabilities.

wards were available for attention, $F(3, 37) = 3.73, p < .02$. Planned contrasts for specific differences between conditions revealed first that when rewards were present, delay times in the wait alone condition differed significantly from those in both the contingent work and noncontingent work conditions: $t(37) = 3.15, p < .01$, and $t(37) = 2.48, p < .02$, respectively. A test for linearity among the group means when rewards were present revealed a highly significant trend, $F(1, 37) = 10.32, p < .01$. This trend is consistent with the differential attention interpretation and accounts for the overall linear trend across task noted previously.

Attention During Delay

The linear trends in delay tested in the previous section derive from our hypothesis about how children will use attention in the different experimental settings. Because we monitored how children deployed attention throughout the delay period, we can assess whether this hypothesis is empirically grounded in their patterns of attention. To form indices of typical attention deployment, the Rustrak recording for each participant was first divided into a series of consecutive 5-s segments. The use of 5-s segments was guided by both pragmatic and theoretical considerations. First, the Rustrak tapes are divided into 5-s divisions. Using these pre-marked divisions simplified the formidable coding task involved in this procedure. In addition, segments needed to be small enough so that the index of typical attention would be roughly equivalent to the proportion of time spent attending to an object. The 5-s segments satisfied this requirement. For each of the seven attentional activities, a separate record was constructed indicating whether the child engaged in the specific type of attention deployment during any portion of each of the 5-s divisions. For example, if a child delayed for exactly 2 min, seven independent records (one for each type of attention deployment) consisting of twenty-four 5-s segments would be constructed. The 24 segments would then be coded with either a 1 or a 0 to indicate that the child did or did not attend to the particular object during that segment.

To simplify presentation, we constructed two composite attentional records. The first consisted of all activities related to the work apparatus. Hence, the records for looking at Baby Bird, feeding marbles, and making a trip to get marbles were combined to form a single record of work-related activities. Similarly, the records for looking at the bell and attempting to ring the bell were combined to form one record of bell-related activity. These combinations reduced the number of attentional records to four: attention to rewards (rewards), attention to bell (bell), attention to the work apparatus (task), and attention to other aspects of the experimental room (room).

To obtain a measure of how much attention children typically devoted to particular objects during the delay period, the four attention records were divided into a series of 60-s intervals, each composed of twelve 5-s segments, and the child's average relative frequency for each attentional activity was computed. We first calculated the relative frequency of a particular attentional activity in each of the 60-s intervals (e.g., if a child attended to the rewards in 3 of 12 5-s segments for a particular minute, the child would receive a score of .25 for attention to rewards in that interval) and then calculated the mean of these relative frequencies across the 60-s intervals. The use of 60-s intervals was guided by two considerations. First, the interval needed to be composed of

enough 5-s segments to generate meaningful variation across children in relative frequency of attention to the different objects. Second, the intervals needed to be short enough to be sensitive to localized shifts of attention across the delay period. The 60-s interval strikes a balance between these two requirements. The top part of Table 2 depicts the group means of these average relative frequencies for the four attentional activities broken down by task when rewards were available for attention and when rewards were not available for attention. Note that because we used such small segments (5 s), the average relative frequencies for any specific attentional target are virtually equivalent to the proportion of time spent attending to each task.

As Table 2 indicates, when the child was working, whether contingently or noncontingently, nearly all attention was devoted to the task of feeding the Baby Bird. Very little attention on average was devoted to other aspects of the situation, and this pattern held regardless of the presence or absence of rewards. When the active work component of the situation was removed and the child was asked to wait with the Baby Bird, the child began spending considerably more time attending to the other aspects of the situation. Finally, when the Baby Bird apparatus was removed from the situation and the child waited alone, attention became divided between the room, the bell, and the rewards when they were available for attention. Absence of the rewards resulted in a shift of attention almost exclusively to extraneous aspects of the delay situation (e.g., the room).

Because our focus was primarily on the impact of reward-directed attention, a one-way ANOVA was conducted to assess differences across tasks in looking at the rewards when they were available for attention (e.g., rewards-present conditions only).³ This analysis revealed that the average relative frequency of attention to rewards did, in fact, significantly vary across the different tasks, $F(3, 37) = 14.05, p < .001$. Consistent with the significant increasing linear trend of delay times for task with rewards present, there was a decreasing linear trend in average relative frequency of attention to rewards (wait alone, .49; wait with apparatus, .29; noncontingent work, .09; contingent work, .06), and a planned contrast revealed that this trend was highly significant, $F(1, 37) = 38.57, p < .001$.

Functional Relationship of Attention Deployment and Delay Duration

To examine the relationship between attention to rewards and delay behavior more directly, we focused on those conditions in

³ Similar analyses were carried out for the other attention deployment activities. Because the different objects varied in their availability across experimental conditions, separate ANOVAs were conducted for each of the three activities: work apparatus (3×2), bell (4×2), and room (4×2). Both attention to the work apparatus and to the bell showed a main effect for task only: $F(2, 53) = 117.18, p < .01$, and $F(3, 69) = 7.90, p < .01$, respectively. Attention to the other aspects of the room produced main effects for both reward presence, $F(1, 69) = 10.78, p < .01$, and task, $F(3, 69) = 57.49, p < .01$, and a Reward Presence \times Task interaction, $F(3, 69) = 7.52, p < .01$. Both the main effect for reward presence and the interaction for this variable are largely accounted for by increased attention to extraneous aspects of the experimental room when rewards are absent and the child must wait alone.

Table 2
Amount of Attention (Mean Relative Frequency) Devoted to Object in Rewards-Present and Rewards-Absent Conditions for Study 1 and Study 2

Task	Object of attention						
	Rewards present				Rewards absent		
	Rewards	Room	Task	Bell	Room	Task	Bell
Study 1							
Wait alone	.49	.44	na	.17	.88	na	.09
Wait with apparatus	.29	.37	.39	.06	.47	.44	.06
Noncontingent work	.10	.06	.81	.01	.06	.86	.02
Contingent work	.06	.04	.85	.02	.04	.891	.02
Study 2							
Wait	.40	.38	.14	.24	.79	.08	.13
Nonengaging work	.13	.10	.84	.07	.07	.95	.12
Engaging work	.09	.09	.90	.04	.07	.93	.04

which rewards were available for attention, with the goal of predicting delay time on the basis of attentional activity within experimental condition. We first examined the correlations between typical attention (average relative frequency) to each of the four attentional targets and delay.⁴ The results of this analysis are shown in the top part of Table 3. Overall, attention to rewards was detrimental to delay of gratification, whereas attention away from these objects (e.g., toward the Baby Bird or around the room) generally facilitated delay. The most consistent finding pertained to attention to rewards; the negative correlations were significant across all tasks. In a complementary fashion, attention away from the rewards to other aspects of the experimental room showed strong positive correlations with delay in the waiting situations. However, in the contingent work condition, where attention was heavily focused on the work task, attention to the task (as opposed to around the room) correlated positively with delay.

In short, the pattern of correlations reported in Table 3 suggests that attention directed at rewards is detrimental to delay regardless of whether the child is actively working or simply waiting for the preferred outcome, whereas attention directed away from the rewards facilitates delay. This finding is consistent with findings from previous studies of attention and self-control that uniformly operationalized attention deployment by calculating the proportion of time children spent attending to various target objects (Cournoyer & Trudel, 1991; Jacobsen et al., 1997; Rodriguez et al., 1989; Vaughn et al., 1986). In this manner, these findings focus on attentional trends across the entire waiting period and are insensitive to important shifts of attention within the delay period. Thus, it is not possible to tell whether termination of delay is the product of periodic glances at rewards throughout the delay period or of fixing attention on the rewards for a significant period of time. This is a significant shortcoming because the former (periodic glances) might be considered as a flexible use of attention, whereas fixing would indicate that attention has become inflexible.

Accordingly, we next examined patterns of attention deployment across the delay interval, structuring the analysis on the proposition that fixing attention to rewards at any point in the delay interval will lead to a termination of the delay period. The relative frequency of attention to the different objects during each minute of delay was

examined, beginning with the first minute of delay and continuing in a sequential manner. At the first occurrence of a relative frequency of attention to a particular object exceeding a predefined criterion level (see below), a predicted delay time was assigned as the total time that had elapsed up to the end of the current minute. For example, if a child paid no attention to the rewards for the first 2 min of the delay period, and then looked at them in excess of the criterion during the third minute, predicted delay was set at 180 s. If a child's attention to rewards never exceeded the criterion, predicted delay was set at the maximal delay time (900 s).

To complete this analysis, it was necessary to establish a priori criterion levels that would indicate a fixing of attention on the different attentional objects. For each attention target, a frequency distribution was constructed representing all nonzero relative frequencies of attention across all participants. To establish a criterion level that represented a relatively large amount of attention to a particular target, we divided the distribution for that target at the third quartile (75th percentile).⁵ The relative frequency of attention associated with this division became the criterion level. The respective criteria established using this technique were as follows: rewards, .33; bell, .25; bird, .91; and room, .83. Thus, the first time attention to rewards exceeded 33% of the time available in that interval, delay was predicted to end.

⁴ Note, however, that the sum of these typical attention indices will approximately equal 1.00 for each child. Hence, these indices, like their proportional counterparts from earlier research (Rodriguez et al., 1989; Vaughn et al., 1986), are not independent. The separate statistical analyses reported here are provided for informational purposes and should be interpreted with a recognition of the nonindependence of the respective indices.

⁵ Because the third quartile was only one of several options (median split, 67th percentile), parallel analyses were conducted for criterion levels at each of the 12 segments of the 60-s interval. The reported results are remarkably stable at neighboring intervals. For instance, for attention to rewards, as long as the criterion level is not set too low (e.g., less than 12.5%) or too high (e.g., greater than 75%), the results are basically unchanged. At the extreme levels, the amount of variance in the predicted delay scores is too small for these measures to retain correlational utility.

Table 3
*Correlations Between Typical and Fixed Attention to Objects and Delay Time
 in Reward-Present Conditions for Study 1 and Study 2*

Task	Object of attention							
	Typical attention				Fixed attention			
	Rewards	Room	Task	Bell	Rewards	Room	Task	Bell
Study 1								
Wait alone	-.82**	.83**	na	-.49	.76**	-.76**	na	-.16
Wait with apparatus	-.69**	.87**	.24	.34	.59	-.29	-.04	-.10
Noncontingent work	-.69**	.28	.01	-.45	.52	-.25	.20	-.37
Contingent work	-.76**	-.49	.66**	.49	.79**	-.16	-.73*	-.16
Study 2								
Engaging work	-.68*	.17	.58	-.23	.75**	-.18	-.17	-.19
Nonengaging work	-.47	-.15	.68*	-.75**	.72*	.23	-.74*	.25
Wait	-.83**	.76**	.57	-.45	.82**	-.70*	-.44	.11

* $p < .05$, two-tailed. ** $p < .01$.

The correlations between the predicted delay times derived using these procedures and the actual delay times of the children are also presented in the top part of Table 3. Note first that because we are using attention patterns to generate predictions of delay time, positive correlations will indicate an association between fixing attention to a particular object and the termination of delay. Even using this quite stringent prediction task, a consistent pattern of predictions emerges with respect to attention to rewards. In the contingent work and wait alone conditions, the correlations are statistically significant, whereas in the other two conditions they approach significance (noncontingent work, $p < .12$; wait with apparatus, $p < .07$). Moreover, using this index of attention deployment, only attention to rewards shows a consistent pattern of prediction.

Note that the indices of typical and fixed attention used in the correlations reported in Table 3 are not statistically independent. When a child fixes attention on rewards during a segment of the delay period, this attentional focus triggers a prediction of delay time for fixed attention. That same attentional focus also increments the average relative frequency of attention to rewards (typical attention). Thus, all other things being equal, children who fix attention will have higher levels of typical attention than those who do not. Thus, the significant correlations between typical attention to rewards and delay may simply reflect differences in whether a child fixed attention.

To explore the extent of this dependence, we computed a third index for attention to rewards. For this index, the first time a child fixed attention on rewards, the relative frequency of attention to rewards in that segment was removed from the typical attention measure. The resulting measure thus reflects the average relative frequency of attention devoted to the rewards in all segments except the first instance of the child fixing attention on the rewards. Within-condition correlations between the new measure of typical attention and delay time were calculated. The resulting correlations for the four tasks were as follows: contingent work, $r = -.67$, $p < .05$; noncontingent work, $r = -.62$, $p < .06$; wait

with apparatus, $r = .45$, *ns*; wait alone, $r = .25$, *ns*. Thus, removing the first occurrence of fixed attention had little impact on the relation between typical attention to rewards and delay time in the working conditions but a powerful impact on this same relationship in the waiting conditions. Previously significant negative correlations become nonsignificant and positive with this adjustment.

Discussion

The results of the first experiment support the distraction interpretation of the increased delay times found in working situations when rewards are salient. First, there was a linearly increasing trend across tasks in duration of self-imposed delay when rewards were present, compared with uniformly high waiting times in their absence. This finding is consistent with the hypothesis that delay time should vary as a function of the amount of distraction from rewards provided by the different tasks. The analysis of spontaneous attention deployment (see Table 2) verified that children display differential levels of attention to the rewards depending on the task required to obtain them. Thus, there was a decreasing linear trend in attention to rewards, with children in the wait alone, wait with apparatus, noncontingent work, and contingent work conditions showing progressively less attention to the rewards.

The significant and consistent associations between attention to rewards (both typical and fixed) and delay time within experimental conditions provide the most compelling support for the distraction hypothesis. These correlations suggest that attention deployed chiefly toward rewards is detrimental to delay regardless of whether the child is waiting or working. Thus, for example, when we focus our analysis strictly on children who worked contingently in the presence of the rewards, those children who paid more attention to the rewards were the children who delayed for the shortest periods of time. This correlational pattern held true for all experimental conditions.

When the impact of fixing attention was removed from the typical attention measure, the correlations between typical attention and delay remained for the working conditions but no longer held for the waiting conditions. Because children paid little attention to the rewards in the working conditions, few instances of fixing occurred. Thus, controlling for fixing had little impact on these correlations. The failure of typical attention to correlate with delay once fixing was removed in the waiting conditions indicates that the correlations between typical attention and delay reported in Table 3 resulted primarily from the fixing of attention. This is important in understanding how attention deployment relates to delay. It suggests that the detrimental impact of reward-focused attention is not the result of the gradual accumulation of attending to rewards during the delay period (e.g., spending proportionally more time attending to rewards across the delay interval). Rather, children are able to take occasional glances at the rewards with little impact on waiting. If those glances shift to focusing on the rewards, children will tend to terminate the delay period.

One problem that clouds the interpretation of the findings of Study 1 is that by replicating the procedures of the Patterson and Carter (1979) design, we also adopted its shortcomings. In particular, the waiting and working situations used in the first experiment vary not only in whether the child works or waits for the reward but also in the level of activity structured into the different tasks. Thus, working children crossed the room repeatedly to retrieve marbles, while waiting children sat in their chairs for the duration of delay. Thus, our findings of lengthened delays and decreased attention to rewards in the working conditions might be as much a reflection of this retrieval activity as of anything intrinsic to work itself.

Study 2

In Study 2, we examined this issue in the context of asking the extent to which the current findings generalize to different types of work situations. The work of feeding Baby Bird is one that seems both interesting and enjoyable to young children. Although filling the jar with over 200 marbles would seem long and tedious, the colorful bird captured the imagination of most of the children. Thus, the task itself may have been so intrinsically engaging for the children that any increments in motivation that were due to the presence of the rewards were not detected. Clearly, not all work is as enjoyable as the work required of these children.

Accordingly, in Study 2 we extended the current analysis to work situations that varied in involvement for the children. Specifically, we had children either work at an engaging task (feeding the Baby Bird of Study 1), work at a nonengaging task (sorting marbles), or simply wait to receive the desired reward. As in Study 1, the rewards were either left available for attention or removed while the children completed the required task. We predicted that if the lengthy work delays of Study 1 derived from children enjoying working with the colorful Baby Bird apparatus, delay times in the new nonengaging sorting task of the present study should be significantly shorter than in the engaging feeding task. In addition, if attention to rewards has a motivating impact on delay in the nonengaging work condition, delay times in the reward-present variation of this condition should be longer than those in the reward-absent variation and should show a positive

correlation with attention actually deployed on the rewards. Indeed, if making the work less engaging increases the motivational impact of reward salience, then the pattern of delay times in this condition should demonstrate a crossover interaction with delay times in the standard waiting condition.

Finally, because children in all conditions of this study remained seated throughout the task, Study 2 assesses whether the differences between the wait alone and contingent work conditions of Study 1 will be replicated when the activity of retrieving marbles from across the room is removed. The monitoring of attention deployment activities further allows consideration of whether the distraction or motivation hypotheses are supported once the retrieval activity is controlled.

Method

Overview

The procedures of Study 2 were modeled after the procedures used in the contingent work condition of Study 1. Upon arrival, children in all conditions indicated their preferences between two rewards and were then provided standard delay instructions as well as specific instructions relevant to the particular task they were to perform. Children were free to terminate the delay session by ringing a bell signaling the experimenter to return to the room. Taking this option resulted in the receipt of the less preferred reward. This procedure was used in a factorial design that varied type of task (engaging work, nonengaging work, waiting) and whether the rewards were in the child's view during the delay period (rewards present or rewards absent).

Participants

Children participating in the study were 32 boys and 28 girls attending the Smith College Preschool. As in the study by Patterson and Carter (1979), they ranged in age from 3 years 4 months to 5 years 4 months, with a median age of 4 years 6 months. Two additional children began to participate in the experiment but their data were not used because they did not understand the instructions (i.e., did not answer a criterion question properly at the end of the session).

Apparatus

The apparatus and physical arrangement were modeled directly after those in Study 1 with the following exceptions. Rather than being observed through a one-way mirror, children were viewed on a television monitor located in an adjacent room. A video camera was located directly across the room from the table where the child worked. The bucket of marbles was placed directly on the table in this experiment. Thus, children did not have to walk across the room to retrieve marbles.

For the engaging work condition, the same Baby Bird apparatus that was used in Study 1 was placed on the table directly in front of the child and adjacent to the bucket of marbles. In the nonengaging work condition, three 16-oz. plastic cups were placed directly in front of the child. Red, green, and blue squares of paper were taped to the front of each cup. In the wait condition, the Baby Bird apparatus, the bucket of marbles, and the colored cups were placed on the far edge of the table, well out of the reach and direct sight line of the child.

Procedure

Children were introduced to the room, taught to use the bell, introduced to the Good Player Awards, and asked to indicate their preference. Finally,

the task required for receiving the preferred reward was explained. In the engaging work condition, children were told that receiving the preferred reward was contingent upon the child feeding marbles to the Baby Bird up to the yellow line on the glass jar. In the nonengaging work condition, children were told that receiving the preferred reward was contingent upon sorting the marbles from the bucket into the cups, matching the color of the marble to that of the paper taped to the front of each cup. This task was designed to mimic the physical action of moving marbles used in the contingent work condition yet be less engaging. Children had little difficulty with the sorting task and made virtually no errors in sorting. In a separate study, we examined how engaging the two tasks were by asking 10 children to work at each task for a period of 8 min in a counter-balanced manner. Children were asked how interesting and fun they found each task to be. They responded using a 5-point smiling/frowning scale. The resulting distributions of ratings were virtually nonoverlapping, with children indicating much more interest in feeding the bird (mean rating of 4.3) than in sorting the marbles (mean rating of 2.0). A paired samples t test showed that this difference was statistically significant, $t(9) = 6.87$, $p < .01$.

In the wait condition, children were instructed that the apparatus was not part of the study and were told that receipt of the desired reward was contingent on their waiting for the experimenter to return. Rewards were either left available for attention or removed as the experimenter left the room. The delay period ended either when the child rang the bell signaling the experimenter to return or at the end of 15 min. As in Study 1, after returning to the room, the experimenter asked the child, "What happens now?" The data for a child were used in the study only if the child was able to answer this question correctly. In all, 2 of the 62 children who began the study did not answer this question correctly.

Dependent Measures

Video recordings of the child during the delay period were coded by a single trained observer who was unfamiliar with the purpose of the study. Total delay time and spontaneous attention deployment of children during the delay period were recorded using different channels of a Rustrak event recorder in a manner parallel to that reported for Study 1.

Results

Delay Time

Mean delay times (in seconds) for all experimental conditions are presented in the bottom part of Table 1. Following Study 1, gender and age were also included in the core analysis of this data, yielding a $3 \times 2 \times 2$ (Task \times Reward Presence \times Gender) ANOVA with age as a covariate. This analysis revealed a significant main effect only for type of task (engaging, 776.2 s; nonengaging, 480.8 s; wait, 587.1 s), $F(2, 47) = 3.34$, $p < .05$. Planned contrasts revealed that this overall effect derived from the relatively short waiting times of children in the nonengaging sorting task in comparison to the lengthy delays of children in the more engaging feeding task, $F(1, 54) = 9.52$, $p < .01$. Overall task times did not differ between the wait condition and either of the work conditions.

Although delay times were somewhat shorter when rewards were available for attention (rewards present, 550.9 s; rewards absent, 678.4 s), this overall main effect was not statistically significant, $F(1, 47) = 2.42$, $p < .13$. Planned comparisons within each of the different tasks revealed that the only condition in which reward presence affected delay time was the wait condition. Consistent with the findings of Study 1, self-imposed delay was substantially longer when rewards were not available for attention

(822.2 s) than when the rewards were present (351.9 s), $F(1, 54) = 12.05$, $p < .01$. The difference between delay time with rewards present versus absent was not significant for either of the work tasks.

The ANOVA also revealed a significant Task \times Reward Presence interaction, $F(2, 44) = 5.40$, $p < .01$. All other two- and three-way interactions were not statistically significant. The presence of this Task \times Reward Presence interaction suggests again that the effect of reward presence is affected by the type of task the child performs in the delay period, although the nature of the interaction is somewhat different from that observed in Study 1. Planned comparisons were conducted to clarify which tasks contributed to the overall Task \times Reward Presence interaction. These analyses revealed significant interactions when comparing the wait condition with either the engaging work, $F(1, 54) = 4.11$, $p < .05$, or the nonengaging work, $F(1, 54) = 11.18$, $p < .01$, conditions. Delay times in the two work conditions did not demonstrate a significant interaction.

Observation of the means in Table 1 makes it clear that the unique finding of Study 2 is the short delay times found in the nonengaging work condition when rewards were absent. Children working at the nonengaging sorting task tended to terminate delay quickly when compared informally with the consistently long reward-absent delay times of all conditions in Study 1 (see top part of Table 1), and when compared more formally with children in the engaging work, $F(1, 54) = 9.69$, $p < .01$, and wait, $F(1, 54) = 9.92$, $p < .01$, conditions of Study 2.

In contrast to the reward-absent findings, delay times with the rewards available for attention demonstrated a pattern quite similar to that of Study 1. Mean delay times with reward present showed a linear relation, with the wait condition demonstrating the shortest delays and the engaging feeding task showing the longest delays, $F(1, 54) = 8.01$, $p < .01$.

Attention During Delay

Indices of typical attention were constructed for each of the four attentional targets (task, room, bell, and rewards) in a manner parallel to that in Study 1. The average mean relative frequencies of attention to these objects are presented in the bottom part of Table 2. In both of the working conditions, the predominant attentional focus was the task, with attention being directed toward the task in roughly 90% of the potential time intervals. In contrast, mean relative frequencies of attention toward the other three attentional targets consistently fell at less than 15% of the available time intervals. This pattern replicates the attentional pattern observed in the working conditions of Study 1 even though children in Study 2 were not required to cross the room to retrieve marbles as part of the work.

In sharp contrast to the working conditions, attention deployment in the wait condition was more dispersed. When rewards were available for attention, children divided attention between looking at the rewards and looking around the room. When rewards were taken away, children tended to simply look around the room. Even though the work objects (the Baby Bird and the sorting cups) were left on the table during the wait period, children paid

relatively little attention to them. This attentional pattern mirrors closely the one observed in the wait alone condition of Study 1.⁶

The analysis of delay time reported previously showed that when rewards were present, time on task increased linearly, with the wait condition having the shortest delays and the engaging feeding task the longest. The differential distraction hypothesis predicts that attention deployed to rewards should decrease linearly across these same tasks. In a manner parallel to that in Study 1, a one-way ANOVA was conducted to assess differences across tasks in looking at the rewards (e.g., rewards-present conditions only).⁷ This analysis revealed that the average relative frequency of attention to rewards did, in fact, significantly vary across the different tasks, $F(2, 27) = 11.17, p < .01$. As in Study 1, there was a decreasing linear trend in average relative frequency of attention to rewards, $F(1, 27) = 18.49, p < .01$.

Functional Relationship of Attention Deployment and Delay Duration

To examine the functional relationship between attention to rewards and delay behavior more directly, we focused on those conditions in which rewards were available for attention, with the goal of predicting delay time on the basis of attentional activity within experimental condition. Attentional activity was operationalized both in terms of typical and fixed attention deployment in a manner parallel to that in Study 1. Correlations between attention to the different objects and delay time are presented in the bottom part of Table 3. Although typical attention to rewards was negatively correlated with delay for all tasks, it reached statistical significance for the engaging work and wait tasks but not for the nonengaging sorting task. When the fixed attention deployment measure was used, attention to rewards predicted delay time for all three tasks. It is worth noting that the correlations in the feeding task parallel those found for the contingent work condition of Study 1. Thus, the removal of the retrieval activity does not seem to affect the influence of reward-directed attention on delay. It is also noteworthy that the correlations reported for the wait condition of Study 2 mirror those found in the wait alone condition of Study 1.

As in Study 1, we calculated the correlation between typical attention and delay once the first instance of fixing attention was removed. The significant negative correlations reported in Table 3 became nonsignificant for both the engaging work ($r = .13$)⁸ and wait conditions ($r = -.47$). This indicates that the observed negative correlations between typical attention and delay primarily resulted from fixing attention in these conditions. In the nonengaging work condition, adjusting for attention fixing shifted the correlation from a nonsignificant, negative correlation to a strong positive one ($r = .87, p < .01$). Thus, it appears that attention to rewards facilitates delay when working at the less engaging task as long as that attention does not become fixed on the rewards.

Discussion

Study 2 provided several important extensions and clarifications to the findings of Study 1. First, Study 2 replicated the general finding that delay times are affected by differential attention to the rewards. In the case of the standard waiting condition, Study 2 provided a replication of the mean differences in delay time with

rewards present and absent, of the amount of attention devoted to various aspects of the situation, and of the correlation of spontaneous attention deployment with delay. The pattern of results in the engaging work condition of Study 2 similarly mirrored the findings in the contingent work condition of Study 1. This is noteworthy because children in Study 2 were not required to cross the room to retrieve marbles. The close replication of the findings suggests that the findings of Study 1 were not primarily attributable to the increased retrieval activity of the children in the work conditions.

Study 2 also examined the generality of the work findings of Study 1. The data suggest that changing the task from the imaginative and engaging feeding task to the more tedious sorting task altered the impact of reward-directed attention during work, but in an unexpected way. The main effect for type of task in part validates the intention of the manipulation. Children worked longer when they were more engaged in the task. The Task \times Reward interaction of Study 2 suggests that the differential distraction interpretation does not fully account for the pattern of findings in the sorting task. The overall interaction in delay times was shown to derive from the linearly increasing delay when rewards were present and the short delay times when children sorted marbles with the rewards absent. Although the bulk of the results of Study 2 are consistent with the differential distraction

⁶ Although the work objects were on the table, this condition varied from the wait with apparatus condition of Study 1 in two important ways. First, rather than being placed directly in front of the children, the apparatus was placed to the side, out of reach and out of the child's direct line of sight. Second, the children were not provided with the introduction to the apparatus provided in Study 1. These two factors appear to have combined to lead children to basically ignore the apparatus despite its physical presence.

⁷ Similar analyses were carried out for the other attention deployment activities. Separate 3×2 ANOVAs were conducted for each of the three alternative activities. All three attentional objects showed main effects for task: room, $F(2, 54) = 124.09, p < .01$; bell, $F(2, 54) = 10.55, p < .01$; and task, $F(2, 54) = 638.15, p < .01$. In all cases, these main effects were primarily the result of the wait condition differing dramatically from the two similar work conditions. The tendency to look around the room was the only attentional activity to evidence a main effect for reward presence, $F(1, 54) = 16.66, p < .01$. This effect resulted from the increased time spent looking around the room when rewards were removed from the wait condition. Finally, all three attentional objects demonstrated Task \times Reward Presence interactions: room, $F(2, 54) = 23.51, p < .01$; bell, $F(2, 54) = 3.53, p < .05$; and task, $F(2, 54) = 4.08, p < .05$. Although statistically significant, these interactions reflect subtle variations within conditions that are largely swamped by the previously reported main effect.

⁸ The impact of removing fixed attention from the typical attention index for children in the contingent and engaging work conditions diverges in the two studies. In Study 1, there was virtually no impact, whereas in Study 2 the correlation changes from a statistically significant $-.68$ to a nonsignificant $.13$. This divergence appears to be related to the subtle differences in the two conditions. In Study 1, contingently working children were engaged not only in feeding the Baby Bird but in having to continually retrieve marbles from across the room. Accordingly, they paid virtually no attention to the rewards, neither glancing nor fixing. In contrast, children in Study 2 sat in their chairs throughout the procedure. Although these children also rarely attended to the rewards, they were somewhat more likely to fix attention when they did. Hence, the removal of the first fix of attention has a more dramatic impact on the correlation in Study 2.

hypothesis, this interaction suggests that differential motivation may play a role in some situations. Note that since rewards are absent, the differential attention hypothesis suggests that all delay times should be lengthy. These should not be challenging situations, and children should be able to wait easily despite the task they face. Given that reward-present delays are negatively correlated with typical attention and strongly predicted by fixing of attention, one would assume that lengthy delays would be seen in the absence of the rewards.

One possible interpretation of the short delay times when rewards are absent in the sorting task concerns the information provided by the task itself. One of the defining characteristics of the self-imposed delay paradigm is that children do not know how long they have to wait for the experimenter to return. This ambiguity adds to the dilemma of the child because the child might terminate the session seconds before the experimenter returns. Indeed, children frequently toy with ringing the bell; placing their finger over the bell while checking the door and hoping the experimenter might return. The critical importance of this ambiguity was demonstrated by Schack and Massari, (1973), who showed that providing children with a temporal aid (a sandglass timer with instructions) yielded lengthy delays in a standard waiting paradigm regardless of the presence or absence of rewards. Work effectively defines the length of the delay period for the child. Filling marbles to a line or sorting all the marbles in a bucket provides children with continuous feedback on how much work they have done and how much work they have left to do. This information provides a framework for children to evaluate the merits of continuing to work.

When work is engaging, children might be so intrinsically involved in the task that the presence or absence of the rewards is largely irrelevant. Indeed, children paid very little attention to rewards when working at the feeding task. When working at a less engaging task, children might observe that the task is not fun and will require considerable time and energy. In this case, delay times should typically be short. Having the rewards available for attention might be motivating if the children attend to the rewards with occasional glances as reminders of the desired outcome. However, Study 2 indicated that it was not the case that the more children attended to the rewards, the more motivated they became. The children must be quite strategic in how they deploy attention. If those reminding glances shift to fixing of attention, then reward-directed attention rapidly becomes detrimental to continued work. The finding of a strong positive correlation between delay and typical attention after the first instance of fixing is removed buttresses this interpretation. As long as children do not become focused on the rewards, more glances are highly correlated with delay time. If the children become focused on the rewards, the termination of the delay is highly predictable.

If these results prove replicable, they pose interesting possibilities for continued research. For instance, these findings appear to be consistent with the growing literature in both animal and human research suggesting that delay of gratification involves the discounting of desired outcomes in light of the time and effort required to attain them (Eisenberger & Adornetto, 1986; Logue, 1995; Rachlin & Raineri, 1992). The findings raise an important empirical question, however, about the importance of understanding the time (or effort) required to obtain rewards for discounting functions. Are discounting functions changed, or largely irrelevant,

if children are not clear about how long they might have to wait, as is traditionally the case in standard waiting paradigms?

General Discussion

The role of attention deployment on rewards has long been recognized as being of central theoretical and practical importance as a determinant of self-regulatory ability in the pursuit of delayed goals. To date, most of this research has dealt with passive delay of gratification situations. That focus has left unanswered the question of whether attention to rewards undermines delay in working situations as it does in waiting situations. This is a basic question for understanding the development of willpower, because much of goal pursuit requires work of various types, not merely waiting (e.g., W. Mischel et al., 1996).

Therefore, the studies reported here systematically examined the relation between attention deployment strategies and effective delay of gratification in both waiting and working situations. In the only previous study addressing work situations in this context, Patterson and Carter (1979) reported increased duration of delay in working conditions with rewards present. They took this as evidence that frustration associated with attention to rewards might foster distinctly different motivational mechanisms in working as opposed to waiting situations, but they did so without adequate controls to test alternative hypotheses of theoretical importance. By adding these essential controls, the present results suggest that the posited frustration associated with reward presence may not be serving an energizing or motivating function in working conditions generally. Rather, attention to rewards appears to undermine children's voluntary delay in both working and waiting situations.

This interpretation is supported by the analysis of spontaneous attention deployment, which consistently shows the detrimental impact of reward-focused attention on delay times. In Study 1, this effect was shown to hold regardless of whether children are actively working to earn the rewards or passively waiting for them. Study 2 replicated this correlational pattern and showed that the detrimental impact of reward-focused attention, especially fixing of attention, holds for both engaging and nonengaging types of work. The significant negative associations obtained between the average relative frequency of attention (typical attention) to the different objects and the ability to delay are consistent with the results of Vaughn et al. (1986) and Cournoyer and Trudel (1991) for toddlers on different sets of self-control tasks. Likewise, they are consistent with the results of Rodriguez et al. (1989), who used a similar paradigm with older children having social adjustment problems. In combination, these studies suggest that attention directed toward desired outcomes is detrimental to delay of gratification in goal pursuit and that this effect is consistent for children ranging from 2 to 12 years of age. In contrast, attention directed away from the goal objects tends to be positively correlated with delay efficacy.

Although prior studies have demonstrated that the proportion of time spent attending to the rewards is negatively related to delay, the current findings clarify just *how* attention deployment is related to the termination of delay of gratification. The results demonstrate that fixing attention to rewards leads to the termination of delay in all of the experimental contexts in which rewards were available for attention. Moreover, the results suggest that the attention devoted to this fixing is a substantial component of the propor-

tional index traditionally used. When the first occurrence of fixing is removed from the typical attention measure, the correlations between delay and typical attention generally become nonsignificant.

An intriguing twist in the pattern of results reported comes from the highly significant Task \times Reward interaction in Study 2. This interaction hints that differential motivation might play a role when the work is not intrinsically engaging for the child. Thus, for boring and mundane situations, work appears to provide children with information about what is expected of them and how long they will need to endure to acquire desired outcomes without absorbing their attention in the task at hand. The results suggest that when work is not engaging, attention to rewards might be adaptive as long as that attention does not become fixed on the rewards. This view is supported by the finding that in this condition alone, removal of the fixed attention component reveals a strong positive correlation between delay and typical attention. Here again, it is not the sheer quantity but the type of attention deployment that predicts delay.

The pattern of findings of Study 2 addresses how attention to extrinsic rewards may differentially impact work at more and less intrinsically interesting (engaging) tasks. It suggests that when a task is intrinsically interesting, extrinsic rewards undermine ongoing performance, but only in those rare instances when attention strays from the task and becomes fixed on outcomes. In contrast, when a task is not engaging, available extrinsic rewards may sustain work as long as attention does not become fixed. Hence, brief glances at rewards might serve to remind the worker of the desirability of the preferred outcome, maintaining interest and encouraging perseverance at the tedious task. The ability to use rewards to motivate in this manner seems to hinge, however, on the ability to strategically deploy attention: keeping glances brief and avoiding fixing on the rewards. Clarifying the factors that underlie this strategic use of attention should be a productive target for future research since the flexible deployment of attention may be especially useful in those many situations when the work itself is not intrinsically engaging.

The present findings are also germane to a methodological point raised by Kihlstrom (1986) in a reply to a meta-analysis of previous delay-of-gratification studies (Funder & Harris, 1986). Addressing the relative effect sizes of personality and situational factors in psychological research, Kihlstrom noted,

Many of the "situational" variables studied [in delay of gratification research] are nothing of the sort . . . Many are experimental operations that refer to mental states: distracting oneself, thinking about the reward, and the like. Conceptually, these are just as "internal" as the traits measured by techniques such as the Q-sort. The experimental manipulations stand in for naturally occurring "cognitive social learning person variable." (1986, p. 478)

Although we might use reward presence as a means of manipulating attentional focus, we are not assured that children will attend to the desired rewards even though they are available for attention. The systematic analysis of how children deployed attention while engaging in different tasks underscores this point. Merely making rewards available for attention (a situational factor) does not mean that children will necessarily attend to them.

The potential import of the current findings is enhanced by recent longitudinal work suggesting that delay behavior taps fun-

damental and enduring cognitive competencies. These may be revealed when children face a challenging situation (e.g., rewards present) and must rely on their own spontaneously generated methods for coping with this challenge (e.g., no ideational instructions suggested) by controlling their impulsive tendencies to terminate delay (Metcalf & Mischel, 1999; W. Mischel et al., 1996; Shoda et al., 1990). The rewards-present conditions of the current study fulfill these criteria, and it is possible that the attention deployment activities of children in these conditions reflect underlying cognitive competencies like those suggested by the longitudinal research. Thus, the ability to control the direction of attention, to strategically self-distract, and to move the focus of attention flexibly across a situation seems an essential component in accounting for individual differences in delay within our various experimental conditions (Derryberry & Rothbart, 1997). The current research suggests that deploying attention so as to avoid fixing on rewards is a critical feature of this attentional competence.

This same competence might also account for the observed longitudinal correlates of individual differences in preschool delay of gratification. The intuitive and theoretical appeal of such an interpretation derives both from theoretical analyses of the developmental progression of self-regulation and from a cognitive social learning analysis of the factors that might yield enduring individual differences (W. Mischel et al., 1989; Shoda et al., 1990). It should be emphasized, however, that neither the current study nor the attention deployment work with children of different ages (Rodriguez et al., 1989; Vaughn et al., 1986) directly supports the inference that the observed attention deployment activities capture enduring individual differences among the children. At present, we do not know what leads children to spontaneously distract themselves from rewards, but the current research suggests that when attention becomes fixed on the rewards, children will terminate the delay period. Future research needs to explore the psychological processes that underlie these attentional differences and the stability of individual differences in attention deployment activities across different goal-directed self-regulatory situations and over time (as in Sethi et al., 2000).

In sum, the current research reveals that attention deployment is an important component of preschool delay of gratification, both in waiting and working situations, and addresses just how attention seems to influence delay ability. The attentional absorption and self-distraction of the work activity itself appears to be largely responsible for longer delays associated with engaging tasks. As Baumeister et al. (1994) suggested, "[w]hatever is not noticed cannot have much in the way of consequences, whereas things that receive extensive attention tend to gain considerable power for producing psychological consequences" (p. 25).

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