PERFORMANCE OF OVERWEIGHT AND NORMAL WEIGHT GIRLS ON TWO DELAY OF GRATIFICATION TASKS

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ABSTRACT

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Two measures of delay of gratification, the ability to delay task and the preference for delay questionnaire (PDQ) were used as indicators of self-control and related to obesity in children. The ability to delay task requires that subjects persist in waiting, alone and without distractors, for a period of time in order to obtain a reward. The subjects were video taped during this task in order to obtain an observational measure of spontaneous self-control strategies.

Subjects were 36 middle class girls between 5 and 9 years of age. Half the sample was overweight according to height weight norms, adjusted for age, and the judgement of trained observers and half were normal weight according to the same indicators. They were first assigned to one of two reward conditions, food or nonfood, and tested on the ability to delay task. The video tape recordings of all children waiting at least 3 minutes on this task were later subjected to behavioral analysis. Finally, the PDQ was administered to each subject.

Results indicated that overweight and normal weight girls were not significantly different in their ability to delay

gratification, regardless of reward condition. Similarily, the groups were not found to differ with regard to their preference for delayed rewards. The results of the PDQ did replicate past research in that a significant effect for age was found. Older children more frequently chose the delayed rewards than did younger children. Thus the notion that overweight children are deficient in self-control ability was not supported by the findings of this study. Behavioral analysis of the waiting task did suggest, however, that overweight girls employed less effective self-control strategies than the normal weight controls. This finding is discussed in terms of implications for the development and treatment of obesity.

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Obesity is a disorder which is becoming more prevalent in children (Forbes, 1975). It is now apparent that, even for children, this condition is associated with health risks and has, as well, negative social and psychological effects (Coates & Thorensen, 1980). In addition to harmful immediate effects, there is mounting evidence that weight problems begun in childhood tend to persist into adulthood. Longitudinal studies show that a large percentage of overweight children become overweight adults (Charney, McBride, Lyon, & Pratt, 1976; Miller, Billewics & Thompson, 1972). Using a retrospective approach, Rimm and Rimm (1976) found that the most severly obese members of a TOPS group were much more likely to report having been overweight as children than their less obese counterparts. Finally, the hypothesis has been advanced that obesity during childhood may be related to physiological changes that could act against weight loss attempts in adulthood (Grinker, 1973; Hirsch, 1974). This discouraging picture has led to a call for increased research efforts towards determining behavioral differences between obese and normal weight children (Lebow, 1977). Such research may prove to be useful in developing effective treatment techniques for this population.

A construct which should be studied in overweight

children is self-control. Several sources suggest an important role for this variable in obesity and weight control. In 1973, based on her clinical observations, Hilda Bruch proposed self-control deficits in the obese. Not surprisingly, there is also a popular assumption that the obese lack self-control, especially concerning food. This notion is frequently used to explain overeating although, until recently, there has been little evidence to suggest that the obese do actually overeat. However, it now seems from the results of several studies that overweight children do exhibit a particular eating style that may include overeating (Drabman, Cordua, Hammer, Jarvie, & Horton, 1979; Keane, Geller, & Schierer, 1981; Marston, London, & Cooper, 1976; Waxman & Stunkard, 1979). The study of self-control in these children may help to clarify the reasons for differential eating habits.

A further reason to study self-control in overweight children pertains directly to treatment of obesity. Research concerning treatment studies suggests that programs which involve self-control techniques for weight loss appear to be quite promising (Abramson, 1973, 1977). A recent study of children who had achieved weight loss in a treatment program showed that the youngsters who maintained their losses had the greatest repertoire of

self-control skills (Cohen, Gelfand, Dodd, Jensen, & Turner, 1980). Thus, self-control appears to play a role in both weight loss and maintenance. A better understanding of the self-control process in overweight children may be useful in order to devise treatment methods that will foster the development of skills necessary for weight control.

The purpose of the present study was to investigate self-control in overweight and normal weight children. A paradigm was used that has been developed by Walter Mischel and his colleagues over the last decade. This paradigm focuses on one aspect of self-control, delay of gratification. It was considered particularly suited to the present research in that as well as providing a measure of self-control ability, it allows the observation of subjects during testing. Thus it was possible to examine behavioral differences that might be associated with performance of obese and normal weight subjects on the task.

The background to this research includes, first of all, the evidence concerning eating patterns and overeating by obese children. In the following section theoretical positions regarding self-control are presented. Finally, the research and theory that relates to delay of gratification is discussed. Some studies have examined

the performance of overweight children on delay of gratification measures and these are described in this final section.

BACKGROUND

Do Obese Children Overeat?

Surprisingly, the common sense question of whether or not obese children actually eat more than normal weight children has been hard to answer. The excess storage of body fat that characterizes obesity is generally considered to be the result of caloric intake that surpasses the individual's energy requirements. Methodological difficulties have hindered efforts to determine the role of eating patterns in the development of this caloric imbalance.

Several early studies reported that overweight children and adolescents ate similar quantities or even less than their normal weight peers (Corbin & Pletcher, 1969; Johnson, Burke, & Mayer, 1956; Stefanic & Heald, 1959). The most recent study to report a similar finding was that of Huenemann, Hampton, Benke, Schapiro, and Mitchell in 1974. These researchers asked 184 teenagers to complete daily diaries of food intake. The subjects were instructed to be very honest and to describe their meals and snacks in detail. The diaries, completed for at least one seven day period, were presented to a nonjudgemental nutritionist and discussed. It was reported that the obese teenagers consumed fewer calories than those in any other weight

category. They also seemed to eat less frequently and skip meals more often. These findings seemed to suggest that overweight youngsters do not overeat. However, all of the early research on caloric consumption relied on self report measures. This form of data is subject to several sources of unreliability. In particular, it is possible that obese children may be unwilling or unable to give accurate reports of food consumption. Or, as Huenemann et al. (1974) suggested, the children may have altered their food intake during the period that this behavior was recorded.

More recent attempts to assess eating behavior of overweight children have used direct observational methods, either in naturalistic settings such as the home and school or in controlled laboratory meals or snacks. Marston, London and Cooper (1976) observed eight pairs of children in the 6-14 year age range. One child of each pair was at least mildly obese, the other slim. Several differences in eating behavior emerged over the one month observation period. The obese children consumed their meals more quickly and were also found to take more bites per unit of time. They chewed each bite fewer times than did controls. As compared to the slim children, overweight children toyed less with their food, hesitated less and drank more while chewing. Finally, the normal weight

children left more on their plates than did the obese. Drabman, Hammer and Jarvie (1977) also observed fast eating rates and limited chewing in overweight elementary school children and replicated these findings with preschoolers (Drabman, Cordua, Hammer, Jarvie, & Horton, 1979). Recently, Keane, Geller and Schierer (1981) served 10 obese fifth graders and 10 slim classmates a standard meal in a controlled setting. Again, direct observations showed that the overweight subjects consumed the meal faster and took more bites per minute than the controls. There was also a trend towards a greater total number of bites and sips for the obese children. These studies consistently demonstrate an eating style that may lead to overeating but do not provide much evidence that the obese youngsters actually eat more than normal weight children. An intensive study done by Waxman and Stunkard (1980) addressed this issue more directly. Families that had one obese boy and one normal weight boy of a similar age were observed at dinner and portions of the meals were weighed. The obese boys were also observed at school meals and their classmates used as comparisons. The overweight boys ate more than their siblings at home and far more than their classmates at lunch. They also ate faster than their brothers and much faster than their classmates.

These conclusions were based on weekly observations over a period of 4 to 5 months. This study coupled with the consistancy of other findings supports the assertion that overweight children overeat. However, there is little information concerning the causes of this overeating.

As self-control appears intuitively to be related to consummatory behaviors and has also been posited as a factor in obesity (Bruch, 1974), it would seem feasible to suggest a link between self-control abilities and eating behaviors in obese children. Overeating may, in fact, be the result of self-control deficiency. However, it would be important to determine if any such deficit in the self-control skills of obese children was general or specific to food related situations.

In recent years, considerable empirical and theoretical effort has been devoted to the concept of self-control. In particular, the delay of gratification paradigm has been used to elucidate cognitive and attentional mechanisms underlying successful self-control. Thus a basis appears to exist for comparison of obese and normal weight children on self-control behaviors which may be related to differential eating patterns.

Theories of Self-Control

It was B.F. Skinner in 1953 who first discussed the ability to control one's own behavior in terms of a repertoire of acquired controlling responses that can be enhanced through instruction in relevant self-control techniques, rather than a generalized trait as implied by the term 'will power'. According to Skinner, self-control can be observed when an immediately reinforcing, high probability response is accompanied by delayed effects that are punishing. For example, the immediately rewarding consumption of highly caloric foods may also be followed by the aversive consequence of weight gain. Individuals can make such responses less probable by altering variables in the environment that control them. The point is summarized as follows:

> "The individual controls himself precisely as he would control the behavior of anyone else through the manipulation of variables of which behavior is a function" (p. 228).

The area of self-control received little attention from behavioral theorists for the next decade. In 1971 Frederick Kanfer presented a theoretical formulation of the self-control process that incorporated and expanded Skinner's position. This was later elaborated in conjunction with Paul Karoly (Kanfer & Karoly, 1972). This

more recent conceptualization of the self-control process proposed that although environmental reinforcement contingencies continuously modify individual behavior as Skinner suggested there arise situations where two responses have similar outcomes or where one response engenders both positive and aversive consequences. These situations represent conflicts for the individual and require self-management of behavior. The resolution of such a conflict can be seen as a transition from environmental control of behavior to self-control of behavior. Descriptively, this transition occurs as follows: A behavioral chain of high probability, reinforcing responses is broken. Learned controlling responses are initiated. Finally, a new behavioral chain of low probability behaviors (that are not immediately reinforcing) is instituted and maintained. It is this transition that is of particular interest in the Kanfer and Karoly (1972) analysis.

The term 'alpha' has been used to describe environmental sources of control and processes formerly called self-control are termed 'beta-control' in this conceptualization. More precisely, beta-control refers to "those moderating psychological processes that supplement a simple input-output relationship on the basis of the person's past history, biological constitution and his

pattern of generating internal situational processes" (Kanfer & Karoly, 1972, p. 405).

The beta-control process is conceptualized in three stages. The initial stage, 'self-monitoring' begins when a behavior chain is not run off smoothly: for example, when a choice point is reached. The individual attends to or monitors his or her own response produced cues. Closely following is the second stage of 'self-evaluation'. Here, the individual's performance is compared to a subjectively held standard or criterion. This stage of self-evaluation has been described as a discrimination, on which is based the final stage of 'self-reinforcement'. When self-evaluation reveals adequate performance the individual self-administers positive reinforcement and maintains a similar response pattern. If the behavior does not meet the internally held standard negative self-reinforcement may be administered and a new behavioral chain begun. Thus, the self-reinforcement stage serves to alter or maintain behavior to bring it in line with performance standards. The whole self-control process, conceptualized as a closed feedback loop, is renewed until behavior continues smoothly. The point has been summarized as follows:

"The antecedants of beta-control (self-control) lie

> in the discrepancy between self-observation and the performance promise, followed by self-reinforcement aimed at reducing the discrepancy" (Kanfer & Karoly, 1972, p. 408).

In contrast to the position proposed by Skinner (1953) which emphasizes environmental control, this more recent formulation stresses internal or cognitive processes. Similarily, clinical interventions focus on the modification of internal events as they relate to the target behaviors. Important applications of self-control techniques include helping clients to approach or tolerate aversive situations (i.e., phobic stimuli, prescribed exercise programs) or to avoid highly reinforcing ones (i.e., certain drugs or foods). Simply stated, in both of these situations the client strives to resist the immediately reinforcing situation in order to obtain a more valued outcome in the future. For the obese client for example, the highly valued future outcome might be improved health and appearance, yet sedentary habits and fattening foods are immediate reinforcers. Clinical self-control strategies based on Kanfer and Karoly's analysis involve strengthening commitment to behavior change through development of individual standards, as well as instructing clients in the necessary behaviors to achieve their internal criteria.

This emphasis on cognitive processes in self-regulation has influenced most recent discussions of self-control. Thorensen and Coates (1976) define the phenomena as "Learnable cognitive processes used in generating controlling responses which in turn alter factors modifying behavior over time." However, Kanfer (1977) has warned against the development of a dichotomous division between external and self-generated factors determining behavior. Rather, he postulates a dynamic model that assumes that each set of variables contributes to the final outcome or behavioral event. Therefore, when considering the phenomena of self-control it must be recalled that the individual's performance is influenced both by external variables and his or her own, internally produced responses. In addition, these forces constantly interact and moderate the final effect.

Kanfer (1977) has proposed another refinement of the concept of self-control that is relevant to this discussion. Two broad categories have been outlined; 'decisional' self-control and 'protracted' self-control. The former refers to situations where an individual must make one choice among available alternatives. Thereafter, behavior is under alpha-control. An illustrative example is that of the alcoholic who ingests a medication that will pro-

duce vomiting when alcohol is consumed. Here, only the variables affecting the choice are of theoretical and clinical interest. The latter form of self-control implies a commitment or contract for future performance which may not be determined by environmental cues. The individual may be required to invoke various self-generated strategies to maintain new behavior which may be competing with strongly established alternatives. Protracted self-control is very important for the clinical application of the self-control concept. The regulation of food intake for treatment of obesity is a case in point. As has been pointed out by Leon (1979), this condition is very difficult to treat because the person attempting to control intake is faced daily with multiple cues for the ingestion of highly caloric foods. Environmental influences frequently work against the dieter who requires a large repertoire of self-control skills in order to maintain commitment to new eating habits.

The delay of gratification tasks which will be discussed in the following section are particularily interesting in that they provide a paradigm for studying decisional and protracted self-control. Not only must an individual make the decision to postpone immediate gratification but he or she must also attempt to sustain wait-

ing behaviors for a period of time in order to obtain the more valued reward. The strategies brought to play during this period may be important to successful delay of gratification. In addition, the individual's responses to food and nonfood items can be examined in order to examine hypotheses relevant to weight control.

Delay of Gratification

Delay of gratification is an aspect of self-control that has received considerable empirical attention, particularily in child populations. Several studies have pointed to delay of gratification processes that may be relevant to self-control in food situations. In addition, a few researchers have begun to examine delay of gratification in obese youngsters.

Mischel (1966) has conceptualized delay behavior in terms of a social learning model. When faced with a choice of an immediate but less valued reward and a delayed but more valued reward, the individual's choice is based on expectancies and reward values associated with each choice. This choice is termed 'preference for delay' in Mischel's work and is similar to 'decisional self-control' as described by Kanfer (1977). In practical terms, this form of self-control is akin to that required in stimulus management treatments and the ini-

tial stages of weight loss. For example, an individual may be asked to dine at the same time of day and at the same place each day. Once the individual undertakes to do this it is hoped that environmental cues will come to govern hunger signals and control eating.

Once the decision to wait for a reward has been made, the individual must call upon a new set of behaviors to deal with the waiting period. The ability to delay, according to Mischel (1974) is a function of attentional and cognitive factors. This is similar to Kanfer's (1977) 'protracted self-control' and in terms of clinical self-management, may be crucial to long term maintenance of lowered body weight when learned cognitive processes are repeatedly brought into play to sustain new behavior patterns. The two phases of delay of gratification will be discussed separately in the following sections.

Preference for Delay

Mischel (1974) notes that the early phases of his work focused upon developing reliable measures of preference for delay choices and investigating correlates of preference for delay patterns. One of the earliest studies (Mischel & Metzner, 1962) employed a sample of children from 5-12 years of age and investigated the relationship of age, intelligence, and proposed length of

the delay to preference choices. A measure of "future time perspective" was also taken. It was found that the proportion of immediate choices increased linearly with the length of delay. The authors interpret this finding as suggesting that children's expectations of actually obtaining the more valuable reward decrease with the length of delay interval. Alternatively, there may occur a change in the relative values of the rewards with the increasingly aversive waiting period. The 'immediate' subjects showed more variability in future time perspective, more frequently making very conservative or very liberal estimates of the location in time of future events. An increasing preference for the delayed reward was related to both age and intelligence.

This study is typical of several investigations which positively correlate preference for delay with age, achievement orientation, social responsibility, personal adjustment, resistance to temptation, sociocultural and rearing conditions and intelligence (Mischel, 1974). Preference for delay has also been linked to reflective (versus impulsive) behavior patterns in first grade (Mann, 1973) but not kindergarten children (Ward, 1973).

Only a few studies have tested preference for delay in overweight children. As a minor part of a larger study,

Sigal and Adler (1976) measured this aspect of delay of gratification as an indication of "internal control"in a sample of obese and normal weight boys between 8 and 13 years of age. At the end of an experiment conducted over two sessions in their own homes, the boys were informed that they had won a prize and were given a choice of accepting the prize immediately or receiving two of the same prize the following week. They were then told that they had also won another prize and were offered a similar choice. For all subjects one of the choices was between two edible prizes, the other, between two inedible toys. Order of presentation for the choices was counterbalanced. Regardless of the condition (edible/inedible) the overweight boys chose the immediate prize significantly more often than did the normal weight subjects. It would be premature, however, to suggest that this finding indicates a deficiency in internal control as other interpretations are possible. The obese boys may have been hesitant to impose a second trip to their homes on the experimenter. One could also speculate that in the edible reward condition, the overweight subjects may have been hesitant to choose two of the food prizes for fear of appearing to 'overindulge' in the presence of their families and the experimenter. However, the study does provide some

evidence for differential preference for delay in obese and nonobese boys.

Johnson, Parry and Drabman (1978) tested 132 children, of both sexes, 6 to 11 years of age. They were given 10 choices, 5 food pairs and 5 nonfood pairs. In each choice the child could express a preference for one item immediately or two the following day. Again, the obese children displayed a slight but significant preference for the immediate rewards. This preference was specific to the food items. However, a closer examination of the data reveals that only for the 10 year old children is this difference significant: it is this group that causes the overall significant finding. Again, this result could be due to the confounding of delay and 'overindulgence'. In the food condition a delayed choice means the choice of two highly caloric food treats (cupcakes, suckers, candy bars, etc.). It is possible that around the age of 10 children become aware of their overweight status and are reluctant to display what may be interpreted as overindulgence, by choosing the delayed rewards which happen to be greater quantities of fattening foods. It is possible that no differences in preference for delay would be shown if the choices employed appealing foods that are not as obviously "fattening" - such as

fruit or nuts.

A recent attempt to replicate the research of Johnson et al. (1979) did not find differences between obese and normal weight children on a similar preference for delay task (Geller, Keane, & Scheirer, 1981). Elementary school children attending the third, fourth and fifth grades were offered choices between immediately available rewards and two of the same rewards available at the end of the school day. Unfortunately this delay is very short. Previous research has shown that when delayed rewards are available the following day fourth grade children all choose to delay gratification. With the delay of only a few hours employed in the Geller et al. (1981) study, a similar pattern would be expected. Indeed the authors report that all subjects, regardless of weight category preferred the delayed rewards. It is not possible to reach any conclusion concerning preference for delay in obese children due to ceiling effects in this experiment.

These studies appear to offer some support for a more immediate preference for delay, particularily in food situations, for obese children. However, both the theoretical rational for these studies and their methodology must be questioned.

Examination of the work of Mischel and colleagues

reveals that the preference for delay task is not a measure of delay ability or internal control as has been suggested by Sigal and Adler (1976) and Johnson et al. (1978). Rather, it was developed as a measure to reflect the child's expectancies, based on situational determinants, concerning the postponement of immediate gratification. Individual variables that have been shown to be related to preference for delay such as age, intelligence and socio-economic level (Mischel, 1974) do not appear to be related to obesity. Past research and theory does not lead to the prediction of more immediate choices on the part of overweight children.

Two methodological problems may have lead to erroneous conclusions concerning the obese child's preference for delay. First of all, delayed rewards are typically double portions of a highly caloric food. Thus, on food choices, preference for delay is confounded with a behavior that could be interpreted as overindulgence. Second, the child has not always been allowed to make his or her choices in absolute privacy from family who might criticize choices of the delayed, larger rewards.

In the present study the preference for delay task is also administered. However, these methodological flaws are corrected as much as possible to eliminate obese/

nonobese differences that are not, in fact, related to the preference for delay measure. First, food choices, although attractive, are limited to less 'fattening' items such as fruit and nuts. Secondly, the choices are made only in the company of the experimenter so that the role of social censure is minimized.

Delay of Gratification Paradigm, ability to delay

More recently, attention has been focused on the behavior of children in protracted self-control situations. Once the individual has made the decision to wait for a preferred outcome how does he or she manage the waiting period? This can be compared to the situation in which the person attempting weight control remains on a calorie restricted diet for several weeks or engages in a course of physical exercise. The temptation is always present to abandon the difficult efforts towards the goal and accept the immediate reward of a rich snack or a return to sedentary habits. Of particular relevance to the understanding and treatment of problems of self-control is the research which has investigated the link between cognition and voluntary delay behavior of children during the actual waiting period.

Mischel and Ebbesen (1970) explored the role of attentional mechanisms in voluntary delay of gratification.

The manipulation was simply to offer the child a choice between two rewards (a pretzel and a marshmallow) and then to inform him that to obtain the preferred item it was necessary to wait alone until the experimenter's return. The less preferred item could be obtained at any point that the child decided to stop waiting. The conflict was conceptualized as one in which the child would continuously be tempted to terminate the delay and accept the less preferred item. Yet he or she would attempt to sustain waiting behavior as long as possible in order to obtain the most desired object. It was assumed that the child would attend to the rewards if they were present before him during the delay. Therefore, attention was varied by leaving the rewards, in various combinations (both rewards; only the nonpreferred item; only the preferred item) on the table before the child. Contrary to the hypothesis, attending to both rewards simultaneously considerably hampered the subjects waiting ability. The presence of the less preferred item had the least effect. Children who waited with no rewards present were able to delay for long periods, many of them reaching criterion of 20 minutes. The researchers observed, as well, that the subjects attempted to transform the waiting period into a less aversive experience by singing, playing

solitary games or even falling asleep. It was concluded that "diverting one's attention from the delayed reward (while maintaining behavior directed towards its ultimate attainment) may be a key step in bridging temporal delay of reward." It is interesting that even children of this age (mean age 4 years 6 months) appeared to be aware of the distraction technique and capable of using it to manage their own behavior.

Mischel and Ebbesen's (1970) post hoc interpretation of their results was based upon the concept of frustration. In voluntary delay of gratification the person self-imposes a frustrative waiting situation. Frustration has been considered to have an actively aversive effect (Amsel, 1962). Therefore, conditions which enhance the aversiveness of frustration make the delay behavior more difficult to sustain. Any cues that increase attention to the desired but unavailable reward make the delay more aversive through this effect. Therefore, presence of the preferred reward shortens delay time. Presence of the less preferred reward has a similar effect by focusing attention on the temptation to terminate the waiting period by accepting this immediate if not equally desirable reward.

Directing attention cognitively to the rewards even

when they are not present decreases waiting ability as dramatically as if the child were actually looking at them (Mischel, Ebbesen & Zeiss, 1972). The same study showed that when the children were given a toy or a cognitive distractor (thinking fun thoughts) their waiting ability was significantly improved. Furthermore, the content of these distractors was shown to be important. Thinking sad thoughts and thinking about the rewards reduced waiting times to levels similar to the rewards present group.

These results suggest the conclusion that "effective delay of gratification depends on cognitive avoidance or suppression of the reward objects during the waiting period". Thus the children transform the waiting period, either spontaneously or by following instructions, into a less aversive situation. A group that simply waited with no contingency showed by delays of less than one minute that it must be necessary for these young subjects to simultaneously bear the contingencies in mind while sustaining waiting behavior.

The influcence of cognitive representations on delay ability has been investigated further by Moore, Mischel and Zeiss (1977). The subjects were taught 'cognitive transformations' which they were to perform during the waiting period. Specifically, subjects were asked to

cognitively transform the reward into "pictures". In an opposite condition, the children were left with pictures of the reward objects which they were asked to imagine were "real". The data indicated that the children's cognitive representation outweighed the effects of the actual reward object left before them. Thus, while earlier studies had shown that when the rewards were present before the child he or she was unable to delay beyond a few minutes, the addition of these simple instructions was able to increase waiting times to a mean of 17 minutes. On the other hand, subjects who saw pictures before them which they imagined were real waited for short periods only. This experiment suggests that the way in which children think about rewards has a significant effect on the way these rewards influence their self-control ability. Manipulation of stimuli cognitively has, in this situation, an effect that over-rides the manipulation of external stimuli. Similar processes applied to clinical programs may be beneficial, particularily as their 'portability' might make cognitive procedures more suitable for the maintenance phase of treatments.

A study that is important for the issue of cognitive self-control procedures for treatment of overweight children was performed by Mischel and Baker (1975). The

effects of consumatory and nonconsumatory ideation about the rewards were studied. Children who focused on the consumatory aspects of the rewards, such as taste and texture, were found to be less able to sustain waiting behavior than were those who focused on the nonconsumatory aspects such as colour and shape. It is possible to speculate that obese and normal weight children may have differing cognitions concerning food items. In situations where the obese child is attempting to avoid highly caloric foods his or her cognitions may focus on aspects of the food that, in fact, make successful avoidance very unlikely. A child who focuses cognitively on the pleasurable taste associated with eating may be less able to tolerate delayed gratification for food than one who distracts him/herself from the unavailable edibles. This may contribute to overeating in the form of between meal snacks.

Most recently, Yates and Mischel (1979) have attempted to study attentional preferences and spontaneous delay strategies in the delay of gratification paradigm. Previous research had suggested two delay strategies that were effective and two that were ineffective. For this discussion it is necessary to recall the earlier study by Moore, Mischel and Zeiss (1977) where it was found that viewing symbolic representations of food items facilitated

delay whereas looking at the real food items made delay more difficult.

In the more recent study children were given an apparatus that allowed them to view stimuli representing the different strategies. Preschoolers and youngsters to the age of 7 years show a consistent preference for the real items, an ineffective strategy. Even when prompted to look at items that would make waiting easier, few of these younger subjects switched to effective strategies. Finally, older subjects in the second and third grades were studied. An interesting finding was that these subjects chose to view nonfood items, either real or symbolic, more often than the real rewards in the food reward condition only. They verbalized their belief that this was a way of helping themselves delay effectively. In the nonfood condition the subjects most often chose to view the real relevant rewards. This study suggests that the ability to generate self-control strategies is related to the child's level of development. Of particular importance to the study of childhood obesity, is the finding that specific strategies are required when the rewards are food items. In the nonfood situation, the children viewed the relevant real objects more frequently, a finding that may seem contradictory. However, in this design, the alter-

native choice was to view a food item. It is possible that the subjects wished to avoid the frustration created by viewing unavailable food items. In any case, the finding that around the age of 7 years children begin to employ specific strategies to manage their behavior related to food gratification is an important one for this discussion. It may be that the obese child demonstrates a lag in the ability to generate self-control strategies. As this ability seems particularly important in the case of food gratification, the deficit may be manifested in the form of overeating and subsequent weight gain.

The findings from empirical manipulations of attentional and cognitive mechanisms have received support from observational studies of childrens' spontaneous use of self-control strategies. Yates and Revelle (1979) attempted to analyse waiting behaviors of children in the delay of gratification situation. Subjects who waited the full 20 minutes were compared to those who terminated the delay after waiting a minimum of one minute. Behaviors were recorded by the experimenter via a one-way mirror in 60 sec intervals. It was found that the successful delayers were more likely to talk to themselves about things not related to the delay situation, rest their heads on their arms, look around at the floor, and fidget. The termina-

tors, on the other hand, were more likely to rehearse the termination signal silently and stare at the prizes. The observable behaviors correspond to some of the cognitive strategies that have been postulated to underlie successful and unsuccessful waiting strategies.

Another group of researchers has assessed spontaneous waiting strategies. Yates, Lippett and Yates (1981) asked children aged 5 to 8 years what they did and thought about while waiting. Their answers were recorded and classified as either 'distractive cognition' or 'on-task cognition'. In addition, evidence of motoric activity was recorded. They found that distractive cognition was associated with longer waiting times at all age levels whereas task oriented cognitions reduced waiting ability but only for the youngest children. Simple motoric activity was also associated with longer waiting times but again, only at the youngest age levels. The authors suggested that perhaps the simple statements of the children failed to reflect their actual ability to use appropriate strategies. For example, a statement such as 'I really wanted those prizes' was classified as on-task cognition but may in fact indicate a more complex achievement oriented strategy. It is possible that children of 6 years of age and older are capable of waiting to the criterion of 15 minutes,

regardless of the strategies employed. It would be interesting to assess the children's perceptions of the difficulty of frustration involved in the waiting task. The subjects reporting on-task cognitions may find the waiting period more aversive than those reporting distractive cognitions.

Both of these studies suggest that the predominant strategies that children employ in self-control situations can be determined through observation. If obese children do, in fact, exhibit a lag or deficit in the development of specific cognitive strategies required for delay of gratification in food situations, it may be possible to pinpoint behavioral differences, relative to normal weight controls, through behavioral analysis.

Some research has examined the ability of obese children to delay gratification. An experiment conducted by Lewittes and Israel (1978) examined the role of certain instructions in maintaining delay behavior. In addition to several other dependent measures, an 'obesity index' was calculated and related to the children's delay ability. A significant negative relationship between obesity rating and delay time was found. While interesting, this finding may be misleading in that from the description of the subjects it seems that, in general, they were within the

normal weight range.

In a recent unpublished thesis (Wilson, 1979), overweight and normal weight kindergarten children were compared on a delay of gratification task. Although fewer obese children waited to criterion than controls and their mean delay times were shorter, these results were not significant. The addition of self-verbalization instructions improved overall waiting time significantly with most of the variance being accounted for by the overweight children. It was concluded that this particular strategy was particularily helpful to the overweight children, suggesting a difference in the spontaneously employed cognitive strategies in the delay situation for the two groups.

Wilson's (1979) study employed a slightly different paradigm from that used by Mischel and his colleagues. Rather than offering the children a choice between two different rewards the subjects in Wilson's experiment were offered one cookie immediately or two cookies later. Again, successful delay results in a larger quantity of food thereby confounding delay and 'overindulgence'. Even at this young age (kindergarten) the obese children may have been sensitive to the possibility of criticism for overeating. This sensitivity may have lead some obese

children to terminate the waiting period and accept one cookie rather than appear to overindulge by taking two cookies. In order to avoid this confound the design of the present study replicates Mischel's work in that food items differ as to type rather than quantity.

With regard to the actual time the children waited for their preferred rewards it is not possible to compare the study by Wilson (1979) and the study by Lewittes and Israel (1978) as the latter report did not include separate data for overweight children. Wilson's (1979) research showed that overweight children of 5 years 7 months waited an average of 9.4 minutes when the rewards were present. Normal weight children matched for age waited 11.9 minutes in the same condition. All rewards were food. Comparison of mean waiting time with the findings of other studies is difficult because tasks differ as to age of subject and type of reward. For example, children between ages 3 years 6 months and 5 years 6 months have been found to wait less than 5 minutes with food rewards present (Mischel & Ebbesen, 1970; Mischel, Ebbesen & Zeiss, 1972). Children in the first grade waited 6.42 minutes in a similar situation (Miller, Weinstein & Karniol, 1978). The same authors found that older children in the third grade waited 11.41 minutes. Another study used toys as rewards but the

subjects were poor black children. These 6 year olds waited an average of 4.5 minutes (Schack & Massari, 1973).

As past research does not allow direct comparisons of mean waiting time, a control group of normal weight children is included in the design of the present study. Subjects of similar age to those employed here waited between 6 and 11 minutes (Miller et al., 1978). It appears that length of delay is positively related to age, although a developmental investigation of delay ability is not available. Therefore, to avoid ceiling effects in the present study, a criterion of 20 minutes was set.

The available research concerning cognitive and attentional strategies during delay of gratification suggests that when food rewards are involved successful self-control requires certain strategies. Specifically, thinking about consuming food lessens delay ability (Mischel & Baker, 1975) as does looking at real food items (Yates & Mischel, 1979). Further, the work of Yates and Mischel (1979) suggests that use of the most effective delay strategies is developmentally related. It is possible that some children are developmentally slower in terms of these skills. Children who manifest a lag in these skills may perform more poorly when self-control is required

towards food but not in other situations. Similarily, if overweight children do have a self-control deficit it would be expected to be specific to food situations.

In the present study the ability of overweight and normal weight children to delay gratification is compared. Two conditions were used, one involving food reward, the other, nonfood rewards. The waiting behaviors of the two groups of children were analysed to determine if weight status and food condition were related to the self-control strategies employed during the delay period.

Statement of the Problem

The following research project has been designed to study the obese child's behavior in both preference for delay and actual delay of gratification situations.

Previous research comparing overweight and normal weight children on preference for delay tasks suggests that overweight children prefer immediate rewards (Sigal & Adler, 1976), especially immediate food rewards (Johnson et al., 1978). However, the evidence that obese children prefer immediate gratification is equivocal for several reasons. First, one study (Geller, et al., 1981) failed to replicate these results. Secondly, research that has examined preference for delay in overweight children has certain methodological flaws. The delayed rewards have typically been double portions of very fattening foods such as chocolate bars and cupcakes. Thus, in order to make a delayed choice the subject must also display behavior that might be considered 'over-indulgent'. This confound between preference for delay and overindulgence may differentially effect overweight and normal weight subjects. Obese children may have been criticized for eating such foods in the past and may choose immediate rather than delayed rewards to avoid further disapproval. Children have also been required

to make their choices in social situations which may have added to the child's reluctance to choose the larger rewards. Finally, Geller et al. (1981) failed to allow a delay period appropriate to the age of their subjects. Fourth grade children were offered immediate rewards or delayed rewards available a few hours later. Under these circumstances, all children chose delay. The work of Mischel and Metzner (1962) would suggest that a longer delay period is required to detect group differences. The present study attempted to correct these methodological problems. Confounding preference for delay and overindulgence was eliminated by offering children attractive foods such as fruit or nuts, which are not usually considered fattening. Choices were made in relative privacy rather than with parents present. As well, subjects were offered choices between immediate smaller rewards and larger rewards available after a delay of one week.

Given these methodological changes, there does not seem to be a basis for predicting that overweight subjects would prefer immediate rewards more than normal weight subjects. Rather, it seems more reasonable to suggest that preference for delay would be related to situational variables and individual characteristics such as age,

socioeconomic level and I.Q. in both obese and nonobese children (Mischel, 1974). It was hypothesized that the current study would replicate Mischel and Metzner (1962) in that delayed preferences would be related to age. More specifically, older children were expected to make a greater number of delayed choices than younger children.

Research concerning ability to delay has focused on the cognitive and attentional mechanisms that are related to successful delay of gratification. Specifically, this research has been concerned with factors which determine the subject's ability to successfully sustain waiting behavior in order to obtain a preferred reward. Two studies have suggested that certain strategies may be required only when the rewards are food.

Mischel and Baker (1975) showed that "consummatory ideation", thoughts concerning the taste and texture of food rewards, considerably hindered waiting ability. Yates and Mischel (1979) found that when children are asked to choose the strategies that help them wait children below 7 years of age choose to view real rewards in both food and non food conditions, an ineffective strategy. Older children avoid the real rewards stimuli in the food condition but not in the nonfood condition. They were able to express their belief that looking at

real food rewards would make waiting more difficult. It appears that delay of gratification for food rewards is a more complex self-control situation than is delay for nonfood rewards. The use of appropriate strategies to manage this situation appears to be developmentally related. It is possible to speculate that overweight children have been slower to develop these strategies and may therefore have self-control difficulties where food is concerned but not in other situations. Through behavioral analysis it may be possible to determine if overweight and normal weight children differ in the self-control strategies spontaneously exhibited while waiting for food and nonfood rewards.

In order to test the possibility that the self-control strategies employed by overweight and normal weight children to delay gratification are related to type of reward stimuli, subjects were tested in one of two conditions. In a delay of gratification paradigm, children of both weight categories were offered either food or nonfood rewards. It was hypothesized that the behavior of the two groups of children would differ in the food condition only. In this condition, it was predicted that the overweight children would not spontaneously employ as effective strategies as the normal weight children.

There has been little research examining obese children's actual ability to delay gratification. One study has found a trend for overweight children to perform more poorly on a task that required waiting for a cookie (Wilson, 1979). Normal weight children tended to wait longer and more of them reached the criterion than did overweight children. In studies of normal populations short delay times have been associated with such behaviors as looking at the rewards (Mischel & Ebbesen, 1970; Yates & Ravelle, 1979), thinking about the rewards (Mischel, Ebbesen, & Zeiss, 1972) and rehearsing the termination signal (Yates & Ravelle, 1979). If, as hypothesized earlier, overweight children employ similar poor strategies when the rewards are food, they may not be able to wait as long for their preferred rewards as normal weight children. Thus is was hypothesized that, in the food condition, the overweight and normal weight subjects would differ on length of delay. Specifically, the normal weight subjects were expected to wait longer than the overweight subjects.

Method

Subjects

Selection criteria. The design of this study called for 20 males and 20 females between the ages of 5 years

and 8 years 11 months. Half of the subjects of each sex were to be overweight and half normal weight, according to specific weight criteria described below. In addition to the age, sex and weight criteria, all subjects were to be recruited from middle class populations and to be performing at the appropriate grade level for their age in school.

The overweight group. For inclusion in the overweight group each subject had to meet two criteria. First, the child had to exceed his or her ideal weight, according to the Baldwin-Wood norms for children (Wohl & Goodhart, 1964), by at least 10%. The ideal weight was calculated by determining the average weight for the subject's exact height and age. Height was calculated to the nearest .25 of an inch and age to the nearest month. In addition to percent overweight, the subject had to be judged overweight by at least one trained observer from a video tape recording.

The normal weight group. For a subject to be considered normal weight his or her actual weight had to be less than 5% above the ideal weight as determined by the Baldwin-Wood weight norms. Children in this group had to be judged as being of normal weight by at least one observer from the video tape recordings.

Recruitment. A variety of sources were contacted in order to recruit subjects. The professionals that were approached were asked to suggest the names of children that would be suitable for a study of the relationship of self-control and eating habits in normal weight and overweight children. A large proportion of the subjects, in both weight groups, were obtained through a network of aquaintances within the university community. Advertisements were also placed in the university paper and these located several control subjects. Pediatricians in middle class areas of Montreal recommended both normal weight and overweight children. Although many schools were contacted in the Montreal area and the West Island suburbs, only two schools, St. Bernard's School and Wilder Penfield School, both in Dollard des Ormeaux, actually provided overweight and control subjects.

Many of the sources contacted, nutritionists, schools, camps and doctors, claimed that there were no overweight children below 9 years of age that they could recommend. Although initially surprising, this is in keeping with the conclusions of a recent review by Brownell and Stunkard (1980). According to these authors one obvious trend that can be detected from their examination of the literature is that the prevalence of obesity increases

with the age of the children being studied. It is difficult to determine the prevalence of obesity in the age range of interest in the present experiment because older populations are usually studied and samples differ according to geographic area and socio-economic level. Huenemann et al., (1974) reported at least mild obesity in 11% of both boys and girls in the ninth grade. By the twelfth grade this had increased to 14% for both sexes. Obesity was defined as at least 20% body fat for boys and 25% body fat for girls. The subjects in the present study were much younger than the youngest subjects in Huenemann et al's (1974) research. Therefore, one might estimate the prevalence of obesity in 5 to 8 year olds as being less than 10%.

It was not possible to obtain an adequate sample through the methods described. Therefore, it was necessary to advertise in the major English language paper as well as small suburban weeklies. The advertisements described the project as a self-control study of children. However, in order to attract overweight subjects, weight control counselling was offered for participation. Thus the four overweight girls and the one overweight boy recruited in this way may have been aware of their parents' concern for their weight. Two other overweight girls were referred to

the project by other sources because their parents were looking for weight control counselling. In all cases parents were asked not to tell their children that weight was of importance for the study but the extent to which the children were aware of this issue is unknown.

Parents were contacted either by telephone or letter. The project was described as investigating the relationship of children's self-control abilities and their eating habits. They were asked to give their children a meal or snack before the session. Before each child was tested parents read and signed a consent form, presented in Appendix A, that described the foods offered in the experiment and the video taping procedure. They were also given a small sum ($5.00) to cover travel costs.

Screening. Fifty-five children were recruited and tested. Two subjects, one boy and one girl, were excluded because they were between 5 and 10% overweight and therefore did not meet the criterion for inclusion in either weight group. A third subject was dropped because she was very much underweight (17% below her ideal weight).

It became apparent after several weeks of testing that fewer overweight boys than girls were being recruited. There is evidence that at all ages boys are leaner than girls (Garne & Clark, 1976). In addition, it could be that parents and even health and education professionals

are less likely to consider a male child overweight than a similar female child. A stout girl may differ more obviously from the norm for body size than a stout boy. The latter may be thought of as 'stocky' or 'muscular' if the obesity is not extreme. To determine the number of boys and girls available for recruitment in the area a survey was conducted of three elementary school with a population of 762 children in kindergarten to grade three. The school nurses were asked to count the number of overweight boys and girls. Our criteria for overweight were described in as much detail as possible. They reported that eight overweight girls and four overweight boys attended these schools. This tended to support the impression that fewer boys than girls were available for testing.

Of the 17 boys tested for this experiment only 5 met the criteria for inclusion in the overweight group. Of these 4 were in the 'older' (7 years to 8 years 11 months) age category. Thus it was not possible to equally represent boys in each cell of the design. In addition, there were insufficient boys to analyze the results for sex differences which may exist in relationship to obesity. Therefore it was decided to include only the normal weight and overweight girls in the sample studied.

Final sample. The final sample consisted of 36 female subjects between 5 years and 8 years 11 months of age. There were 18 girls that met the criterion for overweight and 18 for normal weight.

As can be seen from Table 1 the weight groups were composed of two age categories, 'younger' children (5 years to 6 years 11 months) and 'older' children (7 years to 8 years 11 months). The mean age, in months, of the younger overweight and normal weight groups was 71.2 months and 75.7 months, respectively. The mean age for the older age category was 98.1 months for the overweight group and 95.6 months for the controls. A two way analysis of variance showed a significant main effect for age $F(3,35)=83.82$, $p<.001$, indicating that the younger and older age groups differed significantly from each other in terms of age. There were no other significant main effects or interactions. This suggests that overweight and normal weight groups were similar as to age.

The mean percent overweight, according to age and weight group, is also presented in Table 1. The overall mean percent overweight for the overweight girls was 25.6%. The range was 11.8% to 47.9%. The younger girls averaged 22.4% overweight, whereas the older girls averaged 28.8% overweight. The subjects in the normal weight groups were

Table 1

Overweight and Normal Weight Girls

Compared on Age, Percent Overweight and I.Q.

	Weight Group					
Variable	Overweight			Normal Weight		
Age (in months)	young	(n=9)	M 71.22	young	(n=10)	M 75.70
			SD 7.12			SD 8.09
	old	(n=9)	M 98.11	old	(n=8)	M 95.62
			SD 7.87			SD 8.10
	total	(n=18)	M 85.50	total	(n=18)	M 86.28
			SD 16.40			SD 11.70
% Overweight	young	(n=9)	M 22.4	young	(n=10)	M -1.8
			SD 10.73			SD 4.72
	old	(n=9)	M 28.8	old	(n=8)	M -2.0
			SD 13.78			SD 5.73
	total	(n=18)	M 25.6	total	(n=18)	M -1.9
			SD 12.42			SD 5.03
I.Q.	young	(n=7)	M 113	young	(n=8)	M 116
			SD 15.96			SD 12.16
	old	(n=6)	M 115	old	(n=5)	M 98
			SD 10.27			SD 8.02
	total	(n=13)	M 114	total	(n=13)	M 107
			SD 12.96			SD 13.96

an average of 1.9% below the norm for their height and age. The younger and older normal weight girls were similar in mean percept overweight, -2% and -1.8% respectively. According to analysis of variance (weight x age) the overweight and normal weight groups differed significantly as to percent overweight $F(3,35)=69.250$, $p < .001$. There were no other significant main effects or interactions, suggesting no other weight differences between the groups.

The Peabody Picture Vocabulary test (Dunn, 1959) was used to estimate I.Q. for the Anglophone subjects. Six subjects were French speaking (four in the overweight group, two in the normal weight group) and these were tested in French. Two verbal subtests, vocabularly and analogies, from the French version of the Wechsler Intelligence Scales for Children (Wechsler, 1949) were used to estimate I.Q. for these subjects. Of the 36 subjects tested, I.Q. data were available for 26. All children were within the normal range for intelligence on these measures. The mean intelligence estimates for the normal weight and overweight subjects are presented in Table 1. As can be seen from this Table the mean I.Q. for the older normal weight children appears to differ from that of the other groups. A two way analysis of variance showed a

significant interaction of weight and age $F(3,25)=5.699$, $p < .05$. However, Scheffé comparisons did not reveal any significant differences between the means of the four groups. This result may be attributed to the small size of the groups and the uneven N's. However, the relationship of intelligence to the various dependent measures was calculated in order to determine the appropriate form of analysis in each case. These correlations will be presented in the Results section.

Experimental Measures

Preference for delay questionnaire. This questionnaire was derived from the work of Walter Mischel and colleagues concerning preference for delayed rewards in young children (Mischel, 1966; Mischel & Masters, 1966; Mischel & Metzner, 1962). In one of the first studies, for example, the children were offered a choice of a $.05 chocolate bar immediately or a $.10 chocolate bar after a delay period from one day to two weeks (Mischel & Metzner, 1962). In the present study 12 pairs of items were used. A list of these items is presented in Appendix B. Six of the pairs were food and six were small toys. The dependent measure was the number of delayed choices made by the subject. The nonfood items were similar to those described by Mischel and Masters (1966). These included

comic books, balls, crayons and other trinkets. The original food items were such edibles as chocolate bars and candies. For the present study an attempt was made to choose food rewards that would be attractive to the subjects but not usually thought of as fattening (i.e., popcorn, raisins, sugarless mints). Whenever possible the delayed reward was a larger quantity of the immediate reward, rather than two identical items (i.e., a small versus a large oatmeal cookie). Examples from the Preference for Delay Questionnaire (PDQ) depicting the choice pairs are presented in Appendix C. These changes were intended to minimize the possibility that obese children would hesitate to make delayed choices that might appear 'overindulgent'.

Each of the pairs of items was depicted individually in the PDQ. The words 'NOW' and 'LATER' appeared below the appropriate item and the subject was asked to circle the word signifying his or her choice. The child was advised to make the best possible choice because he or she would actually receive one of the choices, either after the testing or after a delay of one week. The actual reward items were kept in a nearby box and were shown to the child at the same time as the appropriate choice was being made. Once the twelve choices were

made the child was allowed to choose one of these items as a gift.

Another measure was included in the PDQ as a control procedure. It has been suggested that children who choose immediate rather than delayed rewards do so because there is little difference in their attraction to the items (Hertzberger & Dweck, 1978). It could be reasoned that obese children view food items as highly desirable, therefore liking them all to an equally high degree. This could result in more immediate choices as the child may decide that if both rewards are equally attractive there is no reason to wait for the delayed reward. In order to determine the relationship of attraction to preference for delay in this group of subjects an attempt was made to assess the individual subjects' attraction to each of the reward items. An 'Attractiveness Scale' in the form of a five point Lickert Scale accompanied each item in the PDQ. This can be seen in the examples in Appendix C. 'Happy faces' with the appropriate facial expressions were used to remind the children of the meaning of the points on the scale. The first point indicating "doesn't like it at all" has a frowning face under it whereas the last point "likes it a lot" is paired with a smiling face. The child was asked to indicate how much he or she liked

each item by circling the appropriate point on the scale. Attraction to each item was rated after each preference for delay choice.

Delay of Gratification

In the delay of gratification paradigm devised by Mischel and Ebbessen (1970) the subject is offered a choice between two objects, typically, a pretzel and a marshmallow. The child must wait a certain amount of time in order to receive the preferred reward. The dependent measure is the number of minutes elapsed until the child ceases waiting or a criterion is reached. In the present study it was necessary to use different rewards. There were two conditions, food and nonfood. In the case of food rewards it was considered desirable to replace the marshmallow with a healthier and more attractive alternative. Nonfood rewards have been less frequently used and there are no particular rewards that are considered 'typical' for this paradigm. In order to choose rewards that would be attractive to children of the age group studied, a pretest was conducted. The details of the pretest can be found in Appendix D. A sugarless mint and a cookie were chosen as the food rewards and a ball and a small plastic figure as the nonfood rewards. Either the food or the nonfood rewards

were placed on a covered plate before the child in the delay of gratification task. A desk bell was also provided for termination of the waiting period.

Behavioral Analysis

The entire waiting period for each subject was recorded on video tape. The camera was situated about 5.5 feet above floor level on a wall. It was directed towards the subjects at an angle such that he or she was seen from the side and slightly from behind. In this way, although the camera was visible to the subjects if they turned around, it did not appear to make them uncomfortable.

Nine subjects waited less than 3 minutes and their behavior was not analyzed. Of those subjects who waited 6 minutes or more, minutes two through six were edited for behavioral analysis. Two subjects waited between 3 and 6 minutes and the entire waiting period was analyzed for these children. Audio cues were dubbed onto the tape so that the children were observed for 20 second intervals and their behavior was recorded for 10 seconds. In the case of subjects waiting less than 6 minutes, the recording period was shortened to 5 seconds to allow analysis of at least nine 20 second intervals in each case. All tapes were scored by two trained observers.

The observers scored the occurrences of eight behaviors. Each behavior could be scored in one interval but only one occurrence of a particular behavior was scored per interval. A scoring sheet can be found in Appendix E. The behaviors were divided into two categories, inhibitory behaviors (looking at rewards, touching rewards, touching the bell and rehearsing the termination signal) and facilatory behaviors (looking around, leaving chair, playing and resting head). Definitions of these behaviors for purposes of scoring as well as the instructions to observers can be found in Appendix F. These behaviors were chosen to reflect behaviors that have been shown to be related to unsuccessful and successful waiting in past research.

The Testing Room

All subjects were tested in the same room. This room is large and brightly painted. The children were seated at a table facing a one-way viewing mirror that was covered with curtains. As much as possible, distracting objects were removed from the room and extra chairs and tables were stacked in one corner. There was a chair opposite the child for the experimenter. Adjoining the

testing room was a small room where the experimenter could observe the subjects during the waiting period via a closed circuit television monitor.

Procedure

All children were tested individually by the same experimenter (author). They were randomly assigned to either the food or the nonfood condition before testing and the appropriate rewards were prepared in advance.

When each subject entered the testing room she saw the preference for delay items attractively arranged on the table next to the desk bell and the covered plate containing the rewards. The experimenter directed the child to be seated in the chair facing the rewards and attempted to make her as comfortable as possible by chatting informally for a few moments. The 'preference items' were then gathered up and placed in a box. While doing this the experimenter explained that the items were for a game that would be played later on. This type of statement is typically included in delay of gratification studies so that the child will know that termination of the waiting period does not also mean termination of the time with the experimenter. The following instructions were also included:

Before we can play with these things we have something else to do. But don't worry, we'll still have time for these things later. Right now I'll just tuck them out of the way, back here.

After placing the closed box out of reach of the child the experimenter asked if she could identify the desk bell. If the subject could not ring the bell the experimenter demonstrated and encouraged the child to try it a few times. The purpose of the bell was then explained in the following way.

The reason I have this bell is that sometimes I leave the room. When I do you can wait until I come back by myself if you want to. But if you don't want to wait you can just ring the bell (experimenter rings) and I will come right back.

Once the subject appeared to understand the instructions the experimenter explained that in order to show the child that she really would come back when the bell was rung she would like to practice one time. She then asked the child to ring the bell once she had left the room and shut the door. When the child rang the bell the experimenter came back into the room and smilingly said "You see, it really does work. I came right back." All subjects appeared to understand these instructions

very well after one demonstration.

The experimenter then removed the cover from the dish holding the rewards and described the rewards, an oatmeal and raisin cookie and a mint in the food condition and a ball and a pastic figure in the nonfood condition. As many mothers expressed concern about the kinds of candy offered to the children, it was decided to tell the children that the mint was sugarless. To avoid differential perceptions of the caloric values of the two items the children were simply told that this type of mint was not bad for their teeth. The subject was then asked to indicate which of the two items she would prefer to have. The contingencies were then explained to the child in the following manner:

> I am going to leave the room now. If you decide to wait until I come back by myself you can have the ... (preferred reward). If you decide that you don't want to wait just ring the bell and I'll come right back and you can still have the ... (non-preferred item).

The experimenter then asked the following questions to probe for comprehension. What do you get if you wait until I come back by myself? What do you do if you decide that you don't wnat to wait? And what will you get then? These questions were counterbalanced so that alternate

subjects were asked the question pertaining to terminating the waiting period first and the one pertaining to completing the waiting period second. If the child did not answer the questions correctly the instructions were repeated. All children appeared to understand after two explanations. This assumption was verified during the actual testing as all subjects knew which reward to take when the experimenter returned to the room. Once confident that the instructions were understood the experimenter left the room, leaving the rewards on the plate in front of the child. The rewards were left behind for two reasons. First of all, the work of Mischel and associates has suggested that this is a more difficult task than when the rewards are removed from the room (Mischel & Ebbesen, 1970). As the children in this experiment were older than those previously studied it was considered necessary to make the task difficult in order to avoid ceiling effects. Second, the behaviors of the subjects towards the two types of rewards were of interest and it was felt that these would be elicited more readily if the rewards remained in view of the children.

The dependent measure, the amount of time the subject waited before ringing the bell or until the criterion

(20 minutes) is reached, was measured from the time the door closed behind the experimenter. Timing was done by a manual stopwatch on the experimenter's wrist watch. The entire waiting period was video taped for later behavioral analysis. In addition, the children were observed on a closed circuit television monitor. If any subject had shown signs of distress the experimenter would have been able to terminate the waiting period. However, this only occured on one occasion and the subject (a boy) rang the bell himself. When the waiting period ended the experimenter returned to the room and exclaimed "Good waiting...(child's name)!" This was included so that all children would think of themselves as relatively successful and their performance on the following task would not be influenced by a possible feeling of failure even if criterion was not reached on the waiting task. The children were allowed to take the appropriate reward from the plate. In the food condition this could be consumed while the experimenter retrieved the preference for delay items.

In the second phase of the experiment the PDQ, incorporating the attractiveness scale, was administered. The box containing all of the toys and the food items for this task was placed, open, on the table beside the child

and she was given a test booklet and a pencil. The child was told:

> This is a game I made up to help me to understand the kind of things kids like and how much they like them. I am going to show you several pairs of things, like this. (The test booklet and two practice items are placed in front of the child.) Some of these are available today but for some a person would have to wait one week. I want you to tell me which one would be the best choice, this one today or these in one week. Think carefully because I will really give you one of the things you choose. If it's a 'now' choice I will give it to you as soon as we finish. If it's a 'later' choice I will put it in this envelope and send it to you next week. Now show me of these two practice things (sugarless gums) which one you think would be the best to choose. Draw a circle around the best one. Now I would like to know how much you like each thing. See these happy faces? They show how someone feels about each of these things. This one likes it, this one doesn't care. He doesn't like it or dislike it. This one doesn't like it at all. These dots mean something in the middle, likes

it a bit, doesn't like it much. Now show me which one shows how much you like it. And the other one ...good! Now let's look at the other things.

Throughout the administration of the questionnaire the experimenter repeated the contingencies and prompted the child in an animated manner, in order to elicit maximum participation and interest.

When the 12 items in the preference for delay questionnaire were completed the child was allowed to pick one of her choices as a gift. If it was an immediate item she was allowed to take it right away. If it was a delayed item the experimenter put it in an envelope to send to the child later. A record was kept of the children's choices.

The Peabody Picture Vocabulary Test was the last task in the testing session. Once this test was completed the children were praised and thanked. They were then taken to the adjacent room where they were weighed and measured without shoes. A balance beam scale was used. The children and parents were allowed to watch some of the video tape and any questions were answered.

Results

Relationship of I.Q. to Dependent Measures

As indicated in the previous section, when the subjects in this experiment were compared on I.Q. scores it was found that although all groups were within the normal range on the Peabody Picture Vocabulary and WISC subtests, one group (the older normal weight children) had a lower mean score than the other groups. A significant relationship of intelligence scores and any of the dependent measures would indicate that this variable be taken into account in further analysis of the data. For this reason, all possible correlations of I.Q. and the dependent measures, ability to delay (waiting time), PDQ scores and the measure of waiting strategies (proportion inhibitory behavior) were calculated. To compute the correlations of both waiting time and PDQ scores to I.Q. the Pearson correlation coefficient was used. As can be seen from Table 2, the resulting values were not significant when calculated for the total sample or for the overweight and normal weight groups seperately. To examine the relationship between I.Q. and waiting strategies, represented by proportions, a Spearman rank order correlation coefficient was computed. Again, no significant correlations were found for the total sample or

Table 2

Relationship of I.Q. to Dependent Measures

Measure	Total Sample	Group: Overweight	Group: Normal Weight
Preference for Delay (PDQ Score)	(n=26) r=-.116	(n=13) r=.282	(n=13) r=-.125
Ability to Delay (Waiting Time)	(n=26) r=-.109	(n=13) r=.312	(n=13) r=-.125
Proportion Inhibitory Behavior	(n=20) r=-.062	(n=9) r=-.590	(n=11) r=.132

the two weight groups considered separately. One correlation, between I.Q. and the proportion of inhibitory behaviors in the overweight subjects appears relatively high ($r(7)=-.59$). It should be noted that not all subjects in the sample reached the criterion for inclusion in the analysis of waiting behaviors. Therefore, this value is based on a very small sample ($n=9$) and does not approach significance. Given the lack of significant correlations between I.Q. and the dependent measures, covariance analysis was not indicated (Evans & Anastasio, 1968).

Delay of Gratification Tasks

The results of the two delay of gratification tasks are presented in the following sections. The first task, the preference for delay questionnaire or PDQ is a paper and pencil test which is intended to measure the subject's cognitive grasp of the delay of gratification concept. It yields a score which indicates the frequency with which the subject indicates that she would prefer a delayed larger reward as compared to an immediate smaller reward. The second task is a behavioral measure of the subject's ability to delay gratification. This ability is indicated in terms of the amount of time the child is able to wait, alone and without distractors, in order to obtain a preferred reward.

Preference for Delay

In order to calculate the children's scores on the PDQ each delayed choice was given a score of 1, whereas, immediate choices received a score of 0. Thus, the total preference for delay score was equal to the number of delayed choices (maximum score=12).

The means and standard deviations of scores on the PDQ are presented in Table 3. It was hypothesized that older children would choose the delayed rewards more often than would the younger children. Inspection of the data presented in this Table would seem to support this prediction. The young children, regardless of weight category, make an average of 4.1 delayed choices, as compared to a mean score of 7.6 for the older subjects. When the younger overweight children and the older overweight children are compared on their total PDQ scores a similar pattern is seen. The mean score for the younger children is 4.89, whereas for the older children it is 7.78. Comparing the two age groups in the normal weight subjects the same results emerge. The younger normal weight subjects choose fewer delayed rewards (m=3.3) than the older subjects of the same weight group (m=7.5).

The PDQ, which consists of 12 pairs of items, can be subdivided to yield seperate scores for preference for

Table 3

Means and Standard Deviations for Preference for Delay Measures for all Groups

Overweight		Group Normal Weight		Total	
Overall Preference for Delay					
young (n=9)	M 4.89	young (n=10)	M 3.30	young (n=19)	M 4.05
	SD 4.28		SD 2.83		SD 3.92
old (n=9)	M 7.78	old (n=8)	M 7.50	old (n=17)	M 7.65
	SD 3.03		SD 3.16		SD 3.46
Preference for Delayed Food Rewards					
young	M 2.22	young	M .80	young	M 1.47
	SD 1.99		SD 1.32		SD 1.78
old	M 3.67	old	M 3.38	old	M 3.53
	SD 2.18		SD 1.85		SD 1.97
Preference for Delayed Nonfood Rewards					
young	M 2.67	young	M 2.50	young	M 2.58
	SD 2.34		SD 1.84		SD 2.04
old	M 4.11	old	M 4.12	old	M 4.12
	SD 1.17		SD 1.84		SD 1.32

delayed food rewards and preference for delayed nonfood rewards. Means for these subscores follow the same pattern as the total preference for delay scores, in that older children choose the delayed rewards more often than do younger children. However, when the weight groups are compared in Table 3, there appears to be some difference in overall PDQ scores between the young overweight subjects ($\underline{M}$=4.89) and the young control subjects ($\underline{M}$=3.3). Further examination of the subscores suggests that the overall difference is due to the contribution of the preference for delayed food rewards score. When the choice items are food the overweight children make an average of 2.2 delayed choices. The normal weight children of the same age, on the other hand, make very few delayed choices ($\underline{M}$=.80). When the rewards are not food the younger overweight and normal weight subjects' scores are similar. The young overweight children make an average of 2.67 delayed nonfood choices and the young normal weight children make 2.5 of these choices. The older children of both weight groups appear to be similar on both subtest scores. It seems, from inspection of the means, that overweight girls make at least as many delayed choices as do normal weight girls on this test.

A two-way analysis of variance (age X weight) was

performed on the total PDQ scores. The summary of this analysis can be found in Table 4. The apparent difference between the older and younger groups was confirmed by a significant main effect for age $F(3,35)=9.896$, $p<.01$. Thus the hypothesis that the older children would choose the delayed rewards more often than would the younger children was supported. The main effect of weight was not significant, indicating that the two weight groups were similar in their preference for delayed rewards. Further, the interaction of the effects of age and weight did not reach significance. Therefore, the observed difference between the younger overweight and normal weight children cannot be accepted as occuring above chance level.

The subscores of the PDQ, preference for delayed food rewards and preference for delayed nonfood rewards, were also analysed seperately. In each case, two-way analyses of variance were performed for the effects of age and weight. The ANOVA summaries can be found in Table 4. As with the overall scores, there was a significant main effect for age on both preference for delayed food rewards scores $F(3,35)=9.594$, $p<.01$ and preference for delayed nonfood rewards scores $F(3.35)=7.348$, $p<.01$. No other significant results were found. Thus, when

Table 4

Summary of Two-Way Analyses of Variance for Effects of Age and Weight Group on Preference for Delay Measures

Source	SS	df	MS	F
	Overall Preference for Delay			
Age	112.112	1	112.112	9.896*
Weight	8.442	1	8.442	.745
Interaction				
Age X Weight	3.844	1	3.844	.339
Error Within	124.362	2	62.181	
Total	490.750	35	14.021	
	Preference for Delayed Food Rewards			
Age	34.022	1	34.022	9.594*
Weight	8.050	1	8.050	2.270
Interaction				
Age X Weight	3.447	1	3.447	.972
Error Within	44.050	2	22.025	
Total	160.972	35	4.599	
	Preference for Delayed Nonfood Rewards			
Age	22.614	1	22.614	7.348*
Weight	.005	1	.005	.002
Interaction				
Age X Weight	.011	1	.011	.004
Error Within	22.725	2	11.363	
Total	121.222	35	3.463	

*$p < .01$

scores are analysed according to type of reward, normal weight and overweight girls do not differ significantly in their preference for delayed gratification. However, older children show a consistent tendency to choose delayed rewards more frequently than do younger girls.

Behavioral Validation of PDQ

Children were allowed to take one of the preference for delay items as a gift. Their choices here could be seen as a behavioral validation of their choices on the PDQ. In this case, they actually obtained the chosen item, either immeidately or after a delay of one week, whereas in the PDQ they merely indicated their preferences, knowing that the majority of the choices would not be realized. Further, this final choice represents the item that the individual child considered most desirable. They could choose either an immediate or a delayed reward. This reward could be one of the six food items or one of the six nonfood items. The overweight group and the normal weight group did not differ in their choices of food versus nonfood ($X^2(1)=0.44$, p N.S.) or immediate versus delayed rewards ($X^2(1)=1.03$, p N.S.). This finding supports the analysis of the PDQ scores suggesting that these groups are similar in preference for delayed gratification. Interestingly, the younger children and the

older children made the identical number of immediate choices (11) and delayed choices (7). In other words, when faced with this 'real' choice, the older children no longer tended to prefer the delayed rewards.

Relationship of Attraction to Rewards and PDQ Scores

As mentioned earlier, Hetzberger and Dweck (1978) suggested that a child's decision to delay gratification (choose a delayed reward) is based on the relative desirability of the two rewards in the choice pair. It is possible that the children in the two weight groups differ as to perceived desirability of rewards, particularly if the rewards are food. In order to determine if the desirability of the reward items in each pair was related to PDQ scores, subjects rated the items on a five point Lickert scale. The difference between rated attraction to immediate as compared to delayed rewards was calculated and a Pearson correlation coefficient was computed between this 'difference' score and overall PDQ scores. The resulting value was not significant ($r(34)=.273$). Thus the degree to which the subjects rate the immediate versus the delayed rewards on attractiveness does not appear to play a large role in preference for delay in this study. Further, subjects in the two weight categories were compared on differential attraction to immediate versus

delayed rewards. The overweight and normal weight subjects did not appear to differ on this measure when the choices were food ($t(34)=0.79$, p N.S.) or nonfood ($t(34)=-.57$, p N.S.) items.

Ability to Delay Gratification

It was hypothesized that when the rewards were food normal weight subjects would be able to wait longer for a preferred reward than would overweight subjects. The means and standard deviations for waiting times in food and nonfood conditions for both weight groups are presented in Table 5. As can be seen from the Table, this prediction does not seem to be supported. In the food condition the two groups waited about the same amount of time. The mean waiting time for the overweight subjects was 11.53 minutes as compared to 12.47 minutes for the controls. In the nonfood condition, on the other hand, the normal weight girls wait slightly longer (M=15.30 min) than the overweight girls (M=9.36 min). There do not appear to be any age differences in mean waiting times. Another feature of the data that is evident when Table 5 is the high standard deviations. Prior to analysis of the results a test for homogeneity of variance was performed on the two egith groups, ages combined. This test revealed that the assumptions for analysis of variance were not violated, $F_{max}(4.8)=2.07$,

Table 5

Means and Standard Deviations for Delay Time (in minutes) for All Groups in Food and Nonfood Conditions

Reward Condition	Weight Groups					
	Overweight			Normal Weight		
Food Rewards	young (n=4)	M	14.78	young (n=5)	M	13.27
		SD	8.32		SD	2.56
	old (n=5)	M	8.94	old (n=4)	M	11.48
		SD	10.19		SD	9.88
	total (n=9)	M	11.53	total (n=9)	M	12.47
		SD	9.26		SD	6.22
Nonfood Rewards	young (n=5)	M	8.78	young (n=5)	M	14.31
		SD	8.86		SD	8.63
	old (n=4)	M	10.08	old (n=4)	M	16.53
		SD	5.87		SD	5.33
	total (n=9)	M	9.36	total (n=9)	M	15.30
		SD	7.21		SD	6.98

p N.S..

It was considered necessary to further investigate these statistics. The results from other studies were compared to the data from the present experiment to determine if the means and standard deviation were of similar magnitude. The studies presented in Table 6 were chosen because they utilized the delay of gratification paradigm with rewards present and no distractors, as in the present study. It should be noted however, that comparisons are limited by the use of different types of rewards from study to study. Yet examination of the Table shows that when standard deviations are reported they are similar to the present findings. When the mean waiting times are examined it seems that in two cases the delays are considerably shorter than those in the present study. These differences appear to be due to a tendency for older children to wait longer than younger children in these two reports. In the study by Yates et al. (1981) children under 5 years of age waited an average of 4.8 minutes, whereas 8 year olds waited 12.9 minutes. Similarily, Miller, et al. (1978) found that 5 year olds waited only 6.4 minutes, as compared to 8 year olds who waited 11.4 minutes. In other studies, however, very young children have been

Table 6

Comparison of Means and Standard Deviations from Several Delay of Gratification Studies

Study		N	Age of Ss	Type of Reward	M(min)	SD
Bourget, 1982	over-weight	4	5-6.9 yrs	food	14.78	8.32
		5	7-8.9 yrs		8.94	10.19
		5	5-6.9 yrs	nonfood	8.78	8.86
		4	7-8.9 yrs		10.08	5.87
	normal weight	5	5-6.9 yrs	food	13.31	2.56
		4	7-8.9 yrs		11.48	9.88
		5	5-6.9 yrs	nonfood	14.31	8.63
		4	7-8.9 yrs		16.53	5.33
Yates, Lippet & Yates, 1981	normal weight	7	4.8 yrs	nonfood	4.0	-
		8	7.2 yrs		5.8	
		9	8.4 yrs		12.9	
Wilson, 1979	normal weight	5	5.5 yrs	food	11.9	9.3
	over-weight	5	5.7 yrs		9.4	9.8
Miller, Weinstein & Karniol, 1978	normal weight	20	5 yrs	food	6.4	-
		20	8 yrs		11.4	-
Moore, Mischel & Zeiss, 1976		8	4-6 yrs	food	12.24	7.83
Mischel & Baker, 1975		15	4-5 yrs	food	8.44	-

able to wait for considerable lengths of time. The 4 year olds tested by Mischel and Baker (1975) waited an average of 8.4 minutes and children between 4 and 6 years of age waited over 12 minutes in a study by Moore et al. (1977). In the present study as well, examination of the means suggests that the younger children were able to wait as long as the older children. To test this observation a Pearson correlation coefficient was calculated between age and delay time. This was found to be nonsignificant ($r(34)=.151$). When age and delay time are compared for the overweight and normal weight groups seperately, similar low correlations are found, ($r(16)=.04$) and ($r(16)=.34$) respectively. It was therefore decided to combine the age groups for the analysis of variance of delay times. A 2 x 2 (weight x food condition) ANOVA was performed. The results of this analysis can be found in Table 7. There were no significant main effects. Nor was the interaction of the variables significant. These results suggest that contrary to the hypothesis, overweight and normal weight subjects are similar in their ability to delay gratification in this paradigm. The type of reward does not appear to differentially effect the two groups of subjects in terms of the length of time they wait for a preferred reward.

Table 7

Summary of Two-Way Analysis of Variance for Effects of Reward Condition and Weight Group on Waiting Time for Overweight and Normal Weight Girls

Source	SS	df	MS	F
Reward Condition	.951	1	.951	.899
Weight	106.193	1	16.193	1.846
Interaction Reward Condition X Weight	56.225	1	56.225	.978
Error Within	107.144	2	53.572	
Total	2003.863	35	57.253	

In the delay of gratification paradigm the children can have one of the rewards at any time whereas to have their preferred reward they must wait several minutes. Thus in order for the task to differentiate between subjects the rewards must differ in attractiveness but not to the degree that any child would be willing to tolerate a long wait to obtain the better of the two rewards. It seems that the frequency with which each reward was chosen would be an indication of their comparability. Subjects chose between a cookie and a mint in the food condition and a ball and a plastic figure in the nonfood condition. A chi square test revealed that the four rewards were chosen with equal frequency ($X^2(1)=.47$, p N.S.). This suggests that the rewards were each of about equal attractiveness and therefore suitable for the delay task with this sample.

Relationship of the Delay for Gratification Measures

The relationship between preference for delay and ability to delay has not been studied. A Pearson correlation coefficient was computed for scores on the PDQ and delay times for the total subject sample. The relationship between these variables approached, but did not reach, significance ($r(34)=.32$, $p=.06$). When the overweight and normal weight groups were tested separately the rela-

tionship was still not significant, although in the overweight group the correlation reached a probability of .10($r(16)=.43$). For the normal weight groups the correlation coefficient was .20.

Behavioral Analysis of Waiting Strategies

Eight behaviors were scored during the waiting period. These behaviors can be divided, on the basis of past research, into two categories, facilitory, those that help the child to wait and inhibitory, those that make waiting more difficult. It was hypothesized that in the food condition overweight children would not use as effective strategies as normal weight children.

Video tapes of the waiting period were observed by two raters. One of these was aware of the issue being studied but did not know the specific hypotheses, and the second rater was naive. The inter-rater reliability was calculated as the total agreement divided by the total agreements plus disagreements. This value was found to be .79. The frequencies of each behavior, presented in Table 8, are the means of the two observers' ratings.

Examination of the Table of frequencies shows that the overweight and normal weight subjects seem to differ in waiting behaviors only in the food condition. As

Table 8

Recorded Behaviors During Delay Period for Overweight and Normal Weight Girls in Food Reward and Nonfood Reward Conditions

Weight Group	Looks at Rewards	Touches Rewards	Inhibitory Behaviors: Touches Bell	Signals	Total Inhibitory
		Food Rewards			
Overweight (n=6)	4.6	0.2	0.5	0.4	5.7
Normal Weight (n=8)	2.6	0.4	0	0.1	3.1
		Nonfood Rewards			
Overweight (n=6)	2.9	0.8	0.5	0.4	4.6
Normal Weight (n=7)	3.0	1.0	0.3	0	4.3

Weight Group	Looks Around	Plays	Facilitory Behaviors: Leaves Chair	Rests head	Total Facilitory
		Food Rewards			
Overweight (n=6)	8.3	1.4	0	0.2	9.9
Normal Weight (n=8)	7.1	1.5	1.8	2.4	12.8
		Nonfood Rewards			
Overweight (n=6)	7.8	1.4	2.2	1.8	13.2
Normal Weight (n=7)	8.8	1.4	0.6	0.6	11.4

predicted, the overweight children use more of the 'inhibitory' category of behaviors in this condition ($\underline{M}$=5.7) as compared to the normal weight children ($\underline{M}$=3.1). When 'facilitory' behaviors are examined it seems that the overweight children use fewer of these ($\underline{M}$=9.9) than the normal weight subjects ($\underline{M}$=12.8). The behavior of looking at the rewards seems to differ most noticably between the groups. This behavior occurs an average of 4.6 times in the overweight group but only 2.6 times in the normal weight group. In the 'facilitory' category, however, the behaviors of leaving the chair and resting the head appear to differentiate the groups. The normal weight children perform these behaviors more often than the overweight children. They left their chairs an average of 1.8 times whereas none of the overweight subjects were seen to do so. They also rested their heads on the table an average of 2.4 times as compared to .2 times for the overweight group.

Due to the relatively infrequent occurence of most of the behaviors rated, it was decided to group the eight behaviors into the two main categories of 'inhibitory' and 'facilitory' behaviors. Thus each subject received a score representing her total behaviors in each of these categories during the waiting period. The 'proportion

inhibitory behaviors' score was then calculated by dividing the number of inhibitory behaviors by the total number of observed behaviors (both inhibitory and facilitory). This was done so that all of the behaviors, inhibitory and facilitory could be considered in one analysis. In addition, scores calculated in this way are more 'individualized' in that they suggest the child's inhibitory strategies relative to her own total rather than to a group norm. Before subjecting proportions to analysis of variance they must be transformed as this type of data is not normally distributed (Winer, 1971). Therefore, a 2 ARCSIN transformation was computed for the proportion inhibitory behavior scores.

The Spearman correlation coefficient for the relationship of age to proportion inhibitory behaviors was not significant ($r(25)=.16$) so a 2 x 2 (weight by reward condition) was performed. The results of this analysis are summarised in Table 9. As shown here, a significant main effect for weight was found $F(3,36)=4.164$, $p=.05$. This indicates that overweight girls employed a greater proportion of inhibitory behaviors during the waiting period than the normal weight girls, regardless of the type of reward. However, it should be noted that the interaction of the effects of both weight and reward condition approaches

Table 9

Summary of Analysis of Variance for the Effects of Weight and Reward Condition on Transformed Proportion Inhibitory Behaviors Scores

Source	SS	df	MS	F
Reward Condition	.011	1	.011	.13
Weight	.345	1	.345	4.164**
Interaction Reward Condition X Weight	.237	1	.237	2.860*
Error Within	.358	2	.179	
Total	2.499	26	.096	

** p = .05

* p = .10

significance $F(3,26)=2.860$, $p=.10$. This trend reflects the difference between normal weight and overweight subjects that can be observed from examination of the mean frequencies in Table 8. While the overweight group has a greater frequency of inhibitory behaviors in the food condition when compared to the control group, the difference between the groups is very slight in the nonfood condition. The hypothesis that overweight children would employ poorer waiting strategies, as indicated by higher proportions of inhibitory behaviors, in the food condition only was not fully supported. Rather, the analysis suggests that the strategies of the overweight girls are less effective than controls in both reward conditions. A trend towards a significant effect for the interaction of reward condition and weight, as well as inspection of the means, indicates that differential performance of the two weight groups in the food condition contributed greatly to the overall significant effect. The issue of effect of reward on self-control strategies of obese youngsters warrants further study, particularily with larger samples.

Attraction to the Rewards

This measure was originally intended as a control procedure to determine if desirability of rewards influenced preference for delay. However, it seems that

subjects' attraction to the rewards, regardless of the relationship to other measures, is of interest as well. In the case of the food rewards the extent to which children find them attractive may suggest a general orientation to food treats. The means for overall attraction to rewards as well as attraction to food and nonfood rewards are presented in Table 10. As can be seen, the younger overweight and normal weight subjects appear to differ in their overall ratings of attraction to the rewards ($\underline{M}$=107.67 and 97.3, respectively). The mean attraction to the rewards for the older subjects are similar.

A two way ANOVA (age x weight) was computed on the total attraction scores. This analysis is summarized in Table 11. A significant interaction of age by weight was found $F(3,35)=3.986$, $p<.05$. Tukey's HSD multiple comparison procedure (Kirk, 1974) revealed that the young overweight subjects and the young normal weight subjects differed significantly from each other. The overweight girls rated the rewards as more attractive than did the normal weight controls. The older normal weight children also rated the rewards as more attractive than did the younger children of the same weight category.

A seperate ANOVA on attraction to food rewards, also

Table 10

Means and Standard Deviations for Attraction to Rewards Measures for All Groups

Overweight			Normal Weight		
		Weight Category			
		Overall Attraction to Rewards			
young (n=9)	M	107.67	young (n=10)	M	97.30
	SD	10.95		SD	7.02
old (n=9)	M	102.65	old (n=8)	M	107.12
	SD	12.67		SD	13.56
		Attraction to Food Rewards			
young	M	55.33	young	M	46.70
	SD	4.44		SD	6.20
old	M	50.56	old	M	52.62
	SD	8.41		SD	9.09
		Attraction to Nonfood Rewards			
young	M	53.44	young	M	50.60
	SD	6.80		SD	4.25
old	M	52.11	old	M	54.50
	SD	5.88		SD	8.04

presented in Table 11, revealed a significant interaction for weight and age. However, in this analysis, the Tukey tests revealed that only the younger overweight and normal weight subjects differed from each other. The overweight girls rating the rewards as more attractive than the normal weight. A final ANOVA on the rated attraction to nonfood rewards failed to reveal any significant effects for age and weight or a significant interaction. Thus, it appears that, particularly when the rewards are food, young overweight girls consider the reward items to be more attractive than do normal weight subjects of the same age. It should be noted that the young normal weight girls' scores were the lowest of the four groups. Although the young overweight girls' scores were the highest, they did not differ significantly from the other groups. It seems, in effect, that at younger ages, normal weight girls find food (at least of the type presented here) less attractive than do older girls and particularily, than do overweight girls of the same age.

Table 11

Summary of Two-Way Analyses of Variance for Effects of Age and Weight Group on Attraction to Rewards Measures

Source	SS	df	MS	F
		Overall Attraction to Rewards		
Age	50.090	1	50.090	.406
Weight	101.807	1	101.807	.826
Interaction				
Age x Weight	491.435	1	491.435	3.986*
Error Within	160.340	2	80.170	
Total	4596.750	35	131.336	
		Attraction to Food Rewards		
Age	2.612	1	2.612	.051
Weight	115.061	1	115.061	2.234
Interaction				
Age x Weight	256.135	1	256.135	4.973**
Error Within	119.973	2	59.986	
Total	2024.306	35	57.837	
		Attraction to Nonfood Rewards		
Age	14.360	1	14.360	.364
Weight	1.255	1	1.255	.032
Interaction				
Age x Weight	61.240	1	61.240	.222
Error Within	16.138	2	8.069	
Total	1338.889	35	38.254	

* $p = .05$

** $p < .05$

Discussion

Ability to Delay Gratification

The hypothesis that normal weight subjects would be able to wait longer for a preferred food reward than would overweight subjects was not supported. The two groups were similar in waiting ability on a delay of gratification task. Further, the type of reward did not effect the performance of these subjects. This finding is in agreement with Yates and Mischel (1979). In their study preschoolers were compared on ability to delay gratification for food or nonfood rewards. Type of reward did not appear to be related to the delay ability of these normal weight subjects. However, two other reports have suggested that obese youngsters are less able to delay gratification than their normal weight peers on tasks employing food rewards (Wilson, 1979; Lewittes & Israel, 1978).

The subjects tested in the present study differed from previous studies of delay of gratification in obese children. First of all, the subjects were between 5 years and 8 years 11 months of age as compared to 5 years 6 months and 5 years 8 months for the subjects of Wilson (1979) and Lewittes and Israel (1978), respectively. It is possible that only very young overweight children manifest a relative inability to delay gratification. This

explanation of the discrepency between the present study and past research does not seem likely, however, as age did not appear to be related to delay ability in the present sample, which also included a 'younger' group of 5 and 6 year olds. Secondly, only female subjects were tested in the present study whereas the previous studies have included both male and female subjects. Unfortunately, it is not possible to determine if sex differences have contributed to the findings of poor delay ability in obese children as neither of the past studies reported analysis of their results for the effects of sex.

Examination of the methodologies of these experiments may clarify the apparently contradictory findings. Lewittes and Israel (1978) reported that waiting time was inversely related to rating on an obesity index. Those subjects that rated higher on 'obesity' had shorter waiting times. As mentioned earlier, this finding may be very misleading in that, from the information presented in their report, it appears that the children tested were generally within the normal weight range. If the prevalence of obesity in this age group is estimated as 10% there would be approximately five such subjects in the sample. Furthermore, of the four groups in the design, only one (no treatment) showed an effect for obesity. Thus, the conclusion of

these authors may have been made on very few overweight subjects. Further, the 'obesity index' employed in this study reflected the 'percent weight deviation'. This suggests deviation below as well as above the norm. A correlation of this measure with delay times of a group of children unselected for obesity cannot be accepted as evidence of a deficiency in delay ability in overweight children.

As already mentioned, the methodology of Wilson's (1979) study differed from that of the present study in that children reaching the criterion on the ability to delay task received a larger quantity of reward rather than a preferred reward. This apparently slight procedural modification may have important implications for the behavior of obese subjects, especially in view of recent work by Herman (1978). It has been proposed that certain individuals chronically limit or 'restrain' their eating behavior. A restrained eating pattern may be an attempt to control weight or to avoid social censure. While this concept has yet to be examined developmentally, it is possible that restrained eating begins in some children, particularly overweight children, as a response to adult comments concerning acceptable eating behavior. The overeating of

obese youngsters that has been observed experimentally (Drabman, Cordua, Hammer, Jarvie, & Horton, 1979; Keane, Geller, & Schierer, 1981; Marston & Cooper, 1978; Waxman & Stunkard, 1981) may elicit negative comments from parents, teachers and other adults. By offering two highly caloric items such as cookies as the delayed reward Wilson's study seems to have confounded delay of gratification with a behavior that could be considered as overeating. This situation may have elicited restraint from some children. They may have chosen to terminate the waiting period rather than take the second cookie. Given this alternative explanation of the results, as well as the fact that the tendency of the overweight children to attain shorter delay times did not reach statistical significance, this study cannot be considered to support the notion of an inability to delay gratification on the part of obese children.

Based on the results of the present study, in conjunction with the work of Lewittes and Israel (1978) and Wilson (1979) the most appropriate conclusion seems to be that there is, as yet, no evidence of a self-control defeciency in overweight children as indicated by performance on a delay of gratification task.

With regard to the development of delay ability it

is difficult to compare the results of the present study with those of studies of normal weight children as the findings have been inconsistent. Although there have been no developmental studies in this area two experiments have found age effects (Miller, Weinstein, & Karniol, 1978; Yates, Lippet, & Yates, 1981). In both these studies eight year old children were found to delay longer than five year olds. In the present study, however, ability to delay gratification did not appear to be related to age, in subjects of the same age range. Other studies have reported very long delay times for subjects under 6 years of age. There are several factors which may effect waiting ability that can be seen to differ from study to study. These include subject variables such as intelligence, and socio-economic level; situational variables such as location of testing and sex of experimenter and finally, such methodological variables as type of reward, type of termination signal and criterion time. It would be important to establish the parameters of ability to delay gratification in this paradigm in order to allow greater comparability of results and more widely applicable conclusions.

Strategies Employed During the Waiting Period

Of particular interest in this study are the strategies used to bridge the waiting period during the delay of gratification task. It was hypothesized that the overweight subjects would employ less effective self-control strategies than the normal weight subjects, only when waiting for food rewards. The results seem to suggest, however, that in both reward conditions the overweight girls employ strategies that have been shown to inhibit waiting ability. From this finding it appears that overweight girls generally have less effective self-control skills than normal weight girls. If this were the case, overweight children might be expected to show poor self-control ability in many areas of functioning. Such a conclusion supports the view that the obese are deficient in self-control which has been proposed by Bruch (1973). It also conforms to the popular stereotype of the generally self-indulgent or uncontrolled obese individual.

In terms of the available literature concerning both the psychological aspects of obesity and the development of self-control, it is difficult to accept this position. First, if the suggestion that obese children are generally deficient in self-control skills were accepted,

it would follow that as well as overeating, obese children might be found to engage in other excessive, and possibly impulsive, behaviors. There is at present no empirical support of this view (Wilkinson, Pearlson, Parker, & Phillips, 1977). Secondly, the available research on the development of self-control offers no suggestion of the possible mechanisms whereby such a global deficiency could develop.

An alternative explanation for the finding that overweight girls employ generally less effective waiting strategies than controls concerns a generalization effect of poor food related self-control behavior. As will be recalled, there is evidence that when food rewards are used in a delay of gratification task, specific strategies are required to delay successfully (Mischel & Baker, 1975; Yates & Mischel, 1979). An individual who does not develop these strategies adequately may experience failure of self-control concerning food. Expectations of failure might then generalize to other self-control situations leading the child to perform less effectively in nonfood situations as well. This view of the finding is more compelling than that of a general self-control deficit as it is consistent with some of the available literature.

Two aspects of the data of this study suggest the

possibility that putative self-control deficits in obese children are specific to the food reward condition. First, the interaction of the effects of type of reward and weight category approaches statistical significance. Such an interaction would suggest differential performance in the two reward conditions of the ability to delay task, according to the weight group of the subjects. Second, examination of the mean frequencies of the subjects' waiting behaviors suggests that while there is a marked difference between the overweight and the normal weight girls' behavior in the food rewards condition, the two groups are very similar when the rewards are not food. It seems that the finding of an overall main effect for weight is largely due to the use of less effective strategies by the overweight girls in the food condition. It will be necessary for future research to clarify this issue using larger samples of children, however, the implications of this trend in the present findings will be considered here.

The inhibitory behaviors involve attending to the rewards whereas facilatory behaviors are distraction techniques. The trend in the present results suggests that the overweight girls attend more to the rewards and distract themselves less than do the normal weight control

subjects, when the rewards are food. Yet in the nonfood reward condition the two groups appear to be similar in their waiting behaviors. This differential performance of overweight subjects argues against a general inability to use effective self-control strategies. In the nonfood condition their strategies appear to be quite adequate. Rather, the food rewards appear to elicit inhibitory behaviors from the overweight girls.

A concept that might account for this effect is reward 'salience'. If certain stimulus properties of the food rewards are somehow more compelling or salient for overweight girls they may tend to focus their attention on the rewards, an ineffective strategy, at the same time engaging in fewer distraction behaviors or effective strategies. An interesting area for future research would be the effects of stimulus characteristics of food and food related behaviors on attentional and cognitive mechanisms of obese children and adults.

There is some available research that might suggest a mechanism for the development of this 'food salience' effect. It has been suggested that heavier babies (Nisbett & Gurwitz, 1975) and obese adults (Nisbett, 1972) are more responsive to taste cues than normal weight controls. For example, the heavier babies studied by

Nisbett and Gurwitz (1975) drank proportionately more of a sweetened formula than an unsweetened formula. It could be that these heavier babies experience the sweeter formula more positively than other infants. Thus very pleasurable sensations may come to be associated with food experiences. In later life the sight of food treats may trigger these positive associations. Thus food stimuli may become differentiated from other stimuli as particularily important or salient to these children.

It was originally predicted that less effective waiting strategies on the part of obese youngsters would result in shorter delay times. Paradoxically, it was found that in spite of poorer strategies the overweight children were able to wait equally as long as the normal weight children in order to obtain their preferred reward. Mischel first proposed that attention to the rewards during a delay situation increased the experience of frustration and the aversiveness of the waiting period for the subject. Subjects who focus attention on the rewards have been found to have shorter delay times in both studies that manipulate presence of reward and instructions (Mischel, Ebbesen, & Zeiss, 1972; Mischel & Baker, 1975; Moore, Mischel, & Zeiss, 1977) and studies that relate spontaneous waiting behavior to delay time (Yates,

Lippet , & Yates, 1981; Yates & Revelle, 1979). However, no attempt has been made to examine the subjective experience of subjects in the delay paradigm. The overweight subjects in the present study may have experienced the delay period as more frustrating or aversive than did the normal weight girls who reduced levels of frustration by distracting themselves from the unavailable reward items. This explanation is, of course, speculative and cannot be substantiated at present. It would be interesting in future research to examine the frustration hypothesis using both overweight subjects and normal weight subjects who employ effective and inneffective strategies. It may be possible to determine children's perceptions of the waiting period through the use of self-report of task difficulty as well as such measures as time estimation of the length of delay.

It is quite possible that these children who are older than those usually studied by Mischel and colleagues are capable of waiting for several minutes in spite of high levels of frustration. However, self control might be more difficult to achieve over longer periods of time under these conditions. Alternatively, the individual may experience a heightened feeling of deprivation during self imposed delay which could lead to compensatory over-

indulgence once the delay is completed. This phenomena is frequently observed clinically. Individuals report the desire to reward themselves for following a diet by eating highly caloric treats. In any case, it would seem worthwhile, if future research confirms the use of less effective self control strategies in the obese, to attempt to develop more effective ways of managing delay of gratification particularily in food situations. In this society there is a great deal of pressure towards weight control. Therefore, most overweight people will diet at some point in their lives. It would be desirable to be able to recommend self control techniques that minimize frustration and aversiveness of the task.

This study represents an initial attempt to examine waiting strategies of overweight and normal weight children. The behaviors that were recorded were chosen to represent attentional and cognitive strategies. This method appears to have been appropriate for gathering data that are suggestive of differential self-control strategies in overweight female children as compared to normal weight controls, particularily in food situations. Yet, the behaviors observed here cannot be said to correspond exactly to the subjects' cognitions during the waiting period. For example, several subjects who

were overtly inactive reported that they had been very actively engaged in thinking or imagining. Further research is required which attempts to relate more precise measures of cognitive and attentional processes to self-control ability in children.

Preference for delay

As predicted, the overweight and normal weight subjects did not differ in terms of their preference for delayed reward. The preference for delay task measures the child's concept of delay of gratification as well as his or her expectancies associated with each reward choice. However, the child's actual ability to wait is not tested. Once the decision is made the child is no longer in control of the delivery of the rewards and, if a delayed choice is made, must continue to wait regardless of the aversiveness of the delay. This process has been termed 'decisional' self-control by Kanfer (1977) and forms the first stage of delay of gratification behavior according to Mischel (1974). This aspect of delay behavior was tested a second time at the end of the delay task when youngsters were asked to choose one of the items displayed during the test, as a gift for participating. Again, the overweight and normal weight girls did not differ in terms of immediate or delayed choices.

They also chose food and nonfood items with the same frequency.

The results of the present study differ from those of Sigal and Adler (1976) and Johnson, Parry and Drabman (1978). Both of these studies found that their obese subjects chose immediate rewards more often than normal weight controls. It was proposed here that these findings were due to two factors, the confounding of preference for delay and 'overindulgence' and, in the Sigal and Adler (1976) study, the lack of privacy and necessity of a return visit by the experimenter to the subjects' home. In the present study, the rewards were attractive foods that are not usually considered 'fattening', such as oatmeal cookies and fruit. Thus the subject was not required to choose a large quantity of highly caloric food in order to express a preference for delayed gratification. Delayed rewards were mailed to the children and of course, choices were made only in the presence of the experimenter. It is interesting that when these factors are controlled, no differences are found between overweight and normal weight subjects. In view of this finding the results of previous studies must be questioned and the suggestion that obese children prefer immediate gratification appears tenuous. Future research should consider the possibility

that overweight children might be sensitive to potential criticism of their food related behavior. Again, a parrallel can be made to Herman's (1978) concept of restraint. If children wish to restrain their eating behavior rather than choose large quantities of fattening foods in the presence of a potentially critical adult, the only alternative is to make more immediate reward choices. Thus, restraint behavior could be misinterpreted as a preference for immediate gratification. Caution should be used in studies of overweight children to avoid situations that could result in erroneous and possibly harmful conclusions concerning the behavior of the obese.

As predicted, the older children chose the delayed rewards more frequently than did the younger children. This is similar to the findings of Mischel and Metzner (1962). These authors saw preference for delayed rewards as developmentally related and their work shows a marked shift in preference behavior around the age of 8 years. In the present study, however, this shift occurred at the age of 7 years. The 5 and 6 year old subjects made delayed choices only 34% of the time, whereas the 7 and 8 year olds made 63% delayed choices. This slight shift towards preference for delayed rewards is interesting,

although not surprising. It is safe to say that in the 20 years that have elapsed since Mischel's early research young children's experiences have changed dramatically. It would be of interest to replicate the earlier studies in order to examine the impact of such factors as day care and the media on this aspect of cognitive development in children. One finding of the present study suggests that age differences may be more apparent on this type of paper and pencil test than in actual behavior. When the children were allowed to pick the reward they would be given as a gift for participation the majority of subjects, regardless of age, chose an immediate reward. In fact, the number of immediate versus delayed choices was identical for younger and older subjects. It seems that the PDQ reflects the child's concept that it is preferable to delay gratification in order to obtain better rewards but that in children of this age, actual behavior may lag behind the development of this concept. It is important, for this reason, that researchers interpret the results of this measure with caution. The fact that this task measures preference for delayed gratification, and not delay of gratification ability, should be clearly specified.

Mischel and Metzner (1962) also reported that I.Q.

scores were highly related to preference for delay in their sample of elementary school children. In the present study this relationship was very weak. This discrepancy in results can be explained by a major methodological difference in the two studies. In the early experiment the children were only offered one choice, between a $.05 chocolate bar immediately and a $.10 bar at a later time. Since this study Mischel and colleagues as well as other researchers, have used one practice choice followed by several preference for delay choices. However, the relationship of I.Q. to an expanded test of preference for delay has not been reported. It is possible that in the Mischel and Metzner (1962) study only the brightest children were able to identify the complexities of the concept and make the more advantageous choice in this 'one shot' format. In the present experiment, all subjects had an opportunity to clearly understand the instructions and experience one practice choice in this novel situation before completing the PDQ. It is interesting that several subjects were observed to exclaim "Now I get it!" or a similar phrase after completing a few items of the questionnaire. This type of situation which may seem very commonplace for adults is not frequently encountered by children. It is not

surprising that they require some familiarity with the contingencies before fully comprehending the situation and determining the best course of action. In the present study, therefore, PDQ scores were probably less related to ability to grasp instructions and comprehend a novel situation, as in the Mischel and Metzner (1962) study, and more reflective of the subjects' level of cognitive development in respect to delay of gratification.

Hertzberger and Dweck (1978) stated that preference for delay was a logical decision, based on the perceived relative value of the delayed versus the immediate rewards. In the present study it was found that the overweight and the normal weight girls did not differ in their ratings of attraction to the delayed and immediate rewards. Thus the basis of a logical decision to choose immediate or delayed gratification appeared to be similar for the two groups.

The attraction measure can also be examined in another way which may shed some light on the delay strategies data discussed earlier. When overweight and normal weight children are compared on their rated attraction to the food rewards and to the nonfood rewards, it appears that the young overweight girls rate

the food rewards more highly than do normal weight girls of the same age. Nonfood rewards, on the other hand, are rated similarily by all groups of subjects. This finding seems to support the earlier suggestion that food rewards are more salient to overweight children because of associations of pleasure that are stronger than for normal weight children. Two aspects of the data require further explanation. First, the older girls are similar in their ratings of the food items and second, the young normal weight girls' scores appear to be depressed relative to the older groups. What appears to occur is that at the younger ages normal weight girls experience a period of relative indifference to food. A study of behavior problems of normal children noted that more than one third of mothers complain that their six year old girls had insufficient appetities and that children six years of age and younger, especially girls, refused particular foods (MacFarlane, Allen, & Honzik, 1954). Overweight girls may not develop the same kind of 'finicky' food behavior, at least towards the food items presented in this study. Again, it seems that early development of taste preferences may play a role in the differential eating patterns shown by overweight and normal weight children. An interesting area for future research would

be the development of taste perception and particularily, the experience of pleasurable associations related to taste.

Finally, the subjects delay scores and their preference for delayed reward scores were found to be correlated, although this relationship did not reach statistical significance. One would expect to find a relationship between these variables according to Mischel's two process explanation of delay behavior. He suggested that the first stage of delay of gratification was decisional, based on the child's expectations concerning the rewards. This is considered to be the only stage that is relevant to preference for delay but it is the initial stage of a delay situation that requires the child to actually engage in waiting behavior. The child must first make the decision to wait before cognitive and attentional mechanisms can be brought into play to sustain waiting behavior. Thus the child who obtains a low preference for delay score is unlikely to make a strong decision in favor of waiting for the preferred item in the actual delay situation. This child would not move into the second stage of delay process and would be expected to terminate the waiting period relatively early. In the present study, however, the relationship between these

two measures although interesting, was not statistically significant. As pointed out earlier, the children's PDQ score and their actual choices when offered a reward as a gift did not always correspond. Again, it must be emphasized that the PDQ measures the subjects' understanding of the concept of delay of gratification and not necessarily, her ability to delay in a real choice situation. The ability to delay task, however, is a situation where the child must put into practice actual self-control abilities. Thus some children may score relatively high on the PDQ indicating that they understand the advantages of waiting for better rewards but may not have acquired the skills for putting this cognitive understanding into practice. For this reason, the ability to delay task appears to be more useful for examining hypotheses relevant to practical self-control situations such as eating behavior than is the preference for delay task.

Conclusions

On the two measures employed here, the ability to delay gratification task and the preference for delay questionnaire, no evidence was found that overweight girls perform poorly when compared to normal weight girls. These findings argue against the notion that obese children are deficient in self-control.

Analysis of the subjects' behavior during the ability to delay task suggests that although capable of waiting as long as normal weight girls, the subjective experience of the delay period may be more aversive for the overweight girls. They were found to use less effective waiting strategies than the normal weight controls. Theoretically, these ineffective strategies have been linked to heightened feelings of frustration (Mischel, 1974). The possibility that frustration is greater for overweight than normal weight girls when gratification is delayed has implications for the etiology and treatment of obesity.

A trend in the data of this study suggests that differential use of waiting or self-control strategies by overweight girls may be specific to food situations. Future research with larger samples and male subjects must determine if this type of strategy use is specific

to delay of gratification for food or a more generalized behavior pattern. However, as self-control in food situations is of interest here, the effects of ineffective strategies in these situations will be considered. If, as suggested, behaviors which focus the child's attention on unobtainable foods make delay more aversive, the discomfort experienced may lead to compensatory overeating when meals are finally provided. A process of this sort may contribute to overeating and eventual obesity. Although the overweight subjects in this study were able to delay gratification as long as normal weight subjects, it is possible that in situations where the delay is longer they may be incapable of sustaining waiting behavior. In food situations, this may lead to a greater frequency of snacking behavior between meal times.

Clinically, as well, the possibility that some individuals experience delay of gratification as especially aversive is important. Due to pressures in our society towards slimness, most overweight people will attempt to diet frequently. The task of clinically oriented research in this area would be to develop treatment techniques which could be used to maximize the possibility of successful control of eating while assisting the client in avoiding feelings of frustration in food

related situations. In some cases, children may simply not have incorporated the most effective, distraction strategies into their behavioral repertoire. Others may already possess the necessary skills but may require therapeutic assistance to be able to apply these skills in food situations.

A concept of 'food salience' has been proposed here that may account for possible differential use of self-control strategies in food and nonfood situations by overweight girls. This suggests that food is more salient or compelling for overweight youngsters, leading them to focus on the food rewards in a delay of gratification situation. Further investigation of this concept is recommended to better understand obeses eating patterns.

In terms of the delay of gratification tasks employed in this study, the ability to delay measure appears to be the most useful as it can be compared most appropriately to actual everyday experience. The PDQ, on the other hand, measures the child's cognitive understanding of the delay of gratification concept but not his or her ability to implement this understanding. In fact, age differences on the PDQ did not appear when subjects made a 'real' choice between immediate and delayed rewards or on the

ability to delay task.

Finally, it must be emphasized that when testing overweight children on food related tasks the possibility of misinterpretation arises when the subjects are offered highly caloric treats. This situation may elicit 'restraint' behavior from some children who may fear criticism for overeating. This source of confound may have contributed to the tendency of overweight children to appear more 'immediate' on delay of gratification tasks in past research.

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APPENDIX A

Consent Form

Delay of Gratification Study

Donna White, Ph.D. (Supervisor)

Virginia Bourget (Researcher)

The children participating in this Study may receive the following foods:

raisin cookie

sugarless mints

peanuts

popcorn

raisins

apples

I have been informed of the nature of this study and I am willing to allow my child to participate.
I am aware that he or she may withdraw at any time and that a video taped record of the testing will be made.

Signature: _____

Date: _____

APPENDIX B

Preference for Delay Items

Food

Immediate	Delayed
one apple	two apples
small raisin cookie	large raisin cookie
one package sugarless mints	two packages sugarless mints
small bag peanuts	large bag peanuts
small bag popcorn	large bag popcorn
14 g box raisins	42 g box raisins

Non-food

Immediate	Delayed
small ball	large ball
one comic book	two comic books
three crayons	six crayons
three small marbles	four small marbles, one large marble
two nickles	four nickles
plain note pad	note pad with picture

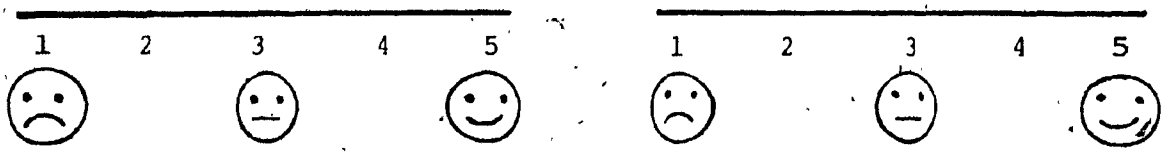
Appendix C

Examples from Preference for Delay Questionnaire

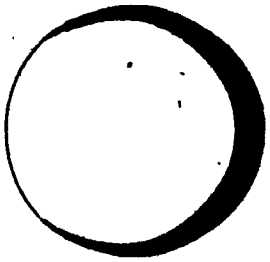
RAISINS

NOW

LATER



BALL



NOW

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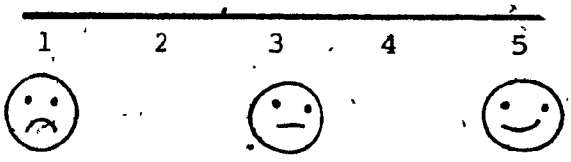

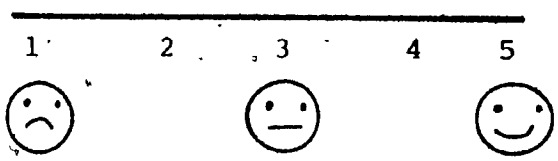

APPENDIX D

Pretest for Ability to Delay Gratification Reward Items

Method

This pretest was designed to choose 2 pairs of rewards, one food pair, one to use as rewards in the ability to delay gratification task. A test booklet was prepared so that each of four food rewards and four nonfood rewards could be presented in all possible combinations within reward category. There were 12 pairs, six food (combinations of a cookie, pretzel, mint or chips) and six nonfood (combinations of a sticker, ball, plastic figure and 'smurf'). Fifteen neighbourhood children (8 boys, 7 girls) were asked to indicate which item they preferred in each pair.

Results

The cookie and the mint were the most popular food items with 27 and 36 choices each. The pretzel and chips received 18 and 9 choices respectively. Among the nonfood items the ball (36 choices) and the plastic figure (21 choices) were chosen most frequently. The sticker received 15 choices and the 'smurf', 18. Thus the cookie and mint were selected for the food rewards and the ball and plastic figure for the nonfood rewards.

APPENDIX B

Subject Number_____

Overweight_____ Normal Weight_____

	looks around	looks at rewards	touches rewards	touches bell	signals	leaves chair	plays	rests head
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
T								

Appendix F

Observers' Manual

i Instructions for Observers

ii Scoring Instructions

Instructions for Observers

In a self-imposed waiting situation children employ various strategies to sustain waiting behavior. Here you will be observing a child waiting alone while seated at a table. The video tapes have been edited so that you will see 5 minutes of the waiting period. Instructions have been dubbed onto the tape so that you will be told which subject you are about to observe. You will observe for 20 seconds and record for 10 seconds so that there will be 10 scored intervals for each child. A voice on the tape will signal the beginning of each observation and recording period. You must not score behavior that occurs during a recording period so that it is best to avoid looking at the screen at this time.

You are encouraged to make any personal observations at the bottom of the sheet. If the child makes any comprehensible verbalizations please record these as well. In addition, we would like your judgement of the child's weight status. Some of the children you observe will be overweight by at least 10%. Indicate, by checking the appropriate space, if you think the child is overweight or normal weight.

Scoring Instructions

Each behavior can only be scored once per interval. However, many of the behaviors could occur in the same interval. Observe the child for the 20 second observation interval and then record what you have seen during the 10 second interval following the audio signal "record".

LOOKS AT REWARDS The child's gaze is directed towards the plate holding the rewards for at least 1 second. This is not scored if the child is touching the rewards at the same time.

TOUCHES REWARDS This also includes touching the plate holding the rewards.

TOUCHES BELL

SIGNALS The child begins to ring the bell and then stops or silently rehearses the termination signal.

LOOKS AROUND The child visually explores the room by directing gaze to walls, ceiling, floor, while seated at the table.

PLAYS The child moves his/her hands, face, body or feet in an organized game, i.e., pat-a-cake, airplane, finger puppets, while sitting at the table.

LEAVES CHAIR The child gets out of the chair and walks away from the table.

RESTS HEAD The child puts his/her head down on arms or table.