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Why Superman Can Wait: Cognitive Self-Transformation in the Delay of Gratification Paradigm

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We examined middle-class Israeli preschoolers' cognitive self-transformation in the delay of gratification paradigm. In Study 1, 66 un-caped or Superman-caped preschoolers delayed gratification, half with instructions regarding Superman's delay-relevant qualities. Caped children delayed longer, especially when instructed regarding Superman's qualities. In Study 2 with 43 preschoolers, with the respective relevant superhero qualities emphasized (i.e., patient vs. impulsive), Superman-caped children tended to delay longer than Dash-caped children. In Study 3, 48 preschoolers delayed gratification after being instructed to pretend to be Superman or a child with the same patient qualities, or after watching a video of Superman, with or without pretend instructions. Invoking Superman led to longer delays and instructions regarding Superman's qualities tended to lead to longer delays than watching the Superman video. In accounting for the data, we differentiated cognitive transformations of the reward's consummatory value and cognitive transformations as basic intellectual processes.

Delay of gratification requires one to forego immediate gratification for the benefit of delayed and presumably more valuable outcomes. In Mischel's (e.g., W. Mischel, Ebbesen, & Zeiss, 1972; W. Mischel & Moore, 1973) classic delay of gratification paradigm, which has become known as *the marshmallow test*, preschoolers are asked to make a choice between two rewards, which are often food rewards like marshmallows and pretzels. After children make the choice, they are informed that their preferred reward can be had only after a delay interval, whereas the less preferred reward can be had at any time following initiation of the delay. During the delay, the experimenter leaves the child alone, either in the presence of the delayed rewards or with the rewards hidden from the child's view. Children can signal for the experimenter to return by ringing a bell, indicating that they no longer wish to wait for the preferred reward. However, by doing so the child forfeits the preferred reward so that once the child rings the bell, the experimenter returns and gives the child the less preferred reward. Any child who does not signal for the experimenter to return receives the preferred reward after a standard wait, generally about 10 to 15 min for the youngest children (e.g., B. T. Yates & Mischel, 1979).

In an impressive series of studies (W. Mischel, 1974), the findings are clear-cut. Children who have the rewards facing them as they wait are less able to maintain the delay than children who have the rewards hidden from their view during the wait. Out of sight is apparently out of mind. Mischel concluded that focusing attention on the rewards, as occasioned by leaving them visible during the delay, induces frustration, which leads children to ring the bell in order to terminate the frustration. In fact, Mischel and his colleagues found that children's ability to wait for the preferred reward was a function of their use of strategies of attention deployment away from the preferred reward. In this vein, W. Mischel and Moore (1973) found that children varied in terms of what they did as they were waiting. Some children sang, others attended the electric outlets in the walls or talked to themselves, and one child apparently even had a short nap. Engaging in these various means of self-distraction appeared beneficial for children in coping with the delay, suggesting that

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one major hurdle in this domain is the acquisition of strategies for self-distraction. From this perspective, any means of reducing the frustration should serve to increase children's delay times and any means of increasing the frustration should serve to further reduce children's delay times.

To examine the dynamics of frustration in such contexts, Mischel and his colleagues conducted research manipulating the instructions children were given regarding what they should think about during the delay period (W. Mischel et al., 1972). Specifically, in further studies using the same delay paradigm, Mischel et al. (1972) attempted to experimentally manipulate children's cognitions during the delay. Some children were instructed to think about the reward objects, how good, chewy, and crunchy they would taste. Other children were given instructions to think of fun things, like swinging or finding frogs. Children who were instructed to think of the reward objects themselves were less able to maintain the delay than those children who were given no instructions or those given instructions to ideate about fun things. Mischel concluded that successful delay requires children to occupy themselves with thoughts and activities that interfere with and subvert the deployment of attention toward the reward objects, thereby reducing the frustration the child experiences in the delay situation.

In fact, W. Mischel and Mischel (1976, 1983) found that between the ages of 5 to 10, children not only discover delay strategies but also shift from reliance on physical ploys, such as covering up tempting objects, to mental strategies, such as thinking about something else or claiming that the preferred reward may be overrated. For instance, a sophisticated 5-year-old understood that covering up tempting objects works by shifting one's attention, saying, "If it's covered, I could wait all the time . . . because that will sort of get my mind on something else" (H. Mischel, 1984, p. 127). Older children explicitly cited cognitive strategies, including redirecting attention, transforming the goal object into something temporarily less desirable, and engaging in self-monitoring.

In additional studies aimed at clarifying the psychological processes involved in maintaining delay, Mischel and his colleagues (e.g., B. T. Yates & Mischel, 1979) found that thinking of the rewards in abstract rather than consummatory terms also facilitated children's delay. Moreover, children who were instructed to cognitively transform marshmallows into "clouds floating in the sky" and pretzels into "logs of wood floating down the river to the saw mill" were more successful at maintaining the delay than those instructed to think of how yummy the reward will taste (W. Mischel & Baker, 1975). The conclusion drawn from these studies was that any cognitive activity that serves to reduce the frustration experienced during the delay period facilitates delay maintenance. In fact, older children seem to know that thinking about the rewards abstractly is better because it changes the consummatory value of the rewards (e.g., "It would make me not think of eating them") but also because it provides alternative things to think about (e.g., "It would make my mind drift to the thought of something different than the marshmallows"; H. Mischel, 1984, p. 127).

W. Mischel (1974; Metcalfe & Mischel, 1999) concluded on this basis that those children who can successfully delay and wait for the preferred reward are ones who have intuited the value of cognitive strategies that facilitate the dampening of frustration and can manage to deploy these strategies during the delay period. This line of analysis was strongly supported by the finding that when preschool children who had participated in such research were tested 15 years later, when they were about 18 years old, their ability to delay at preschool without ideational instructions was significantly correlated with their academic success, their social skills, their social responsibility, and their tolerance of frustration as reported by parents (W. Mischel, Shoda, & Peake, 1988; W. Mischel, Shoda, & Rodriguez, 1989; Shoda, Mischel, & Peake, 1990). Of critical importance, delay time at preschool was found to be significantly correlated with high school SAT scores. The correlations were. 42 with SAT verbal scores and .57 with SAT quantitative scores. Those preschool children who delayed longer when in a self-imposed delay with the rewards exposed and without being provided with any strategies for coping with the delay had higher SAT scores. This is all the more remarkable because the correlation between preschool intelligence test scores and intelligence test scores at age 18 hovers around .40 (e.g., Honzik, Macfarlane, & Allen, 1948).[1]

Mischel's account for this pattern of findings is that those children who use effective self-regulating strategies in preschool have a distinct advantage because they know how to deploy strategies to reduce frustration in situations in which self-imposed delay is required to attain desired goals. By using these strategies to make self-control less frustrating, these children can more easily persist in their efforts, becoming increasingly more competent as they develop. These strategies serve them well in coping with the frustration of academic tasks in particular. It is important to note that this account of the observed correlations does not provide any explanation for the higher correlation with the quantitative SAT score than the verbal one.

[1]It should be noted that Sontag, Baker, and Nelson (1958) found correlations of .46 between assessments of IQ at age 3 and age 12; Wilson (1983) reported higher correlations, of about .60 between IQ assessed at age 3 and at age 15, but no correlations were reported with age 18, which is the relevant age for the current discussion.

A different account of this pattern of findings emerges from Piagetian theory. According to Piaget (e.g., Piaget, Henriques, & Ascher, 1992) there are two principal processes of intelligent thought: comparing and transforming. In transforming, one takes either external or internal stimuli and creates new internal stimuli such as thoughts and affective reactions or a combination of both (Karniol, 2010). Piaget and Inhelder (1968/1973) actually suggested that man is "a machine engaged in transformations" (p. 8), with Piaget elaborating that "to know is to assimilate reality into systems of transformations. To know is to transform reality" (Piaget, 1970, p. 15). In fact, children in delay of gratification contexts often indicate performing cognitive transformations that change the unpleasant reality of being in an aversive delay period. Some of these cognitive transformations relate directly to the reward objects themselves (e.g., "The marshmallows are filled with an evil spell"; W. Mischel & Mischel, 1983, p. 609). Other cognitive transformations relate directly to the delay context, which children often transform by playing pretend games (e.g., "I made believe I was flying an airplane and bad guys were after me"; Singer, 1973, p. 71; "I'd pretend I was a fish and was swimming"; G. C. R. Yates, Yates, & Beasley, 1987).

In her research with chronically ill school children, Clark (2003) found that they often use what she called "*imaginal coping*," which involves cognitively transforming aversive medical contexts into playful, pretend games. For instance, a child explained:

> Sometimes I play games when I do my breathing machine. I pretend I have a friend who is a dragon, and the dragon breathes smoke. You know the steam coming from the machine? That's dragon smoke. Another game is, I have a toy airplane. I fly my airplane through the steam. I pretend to fly away, to a place away from this. (p. 60)

In fact, many therapeutic practices focus on cognitively transforming aversive contexts. A 10-year-old who was scared of the dark was asked to imagine that Superman has asked him to wait in a nearly dark room for instructions regarding his impending mission (Lazarus & Abramovitz, 1962). With the help of this pretense, the child was able to do so.

The interplay between the ability to deploy cognitive transformations in pretense and coping ability has been demonstrated in several studies. To illustrate, Saltz, Dixon, and Johnson (1977) found that children who were instructed to engage in thematic fantasy play were better able to resist touching a forbidden toy, especially if instructed to think about their favorite story or look at a picture book while waiting. As well, children whose quality of play was judged to be more imaginative in first and second grade evidenced more varied and more efficacious coping on a hypothetical coping task in fifth and sixth grade (Russ, Robins, & Christano, 1999), as well as in coping with an invasive dental procedure (Christano & Russ, 1996).

In the research conducted by Mischel and his colleagues, the transformations generally focus on either changing the value of the rewards (e.g., W. Mischel & Moore, 1980) or transforming the context (e.g., W. Mischel et al., 1972). From Mischel's perspective, any transformation that moves attention away from the delayed rewards' consummatory value reduces frustration. But if in fact cognitive transformations are the critical factor in being able to cope with aversive delay periods, then it should be possible to facilitate children's delay by transforming *themselves* rather than the rewards or the context. Specifically, if children transform themselves and pretend to be someone else, perhaps someone with powers that they themselves do not have, children can then imagine having these powers themselves and can behave in line with these imaginary powers.

This line of conceptualization fits well with many therapeutic practices in which cognitive self-transformations are used for therapeutic ends. For instance, a boy who was bullied was told to be "King Kong, just a big hunk of muscle, all powerful, and no one could stand up to you" (Corsini, 1966, p. 22); by adopting this pretense, the boy was able to fight back and the victimization stopped. Similarly, a child who experienced temper tantrums became a Temper Tamer, with a pouch containing a spyglass, a whistle, and a notebook, to be used for spying on Temper, blowing the whistle when it was detected, and keeping score of successful temper tamings (Freeman, Epston, & Lobovits, 1997). Scanlon (2007) explicitly used a Superman cape to foster thinking like Superman and to encourage the appropriation of his behavior in therapy. The pretence of being the superhero may not be necessary, though. Nelson (2007) used a technique called "What would Superman do?" in which children harness the power of the superhero, being asked to imagine how Superman would deal with problem situations and being urged to adopt similar strategies to deal with their own problems (cf. Rubin & Livesay, 2006).

Preschool children often pretend play at being superheroes with magic powers (Rubin, 2007). Superhero capes and props are an integral aspect of this (e.g., Elgas, Klein, Kantor, & Fernie, 1988). In many studies girls "cross-dress," using male superhero props and capes to be able to perform those behaviors that the superhero manifests (Davies, 1989; Marsh, 2000). In fact, superhero props (e.g., the red Superman cape) are apparently used by children to imaginatively conduct cognitive self-transformations and to enact the powers in question. As Cawelti (1976) noted, superheroes are fantasy figures who have exceptional strengths and

abilities that enable them to overcome perils and obstacles and triumph in their endeavors, but they also hide among us and are like everyone else until they don their respective garb. The costume of superheroes serves to signal that "the figure is now operating in his superhero identity .... To wear the costume is to *become* the superhero" (Bongco, 2000, pp. 105–106).

Pretending to be a superhero leads to the incorporation of those qualities that are lacking in oneself, and this can facilitate change in one's behavior to manifest those missing qualities. This is well illustrated in the following anecdote. When a Batman-caped preschooler is upset because he can't cram his tricycle into a full station wagon, his sister offers, "Batman, you don't need a bike. You can *fly* over everyone faster than their bikes" (Ervin-Tripp & Gordon, 1986, p. 89), a suggestion Batman gratefully followed. Paley (e.g., 1990, 2004), who documented her magical career experiences as a preschool teacher, told a preschool child who knocked over a girl's dishes while being an Angry Wolf to "be somebody else.... You're spoiling everyone's play.... Could you pretend to be a wolf that doesn't knock over things?" (Paley, 1990, pp. 89, 91). In the same vein, Bauer and Dettore (1997) suggested using superheroes to get young children to comply with requests (e.g., "Let's see if you can clean up as fast as a Power Ranger," p. 119).

Of interest, in a study that gave children either literal or metaphoric instructions (e.g., "Pretend you are a turtle going into its shell"), children were found to prefer the metaphoric instructions (Heffner, Greco, & Etfert, 2003). The "turtle technique" capitalizes on this and teaches children anger control by suggesting they pretend to be a turtle, withdraw into their shell, think calming thoughts, and come out of their shell when they are calm (Schneider, 1974). The technique has been found to be effective in both educational and therapeutic settings (e.g., Robin, Schneider, & Dolnick, 1976).

STUDY 1

In light of the previous discussion, we generated the following hypotheses for Study 1. Children who are provided with a Superman cape will be better able to delay gratification because they can imaginally transform themselves into Superman and adopt his qualities. But what are the qualities that make Superman better able to wait? Presumably, children who are provided with explicit instructions as to the qualities that Superman incorporates would be better able to wait than those who are simply provided with the cape without such explicit instructions. On the other hand, perhaps children's ability to imaginally transform themselves into Superman only indexes their intelligence. Consequently, children's intelligence was also assessed using a nonverbal measure of intelligence, the J. C. Raven's (1973) Standard Progressive Matrices (SPM) test. The Raven's test is highly correlated with multidomain measures of intelligence (Snow, Kyllonen, & Mashalek, 1984) and is considered a test of general intelligence or abstract reasoning (Neisser, 1997) that is relatively free of cultural bias.

Method

Participants. Participants were 66 Jewish children, aged 36 to 63 months, in three preschool classes in middle-class neighborhoods in three Israeli cities. There were 27 boys and 39 girls.

Procedure. The study was approved by the Ethics Committee of the Department of Psychology at Tel Aviv University and the preschool authorities.[2] A week before the study was conducted, children were individually administered the J. C. Raven's (1973) SPM test. The SPM was developed as a nonverbal measure of intelligence that has been used in more than 1,000 studies (J. Raven, Raven, & Court, 1998), purportedly measuring the ability to adapt one's thinking to new cognitive problems (Carpenter, Just, & Shell, 1990). The SPM has a test–retest reliability of about .82 depending on the interval between tests and a split-half reliability of about .82 in a wide range of cultures. It consists of five sets of increasingly difficult matrices, 12 in each set, each of which has a missing part that the individual being tested needs to find from among six or eight options. In each set, the first matrix is easiest and the matrices become increasingly more difficult. Young children and individuals with mental disabilities are generally able to complete all or part of the first four sets and are rarely administered the fifth set. The test has been successfully administered to children as young as 3 (Fidalgo & Pereira, 2005).

To administer the SPM, each child was asked to accompany the experimenter to a different room "to play a game." The experimenter and the child sat opposite each other next to a table on which a booklet containing the matrices was prearranged. The first matrix was shown to the child who was asked to look at it. The experimenter then said, "Look, this is a series that's missing a piece and we want to find the missing piece. Can you see the pieces here below?" Showing the child the response options, she continued, "Each one of these pieces could be the right one to complete the series." She then went on to explain to the child why two of the answers were wrong and asked him or her to show

[2]Written parental consent is not required by Israeli law.

the one that was right, saying, ''Can you choose the one that's right to complete the series?'' If the child gave the correct response, the experimenter continued; otherwise, the child was corrected. Children were then told that on each page there was a different series, that the series got harder and harder, and that all they had to do was show the piece that in their opinion was the right one to complete the series. They were told to take their time, that they could take as long as they wanted, and that they should remember that there is only one piece that's correct for each series. The number of items the child completed correctly and the time taken to do so was noted.

About a week later, a different experimenter asked the child to come with her to play a game. She asked the child to sit on a chair that faced a window, and she sat opposite the child. The experimenter first showed the child a small basket of toys, displayed each toy, and told the child that afterward, they would play together. The toy basket was then removed from the child's sight. The experimenter then brought another covered basket and said, ''Let's see what under the cover. I'm sure it's a surprise.'' When she took off the cover, revealing five pretzel sticks and three tiny cookies, she said, ''Oh wow, look at the cookies and the pretzels. Which do you prefer to eat? I will let you eat what you choose, either the cookies or the pretzels.'' After the child chose, the experimenter said, ''You know what, I need to go out of the room now. If you wait for me here until I come back, and sit in the chair without getting up, then you can eat the [preferred treat] right after I come back. But if you don't want to wait for me to come back, you can shake this rattle and make me come back when you want. But if you shake the rattle, then you can't eat the [preferred treat] but you can eat the [less preferred treat]. Do you understand? If you wait for me to come back and sit nicely in the chair until I come back you will get the [preferred treat]. But if you shake the rattle you will get the [less preferred treat]. Can you tell me what you'll get if you wait for me in the chair until I come back? Can you tell me what you will get if you use the rattle?'' These instructions were repeated until children evidenced understanding of the contingency.

At that point, the experimenter looked at a random assignment sheet, which was used to assign children to one of three conditions. Children in the control condition were not given any other information. Boys and girls in the experimental condition were provided with a Superman cape. The use of the same cape for boys and girls was the result of discussions with preschool teachers and children prior to conducting these studies, discussions which indicated that there do not seem to be equivalent female superheroes. Superman and his cape are almost universally recognized by children of both sexes of these ages, and the red cape is highly attractive to children of both sexes. As previously cited, there is also anecdotal evidence that preschool girls often cross-dress to pretend to be male superheroes (Davies, 1989; Marsh, 2000).

Children in the cape-only condition were told, ''Before I go, there is a Superman cape here. You can put it on while you wait for me to come back.'' Children in the cape and instruction condition were told, ''Before I go, there is a Superman cape here. You can put it on while you wait for me to come back. Do you know who Superman is? He has special powers. He is a superhero and he has lots of patience and he knows how to wait really well.'' In both of these conditions, the experimenter helped the child put on the cape.

Before conducting the study, we ran a pretest with five preschool children, three boys and two girls, who were asked to wait for a delayed reward while wearing the Superman cape, and their behavior during the delay was viewed by two observers. Observation showed that children evidenced ''Superman''-like behavior, putting their hands forward and ''flying'' around the room, often while making ''whirring'' noises. Consequently, in the study proper, participants were required to sit on the chair without getting up. After putting on the cape, children in the caped conditions were told, ''I'm going now. Whether you use the rattle or not, we will play with the toys when I come back.'' Wait time was measured with a stopwatch from the moment the experimenter closed the door, and children's behavior during the delay was unobtrusively observed through the window by an observer while the experimenter waited behind the door and listened for the rattle and noted any other sounds (e.g., children singing, talking). The experimenter came back either when the child shook the rattle or after 20 min. When the experimenter came back, she asked the child whether the child remembered what he or she would get now. Each child was given the appropriate reward, played with the toys for 5 min, and was taken back to the preschool room.

Results and Discussion

Correct scores on the Raven's Progressive Matrices could range from 0 to 48, as each child completed 12 items in each of four sets. In fact, the range of correct scores was 6 to 20. In light of the fact that we did not limit the amount of time children could take to complete the four sets, the time required to do so was also assessed and a final score was calculated by dividing the time taken by the child by the number of correct responses. Thus, these scores represent speed for correct solutions. This was done because the SPM is generally administered as a timed test, whereas children in our study could take as long as they wanted to complete the entire series.

Our first analysis examined the number of children who waited to criterion in each condition. Only 2 of 22 children waited to criterion in the control condition, whereas 8 of 22 waited to criterion in the cape-only condition and 15 of 22 waited to criterion in the cape plus instructions condition. A chi-square analysis on these data was significant, $\chi^2(2) = 16.36$, $p < .001$.

Next, children's delay times were examined. An analysis of variance (ANOVA) with condition (3) and sex of participants as the only factors showed a significant effect for condition, $F(2, 60) = 14.81$, $p < .001$, $\eta^2 = .33$. The relevant means were 327.59 s in the control condition ($SD = 375.70$), 714.38 s in the cape condition ($SD = 433.07$), and 993.11 s in the cape plus instructions condition ($SD = 390.05$). Both experimental conditions differed significantly from the control condition; in addition, the difference between the two cape conditions was significant, $t(\mathrm{df} = 42) = -2.27$, $p < .05$. Participant sex was not significant either alone or in interaction with condition.

Then, the same analysis was conducted with children's SPM scores covaried. SPM scores were a significant covariate, $F(1, 59) = 4.27$, $p < .05$, with more intelligent children evidencing longer delay times than less intelligent ones. The obtained pattern of results did not change after covarying SPM scores and the condition effect was still significant, $F(2, 59) = 12.79$, $p < .001$.

Recall that children were required to sit in their chair without leaving it. An observer kept a running record of children's physical behavior during the delay, and the experimenter kept a record of their singing/talking behavior. These records showed that all children complied with the requirement to remain seated during the delay, but they did so differently in the control group than in the two experimental groups. Children in the control group sang songs, talked to themselves, turned their faces and bodies away from the rewards, and put their heads down on the table; some closed their eyes. In the experimental groups, children repeatedly touched and stroked the cape and were more likely to display Superman-like behavior, spreading their hands in front, like Superman in flight, despite remaining seated. Although there was some emulation of Superman-like behavior during the delay, it is important to note that we are arguing for a *cognitive* self-transformation in which children adopt Superman's characteristics. It is this adoption that facilitates their wait. This was underscored by a girl who took off the cape after a few minutes. When the experimenter returned and asked her why she took off the cape, she said, "I didn't need it any more; I said goodbye to Superman and took his powers for myself." That is, she was able to voice her appropriation of Superman's characteristics and to use these characteristics to guide her own behavior during the delay.

STUDY 2

There are two possible concerns regarding Study 1. The first of these concerns is that by providing children with a cape, what was actually transformed was the context rather than self. That is, the provision of a cape may have provided children with a distraction that also served to reduce the frustration experienced in the situation. Although children's statements as to what they did during the delay tend to belie this interpretation, a more stringent methodological test of this issue was necessary. A second possible concern is that the delay time measure in Study 2 was actually an index of obedience. That is, children were asked to sit in the chair during the duration of the delay. Perhaps more obedient children are those who are more willing to comply with the experimenter's request and end up sitting in the chair for longer and concomitantly, wait longer.

To disentangle these possibilities, we conducted another study in which several aspects of the prior methodology were changed. First, children were provided with the same cape under two different instruction conditions. The first of these presented the cape as Superman's cape and Superman himself was described as having incredible patience and the ability to delay gratification. The second of these presented the cape as Dash's cape. Dash is a superhero from the children's film *The Incredibles*; in contrast to Superman, he was described as impulsive and unable to delay gratification. To the extent that children appropriate the characteristics associated with each figure (Fein, 1981), children in the Superman condition should evidence longer delays than children in the Dash condition.

The second aspect of the study that was changed was that children were not required to sit in the chair to fulfill the contingency. They were simply asked to put on the cape and to wait seated. This was done to eliminate the possibility that obedience was actually assessed in the prior study.

Method

Participants. Participants were 43 Jewish children, 21 boys and 22 girls, from several preschools in middle-class neighborhoods in two Israeli cities. Children's ages ranged from 42 to 60 months.

Procedure. The study was approved by the Ethics Committee of the Department of Psychology at Tel Aviv University and the preschool authorities. Children were invited to come with the experimenter to play a game of "shapes and drawings." The SPM was administered as in Study 1.

About 2 weeks later, children's delay of gratification was tested using the same procedure as in Study 1.

The reward objects, selected on the basis of consultation with the preschool teacher, were a piece of candy or a pretzel. After a child chose the preferred reward, the delay contingency was explained, and the experimenter verified that the child understood the contingency. Being seated was not explicitly made part of the contingency. Then the experimenter showed the child the cape and said, "Look what I have here. A Superman/Dash cape. Do you want to put it on?" While helping the child put on the cape, for those children in the Superman condition, she continued, "Do you know who Superman is? He is a superhero. He has very special powers. He is a hero with lots of patience and he knows to wait really well." In the Dash condition, after asking the child if he or she knows who Dash is, the experimenter continued, "He is a superhero. He has very special powers. He is a hero who is very quick and impulsive, he never waits for anything." Before leaving, the experimenter verified that the child recalled the contingency and reiterated that she and the child would play with some toys after she returned.

Delay time was measured from the moment the experimenter left the room until the child summoned the experimenter, for a maximum of 20 min, at which point the experimenter came back. During this time, children's physical behavior was unobtrusively observed through a window by the experimenter who recorded whether (a) the child sat or stood up and whether (b) the child kept the cape on or removed it. When the experimenter returned, she verified that the child recalled the contingency, gave the child the appropriate reward, and played with the child for about 5 min. During this time, the experimenter inquired as to what the child had thought about and did during the delay. At the end of this play period, the child was thanked and escorted back to the classroom.

Results and Discussion

Our first analysis focused on the number of children who waited to criterion in the Superman versus Dash cape conditions. The number of children who waited to criterion was 11 of 22 when the cape was introduced as Superman's cape and 4 of 21 when it was introduced as Dash's cape. A chi-square analysis, with correction for continuity, was significant, $\chi^2(1) = 4.53$, $p < .05$.

Next, children's delay times, in seconds, were used in an ANOVA in which figure (Superman or Dash) and children's sex were the only factors. This analysis showed only a trend for figure, $F(1, 37) = 3.19$, $p < .10$, $\eta^2 = .08$. Children for whom the cape was introduced as Superman's cape waited for 810 s ($SD = 496.94$), whereas children for whom the cape was introduced as Dash's cape waited for 547 s ($SD = 419.30$). Sex of participant was not significant either as a main effect, $F(1, 37) = 2.63$, *ns*, or in interaction with figure, $F < 2$, *ns*. Hence, it is not the cape that facilitated children's delay but the fact that it was identified as Superman's rather than Dash's cape and children were able to appropriate Superman's relevant characteristics in coping with the delay. When the same analysis was rerun with SPM scores covaried, the covariate was not significant and the trend for the differences between conditions was still evident, $F(1, 36) = 3.67$, $p < .10$.

TABLE 1
Likelihood of Cape Removal, by Figure and Sex of Participant, Study 2

	Figure			
	Superman		*Dash*	
Participant Sex	*M*	*SD*	*M*	*SD*
Boys	.31	.48	.56	.53
Girls	.71	.49	.25	.45

Recall that children's behavior during the delay was recorded by the experimenter. Half the children were also randomly observed by a second observer, and there were no instances of disagreements between the two observers on the two dichotomous measures that were recorded: whether or not children remained seated and whether or not they removed the cape. Observation of children's delay behavior during the time they waited showed that close to half the children did not remain seated during the delay. More interesting, the majority of those children who did not remain seated took off the cape during the delay. An ANOVA was first conducted to examine whether cape removal was related to participant sex or figure (Superman vs. Dash). An ANOVA showed no main effects, both Fs < 1, *ns*, but there was a significant interaction between sex of participant and figure, $F(1, 37) = 5.23$, $p < .05$, $\eta^2 = .12$. The means for this interaction are shown in Table 1. As evident the table, the interaction emerged because girls were more likely to remove the cape when it was Superman's cape and boys were more likely to do so when it was Dash's cape.[3] An analysis which included a dichotomous variable reflecting whether children did or did not remove the cape did not change the pattern of results for delay time.

STUDY 3

In the previous studies, we argued that children used the cape to transform themselves to become Superman in

[3]When girls explained why they took off the cape, they tended to explain that Superman is not a girl; boys who took off the cape explained that they didn't want it on. The number of children who were able to justify cape removal was not large enough to conduct analyses.

Study 1 and Superman and Dash in Study 2. In Study 1, children with a Superman cape delayed longer than children without the cape, especially if they were also informed about Superman's delay-relevant qualities. In Study 2, we showed that the impact of the cape depended on the superhero involved. Children for whom the cape was introduced as Superman's cape evidenced longer delay times than those for whom the cape was introduced as the cape of the impulsive superhero Dash.

However, it is still unclear from these results whether children's cognitive self-transformation requires props like the cape or whether children can imaginatively self-transform without such props. Moreover, because in Study 2 children were provided information as to the relevant traits that characterize Superman and Dash, the provision of the relevant traits may by itself be sufficient to guide children respectively into longer or shorter delays. Thus, a third study was conducted to test this alternative account for the results of Study 2. Specifically, in the third study, some children were asked to imagine themselves as Superman, with the same delay-relevant characteristics that were attributed to the superhero in Study 2, whereas other children were asked to imagine themselves as a child called Danny with the same delay-relevant characteristics attributed to Superman. Two more groups of children watched a short video of Superman, with or without being asked to imagine themselves as Superman.

We generated three hypotheses. First, imagining self as a superhero with delay-relevant qualities was expected to facilitate children's delay time more than imagining self as a same-aged child with the same delay-relevant characteristics. Second, imagining self as Superman with delay-relevant qualities was expected to facilitate children's delay more than watching a video of Superman without being instructed regarding his delay-relevant qualities. Finally, children who watched the video of Superman were expected to evidence the same delay times, irrespective of whether they had been asked to pretend to be Superman. This is because although children of these ages do assume the pretend mode in their play, children in these conditions were not expected to spontaneously understand the relevance of being Superman to coping better with the delay context.

Method

Participants. Participants were 48 Jewish children, 20 boys and 28 girls, in three preschools in middle-class neighborhoods in an Israeli city. Children's age ranged from 38 to 59 months.

Procedure. The study was approved by the Ethics Committee of the Department of Psychology at Tel Aviv University and the preschool authorities. As in the previous studies, children were brought individually "to play games." The experimenter first showed the child a small basket of toys and told the child that afterward, they would play together. The reward objects, selected on the basis of consultation with the preschool teachers, were a wrapped toffee candy or a pretzel. To introduce the contingency, the experimenter showed the child a covered paper plate and revealed the two rewards. After asking each child his or her preference, the experimenter explained the delay contingency and displayed the use of the rattle to summon the experimenter. Children were questioned and the contingency was repeated until they evidenced understanding of the contingency.

At that point, the experimenter looked at a random assignment sheet, which was used to assign children to one of four conditions. Children in the Delay-Relevant Characteristics conditions were told, "Superman/Danny is a superhero/child your age who has lots of patience and knows to wait really well. While I'm gone, you can pretend to be Superman/Danny." Children in the Video conditions were told, "Before I go, I will show you a short video of Superman." Children were then shown a 20-s video of Superman on a laptop computer. Half the children who viewed the video of Superman were also told, "While I'm gone, you can pretend to be Superman." The experimenter then left the room, taking the computer with her.

Children's wait time was measured with a mobile phone from the moment the experimenter closed the door. The experimenter came back either when the child shook the rattle or after 20 min. Children were unobtrusively observed while they were waiting. When the experimenter came back, she asked the child whether he remembers what he or she gets now. Each child was given the appropriate reward, played with the toys for 5 min, and was taken back to the preschool room.

Results and Discussion

First, the number of children who waited to criterion was examined. These frequencies are shown in Table 2.

TABLE 2
Number of Children Waiting/Not Waiting to Criterion, by Condition, Study 3

Condition	*Waiting to Criterion*	*Not Waiting to Criterion*
Delay-Relevant Qualities		
Superman Pretense	8	3
Child Pretense	0	12
Superman Video		
Superman Pretense	5	7
No Pretense	5	8

Note: Criterion wait time = 20 min, $\chi^2(3) = 13.12$, $p < .005$.

TABLE 3
Delay Time in Seconds, by Condition, Study 3

Condition	*M*	*SD*
Delay-Relevant Qualities		
Superman Pretense	1,050.90	306.21
Child Pretense	299.63	229.96
Superman Video		
Superman Pretense	883.31	358.12
No Pretense	789.87	401.77

A chi-square analysis on these data was significant, $\chi^2(3) = 13.12$, $p < .005$. Further analyses showed that waiting to criterion was as likely among those children who had been asked to imagine being Superman with the delay-relevant qualities as among those who had watched the Superman video, whether or not they were asked to imagine themselves being Superman, $\chi^2(2) = 3.30$, *ns*.

Children's delay times were next converted to seconds and an ANOVA with children's sex and delay condition (4) as the only variables was conducted. This analysis showed a significant effect for condition, $F(3, 40) = 9.43$, $p < .001$, $\eta^2 = .41$. The respective means are shown in Table 3. As can be seen in Table 3, the main effect emerged because children who were asked to imagine themselves as a child with the same delay-relevant characteristics as Superman delayed significantly less time than all other children, $F(1, 44) = 24.91$, $p < .001$, $\eta^2 = .36$. In addition, further analyses showed that there was a trend, $F(1, 40) = 2.96$, $p < .10$, $\eta^2 = .08$, such that children who were asked to pretend to be Superman and were instructed as to Superman's delay-relevant characteristics tended to delay longer than children who watched the video of Superman, whether or not they were instructed to pretend to be Superman. Children who watched the video of Superman and were instructed to pretend to be Superman did not differ in their delay times from those children who watched the Superman video but were not instructed to pretend to be Superman. Sex of participant was not significant either as a main effect or in interaction with group.

GENERAL DISCUSSION

These three studies demonstrate the interplay between cognitive self-transformations and the ability to delay gratification. In the first two studies, we found that the use of a cape identified as Superman's cape helps children cope with self-imposed delay of gratification. Although therapeutic contexts occasionally incorporate dress up and props (e.g., Rubin, 2007), this is the first demonstration of the actual effectiveness of such cognitive self-transformations for children's delay behavior. Our third study showed that children can deploy their imagination to cognitively self-transform without the use of actual props like the Superman cape.

From Piaget's perspective, it is the ability to engage in such thought transformations that indexes intelligent behavior. In fact, Johnson, Ershler, and Lawton (1982) found that preschool children's spontaneous transformations during free play were significantly correlated with their concurrent intelligence, as assessed by performance on the Peabody Picture Vocabulary Test ($r = .34$) and the Raven's Progressive Matrices ($r = .31$). Other researchers have found that preschool symbolic play substitution during spontaneous play (e.g., using a blanket as a baby, eating "air" cookies) were the most powerful predictors of math and reading ability at age 8 (Hanline, Milton, & Phelps, 2008). The ability to conduct thought transformations, then, may well provide a parsimonious account for the documented relation between delay of gratification and intelligence (Shamosh & Gray, 2008). Specifically, from the current perspective, the ability to deploy cognitive thought transformations likely undergrids the correlation between preschool delay ability and later Verbal and Quantitative SAT scores (W. Mischel et al., 1989). In particular, the higher correlation with Quantitative SAT scores may reflect the fact that mathematics itself is predicated on transformational thought (Piaget et al., 1992); reasoning transformationally is critical to children's mathematical thinking (Harel & Sowder, 2005) as well as to successful performance in other academic subjects (Jensen, 1998). Most likely these correlations hold because fundamental concepts in early childhood math involve making comparisons and transformations, abilities that are both prevalent in pretend play and that, for Piaget, represent the essence of intelligence.

On the other hand, these studies also show that it is not the prop per se that is the critical variable. Rather, it is children's construal of the implications of the prop for their own self and behavior that is relevant. By engaging positive superhero figures that have characteristics children themselves want to have, one can encourage children to adopt these characteristics and become behaviorally more like these superheroes. When props represent figures whose characteristics are antithetical to those the child wants to appropriate, such props appear to afford the child little benefit. This was the case when the cape was introduced as one representing the impatient Dash; children tended to delay for less time when it was Dash's cape. The fact that children were able to "become" Superman in terms of delaying attests to their transformational skill and their ability to apply this skill in aversive contexts. The fact that children's assessed intelligence impacted their ability to delay gratification underlines, as Piaget argued, that the ability to conduct comparisons and transformations is at the very basis of

human intelligence and provides the building blocks of children's abilities in many domains, including as we have shown here, their ability to delay gratification.

It is important to note that in Study 2, in which instructions were provided to both groups of children, intelligence, as assessed by the SPM, did not impact children's delay times. This null result parallels the finding of Mischel and his colleagues (e.g., W. Mischel et al., 1998) who found no correlation between the delay times of children given various transformational instructions during the delay and children's SAT scores at age 18. That is, children's intelligence comes into play when they themselves need to cope by transforming aversive contexts. Whereas in previous research, they were shown to do so by transforming either the rewards or the context, our research shows that they can do so by cognitively transforming self, appropriating superhero qualities that facilitate their delay. If Superman can wait, so can the child who puts on his cape.

But our third study shows that children can cognitively self-transform without physical props. In this study, being instructed to pretend to be Superman with delay-relevant qualities significantly facilitated children's delay of gratification as compared to being instructed to pretend to be a child with the same delay-relevant characteristics. As well, pretending to be Superman with delay-relevant qualities tended to facilitate children's delay more than being shown a 20-s video of Superman, with or without being instructed to pretend to be Superman. It is important to note that children who watched the Superman video and were instructed to pretend to be Superman did not delay any longer than those who watched the Superman video and were not instructed to pretend. These data indicate that these preschool children did not apparently know what aspects of Superman were relevant to maintaining the delay in this context. So it may well be that the video of Superman provided children with Superman-related thoughts, but these thoughts, although supporting children's delay, did not translate into the appropriation of Superman's delay-relevant qualities. It seems, then, that children of these ages are able incorporate relevant Superhero qualities when they know what these qualities are and how they are relevant for the situation at hand.

One of the possible limitations of these studies is that the same Superman cape was used for boys and girls alike. Although several boys and girls refused to don the cape in Study 2, only one girl justified her refusal by referring to Superman being a boy. The fact that wearing the cape led to longer delay times and that sex of child did not contribute to this either as a main effect or in interaction with condition further validates the use of the same cape for both boys and girls. Further, the finding that in Study 3 children were able to pretend to be Superman without the cape and that, here as well, there were no main effects or interactions related to gender also provides further testament to the validity of this manipulation for male and female children alike. Superheroes can wait so a child who cognitively transforms himself and pretends to be a superhero can incorporate the same necessary qualities and delay gratification longer.

Implications for Research, Policy, and Practice

These findings have important implications for clinical child theory and practice. First, children find delays of all kinds aversive and difficult to cope with. Previous research implicated cognitive transformations of objects and contexts as important in facilitating children's ability to do so, particularly in coping with delay of gratification. In clinical practice, however, transformations of self are often invoked by therapists to help children cope with the need to delay, while waiting for medical interventions, for instance. This study is the first to demonstrate the utility of cognitive self-transformations in delay of gratification contexts, showing that cognitive self-transformations are a more general intellectual activity that can be used by children to help them cope. As most children are able to engage in cognitive self-transformation within play contexts, this strategy is one that they can readily adopt when the therapeutic uses of doing so are clarified. Of importance, some children intuitively understand the virtue of doing so even without therapeutic intervention. Future research should address possible differences between children in their tendency to spontaneously deploy cognitive self transformations in coping with aversive contexts.

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