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The effect of friendly touch on delay-of-gratification in preschool children

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Physical touch has many documented benefits, but past research has paid little attention to the effects of touch on children's development. Here, we tested the effect of touch on children's compliance behaviour in a modified delay-of-gratification task. Forty children ($M = 59$ months) were randomly assigned to a touch or no touch group. Children in the intervention condition received a friendly touch on the back while being told that they should wait for permission to eat a candy. Results showed that children in the touch condition waited an average of two minutes longer to eat the candy than children in the no touch condition. This finding has implications for the potential of using touch to promote positive behaviours in children.

Keywords: Childhood development; Cognitive development; Touch; Delay of gratification.

Physical touch has many documented benefits including decreasing stress (Coan, Schaefer, & Davidson, 2006; Holt-Lunstad, Birmingham, & Light, 2008), increasing attachment (Weiss, Wilson, Hertenstein, & Campos, 2000), and increasing compliance in interpersonal situations (Crusco & Wetzel, 1984; Kleinke, 1977). In children, the effects of nurturing touch are relatively understudied, probably because of abundant caution about the boundary between appropriate and inappropriate touch (Belkin, 2009; Glod, 2007). Given the positive effects of touch, it could be a powerful tool for supporting children's healthy development (Blackwell, 2000; Diamond & Amso, 2008). Here, we test the effect of a brief, supportive touch on preschool-age children's compliance during a modified delay-of-gratification paradigm.

Positive behaviours like waiting, following instructions, or helping might be interpreted as everyday compliance tasks requiring children to self-regulate (Dennis, 2006; Kalpidou, Power, Cherry, & Gottfried, 2004). Improving these skills is important because related abilities, such as delay of gratification, are predictive of future life outcomes (Mischel et al., 2011). For example, in the classic marshmallow task (Mischel & Ebbesen, 1970) children were given a choice: Eat a single marshmallow immediately or resist this temptation during a delay period and receive two marshmallows. Studies have shown that longer wait-times during the preschool years are correlated with higher scores on the USA's most widely used college admissions exam, the Scholastic Assessment Test (SAT; Shoda, Mischel, & Peake, 1990), greater self-confidence and

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interpersonal skills (Mischel, Shoda, & Peake, 1988), and lower likelihood of substance abuse (Ayduk et al., 2000).

Past studies have manipulated children's wait time on the marshmallow task through cognitive interventions (e.g., Kidd, Palmeri, & Aslin, 2013; Mischel & Underwood, 1974). For example, a study by Kidd et al. (2013) showed that children's wait time was affected by the reliability of the experimenter, with children waiting less for experimenters who just failed to deliver a promised set of art supplies, saying they had made a mistake, than for experimenters who brought the goods as promised. Kidd et al. interpreted the children's behaviour as a rational decision-making process, with the reliability of the environment affecting the decision to wait. Importantly, the "cognitive" interventions used in previous experiments probably have affective components, because children's cognitive appraisals can increase or decrease emotional states like frustration or social trust with the experimenter (Gross, 2002).

Given that delay of gratification places demands on emotional regulation as well as cognitive control, the current study emphasizes a "hot" approach, focusing on an emotional system, rather than a "cool" approach, focusing on a complex cognitive system (Metcalfe & Mischel, 1999). To the best of the authors' knowledge, the current study is the first to take a "hot" approach with children with the goal of increasing delay time using a simple intervention.

Touch has been studied in terms of both short- and long-term effects, with little integration across these areas. Many studies on the long-term effects of touch have indicated that touch reduces stress and anxiety across the lifespan, particularly early in life and for low-birthweight infants (e.g., Field, 2003; Weiss et al., 2000); such effects raise the possibility that touch could have a broader effect on development, including areas such as cognition and self-regulation. The long-term impact of touch on healthy attachment and social development has been extensively documented in nonhuman animals (e.g., see Liu et al., 1997, on maternal licking and grooming in rodents, and Harlow & Zimmerman, 1958, on primates). In humans, many studies of extreme neglect have documented the negative effects of touch deprivation in humans (Blackwell, 2000). Furthermore, a vast literature has related parental warmth to children's self-regulation (e.g., Colman, Hardy, Albert, Raffaelli, & Crockett, 2006; Eisenberg, Zhou, Losoya, et al., 2003; Eisenberg, Zhou, Spinrad, et al., 2007), but these studies did not single out *physical affection* as the central variable.

Little research, however, has explored the effects of touch on typical cognitive and emotional development in childhood. Therefore, our study explored the possibility that touch could enhance a fundamental cognitive and socioemotional skill, self-regulation, in typically developing preschool children. As a first step, we explored the effects of a short-term, single-session touch intervention, which is in some ways quite different from the sustained daily-touch interventions in the existing literature. However, one possibility is that the long-term positive effects of touch arise from accumulated short-term effects, and we wanted to find out whether a minimal intervention would affect children's behaviour.

A second reason that touch was chosen as the critical intervention was the robust findings in the adult literature showing the positive short-term effects of touch on compliance. This led us to ask whether touch could have similar short-term benefits in children, improving self-regulation and compliance. In past studies, adult subjects who were touched by a researcher were more likely to comply with the request to watch a large dog (Gueguen & Fischer-Loku, 2002) or score tedious personality tests (Patterson, Powell, & Lenihan, 1986). Touch also enhances prosocial behaviours even in the absence of a direct request in both adults and children: Customers who are briefly touched by their waiter tip more (Crusco & Wetzel, 1984), and students who are touched by their teacher are more likely to volunteer to solve maths problems in front of a class (Gueguen, 2004). Similarly, a touch from a teacher has been found to promote attentive behaviour in a classroom of 5- and 6-year-olds (Wheldal, Bevan, & Shortall, 1986), and touch from a dentist has been found to reduce the anxiety of pediatric patients (Greenbaum, Lumely, Turner, & Melamed, 1993). Although not directly assessing touch, Parke (1969) showed that a brief warm interaction between the experimenter and child enhanced the child's compliance with given prohibitions. Taken together, the findings from these studies provide compelling evidence to suggest that touch can promote self-regulation and compliance in children. As such, we hypothesized that a brief touch could have similarly positive short-term effects on compliance in preschool-age children, who are at a critical age for behaviour interventions (Webster-Stratton, Reid, & Hammond, 2001, 2004).

To investigate our hypothesis, we measured the effect of touch on children's compliance with a request to refrain from looking for or eating a hidden candy until they received permission from an experimenter. This paradigm was modified from a food-reward task by Vaughn, Kopp, and Krakow (1984), in which children had to wait for permission to look for or eat a candy, but with no added touch component. In the current study, children were randomly assigned to one of two conditions before arriving at the lab: Half the children were briefly touched on the back by the experimenter while she explained the instructions, and half were not. The experimenter then left the room for ten minutes and watched the child through a hidden camera. At any time, the child could ring a bell to bring the experimenter back. There were two main outcome variables: (a) wait time (defined as how long children waited before eating the candy, regardless of whether they received permission), and (b) compliance (defined in two ways, whether or not children *looked for* the hidden candy without permission, and whether or not children *ate* the candy without permission). To ensure that differences in wait time between the two groups were not based on previously existing differences in ability to self-regulate and exercise inhibitory control (in other words, to make sure that random assignment had indeed yielded comparable groups), a baseline executive function task was administered before the critical food reward task (adapted from the "Dots Task" from Davidson, Amso, Anderson, & Diamond, 2006, and Bear–Dragon Task from Carlson & Moses, 2001).

Based on previous adult findings (Crusco & Wetzel, 1984; Gueguen & Fischer-Loku, 2002; Kleinke, 1977; Patterson et al., 1986), we hypothesized that children who were touched when given directions would be better able to comply than children who were not touched. Specifically, we hypothesized that children who were touched would not search for or eat the candy without permission. We further hypothesized that children who were touched would wait longer to eat the candy, thereby showing enhanced delay of gratification.

EXPERIMENTAL STUDY

Method

Participants

Forty preschool children ($M = 59$ months; range = 48 to 71 months; 20 female) participated in the study. Participants were recruited from the central Connecticut area and were tested at the university child development laboratory. According to a demographic questionnaire completed by parents during the visit, the participant sample was 92% White, 87% English monolingual, 87% from middle-to-upper income ranges (over $60,000 per year), 82% with at least one college-educated parent, and 90% with at least one sibling (Table 1). An additional three children did not complete the study because they became upset while alone in the room. All protocols were approved by the Wesleyan University Institutional Review Board.

Set-up

Tasks were administered by one of two female experimenters of similar age and demeanour. Before starting, the experimenter played with the child to develop a rapport but was careful not to have any physical contact with the child so as not to influence the effect of touch during the experiment. The child was then invited to play games in a different room. A tripod-mounted camera

Table 1. *Sample characteristics*

Characteristics	*Group* Touch n = 20 (10 F) Mean (SD)	No touch n = 20 (10 F) Mean (SD)	t (df)	p
Age (months)	60.15 (8.09)	57.95 (8.20)	.854 (38)	.40
	n (%)	*n (%)*	χ^2 *(df, n)*	
Ethnicity: White	20 (100)	16 (84)	3.42 (3, 39)	.33
English monolingual	17 (85)	17 (89)	0.00 (1, 38)	1.00
Income (over $60,000)	19 (95)	15 (79)	4.02 (5, 39)	.55
Parent education: one college-educated parent	17 (85)	15 (79)	8.82 (5, 39)	.12
Sibling: at least one sibling	18 (90)	17 (89)	0.00 (1, 39)	.96

Note: F = female.

recorded children's behaviour, and a video feed allowed for online observation.

Before coming into the lab, children were categorized by age (older or younger group) and gender (male or female). Within each of these four groups, children were assigned in an alternating fashion to the touch or no-touch group. Group assignment was balanced across the two experimenters. The experimenter was blind to condition until just before the delay task.

Parent survey

Before children were tested, parents were given a questionnaire that asked them to rate their child's comfort and experience with touch on a 1–7 Likert scale (7 = very comfortable/often; 1 = very uncomfortable/never).

Baseline task: Executive function

We used an executive function (EF) paradigm that tested working memory and inhibitory control, adapted from the "Dots Task" (Davidson et al., 2006) and Bear–Dragon Task (Carlson & Moses, 2001), to ensure that the groups did not exhibit baseline differences. We used an adapted EF paradigm in order to have a single measure that could be used for the entire age range in our sample without ceiling or floor effects. The EF measure used in the current study has been validated through strong correlations with age and other EF measures (Slusser et al., 2012).

For the EF task, the experimenter and child sat on the floor across from one another, with a small table in between them. Two buttons were placed in front of the child. The experimenter introduced the child to the "nice" elephant puppet and explained that when the elephant pushed a button, the child should raise his or her hand on the same side as that button (congruent phase). The child received two practice trials with corrective feedback, then four trials without feedback. Next, the experimenter introduced the "mean" crocodile puppet and explained that when this puppet pushed a button, the child should raise his or her hand on the opposite side of that button (incongruent phase). Again, each child received two practice and four test trials.

Finally, the two rules were repeated, and each child completed a mixed block of 12 trials, in a fixed pseudorandom order with six trials per puppet. Trials in the mixed block were given 0 points for correct, 1 point for self-correction (child initially responds incorrectly, but immediately self-corrects without experimenter feedback), and 2 points for incorrect responses. Consistent with typical scoring on the Bear–Dragon task, only the mixed block was used to compute EF score (percentage correct out of 12 trials).

Critical task: Food reward (adapted from Vaughn et al., 1984; also see Mischel & Ebbesen, 1970)

A modified form of the marshmallow task was used, adapted from a food-reward task from Vaughn et al. (1984) emphasizing compliance. This task was chosen for three reasons: First, it had been previously used and validated in the literature; second, it allowed us to explore children's self-control in a delay-of-gratification context, which we viewed as the most important target of our intervention; and third, it put our developmental study into alignment with a substantial adult literature on the influence of touch in compliance situations.

The child and experimenter were seated in the testing room at perpendicular sides to each other at a small square table in both the touch and no touch conditions. The child watched as the experimenter hid a piece of candy under one of three cups on the table and was told not to look for or eat the candy until the experimenter gave permission to do so. Children received two training trials (5-s and 20-s wait) to ensure they understood the rules.

The experimenter then introduced a "bring-me-back" bell, which could be used to call the experimenter back into the room, and gave the child one opportunity to practise using the bell.

The experimenter then said:

> Great! Now I have another challenge for you! I'm going to hide five (candies) under this cup, and I want you to wait until I tell you to look for and eat the (candy). This time, I need to do some paperwork outside. But remember, *I'd really like you to wait until I tell you to look for and eat the (candy).* Okay?

Half the children received a friendly touch on the back during this request (only the italicized portion). The experimenter placed the candy under one of three cups and left the participant for 10 min. If the child rang the bell, the timer was stopped, the experimenter reentered the room and asked if they were okay. If the child was confused or lonely, the experimenter restated the task and asked whether the child could wait until the experimenter was finished with their paperwork to eat the candy. The timer was restarted as soon as the experimenter left the room again. If the child requested permission to eat the candy and said they did not want to wait any longer, then the experimenter gave them permission to eat the candy. The experiment ended, and total wait time was recorded, when the child ate the candy (with or without permission), rang the bell for a fifth time, or after 10 min passed.

Children's physical (flinch, neutral, bubbly) and emotional reactions to touch (positive talk, negative talk, smile, grimace, no reaction) were scored from video to see whether children's perception of the touch affected their behaviour. Children's behaviour during the waiting period was categorized into self-distraction behaviours (e.g., exploring the room) and other behaviours (e.g., gazing at the reward, rocking; see Mischel, Shoda & Rodriguez, 1989). All sessions were video-recorded and coded by two observers with 100% agreement ($K = 1$) on children's waiting behaviours, reaction to touch, and total wait time.

Results

Baseline measures

Executive function. EF scores were not statistically different between groups, confirming that random assignment yielded groups that were equivalent on a different measure of inhibitory control (Table 2). There was no effect of sex on EF (73% correct for males and females, $p = .96$). Age and EF scores were positively correlated, $r(38) = .37$, $p = .02$, validating the EF task. However, wait time and EF scores were not correlated, $r(38) = .24$, $p = .13$, even after controlling for age, $r_p(37) = -.00$, $p = .99$.

Sex effects. There was no significant effect of sex on wait time, $t(38) = 0.38$, $p = .70$, 95% CI [−0.25, −0.37], $d = 0.12$, eating the candy without permission, $\chi^2(1, n = 40) = 0.78$, $p = .38$, $\Phi = -.14$, or uncovering the candy without permission, $\chi^2(1, n = 40) = 2.67$, $p = .10$, $\Phi = .26$.

Effect of touch

Wait time. The data exhibited strong kurtosis (−.99) and skewness (−.86), so analyses were performed on log-transformed data. Children in the touch condition waited significantly longer to eat the candy than children in the no touch condition [touch: $M = 499.80$ s, $SD = 164.64$; no touch:

Table 2. *Dependent variables*

Characteristics	*Group* *Touch*	*No touch*	χ^2 *(1, n = 40)*	p	*Φ*	d
Exhibited self-distraction behaviour during waiting task	11 yes, 9 no	11 yes, 9 no	0.00	1.00	0.00	
	Mean (SD)	*Mean (SD)*	*t (df = 38)*	*p*	*95% CI*	
Mean number of times child rang bell	1.0 (1.38)	1.2 (1.23)	−0.24	.81	[−0.94, 0.74]	−0.07
Executive function score (% correct)	75.42 (21.79)	69.70 (18.41)	0.90	.38	[−7.19, 18.63]	0.29
Total time until candy eaten (s)	499.80 (164.64)	366.25 (259.45)	2.34	.02	[0.05, 0.64]	0.76

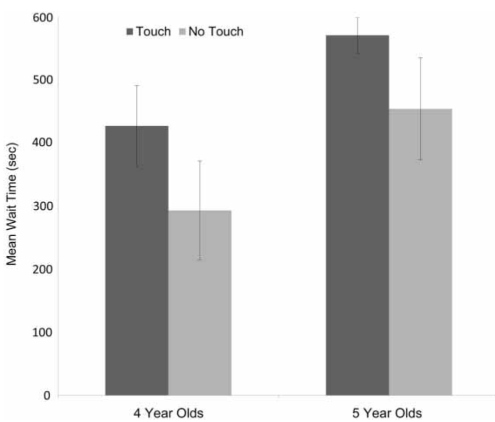

Figure 1. *The effects of touch and age on mean waiting times in a delay-of-gratification task*

$M = 366.25$ s, $SD = 259.45$; $t(38) = 2.34$, $p = .02$, 95% CI [0.05, 0.64], $d = 0.76$, Table 2]. An analysis of covariance (ANCOVA) on wait-time$_{log}$, with age entered as a covariate, revealed large main effects of age, $F(1, 37) = 6.43$, $p = .02$, $\eta_p^2 = .15$, and condition, $F(1, 37) = 4.60$, $p = .04$, $\eta_p^2 = .11$ (Figure 1).

The number of children who waited the full 10 min (14/20 children in the touch condition and 10/20 in the no-touch condition) was not significantly different across groups, $\chi^2(1,\ n = 40) = 1.67$, $p = .20$, $\Phi = .20$. Focusing on the 16 children who ate the candy before the full 10 minutes (i.e., excluding the children who waited the full 10 min), we found a significantly longer wait time for children in the touch condition [touch: $M =$ 266 s, $SD = 125.11$; no touch: $M = 133$ s, $SD =$ 143.82; $t(14) = 2.17$, $p = .05$, 95% CI [0.01, 1.04], $d = 1.16$].

Compliance with directions. Six participants (15%) ate the candy without permission, 25 (62.5%) looked for the candy without eating it, and 15 (37.5%) fully complied with the request. There was no effect of condition on these variables [respectively, eat: $\chi^2(1,\ n = 40) = 0.78$, $p = .38$, $\Phi = -.14$, look: $\chi^2(1,\ n = 40) = 0.96$, $p = .33$, $\Phi = -.15$, fully comply: $\chi^2(1,\ n = 40) = 0.96$, $p = .33$, $\Phi = -.16$]. Age alone did not predict compliance with the requests not to eat or look for the candy, respectively, $F(1,\ 38) = 1.49$, $p = .23$, $\eta_p^2 = .04$; $F(1,38) = 1.21$, $p = .279$, $\eta_p^2 = .03$.

For 4-year-olds only, there was a strong association between sex and whether or not children looked for the candy without permission, $\chi^2(1,\ n = 21) = 9.24$, $p = .00$, $\Phi = .15$. This was due to the fact that 100% of the 4-year-old boys (in both conditions) looked for the candy without permission, compared with 40% of 4-year-old girls. There was no observable sex difference in the 5-year-olds, with about half of the boys and girls looking without permission. Detailed analyses did not yield any evidence for effects of condition, nor interactions between condition, sex, and age, on the compliance variables.

Additional analyses

Self-distraction behaviour. Consistent with Mischel, Shoda, and Rodriguez (1989), children who exhibited self-distraction behaviours ($n = 22$, $n = 11$

Table 3. *Children's physical and emotional reactions to touch*

Reaction to touch	*Female* (n = *10)* n *(%)*	*Male* (n = *10)* n *(%)*
Physical		
Flinch	0 (0)	2 (20)
Neutral	7 (70)	8 (80)
Animated	3 (30)	0 (0)
Emotional		
Positive talk	2 (20)	2 (20)
Smile	6 (60)	2 (20)
No reaction	2 (20)	6 (60)

from each condition) waited significantly longer than children who did not [distraction: $M =$ 506.82 s, $SD = 154.64$; no distraction: $M =$ 342.83 s, $SD = 269.61$; $t(38) = 2.87$, $p = .01$, 95% CI [0.12, 0.070], $d = 0.93$]. The association between condition and distraction behaviour, however, was not significant (Table 2). Further, distraction behaviour did not differ by age, $t(38) = 1.64$, $p = .11$, 95% CI [−0.98, 9.25], $d =$ 0.53, or sex, $\chi^2(1, n = 40) = 0.40, p = .53, \Phi = .10$.

Reaction to touch. For children in the touch condition, the dominant emotional response to touch was to smile. Most children did not exhibit a physical response (see Table 3), thus it was not possible to relate these responses to wait times. A trend for girls to react more positively to touch was noted but was not statistically significant (Fisher's exact $p = .17$). There was no statistically significant effect of age on the distribution of children's emotional or physical reaction to touch (all $\chi^2 >$ 0.16).

Bell-ringing behaviour. The number of times children rang the bell did not differ by condition (Table 2), age, $t(38) = 1.16$, $p = .25$, 95% CI [−0.35, 0.33], $d = 0.37$, or sex, $t(38) = -0.98$, $p = .34$, 95% CI [−1.23, 0.43], $d = -.032$, or correlate with wait time, $r(38) = -.05$, $p = .75$.

Parent survey. Parents of all participants, except for one child in the no touch condition, filled out the parent survey ($N = 39$). The survey collected demographic information as well as 1 to 7 Likert ratings on children's comfort being touched, with 1 being not comfortable and 7 being very comfortable. Based on parental report, there was no significant difference between conditions (nor for age or sex) with regard to each child's comfort with being touched by family or friends [touch: $M = 6.55$, $SD = 0.83$; no touch: $M = 6.79$, $SD = 0.42$, $t(37) = -1.13$, $p = .27$, 95% CI [−0.67, 0.19], $d = -0.37$]; how often children sought out touch [touch: $M = 6.90$, $SD = 0.31$; no touch: $M =$ 6.79, $SD = 0.54$, $t(37) = 0.80$, $p = .43$, 95% CI [−0.17, 0.39], $d = 0.26$]; and how comfortable the children were with being touched by a new person [touch: $M = 5.00$, $SD = 1.75$; no touch: $M =$ 5.89, $SD = 0.99$; $t(37) = -1.95$, $p = .06$, 95% CI [−1.8, 0.03], $d = -0.64$]. Importantly, the data revealed that children often seek touch ($M = 6.85$, $SD = 0.43$) and are typically quite comfortable with touch from both familiar people ($M = 6.67$, $SD = 0.66$) and new people ($M = 5.44$, $SD = 1.48$).

Discussion

The current study found that a friendly touch on the back increased children's duration of waiting for a reward by over two minutes. Overall, across both conditions, over half of the children violated the experimenter's request by looking for the candy without permission, but the vast majority of children complied with the central request to wait for permission to eat the candy. The main variable that differed across conditions was the length of time children waited before asking to eat the candy. Thus, the touch intervention affected children's decision, ability, or willingness to delay gratification, not just their compliance in following directions. Although this study was originally motivated by the adult literature on touch and compliance, the wait time measure revealed the most robust and interesting effect of touch.

There are several reasons why touch may have increased children's waiting. First, touch (in the form of hand holding for 6–12 s) has been found to reduce perceived stress (Coan, Schaffer, & Davidson, 2006) in adults. Although the current study did not use hand holding, the brevity of the hand holding in Coan et al.'s (2006) study demonstrates that even a brief touch can have an effect on perceived stress. Past studies have demonstrated that acute stress decreases cognitive abilities, such as attention and working memory (Hostinar, Stellern, Shaefer, Carlson, & Gunnar, 2012; Shaozheng, Hermans, van Marle, Luo, & Fernandez, 2009; Vedhara, Hyde, Gilchrist, Tytherleigh, & Plummer, 2000). Thus, the brief touch may have decreased the anxiety associated with being alone for 10 min, enabling children to wait longer by successfully allocating cognitive resources in a productive way (e.g., enabling them to harness their best self-regulation ability).

Second, warm touch has been shown to increase attachment (Weiss et al., 2000) and affect emotional states (Hertenstein & Campos, 2001; Hertenstein, Holmes, McCullough, & Keltner, 2009), so the touch in this study might have made the child feel more motivated to wait for the experimenter to return, as they had been asked to do. Our findings expand on the work of Kidd et al. (2013), by showing that children's delay of gratification is modulated not solely by the experimenter's reliability, but more broadly by the quality of their interpersonal interaction with the experimenter. "Warm" emotionally supportive interactions between experimenter and subject could lead to a child's increased willingness to wait for a reward.

Further, emotional experiences can alter perceived temporal increments (Droit-Volet & Meck, 2007; Lui, Penney, & Schirmer, 2011), and temporal perception can clearly affect one's performance on a delay task (McGuire & Kable, 2013). One possibility, therefore, is that the positive interaction between the experimenter and subject altered the child's perception of time so that waiting seemed shorter.[1]

These findings raise a number of questions. First, how do "hot" emotional approaches affect delay of gratification in children, compared with "cold" cognitive approaches? The effects of "hot" approaches have been hinted at in previous literature; for example, several studies report that teacher warmth has beneficial consequences for self-regulation and cognitive gains in early childhood settings (e.g., Kazdin & Klock, 1973; Kontos & Wilcox-Herzog, 1997; Wheldall, Bevan, & Shortall, 1986). However, the current study is the first clear experimental demonstration that a single expression of warmth, in the form of a brief touch, can have a robust short-term effect on a classic indicator of self-regulation.

A second question of interest is what specific aspects of behaviour can be affected by touch? In the current study, we used a task that placed demands on children's compliance and their delay of gratification. The fact that children in both conditions sneaked peeks at the candy, but children in the touch condition waited significantly longer to eat it, suggests that the touch intervention affected delay of gratification more so than compliance. Nevertheless, this question needs to be addressed directly with tasks that clearly distinguish these outcomes. Furthermore, it is of interest to know whether touch increases children's compliance as strongly as it does for adults. A possibility in this case is that children sneaked peeks at the candy because they did not realize they were being watched and thus did not feel that they were violating the experimenter's request. Because nearly all the children waited for permission before eating the candy, this task might not have been sensitive enough to detect differences in children's levels of compliance with and without touch.

Finally, it is of interest to better understand the underlying mechanisms regulating how touch affects delay of gratification specifically and positive behaviour more broadly. Further research will also be valuable to more explicitly link studies of human touch to comparative research, such as maternal licking and grooming (Liu et al., 1997). A fascinating aspect of touch is that it might exert its effects via multiple pathways: through social pathways, enriching the social context for the behaviour or increasing attachment to social partners (e.g. Olausson et al., 2002); through neuroendocrine pathways by reducing stress and anxiety; and through somatosensory pathways (Schirmer et al., 2011).

[1]We thank an anonymous reviewer for this suggestion.

In sum, these results reveal a clear short-term benefit in delay of gratification from a touch lasting approximately five seconds. Further, our study shows that most children actually enjoy being touched on the back, with most participants smiling after the "touch" and most parents reporting that their children often seek out touch. With clear long-term benefits from enhanced self-control in childhood (Mischel et al., 2011) and increasing cases of externalizing disorders (Lavigne et al., 1996), touch may be a simple and inexpensive means to foster self-control. Though further research is needed to make any conclusions about the long-term benefits of such a touch-based intervention, the current findings present an opportunity for parents and educators to harness the benefits of touch as a simple and effective way to promote positive behaviours in children.

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