



## Who peeks: Cognitive, emotional, behavioral, socialization, and child correlates of preschoolers' resistance to temptation

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### ABSTRACT

Research over several decades has demonstrated that children's ability to wait and delay immediate gratification in preschool is related to a multitude of developmental outcomes throughout childhood, adolescence, and into adulthood. However, less research has focused on concurrent abilities, characteristics, and contexts related to the waiting behaviour itself. This study seeks to explore some of the cognitive, emotional, behavioural, and socialization correlates of an at-risk (poor inner city) group of preschoolers' ability to wait. The study used a resistance to temptation paradigm in which children were instructed not to peek at a 'forbidden toy' while left alone. As predicted, 4-year-olds' ( $M = 4.5$ ;  $SD = 1.2$  months) general IQ and emotion knowledge were related to their delay in peeking, with longer delays related to higher scores. Results also indicated an effect of gender such that girls waited longer than boys. Contrary to expectations, there were no effects related to harsh parenting practices or to general environmental risk. Of all the variables investigated, emotion knowledge seemed to be the most important.

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Research has consistently shown that preschooler's ability to wait is predictive of a broad range of cognitive, behavioural, emotional, and social outcomes as well as health risk behaviours throughout child, adolescent, and adult development (Hoerger, Quirk, & Weed, 2011; Mischel et al., 2011; Mischel, Shoda, & Peake, 1988). Past research has directed attention towards exploring some of the cognitive strategies involved in the waiting behaviour itself (Mischel & Ayduk, 2004; Mischel & Mischel, 1983). In the context of deception research, resistance to temptation paradigms have

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also been used to look at concurrent relations involving children's waiting behaviour (Fu, Evans, Xu, & Lee, 2012; Lewis, 1993; Lewis, Stanger, & Sullivan, 1989; Talwar & Lee, 2008). In these procedures, the amount of time that children are able to refrain from peeking at the toy while left alone in a room provides a measure of their ability to wait. After a fixed amount of time, the experimenter returns to the room and asks children if they peeked at the toy. Children's answer to this question provides a measure of their spontaneous lie-telling behaviour.

Existing research using this general paradigm has not demonstrated a relation between children's peeking behaviour and whether they lie about it (Fu et al., 2012; Lewis, 1993; Talwar & Lee, 2002, 2008) and there is some indirect evidence for believing that these two behaviours involve opposing processes. Specifically, as children get older, while they become better able to wait they are also more likely to deceive if they do succumb to the temptation to peek (Evans, Xu, & Lee, 2011; Lewis, 1993; Talwar & Lee, 2002; Talwar & Crossman, 2011). While inhibitory control and first-order false-belief understanding predict whether children lie or confess after peeking, neither variable has been shown to predict children's latency to peek (Talwar & Lee, 2008).

Some work on individual differences related to peeking and deception has been done with children in middle childhood. Talwar, Gordon, and Lee (2007) used a modified peeking procedure and found that age was a significant predictor of peek latency but that gender and second-order ToM ability were not. Another study found that cheating was a significant predictor of children's concurrent behaviour problems and for 'severe' cheaters, latency (time to violate the rule) was related to mother ratings of impulsivity (Callender, Olson, Kerr, & Sameroff, 2010). Other sorts of paradigms involving self-control have also studied individual differences related to the cognitive and behavioural strategies that children use while waiting (e.g., (re-)directing attention, (re-)representing the tempting object, fine and gross motor behaviours, using language as a scaffold, etc.; (Manfra, Davis, Ducenne, & Winsler, 2014; Mischel & Ayduk, 2004). These sort of studies differ from those used in the deception literature in that they are focused on the *real-time* processes related to children's behaviour while they perform the task. In contrast, the peeking procedure used by deception researchers has tended to focus on more general abilities or characteristics that are measured separately from the peeking task itself.

In order to comply with adult prohibitions, children's ability to wait is an important variable to study. When children fail to resist temptation

and wait, deception can be an adaptive response to such failures (i.e., children quickly learn that lying can be a useful strategy to avoid the consequences of their transgressions). The majority of work on individual differences in the area of deception research has been focused on how more general abilities are related to lie-telling rather than how those abilities could be related to the waiting/peeking behaviour. The exceptions to this have tended to focus on a relatively narrow set of cognitive variables (e.g., inhibitory control, working memory, executive functioning) or conducted research with children in middle childhood. As pointed out by Lee (2013), there is less research examining the socio-emotional factors which contribute to children's ability to wait. Accordingly, the present study was designed to look at some of those factors. We were interested in exploring how more general individual differences variables are related to preschool-aged children's ability to wait. In particular, how their cognitive and emotional intelligence, general environmental risk, and the harshness of socialization might affect children's ability to wait. Given the sample of poor inner city children and families, the effects of poverty were also examined as they relate to waiting behaviour.<sup>1</sup>

### *Individual differences variables*

Resistance to temptation, child compliance, delay of gratification, and other violation-of-prohibition tasks can be understood broadly in terms of inhibitory control; in each case children need to inhibit their desire to violate the prohibition imposed by the experimenter. Along these lines, Diamond (2013) has suggested that self-control is the aspect of inhibitory control that is most relevant for controlling one's behaviour and emotions in ways that are directly related to resisting temptation. Talwar and Lee (2008) have used a temptation resistance paradigm to look at EF tasks that included inhibition. However, contrary to Diamond's (2013) idea that inhibition is a central aspect of resisting temptation, none of the EF tasks they used were related to children's peeking behaviour. Although these findings do not show an association between delay in peeking and inhibition, we thought the association important enough to revisit this issue.

The interest in IQ is based on findings in which children's use of task-specific strategies have enabled them to control their temptation to act

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<sup>1</sup>Because relatively few children peeked and admitted peeking (4.3%), it was not possible to compare children who peeked and lied to those who peeked and told the truth.

immediately in favour of longer-term goals (Mischel & Ayduk, 2004; Vaughn, Kopp, Krakow, Johnson, & Schwartz, 1986). These self-control strategies have been grouped according to those that redirect attention and those that alter the cognitive representation of the tempting object. Specifically, children learn that they will have greater success at waiting if they distract themselves in general and especially if they do not focus on the *emotionally arousing* nature of the object in particular. It is not until 5 years of age that children show a clear understanding of these strategies (Mischel & Mischel, 1983); however, younger children are also able to use motor and verbalization strategies to resist temptation (Manfra et al., 2014). In general, children with greater intelligence are more likely to be able to realize and effectively deploy adaptive strategies (Calero, Garcia-Martin, Jimenez, Kazen, & Araque, 2007) and general IQ is predicted here to be related to delay of peeking even in a sample of children who usually score lower on standard tests.

The use of cognitive strategies have their effects by changing the emotionally arousing nature of the desired objects. Accordingly, children's emotion knowledge may directly influence their ability to wait as well. Emotion Knowledge (EK) involves the perception and understanding of the expressions, feelings, and functions of emotional information within the self and from others. There is some data suggesting a relationship between maternal emotional behaviour and children's delay of gratification (Jacobsen, 1998) but there is little data on children's EK and their ability to delay peeking. Language is a key feature in the development of EK and provides emotions with their inter-subjective meanings. Accordingly, the ability to correctly recognize and label emotions reflects children's representations of these shared meanings through the creation of emotion schemas (Izard et al., 2011). As representations, emotion schemas help create 'distance' between *automatic* responses to emotional arousal and more deliberative behaviour. Such distancing is the hallmark of delay behaviour in resistance to temptation type situations. Accordingly, it is predicted that EK will be positively related to delay in peeking behaviour.

Research on children's behaviour problems has demonstrated a relation between effortful control and externalizing problems such that children with lower levels of effortful control display more problems (Olson, Sameroff, Kerr, Lopez, & Wellman, 2005). Effortful control includes the ability to delay as one of its components, and the delay component has been found to be the strongest predictor of both conduct problems and hyperactivity (Gusdorf, Karreman, van Aken, Dekovic, & van Tuijl, 2011). Moreover, children's latency

to cheat has been found to be related to both concurrent and longitudinal externalizing behaviours (Callender et al., 2010). There is, however, no direct information with regard to whether concurrent behaviour and emotional problems are related to peeking behaviour. That said, we predict children with longer latencies will have fewer behavioural problems.

Of considerable interest is the relation between risk factors in socialization and the ability of children to delay peeking. Lewis et al. (1989) showed that some children were able to resist peeking for 5 minutes or more when left alone. This data raised the question of whether children who did not peek did so because of harsh parenting and thus were motivated by fear of punishment. Alternatively, it may be that these children possessed greater emotional and cognitive abilities that allowed them to inhibit their response. There is support for the general cognitive ability hypothesis, but little for the punitive environment view (Raver, 2004; Sektnan, McClelland, Acock, & Morrison, 2010; Talwar & Lee, 2011). Further, Crockenberg and Litman (1990), and Parpal and Maccoby (1985) showed that child non-compliance was related to more punishment and that the reverse was true for warm and supportive maternal discipline. Moreover, studies on child-rearing practices and delay of gratification have found that children with secure attachments or with authoritative mothers have an increased ability to delay (Jacobsen, Huss, Fendrich, Kruesi, & Ziegenhain, 1997). The little data to date between socialization contexts and peeking suggests that harsh parenting and greater environmental risk will be associated with faster peeking.

Because this sample contains poor inner city children with risk factors such as prenatal exposure to alcohol, cigarettes, and other teratogens, it also provides an opportunity to examine these risk factors and delay behaviour in a peeking situation. Ackerman, Riggins, and Black (2010) and Lewis and Kestler (2011) have found that exposed children have greater difficulty with sustained attention, impulse control, and arousal regulation. Toddlers with prenatal cocaine exposure reached for a 'forbidden' cookie much sooner than those who were not exposed (Bendersky & Lewis, 1999). Using a resistance to temptation paradigm with 4- to 8-year-olds, children with Foetal Alcohol Spectrum Disorder (FASD) did not show a significant difference for peek latency when compared to a non-FASD group of same-aged peers (Rasmussen, Talwar, Loomes, & Andrew, 2007).

Children who have been prenatally exposed to drugs tend to have an increased number of medical complications after birth and this has been predictive of deficits in motor, cognitive, and self-regulation abilities in early development (Korner et al., 1993; Lynn, Cuskelly, Gray, & O'Callaghan, 2012).

However, the negative influence of neonatal medical risk may only persist into the preschool and kindergarten years for those children with 'extreme' medical risk (Edgin et al., 2008; Orchinik et al., 2011; Scott et al., 2012). We hypothesize that peeking will be related to child risk factors such that substance exposed children and children with greater neonatal medical risk will peek more quickly.

Gender differences in children's ability to wait have been mixed. In a meta-analysis, Silverman (2003) suggests that tasks involving a 'forbidden' object consistently find that females are better able to wait than males before peeking (also, Lewis et al., 1989). Given our task, we hypothesize that females will delay peeking longer than males. Finally, the data on poor inner city children's ability to wait at an early age can be compared with the data on middle class American and other ethnic groups.

The primary aim of the current study is to investigate some general characteristics, contexts, and abilities of children that may be related to their waiting behaviour. We hypothesize that longer waiting will be related to higher IQ and emotion knowledge as well as fewer behaviour problems. For inhibitory control there is some empirical evidence that it will not be related to peeking but strong theoretical reason to expect a relationship and so we leave open what to expect. We also predict that risk factors in socialization contexts and child risk factors will be related to peeking such that more risk will be related to shorter peeking times. Finally, we expect girls to wait longer than boy before peeking.

## Method

### *Participants*

One hundred and eighty-two children (95 male,  $M = 4.5$  years,  $SD = 1.2$  months) completed the peeking task during their 4 to 5 year laboratory visits as part of a larger longitudinal study that had been following children from birth ( $N = 258$ , Kestler, Bennett, Carmody, & Lewis, 2011). Visits lasted for approximately 2 hours and data collection took approximately 6 months. Mothers had been recruited from hospital-based prenatal clinics in low socioeconomic status areas of Philadelphia and Trenton. Mothers were predominantly African American (88%). Two hundred and fifty eight children participated in their first laboratory visit at 4 months and were invited back for follow-up sessions once or twice a year after that. There were no significant differences in gender, drug exposure, neonatal medical risk,

environmental risk, ethnicity, or SES between those children who participated in the current study and those who did not.

The research was conducted with Internal Review Board approval from the US institution where the research was conducted. All researchers involved with data collection, coding, and analysis had the required ethics training that included HIPPA.

### **Procedure**

Children came to the lab with their parents and were assessed on a number of instruments used to measure, cognitive, emotional, behavioural, parenting, and child variables. For the peeking task, children were video-taped while sitting at a table that was facing a two-way mirror. For this task, the experimenter placed a toy on the floor behind children and out of view, told them not to peek, and left the room. The experimenter then returned to the room as soon as children peeked or after 5 minutes had elapsed and asked, 'Did you peek?'.

Two different measures of peeking were obtained. The first was a continuous variable, *peek latency*, while the second was categorical, *type of peeker*. Latency to peek was determined by measuring the amount of time that elapsed between the experimenter leaving the room and children peeking at the toy. Children who did not peek at the toy while the adult was absent were assigned the maximum value of 300 seconds. Those who peeked immediately were given a value of one second. We also sought to determine whether there were meaningful differences at the group level that may or may not be reflected by the continuous peeking measure (Callender et al., 2010; Vaughn et al., 1986). High risk individuals are often defined as the top quartile of the sample (Sameroff, Seifer, Zax, Barocas, & Greenspan, 1987) and for our peek categories, cut-offs were also determined by distributional quartiles with the 'high' and 'low' defined as the top and bottom 25% and the normative defined as the middle 50%. The high and low groups were the 'fast peekers' (latency = 1–5 seconds;  $n = 54$ , 29%) and the 'non-peekers' (latency = 61–300 seconds;  $n = 49$ , 27%)<sup>2</sup>. The remaining

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<sup>2</sup>Given that multiple children had the same peeking scores at the fast end we could not make a cut-off of exactly 25% and had to use the next closest value of 29%. For the non-peekers we had more flexibility because scores were more spread out. Accordingly, we decided to use a one-minute cut-off (27%) because this enabled the group sizes of the fast-peekers and non-peekers to be comparable.

children were the 'normative peekers' whose scores were in the inter-quartile range (latency = 6–60 seconds;  $n = 79$ , 44%).

## *Measures*

### *Inhibitory control*

The day-night Stroop task (Gerstadt, Hong, & Diamond, 1994) was used to test children's ability to inhibit a pre-potent response to match a verbal label with the corresponding picture. Children were asked to say 'night' when they were shown a picture of the sun and 'day' when shown a picture of the moon. After using practice trials to establish that children understood how to play the game, they were given 16 test trials in random order with no corrective feedback. Children's scores were the number of errors committed over a total of 16 trials.

### *General intelligence*

The Stanford-Binet Intelligence Scale, Fourth Edition (Stanford-Binet IV, Thorndike, Hagen, & Sattler, 1986) was used to assess intelligence. This scale uses a normed mean of 100 and standard deviation of 15. The scale is widely used and has sound psychometric properties with internal consistencies for KR-20 that were between .81 and .88 for the sub-scales. The scale is comprised of 8 sub-tests in four areas (verbal reasoning, abstract visual reasoning, quantitative reasoning, & short-term memory) that enabled the calculation of an overall IQ composite score.

### *Emotion knowledge*

EK was assessed using three separate tasks that measured labelling, recognition, and narrative comprehension of emotions. For the first task (labelling), children were shown a series of photos of a woman who displayed a total of six different emotional expressions (happy, sad, angry or mad, surprised, disgust, and afraid). Children were then asked to provide the emotion label for how the woman felt in each of the pictures (Denham, Zoller, & Couchoud, 1994; Michalson & Lewis, 1985; Schultz, Izard, Ackerman, & Youngstrom, 2001). For the second task (recognition), children were shown a randomly organized array of the six emotion photos and asked to point to the photo corresponding to each emotion (e.g., 'Point to the scared face. How does Felicia look when she's scared?'). This procedure was repeated for a second time with the photos being rearranged between the two trials (Denham et al., 1994;



lizard et al., 2001; Michalson & Lewis, 1985). Finally, in the third task (narrative), children were read a series of ten scenarios and asked to choose which emotional expression the main character in the scenario would display (e.g., “Show me the face Felicia will have in this story. What will she look like”; Michalson & Lewis, 1985; Schultz et al., 2001; Smith & Walden, 1999). Children’s score on each of the three tasks was converted into a z-score. An overall EK composite score was then constructed by summing the converted z-scores.

### *Abusive parenting*

The Parent-Child Conflict Tactics Scale (CTSPC, Straus, Hamby, Finkelhor, Moore, & Runyan, 1998) was used to assess abusive disciplinary practices. The CTSPC uses 22 items in a parent self-report to assess the type, frequency, and severity of child maltreatment and all items were recoded dichotomously as present or absent. Of the three subscales, we were only interested in the two related to abusive parental behaviour: physical assault and psychological aggression and not the non-violent disciplinary practices. The physical assault subscale measures disciplinary behaviours that range from forms of corporal punishment (e.g., spanking) to severely abusive acts (e.g., punching or kicking a child). The psychological subscale measures practices that are intended to provoke fear or emotional distress (e.g., threats of physical violence). Scores from these two subscales were combined to form a composite parental abuse score ( $\alpha = .73$ ).

### *Punitive parenting*

The Parenting Scale (PS, Arnold, O’Leary, Wolff, & Acker, 1993) was used to assess parental disciplinary practices. The scale consists of 30 items and parents responded along a 7-point range indicating the likelihood of using a particular disciplinary strategy to deal with their child’s misbehaviour. For example, an item stem might ask ‘When my child misbehaves ...’ followed by potential responses that ranged from an effective disciplinary strategy – ‘I do something right away’ to an ineffective disciplinary strategy – ‘I do something about it later’. Scores closer to 1 indicate more effective discipline while those closer to 7 indicate more ineffective discipline. The scale was originally divided into 3 factors: laxness, over-reactivity, and verbosity; however, subsequent research has not been able to replicate the verbosity factor and recommends scoring the parenting scale according to a modified two-factor solution

for over-reactivity and laxness (Reitman et al., 2001; Rhoades & O'Leary, 2007). Our analyses only used the over-reactivity factor ( $\alpha = .72$ ) and it was scored separately according to both the original and modified factor solutions.

### *Environmental risk index*

Several environmental risk variables were obtained through structured interviews administered to the mother during the 4-, 18-, 30-, and 54-month laboratory visits. Risk variables were dichotomized as present or absent and summed to create a cumulative environmental risk index score. Composite scores are more stable than using individual measures and they are more powerful in terms of detecting effects (Burchinal, Roberts, Hooper, & Zeisel, 2000). The composite score included several risk variables: maternal life stress based on the Social Environmental Inventory, maternal social support network size based on the Norbeck Social Support Questionnaire, number of caregivers (more caregivers = higher risk), regularity of the child's schedule and stability of their surroundings based on the Family Chaos Scale (R. Seifer, personal communication), single parenthood (single parent = higher risk), maternal education, and public assistance (public assistance as main source of income = higher risk). The composite risk scores from each of the four time points were averaged to give each participant a single environmental risk score. This score has been shown to be a reliable measure of general environmental risk (Bendersky, Bennett, & Lewis, 2006; Bennett, Marini, Berzenski, Carmody, & Lewis, 2012).

### *Behavioural and emotional problems*

The Child Behaviour Check List (CBCL) provided a parent-report of children's emotional and behavioural problems (Achenbach, 1991). The CBCL is for use with children from 4–18 years and has high test-retest reliability. Parents rated children on 118 items using a 3-point scale that ranged from 'not true' to 'very true'. Eight syndrome sub-scales were grouped according to three summary scales: (1) Externalizing or under-control included aggressive and delinquent behaviours; (2) Internalizing or over-control included anxious or depressed, somatic complaints, and withdrawn behaviours; (3) Total problem included the three additional subscales of social, thought, and attention problems for an overall behaviour problems score. Our analyses used the raw scores from the externalizing ( $\alpha = .90$ ) and

internalizing problems ( $\alpha = .70$ ) summary scales with higher scores indicating more behaviour and emotional problems.

### *Prenatal drug exposure*

Maternal drug use was determined by a semi-structured interview administered to mothers by a trained interviewer within two weeks of the child's birth. The drug use interview contained questions about the frequency and amount of the mother's use of alcohol, cigarettes, marijuana, cocaine, and other substances. Drug use was dichotomized as present or absent depending on whether mothers used any of the drugs or not with some tolerance for alcohol and cigarettes. Specifically, children were classified as absent for prenatal exposure if their mothers used up to 0.5 drinks and 5 cigarettes per week. There were no tolerances for marijuana, cocaine or other substances.

### *Neonatal medical risk*

Neonatal medical data was abstracted by nurses from hospital records and used to complete a neonatal medical complications scale consisting of 35 possible complications (Hobel, Hyvarinen, Okada, & Oh, 1973). Problems on this scale related to birth weight, respiratory problems, metabolic disorders, haematologic problems, as well as central nervous system problems.

## **Results**

Analyses were conducted to determine the relations between children's peeking behaviour and a number of cognitive, emotional, behavioural, socialization and child characteristics. First, descriptive statistics regarding children's peeking behaviour were conducted. Second, ANOVAs were conducted to evaluate group differences between fast-, normative-, and non-peekers for each of the outcome measures. Finally, to determine which of the outcome measures predicted children's peeking behaviour, multiple regression was used.

Of the 182 children who participated in the study, 133 of them (73%) peeked at the toy within one minute. The average latency for all children to peek over the five minutes was 63s ( $SD = 96s$ ) with half the children peeking within 12s. This means that the distribution for peeking times was positively skewed (1.7).

**Table 1.** Means and standard deviations according to peek category for all outcome measures.

	Cognitive Processes			Socialization Contexts		
Peek Groups	Inhibitory Control (error)	IQ	Emotion Knowledge	Punitive Parenting	Abuse	Env. Risk
Fast Peekers	n = 42 6.90 (5.40)	n = 51 80.1 (10.8)	n = 53 1.80 (.95)	n = 44 24.8 (9.7)	n = 46 13.3 (5.4)	n = 54 3.86 (1.57)
Normative Peekers	n = 64 7.28 (5.66)	n = 78 84.8 (12.1)	n = 77 2.12 (1.03)	n = 63 25.9 (9.9)	n = 69 12.2 (6.5)	n = 79 3.81 (1.48)
Non-Peekers	n = 40 5.27 (4.75)	n = 45 88.4 (11.2)	n = 48 2.48 (0.95)	n = 39 23.4 (8.8)	n = 40 12.0 (5.7)	n = 49 3.64 (1.37)
	Behaviour and Emotional Problems			Child Characteristics		
Peek Groups	External-izing Problems	Internal-izing Problems		Neonatal Risk	Gender	Prenatal Drug
Fast Peekers	n = 51 11.9 (8.7)	n = 51 3.78 (3.47)		n = 43 5.42 (4.33)	n = 54 59% (male)	n = 53 55% (exposed)
Normative Peekers	n = 77 10.7 (9.1)	n = 77 3.38 (3.43)		n = 58 5.33 (3.94)	n = 79 54% (male)	n = 78 44% (exposed)
Non-Peekers	n = 46 8.5 (6.3)	n = 46 3.13 (3.26)		n = 34 4.18 (3.5)	n = 49 41% (male)	n = 46 35% (exposed)

Table 1 provides the means and standard deviations for all of the outcome measures by the three latency-to-peek groups. With the exception of inhibitory control and punitive parenting, all of the measures have a rank order that is in accordance with our predicted hypotheses (i.e., higher positive scores and lower negative scores going from non- to normative- to fast-peekers).

To further investigate the differences between the fast- and normative-peekers and children who did not peek (non-peekers), we conducted a one-way ANOVA for each of the continuous outcome measures that corresponded to each of our a priori hypotheses. There was a significant effect of type of peeker for both IQ ( $F(2, 171) = 6.31, p < .002$ ) and for EK ( $F(2, 175) = 6.03, p < .005$ ). Post-hoc analyses indicated that fast-peekers ( $M = 80.1, SD = 10.8$ ) had significantly lower IQ scores than normative-peekers ( $M = 84.8, SD = 12.1, p < .05$ ) and non-peekers ( $M = 88.4, SD = 11.2, p < .005$ ) but the latter two were not different from each other. For EK, non-peekers ( $M = 2.48, SD = .95$ ) had significantly higher EK scores than normative-peekers ( $M = 2.12, SD = 1.03, p < .05$ ) and fast-peekers ( $M = 1.80, SD = .95, p < .005$ ) while the latter two were not different from each other ( $p = .07$ ). For gender and prenatal drug exposure we conducted two non-parametric tests (Kruskal-Wallis). The effect of

prenatal drug exposure was significant ( $\chi^2(1, N = 177) = 3.99, p < .05$ ) while gender was marginally significant ( $\chi^2(1, N = 182) = 3.39, p = .066$ ).

Table 2 provides the correlations between children's latency to peek and each of the outcome measures. Given the positive skew in children's latency to peek and a more meaningful interpretation, we performed a log transformation (Tabachnick & Fidell, 2007). The following correlation and regression analyses used that transformed variable. The transformation did decrease both the skew and the non-normality of the residuals. Result indicated that latency to peek was positively correlated with IQ, EK, and gender such that girls waited longer than boys. Latency was negatively correlated with prenatal drug exposure and externalizing problems.

To predict latency, the variables that were significantly correlated with peek latency were used in the regression analysis and consisted of IQ, EK, externalizing problems, gender, and prenatal drug exposure. Although environmental risk was not significantly correlated with peek latency, there are strong theoretical and empirical reasons to include it as a control variable when considering the effects of prenatal drug exposure on development (Bendersky et al., 2006; Bennett et al., 2012). Table 3 provides the results for the variables tested in the models. Given the log transformation for latency, the beta values (times 100) can be interpreted as the percentage change in the amount of time that children waited (Gujarati, 2018). Of the six predictors entered into the final model, EK, gender, and prenatal drug exposure were significant such that higher EK ( $\beta = .25, p < .005$ ), being female ( $\beta = .22, p < .005$ ), and having not been prenatally exposed to drugs ( $\beta = -.17, p < .05$ ) were related to longer latencies<sup>3</sup>. The effect of prenatal drug exposure on developmental outcomes is often strongest for males (Lewis & Kestler, 2011); therefore, a gender by drug interaction term was entered into the regression model as a third step. This model did not involve a significant change in  $r^2$  and while the significant effects of gender and drug exposure remained, the interaction term was not significant.

Two post hoc analyses were done to inform the discussion. The first was to look at the correlations between the three sub-components of the emotion knowledge measure (labelling, recognition, and narrative) and latency to peek. Latency was significantly correlated with recognition and narrative ( $r = .27$  &  $r = .19$  respectively) but not labelling. The second analysis was to determine the mean and standard deviation

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<sup>3</sup>If the analysis is run with the original, non-transformed variable, none of the statistical decisions change.

Table 2. Correlations between peek latency and all outcome measures.

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1 Peek Latency												
2 Inhibition		-.11										
3 IQ			.24**									
4 Emotion Knowledge			-.05	.25**								
5 Punitive Parenting				-.00	-.07	-.05	-.09	-.13	.17*	-.14 <sup>†</sup>	-.17*	-.06
6 Abuse				.55***	.02	.11	-.01	.12	-.07	.10	.03	.03
7 Env. Risk					-.20	-.13	-.19*	-.05	.17*	-.05	-.07	-.02
8 Neonatal Risk					-.14 <sup>†</sup>	-.14 <sup>†</sup>	-.22**	-.03	.07	.00	-.10	-.08
9 Gender						.48***	.31***	.19*	-.10	.12	.22**	.14
10 Prenatal Drug Problems							.24**	.05	-.01	.11	.30***	.25**
11 Externalizing Problems								.00	.08	.11	.13 <sup>†</sup>	-.03
12 Internalizing Problems									-.03	.35***	-.12	-.18*
										.01	.02	.00
											-.01	-.16*
												.69***

\* $p < .05$ ,  
\*\* $p < .01$ , \*\*\* $p < .001$ , <sup>†</sup> $p < .10$

**Table 3.** Regression analysis summary for predicting latency to peek (N = 163).

Model	Variable	<i>B</i>	<i>SE</i>	$\beta$	Sig	<i>R</i> <sup>2</sup>	$\Delta R^2$
1						<b>.11***</b>	
	Gender	.36	.11	<b>.25**</b>	.001		
	Prenatal Drug Exposure	-.25	.11	<b>-.17*</b>	.026		
	Environmental Risk	-.08	.04	<b>-.16*</b>	.040		
2						<b>.19***</b>	<b>.08***</b>
	Gender	.32	.11	<b>.22**</b>	.004		
	Prenatal Drug Exposure	-.25	.11	<b>-.17*</b>	.022		
	Environmental Risk	-.04	.04	-.08	.331		
	IQ	.00	.01	.02	.807		
	Emotion Knowledge	.18	.06	<b>.25**</b>	.006		
	Externalizing	-.01	.01	-.11	.131		

\**p* < .05,\*\**p* < .01,\*\*\**p* < .001

(*M* = 8.40, *SD* = 5.82) for inhibitory control of those participants (*n* = 10) who peeked immediately (latency = 0–1 seconds).

## Discussion

While research has consistently demonstrated that children's ability to wait during the preschool years is related to a diversity of cognitive, emotional, behavioural, social, and mental health outcomes throughout later development (Hoerger et al., 2011; Mischel et al., 2011, 1988), less attention has been directed at the general characteristics, contexts, and abilities that are related to the waiting behaviour. Accordingly, the objective of the current study was to look at preschoolers' waiting ability in relation to a variety of potentially relevant variables.

### Summary of results

For the categorical peek variable (i.e., non-peekers, normative-peekers, fast-peekers) there was an ordering for higher positive scores and lower negative scores going from non-, to normative-, to fast-peekers for all of the measured variables except for inhibitory control and punitive parenting (see Table 1). When all of the significantly correlated variables were entered into a regression analysis, EK, gender, and drug exposure were significant predictors after controlling for environmental risk.

Past research has established links between IQ and self-regulation for children in middle school (Calero et al., 2007) and it has been suggested that IQ may be directly related to resisting temptation (Talward &

Crossman, 2011). While both IQ and EK composite scores were correlated with peek latency, only EK was a significant predictor in the regression analysis. This finding is consistent with the idea that emotion knowledge functions to create 'cognitive distance' between automatic responses to emotional arousal and more deliberative behaviour (Izard et al., 2011). The notion of distancing has been discussed in the context of symbol formation by Werner and Kaplan (1963) but also fits with the theorizing of Piaget, 1945–1962. For Piaget, the end of the sensori-motor period meant that children were able to separate perception from action and engage in what we think of as symbolically mediate thought. Symbolic thought can then serve as the foundation for regulating oneself by allowing children to think without acting directly on the world. Through the development of language, children's symbolic capabilities become more sophisticated. In the current context, it would be the language-mediated knowledge about emotions that provides children with the 'distance' needed for more effective regulation of the arousing situation. Of the three sub-components of our EK measure, it was the recognition task that was most strongly related to children's delay behaviour. It may be that children's recognition of their own feelings as related to the task provided them with essential information to be used in the symbolically mediated control of their behaviour. Future research will have to empirically test such ideas but the fact that emotion knowledge seems to be more relevant than general intelligence for peeking behaviour is an important finding.

The measure of inhibition used was not related to children's peeking behaviour which is consistent with Talwar and Lee's (2008) finding. The failure to find a relation between our experimental measure of inhibitory control and 'real life' peeking behaviour is difficult to explain. Nigg (2000) has distinguished between effortful cognitive or behavioural inhibition and inhibition ability related to automatic processes. Within this taxonomy, interference control is of particular relevance. Interference control has been defined as the 'ability to suppress a dominant response related to perceptual stimuli in the task while selecting and executing a competing, conflicting subdominant response' (Montgomery & Koeltzo, 2010, p. 308). While interference control is thought to underlay performance on Stroop tasks (i.e., our Day-Night task), it may be less relevant for inhibiting responses over longer durations such as what is more typical in waiting behaviour. However, interference control may be relevant for the immediate behavioural



compliance to avoid peeking. To clarify, consider everyday situations in which we hold up an object and say 'don't touch' or begin some gossip with 'don't look now but ...'. It may be that interference control is relevant for the immediate compliance to inhibit touching or looking and that other control processes (e.g., hot EF) are more relevant afterwards.

Some limited evidence that interference control might have been important for children in our study to avoid peeking *immediately* is suggested by the finding that those who peeked immediately had the highest mean number of errors on the Stroop task as compared to the fast-, normative, and non-peekers. Also consistent with this suggestion, Callender et al. (2010) found that the latency sub-component of the 'severe' cheaters were rated by mothers as being higher in *impulsivity* but not differing in inhibitory control. Thus, it is possible that interference control is related to waiting behaviour for the immediate delay and that other inhibitory processes take over afterwards (e.g., hot EF).

Along these lines, a distinction has been drawn between 'hot' and 'cool' Executive Function (EF) processes (Zelazo & Müller, 2002). Both sets of processes involve top-down, conscious control of thoughts and behaviour but the hot processes operate in emotionally/motivationally significant contexts. Research has provided both neurocognitive and behaviour evidence that the two types of EF are distinct and they seem to unfold along different developmental trajectories (Zelazo & Carlson, 2012). Resistance to temptation tasks are inherently affective context and so the distinction between hot and cool EF might help explain that lack of relationship between children's performance on the day-night Stroop tasks (cool EF) and their peeking behaviour (hot EF).

While past research has not tended to look at behavioural and emotional problems in the context of peeking (Olson et al., 2005), the delay component of effortful control has been found to predict both conduct problems and hyperactivity (Gusdorf et al., 2011). Although correlated, externalizing problems were not a significant predictor of peek latency. The lack of a significant relationship between latency and externalizing problems may be due to the concurrent nature of the measures. For instance, Callender et al. (2010) found similar correlations to our study between latency to cheat and their concurrent measure of externalizing and internalizing problems which increased in magnitude when measured 4.5 years later. Accordingly, behavioural and emotional problems

may be a cascading consequence of delay ability at age 4 rather than a concurrent contributing factor.

Contrary to our prediction, harsh parenting practices, parental abuse, and higher environmental risk were not related to peeking more quickly. The parenting measures we used concerned relatively extreme practices and our task paradigm may not have elicited the type of situation that normally results in behavioural compliance problems. Some indirect support for this possibility is provided by the significant correlations between externalizing problems and both punitive and abusive parenting practices. Further, most studies examine compliance with maternal directives rather than with an unknown/friendly experimenters and children may be sensitive to *who* directs their actions. Lastly, environmental risk was not correlated with peek latency but was a significant predictor of peeking behaviour in the first regression model. The relationship between environmental risk and behaviour is often indirect which may help explain why it only sometimes found to have an impact on children's self-regulatory processes (Li-Grining, 2007; Raver, 2004). Regardless of any direct effects, environmental risk was important to include as a control variable given the at-risk nature of the sample.

We hypothesized that children who were male, prenatally exposed to fetal teratogens, and who had greater neonatal medical risk would peek more quickly. Although there are mixed findings on gender, Silverman (2003) indicated that there is a consistent 'female advantage' for resistance tasks involving a forbidden-object. Our findings are consistent with these results with the largest gender differences being between the fast- and non-peekers. Prenatal drug exposure showed an effect that was largest for those who avoided looking at the toy (i.e., the non-peekers), such that only 35% of them were prenatally exposed to drugs. Thus, the effect for drug exposure seems to be most relevant for whether children can achieve high levels of self-control, and gender may be most relevant for children with low or high self-control ability. The group differences for neo-natal medical risk were not significant; however, the descriptive statistics suggest a pattern similar to prenatal drug exposure. This result may be expected given that the negative developmental influences of neonatal medical risk on preschoolers has tended to be significant for only those children who were considered 'extremely' high risk (Orchinik et al., 2011; Scott et al., 2012).

### Limitations and future directions

The sample used in the current study was comprised of mostly poor inner city children. However, comparisons with similar data for middle class white Americans as well as for Chinese and Japanese children (Evans et al., 2011; Fu et al., 2012; Lewis, 1993; Talwar & Lee, 2008) suggests that the findings reported here are not limited by the particular sample. For all samples, a large majority of children peek and then go on to lie about it (Lee, 2013). Further, if there were sample differences, it was the pattern of relations between the variables measured that was of interest here and examination of prenatal exposure to drugs and environmental risk were controlled for in the final model from the regression analysis. The lack of relation between children's peeking behaviour and our parenting variables suggest the need for practices that are less extreme or else a paradigm that is more likely to elicit concern about punishment. Further, it would seem that interference control may not capture the most relevant aspect of inhibition for waiting behaviour and that other aspects/measures of inhibition could be relevant to explore. Our study provided a comprehensive look at some of the general abilities, characteristics and contexts of children's development that were related to their peeking behaviour in a resistance to temptation paradigm. We see this as a first step in the subsequent process of trying to explain how and why these individual differences variables have their effects on children's real-time processes while performing the task itself.

### Disclosure statement

No potential conflict of interest was reported by the authors.

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