

UNDERSTANDING TIME CONCEPT TO
HELP DELAY OF GRATIFICATION IN YOUNG CHILDREN

By

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DELAY OF GRATIFICATION AND TIME PERCEPTION

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DELAY OF GRATIFICATION AND TIME PERCEPTION

Abstract

Delay of gratification (DG) is the ability to resist the temptation for a smaller but immediate reward in order to get a larger and more desirable delayed reward. Many factors involved in delay of gratification have been well explored, however, the importance of time perception contributing to delay of gratification has not yet been well established. Given that the waiting period during the DG task is a central aspect of the deferred reward, individual differences in time perception may cause different decisions in delay of gratification. The purpose of the study was to research how a scaffolded approach to waiting with auditory and visual cues in determining the passage of time could help children delay gratification. Research sample was a convenience sample from a day care in China. Forty-five Chinese four- to five-year-old children, consisting of twenty-one females and twenty-four males, were randomly divided into three groups with equivalent gender ratio. Each child was asked to perform under one of three conditions. In the first condition, fourteen children were asked to wait for ten minutes to get the preferred reward with an auditory cue (i.e., record of verbal counting of seconds and minutes). In the second condition, fourteen children were asked to wait for ten minutes to get the preferred reward with a visual cue (i.e., a digital timer). In the third condition, thirteen children were asked to wait for ten minutes to get the preferred reward without any form of external cue. The length of time each child in each group could wait was measured at the end of this quasi experimental study. Group descriptive statistics comparisons were made. Mean wait time comparisons were made across all three groups. It was predicted that an increase in accuracy of time perception with visual and auditory cues (i.e., scaffolds) could help young children to delay gratification than the no-treatment group. No prediction was made in reference to the auditory versus the visual cue groups since not enough prior research had been conducted

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to make such a prediction which makes this research all the more important. A pilot study was conducted to evaluate feasibility and potential challenges to internal validity on conducting the proposed study. Limitation of this study was that it was being conducted with a small sample size. The sample was not random and it was a convenience sample with random assignment to groups, but matched on sex. This study may give some implications for the emphasis on time perception in future DG studies, as well as offering new strategies regarding use of time perception education in improving impulse control in young children. Discussion of implications for DG in Chinese sample of young children were shared.

Keywords: delay of gratification, time perception, time duration, visual cue, auditory cue

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Chapter 1. Introduction

Definition and Introduction to Delay of Gratification

The Delay of gratification (DG) has been defined as the ability to "postpone immediate gratification and persist in goal-directed behavior for the sake of later outcomes and future-oriented self-control" (Mischel, Shoda, & Rodriguez, 1989). Examples of children's ability to delay gratification includes resisting temptation, lowering of vocal volume, complying with requests of parents and teachers, and controlling pace of motor behaviors. Several variables that may contribute to the ability to delay gratification, include cognitive control, impulsiveness, and time perception. Delay of gratification has been related to a child's ability of cognitive control. Cognitive control is the overall ability to avoid impulsive behaviors in different situations, giving young children the ability to suppress irrelevant or even salient distraction and to stay on track when pursuing a desired goal (Mischel, Shoda, & Rodriguez, 1989). Many types of children will have difficulty in cognitive control due to impulsivity. Impulsivity refers to a child's tendency to make hasty decisions without prior thought, and sometimes impulsive behaviors occur in response to a valued long term goal or a valued short term goal (Robbins & Crockett, 2009). A variable that has been identified to assist children in delaying gratification is the child's ability to accurately determine the passage of time. Time perception is another moderating factor in DG task. An individual with a future time perception is more likely to realize the value of future rewards and therefore facilitate the ability to delay of gratification (Meade, 2012). Not many researchers have focused on the relationship of time perception and DG (Sargent, 2014).

Previous research on preference for deferred rewards has been widely conducted with young participants around three- to six-years old. Preliminary observations of the waiting behaviors during DG tasks of preschool age children suggest that the ability to wait for long-term goals and to inhibit both immediate gratification and motoric activity has a salient development around the age of four (Atance & Jackson, 2009; Karreman, Tuijl, Aken and Dekovic, 2009; Mischel H. N., & Mischel W., 1983). For the purpose of this study, an initial step was introduced where the child was taught that he could immediately terminate the waiting period simply by signaling for the experimenter (i.e., ring the desk bell). Several parameters were used for observing DG, including (1) display of patience through behavior and speech, and (2) minimal movement or fidgeting. For instance, during the waiting period, young children displaying DG would be able to wait entirely alone in an experimental room for a designated period without getting upset and anxious, without throwing temper tantrums such as screaming and hitting oneself or any object in any conditions (Lee, 2014), without getting out of the chair and wandering around (Mische & Ebbesen, 1970). As long as the participant does not get out of the seat for more than ten seconds at a time, turning and looking around, squirming and squatting on the chair, minimal self-verbalization (e.g., positive comments or negative comments), and touching the reward, were considered as permissive DG behaviors.

The Importance of DG in early development.

Researching children's DG development allows educators to forecast patterns of self-regulatory behaviors later in adulthood (Anokhin, Golosheykin, Grant, & Heath, 2011). Children who effectively delay gratification are predicted to have better developed cognitive and social competence later in life. Preschool-aged children who have better effortful control predicted lower level of externalizing problems later in life (Karreman, Tuijl, Aken and Dekovic,

2009), better social–cognitive and emotional coping in adolescence and adulthood (Eigsti et al., 2006; Casey et al., 2011), and better physical health and personal finances (Moffitt et al., 2011). A Chinese longitudinal study demonstrated that four-year-old children who delayed gratification longer in the classic Mischel’s DG task (Mischel & Ebbesen, 1970) showed improved academic and social competence as well as better coping strategies with frustration and stress, when measured by teacher’s interview and assessment, peer feedback and children’s self-report on social anxiety and loneliness, at the age of nine (Yang & Wang, 2007).

On the other hand, the inability to postpone immediate gratification has many deleterious effects (Anokhin, Golosheykin, Grant, & Heath, 2011). Studies have showed that inability to delay gratification at age of four was related with reduced self-control abilities in adulthood (Casey et al., 2011), lower scholastic performance (Li-Grining 2007), less financial planning and more credit problems (Moffitt, 2011), externalizing disorders (Krueger, Caspi, Moffitt, White, & Stouthamer-Loeber, 1996). Children with limited ability to delay gratification at the age of four were more likely to be found obese at the age of eleven (Seeyave et al., 2009) whereas longer delay of gratification at the age of four predicted lower Body Mass Index (BMI) 30 years later (Schlam, Wilson, Shoda, Mischel & Ayduk, 2013). It was found that obese and overweight children were less able to control impulses and/or delay gratification than healthy weight children (Bruce et al., 2011). Individual differences in DG in four-year-olds also predict long term development of inhibition of attentional and behavioral responses, as well as attentional control systems in adolescence and adulthood (Eigsti et al., 2006). These findings indicated that importance and further evidence for the predictive validity of DG in preschool-age children.

Preschool years as a critical period in the development of DG.

The literature suggests that the age range between four- to five-years old is critical for

facilitating DG. Early childhood researchers demonstrated that the preschool developmental period is important for examining the relationship between spontaneous attention deployment and time delay, because children begin to understand basic rules and strategies for longer and easier delay to get bigger rewards (Mischel, H. & Mischel, W., 1983; Peake, Hebl & Mischel, 2002). By the age of four, most children achieve the ability to self-distract while waiting. They also start to see the value of self-instructions, obscuring the temptations and ignoring arousing thoughts about rewards, as strategies for self-control (Mischel, Shoda & Rodriguez, 1989). More recent studies have demonstrated noticeable individual differences in four-year-old children's self-imposed DG. In addition, at the age of four, other useful self-management techniques to delay gratification become more developmentally feasible. At the age of four, young children may be able to use specific emotional self-regulation strategies (e.g., comfort seeking from caregivers), greater use of planful self-regulation strategies (e.g. active self-distraction), future-oriented behavior, verbal ability to talk about plans, relatively mature memory capacity, and begin to be able to differentiate the time between events because of their emerging sense of time constructs (Supplee, Skuban, Trentacosta, Shaw & Stoltz, 2011; Suddendorf, Nielsen & Gehlen, 2011; Atance & Jackson, 2009; Busby Grant & Suddendorf, 2009; Yang & Wang, 2007; Atance & Meltzoff, 2005). It is important to note that providing explicit instructions on delay-relevant qualities (e.g. superhero can wait because he/she has an accurate sense of passage of time) is essential for preschool-age children to understand how these qualities are relevant to maintain the delay situation, to help them incorporate the same qualities during the delay tasks (Karniol et al., 2011).

There is noticeable individual variability on DG tasks in young children. The ability to delay gratification increases with age and develops substantially during preschool years (Atance

& Jackson, 2009). Though many preschoolers do not specify strategies that are in fact helpful to delay gratification, children above the age of five appear to utilize cognitive strategies (e.g. redirecting attention) that are conducive to maintaining delay (Karniol, 2010; Mischel, 1984). Beginning at the age of five, children show the ability to significantly reject consummatory ideation about edible rewards (e.g. taste and texture of the cookie) by using strategies such as explaining how to facilitate delay or emphasizing the necessity of waiting. At the end of the fifth year, children begin to facilitate delay by shifting one's attention, i.e. covering up tempting objects, rather than exposing them, and engaging in task-oriented rather than in consummatory qualities (e.g. thinking about how yummy, sweet, chewy, tasty, the reward is) while waiting (Mischel, Shoda, & Rodriguez, 1989; Mischel H. N., & Mischel W., 1983).

Some researchers demonstrated that female kindergartners outperformed males both in self-regulation task and a teacher report of classroom self-regulatory behavior (Matthews, Ponitz, & Morrison, 2009). Eight-grade girls show more adoption of self-regulatory strategies, more disciplined and more tended to delay gratification than their male counterparts generally according to self-report questionnaire, teacher and parent ratings (Duckworth, & Seligman, 2006). However, Mischel H. N. and Mischel W. (1983) did a study on choices of DG strategies, i.e., cover versus expose the rewards during delay, and task-oriented (e.g., "I'm waiting for the two marshmallows.") versus consummatory ideation (e.g., "The marshmallows are yummy and chewy.") The result showed no sex differences approaching significance in children at ages four, eight, and eleven years on knowledge of manipulating DG strategies. In addition, Silverman (2003) used the methods of meta-analysis to provide a quantitative estimate of the effect size for the gender difference in DG obtained in a large sample of both published and unpublished studies. The gender difference examined was found to be relatively small.

Previous DG studies done in early childhood mainly used snacks and toys as rewards, such as marshmallows, pretzel sticks, animal cookies, chocolate chips, battery- and hand-operated toys, wrapped gifts (Mischel & Ebbeson, 1970; Mischel, Ebbesen & Zeiss, 1972; Atance & Jackson, 2009; Carlson, 2005); character pretend (Karniol et al., 2011); and educational materials, such as iPad, book, Lego, blocks, crayons (Lee, Lan, Wang & Chiu, 2008; Lee, 2014). Due to the obesity found in one third of the children in 2012 and childhood obesity has doubled in the past decades (Ogden, Carroll, Kit & Flegal, 2014), the snack rewards were excluded in this study and educational materials were considered.

Carlson (2005) demonstrated five minutes as waiting period for three- and four-year-olds to get the deferred rewards in the DG task, while Atance & Jackson (2009) extended to 8 minutes for four- and five-year olds and indicated most of the children could wait the full period. As a result, a longer delay (e.g., ten to twelve min) was suggested to be more appropriate for four- and five-year-olds.

Parenting Styles and Its Relations to DG

Baumrind's (1971) parenting styles (e.g., authoritative, authoritarian, and permissive) are one of the most influential conceptual analyses on parenting and have been widely cited in parenting studies in Western societies (Patrick, Nicklas, Hughes, & Morales, 2005; Chao, 2000). According to Baumrind (1971), authoritative parenting is about being responsive to child's emotional needs, setting reasonable limits, facilitating the development of child competent behavior and reasoning with the child. In contrast, authoritarian parents are demanding absolute obedience of the child, rejecting the emotional needs of the child, using power-assertive and

punitive strategies. Permissive parenting refers to those who adequately respond to their children, but lack of rules and disciplines.

A lot of Chinese studies have been done regarding authoritative, authoritarian and permissive parenting styles mediating children's internalizing behaviors to delay gratification, and the results of these studies were consistent with the findings that Chinese parents' reported authoritative parenting style has been positively related to children's successful outcomes, such as self-reliance, social acceptance, academic success, better self-discipline and higher levels of self-regulation (Zhou et al., 2005; Eisenberg, Chang, Ma, & Huang, 2009); whereas their authoritarian and permissive parenting styles have been associated with children's lower levels of self-regulation, more internalizing and externalizing problems, deviant behaviors and adjustment problems (Zhou, Eisenberg, Wang, & Reiser, 2004; Eisenberg, Chang, Ma, & Huang, 2009; Chen, Dong, & Zhou, 1997). There is also an American study about the influence of mothers' teaching strategies and child-rearing attitudes on preschoolers' DG development showed that the mothers of children, who had problems in inhibiting touching a brightly wrapped gift when their mothers left, used permissive parenting styles (Mauro & Harris, 2000). However, Chinese researchers demonstrated that Chinese parents are more controlling and authoritarian and less authoritative than parents in the Western societies, whereas authoritarian parenting has been associated with more inability to delay gratification (Chao, 1993; Lin & Fu, 1990). There is enough evidence to expect that different parenting styles relate to different outcomes of children's self-regulation. As a result, parenting styles will be assessed in this study as one of the descriptive factors influencing children's DG.

A Chinese version of Parenting Styles and Dimensions Questionnaire (PSDQ) was developed by Robinson, Mandelco, Olsen, and Hart (1995) based on Baumrind's theory (1971),

effectively assessing authoritative, authoritarian and permissive parenting. The authoritative subscale consisted of four dimensions: (1) warmth/acceptance; (2) reasoning/induction; (3) democratic participation; and (4) easy-going/responsiveness. The authoritarian subscale also consisted of four dimensions: (1) nonreasoning/punitive strategies, (2) directiveness, (3) corporal punishment (or physical coercion), and (4) verbal hostility (Wu et al., 2002). The permissive subscale consisted of 4 items from one dimensions: withdrawal of disciplines.

Fu and colleagues (2013) had a study aimed to test the reliability and validity of Chinese version of the PSDQ based on a sample of 443 students' parents in Mainland China. There was a relatively high intercorrelation between the scales and the various factors, and researchers demonstrated that PSDQ was suitable for China's national conditions and cultural background and has relatively good reliability and validity with providing an effective and reliable psychometric instrument to evaluate parenting styles and education model in each family (Fu et al., 2013; Chen, Zhou, Eisenberg, Valiente, & Wang, 2011; Eisenberg, Chang, Ma, & Huang, 2009). As a result, PSDQ is acceptable to use in evaluating the parenting styles of Chinese parents whose children would be participating in the study of DG.

Cultural Background of DG

Following the Chinese civil war from 1927 to 1950, the Communist Party of China formed the People's Republic of China (PRC) in Beijing, sometimes referred to as Mainland China, and the PRC follows the socialist ideology (Yan, 2003). In contrast, the Kuomintang-led government formed the Republic of China in Taiwan which developed under a capitalist economic policy (Fung, 1997; Davidson, 2003). Hong Kong and Macau are two Special Administrative Regions of the People's Republic of China. Hong Kong was a colony of British

Empire from 1841 to 1997 and Macau was a colony of Portuguese Empire from 1557 to 1999, which has been governed under Capitalistic government for centuries until the present (Bray, 1992). During the colonial era, Hong Kong and Macau shaped different cultural, economic and societal systems from Mainland China. For example, the educational system in Hong Kong modeled on the one that was found in the UK (Sweeting, 1990) and Macau followed a “local education system” approach, which is also described as a “Non-Regulated education system” (Morrison, 2001). The education in Mainland China is a state-run system which is administered by the Chinese Ministry of Education. There are nine years of compulsory schooling and students are admitted to colleges strictly through the scores of the “National Higher Education Entrance Examination” (Gao, 2014). Due to the societal and cultural differences, when people have mentioned “Mainland China”, Hong Kong and Macau may not be included. The present study will be conducted in the Mainland China and so will include participants who follow a socialist ideology.

Collectivism in Mainland China has been found to be the major societal value compared with the individualistic perspective prevalent in the United States (Oyserman, Coon, & Kimmelmeier, 2002). Gries (2004) described Chinese national identity of collectivism as “that aspect of individuals’ self-image that is tied to their nation, together with the value and emotional significance they attach to membership in the national community”. The People’s Republic of China has been founded in the social behavior construct of the importance of fitting in with the norms of group harmony and societal conformity (Cheah & Rubin, 2004; Triandis, 1994, Bond & Chi, 1997). Thus, Chinese adults discourage behaviors that are disruptive to group functioning (Cheah & Rubin, 2004). Chinese schools highly reinforce attributes such as self-regulation and attentiveness (Phelps, 2005). As a result, DG is highly valued in Chinese schools, but this

perspective is in sharp contrast to parents who may not prize DG. The explanation for this parental perspective is described below.

Chinese researchers Chen, Cen, Li, & He (2005) suggested that Chinese culture has gone through Westernization in the past decade. In traditional Chinese culture, shy, sensitive and restrained behavior was a characteristic of social accomplishment and maturity (Chen et al., 2005). From recent times, increasing assertiveness, self-direction and exploration has become a salient value of the social and economic reforms in China due to the challenging market place. Children's shy, wary and restrained behaviors are particularly incompatible with the influence of the new social norms and expectations (Cai & Wu, 1999; Yu, 2002). Due to the One Child Policy launched in the People's Republic of China in 1979, developmental psychologists in China observed that Chinese parents gave more attention and became more responsive to children's needs, and perhaps required less DG, thus creating a new generation of children developing differently from their prior counterparts with siblings (Cameron, Erkal, Gangadharan, & Meng, 2013). As a result, children's impulsivity and inability to delay gratification have emerged since the implementation of the One Child Policy. Since the Chinese government has eased the One Child Policy in recent years, the trends of parental expectations in child development have represented more of an emphasis on internalizing behaviors such as DG. In addition, one might expect that evolution and emphasis on DG in Chinese society might be shifting towards a Western perspective as new Chinese parents are allowed to have more than one child. Nevertheless, the parents of the Chinese children in this study grew up under the Chinese One Child Policy and may still have a high tolerance for less waiting time on the part of their children.

Some of the Chinese early childhood studies demonstrated that instructing five-year-olds

with attention-shifting and self-verbalization strategies to delay gratification had significant improvements in waiting time compared to young children instructed to use “cool ideation” of the reward quality (e.g., it’s not fun. I don’t want it.) (Zuo & Zhang, 2008). In addition, it would appear that age is the main factor mediating the ability to delay gratification in young children. Children at the age of four and five exhibited a significant developmental advance on the DG tasks compared to those at the age of three (Zuo & Yang, 2007). However, the study of DG in Chinese young children is still at an initial stage and has not been well explored (Huang, 1999).

Definition and the Development of Time Perception in Children

Children’s ability to wait and DG has been associated with their ability to accurately comprehend the passage of time (Sargent, 2014). Time is the distance traveled from one point to another on a watch. This is the only representation invented by human beings for the purpose of measuring its passing with precision. It also can be measured by digital numbers ascending from zero to a certain number. As Bergson (1968) says, “time is purely and simply an item of data relating to our experience... and we want to hold onto that experience” (as cited in Droit-Volet, 2011). Time perception refers to the subjective experience of time that essentially involve the senses and is sometimes measured by one’s own perception of the duration of successive events (Le Poidevin, 2011). The issue, however, is that time perception may be aided by supportive cues.

Piaget (1969) theorized that a child’s concept of time (as well as space and speed) passes through three developmental phases: Sensorimotor, Preoperational Stage, and Concrete Operational. Children at the four- to- five- years old range are in the preoperational stage, with mental operations that are still logically inadequate, yet stable concepts burgeon, magical beliefs

form and mental reasoning emerges (Santrock, 2007). Piaget posited that children must act on their own environments to learn experientially. This notion suggests that time evaluation cannot be taught and understood by children at the preoperational stage. Based on his theory, Piaget (1954) believed only children beyond the age of eight possessing sophisticated reasoning abilities and proper mental operations could make correct judgments of durations. However, Lev Vygotsky challenged Piaget's theory and offered an alternative notion known as "the zone of proximal development (ZPD)", which is "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance, or in collaboration with more capable peers" (Vygotsky, 1978).

Vygotsky's socio-cultural theory (1978) stated that social interactions and culture help children shape cognition. He believed young children's individual learning could be encouraged and advanced by providing them with experiences, such as visual and auditory cues, that are within their zone of proximal development. Interestingly, recent studies have demonstrated that children's ability to accurately estimate time can emerge earlier than Piaget had thought, which supports Vygotsky's theory that children can be taught to achieve more advanced time perception tasks at an early stage (Droit-Volet, 2011; Zélanti & Droit-Volet, 2011, 2012).

Researchers demonstrated that infants were able to create habituation, learn the temporal intervals between two events, become sensitive to differences of structure and interval, and distinguish different durations associated with events (Provasi, Rattat & Droit-Volet, 2011; Droit-Volet, 2013). Though it is still difficult for children to precisely time their behaviors, sensitivity to time increases with age and researchers believe children have some knowledge of time duration by the age of three, because young children have a primitive sense of time, i.e., an

internal clock, which allows them to estimate duration from as young as the age of three (Droit-Volet, 2011; Droit-Volet, Delgado & Rattat, 2006). In addition, Droit-Volet (2013) indicated a noticeable improvement in timing sensitivity starting from this age. The efficiency of accurate temporal regulation of behavior emerges between four and six years of age (Pouthas, Droit, & Jacquet, 1993). Children aged five to ten years old were able to quickly learn timing through games that repeated touching on one of the rooms in a house on a computer screen with a 30 s interval to get animation and sound (Thorpe, Hallet, Murphy, Fitzpatrick & Bakhtiar, 2012).

There is an age difference observed between three years and five and a half years, when children are prompted with temporal and/or force instructions. For example, children around age three rely on a certain amount of force in time estimation. When they were asked to press “hard enough”, they pressed “longer”. Meanwhile, when asked to press “long enough”, they pressed “harder”. In contrast, children at the age of five and a half did not press longer when asked to press harder and showed more accuracy with the temporal than with the force instruction. The study showed force instruction governed three year olds’ temporal behavior, but not at age five. Until the age of five, the marked dissociation between force and duration emerged and older children were able to understand temporal instructions better (Droit-Volet, 1998). All these studies raise the importance of exploring how the development of time perception mediates ability to delay gratification in young children.

Some studies of time perception in early childhood have been done in China. In an experiment of future-oriented cognition, Chinese researchers showed four-year-old children two groups of pictures. The first group was the pictures of tadpoles, tadpoles with two hind legs and the frogs, representing developmental phase of organism. The second one was the pictures of

four national holidays, representing different point of time in one year. The children were asked to arrange the pictures according the succession of the events with or without external tools (e.g., circling on a calendar). Researchers demonstrated that education using cues such as “circling on a calendar” was considered as the most important variable to promote the development of future-oriented cognition between four- to six-year-old children, and four-year-old children have already developed future-oriented cognition and can distinguish succession of events that happen in the future in daily life (Wang, 2004). In the experiment regarding to concept of relationship among time, speed and distance, a puppet show of “Running Race between the Tortoise and the Rabbit” was presented to four and a half to seven and a half year-old children. This was a story about the running race between the rabbit who had superiority in speed but took a nap under a tree first, while the tortoise who moved slowly but kept working towards the destination and finally won the race. The experimenter asked the children which one took longer time during the race. Four- and a half-year-old children tended to discriminate time by the space, saying that they both started from the same line and reached the same finish line, so they used the same amount of time. Children started to distinguish relationship among time, space and speed above the age of five and a half, saying the tortoise moved slowly thus took longer time during the race. The result revealed a salient development of the notion of time duration between five and a half and seven and a half years old (Lin, 1996). In a time reproduction task, a panda figure was presented with durations of two to eight seconds on the computer screen either with an auditory cue of clicks or without auditory cues. Five- and six-year-old children were asked to press the key and reproduce the durations. The result showed children at this age had achieved the ability to distinguish the time durations within a discrepancy of several seconds. In addition, five-year-olds were especially sensitive to durations when accompanied by an auditory cue, explained by the

researchers as the rhythmic beat of clicks which increased the tendency towards counting strategy (Fang G., Feng, & Fang F. X., 1994).

Cultural perceptions of time.

Different viewpoints derived from different cultures determine the importance of time. “Time is one of the fundamental bases on which all cultures rest and around all activities revolve” (Hall, 1990). The perception of time is a social construct that is affected by cultural orientation and “It’s possible to synchronize clocks, synchronizing cultures has proven more challenging”(Keating, 2013). Cultural differences affect the way how people deal with time.

Time is not simply measured in minutes and seconds, but often by the concept of “early” and “late” (Keating, 2013). In some cultures, time is perceived as rigid, segmented, limited and linear (Zafar, 2000). For example, punctuality has different meaning according to different cultures. Being 30 minutes late or even more to appointments may be tolerated in most Mediterranean and Arab countries. In Britain and North America, it’s accepted that one might be late for 5 minutes for a business appointment. Germans are highly time conscious, whose most important attitude is always punctual. Japanese have extremely low tolerance for tardiness and delay. The great example of this rigid view is the Japanese train system. The trains with less than a minute’s delay could be counted as “on time” while a “delay” means “ten to fifteen minutes behind schedule” in some European railway systems (Hall, 1990).

As the societies develop both technologically and economically, more and more countries are moving forward to faster paced lifestyles that also influence cultures and time perception. A study found that the more industrialized and economically developed countries tend to be more fast-paced. Less developed or developing countries usually live slower paced lifestyles (Levine, 1998). Levine (1998) conducted an experiment to compare the pace of everyday life in 31

countries all over the world, using measures such as average walking speed of pedestrians in downtown areas, the efficiency of local post office and accuracy of public clocks. The result showed that Switzerland, Ireland, and Germany were the countries with the fastest pace. For these fastest paced societies, time is truly money, which is precious, rare and expensive. It has to be perfectly organized. Thus, people from these societies have more accurate estimations of time.

In contrast, for South America, Africa, Saudi Arabia and much of Asia, all of which are considered as slower-paced countries, time is more fluid, relaxed, elastic and flexible (Hall, 2000). However, punctuality on arrival is considered important in China, although not that rigid compared to Japan or Western societies, still more so than in many other Asian countries (e.g., Pakistan, India) (Lewis, 2014). Though Chinese people have a relatively heightened sense of time, the concept of time developed in Chinese culture is remarkably different from the one in Western culture (Liu, 1974). In Chinese culture, time is perceived to be subjective, limitless and flexible (Li, 2008). The concept of time in Chinese culture has been described as mentioned as “cyclic time,” compared to “linear time” in Western culture (Dy, 2000). “Linear time” is a concept that time is seen as a straight road with a beginning and an end. People tend to complete tasks sequentially, as its succession of events (one after another) that are leading toward from beginning to an end (Hall, 2000). In contrast, Lewis (2014) described “cyclic time”, as well as life, as a curved concept that goes around in a circle. People think they could always encounter the similar “scenery” and conditions to what they experience at present and experience eternal time because of the doctrine of reincarnation. The sun and moon rise and set every day. Seasons follow one another. This cycle has gone on for centuries and time has been seen to be an unlimited supply. Even the Western influences will not change this perspective. Whatever they

plan, however, they organize the particular world from the Chinese perspective of time, certainly rushing things won't help at all (Lewis, 2014).

People with cyclic time concept were considered as less disciplined in the planning of future events, since "they believe that it cannot be managed and that humans make life easier for themselves by 'harmonizing' with the laws and cyclic events of nature" (Lewis, 2014). This attitude towards time influences daily life since cyclical time is not a scarce commodity. For example, when a Chinese parent sets a twenty-minute limit of TV time, she does not usually judge the duration with a timer, but by looking at the clock on the wall once a while, with a five to ten minutes' deviation accepted. It may not be conscious, but these are the cultural attitudes and behaviors that one develops over time and may not be easily changed in a short term (Zafar, 2000). One can expect that children growing up in Chinese culture may not have a rigid and accurate sense of time and this time perception may be related to a child's ability in a DG task.

The relationship of Time Perception and Delay of Gratification in Children

Timing ability is an important factor for executive functions as a form of encoding temporal intervals, reproducing durations and recalling them after previous codification (Vicario, 2013). Time processing abilities strongly relate to impulsivity control (Rubia et al., 2009) and attention (Vicario, 2011). However, the importance of time perception as it may contribute to the delay of gratification has not yet been well established. Given that the waiting period during the DG task is a central aspect of the deferred reward, individual differences in time perception may cause different decisions in delaying gratification. Decision making is based on individual differences in accurately perceiving the speed of passing time. It has been proposed that time

perception may be the main cause of impulsivity (Wittman & Paulus, 2008). The ability to perceive time may well predict a child's willingness to defer immediate gratification.

In daily life, deficiency in time reproduction may be reflected as difficulties with tasks that require a timing component and resulting impulsive behaviors while waiting leading to the inability to delay gratification (Rommelse, Oosterlaan, Buitelaar, Faraone, & Sergeant, 2007; Rubia, Noorloos, Smith, Gunning and Sergeant, 2003). Timing function deficits are the main reason for difficulties in DG tasks for ADHD and impulsive subjects (Yang et al., 2007). Even if children with ADHD can estimate the time with some accuracy, because of their less accurate time perception in real time compared to healthy children, they still reproduced stimulus durations less accurately (Gooch, Snowling, & Hulme, 2011; Houghton, Durkin, Ang, Taylor & Brandtman, 2011; Meaux & Chelonis, 2003). ADHD patients are coincidentally impaired in perceptual timing and temporal foresight, which lead to impulsiveness and inattention (Noreika, Falter, Katya & Rubia, 2013). Impulsive children also tend to overestimate the duration of time intervals (Wittmann & Paulus, 2008). Because of their altered sense of time, they all strongly devalue temporally delayed rewards and tend to experience more difficulty in delaying gratification tasks (Lawrence, Allen, & Chanen, 2010). The sense of time should also be related to executive functions for healthy individuals. Healthy children who make greater time errors in reproducing the duration of a stimulus picture on the computer exhibited lower performance in executive functioning tasks, such as pressing a specific key when a stimulus letter appeared on the computer and withheld a response when heard a beep (Carelli, Forman, and Mantyla, 2008). As a result, timing function should be considered as an important factor in DG study.

These studies support the idea that exploring time perception ability is important when the accuracy of time judgment is a predominate feature for the prediction of delay of gratification.

Individuals who tend to overestimate time may feel that a delay period is longer, than it actually is, so they are more likely not to hold out for delayed rewards.

Auditory and Visual Cues for Time Perception

In Vygotsky(1978)'s view, the use of knowledge scaffolding serves as an instructional strategy to help children manage cognitive tasks. Knowledge scaffolding takes place when a more experienced instructor provides support for the construction of knowledge and helps learners accomplish tasks that are beyond their present ability with guidance or cues (Greenfield, 1984). Learners accumulate their knowledge by processing information that supports their learning and takes on different forms, such as visual and auditory cues, which can serve as fundamental scaffolds for the acquisition of new skills (Verenikina, 2003). For time management in the visual modality, a clock and a timer are the basic tools used to help measure time duration or wait time. Counting the passage of time in seconds and minutes is the method used to estimate time in the auditory modality.

Studies on five- to eight-year-old children that focused on modality differences found that sensitivity to time increased more quickly with auditory than with visual cues, indicating improved developmental temporal sensitivity for “sound” rather than “sight” (Droit-Volet, Turret & Wearden, 2004; Droit-Volet, Meck & Penney, 2007; Zelanti & Droit-Volet, 2011; Zelanti & Droit-Volet, 2012). Two groups of five- and eight-year-old children were respectively presented with a visual picture (i.e., a blue filled circle) on the computer screen as well as an auditory sound (i.e., a 500-Hz synthetic piano tone) for certain durations, and then they were asked to reproduce the durations. The result showed the children had lower sensitivity to reproduce the duration in the visual modality compared to reproduce it in the auditory modality

(Droit- Volet, Tourret, & Wearden, 2004). Zelanti and Droit-Volet (2012) did a further time reproduction experiment that presented five- and eight- year-olds with either auditory (i.e., a 500-Hz synthetic piano tone) or visual signals (i.e., a solid red circle on the computer screen) and either a short duration (0.5-1.0 second) or a long (4.0-8.0 seconds) duration range. Children aged five and eight exhibited poorest sensitivity to reproduce long durations presented in the visual modality. The explanation made by the researchers for the superiority of auditory scaffolding was that visual stimuli require more executive attention during temporal processing, and young children have limited executive attention (Zelanti & Droit-Volet, 2012). Limited attentional capacities were the main reason of the lower sensitivity to time in young children (Zelanti & Droit-Volet, 2011) and performance on timing in the long duration range depends in part on attentional capacities. As a result, sustaining attention and avoiding distraction in visual modality as well as in the long duration are especially difficult for young children (Zelanti and Droit-Volet, 2011). Droit-Volet and colleagues (2008, 2011) did an age-related experiment that presented five-, eight- and nine-year-old children and adults with a visual stimulus (e.g., a red circle on the computer screen) for a short (i.e., one second) and a long duration (i.e., longer than three seconds) and asked the participants to reproduce the durations. The result showed an increasing precision of time sensitivity with age for each duration range. Researchers demonstrated that the age-related improvement may account for development of attention function and short-term memory span (Droit-Volet and Meck, 2007; Droit-Volet, Meck, & Penny, 2007; Wearden, 2005; Rattat and Droit-Volet, 2005). In a recent study, participants were presented with a filled duration (e.g., continuous tones) and an empty duration (e.g., with onset and offset marked by clicks) in different pairs of time intervals. The task was to discriminate which of the two was longer in duration. The result showed that filled duration were discriminated more accurately

than empty one (Rammsayer, 2010). Droit (2008) argued that filled duration provided children with certain concurrent tasks during the timing and helped them to sustain attention while waiting to respond. Verbal counting, which requires memory, may be implemented as an efficient filled duration to sustain children's attention (Magimairah & Montgomery, 2013).

Auditory cues for time perception.

Humans spontaneously use verbal counting as an auditory strategy for time measurement and language development is also a key factor in delay ability (Duckworth, Tsukayama & Kirby, 2013; Krashen, 1993). Sensitivity for time and number is well established at an early age and continues to improve with maturation. Temple and Posner (1998) demonstrated that the change in the pattern of brain activity associated with numerical language and skill occurs dramatically at age five. Perhaps counting strategy could be introduced to children as assistance in time measurement, because between the ages of five and eight years old, sensitivity to time lags behind sensitivity to numbers (Droit-Volet, 2003) and children demonstrate increased capabilities in discriminating numbers with increasing precision after age five (Allman, Pelphrey & Meck, 2012).

Counting numbers is effective in the judgment of duration. Clement and Droit-Volet (2006) demonstrated an experiment that explicitly instructed one group of five-year-olds to count aloud at the rhythm with which they felt comfortable and reproduce the presentation duration of a blue circle stimulus on the computer, while the other group was instructed to repeat fast and aloud with "blablabla..." to preclude subvocal counting. The result showed a significantly improved temporal sensitivity in the counting group. But young children do not spontaneously employ counting as a strategy to measure the passage of time as Wilkening and his colleagues (1987) demonstrated. They asked the children to watch carefully at the duration that a light bulb

that had been lit. Then the children were asked to press a key to let the light bulb burn again for the same duration that it had been lit by the experimenter. At the same time, researchers asked the children to repeat the strategy aloud that they used throughout the reproduction of durations. It was found that the majority of five-year-olds did not spontaneously employ a counting strategy to measure the passage of time although they can count, while a sensible counting strategy was adopted by most of the seven-year-old children (Wilkening, Levin., & Druyan, 1987). As a result, younger children below the age of seven may need to be explicitly instructed to count during time-related tasks.

According to Vygotsky (1978)'s socio-cultural perspective, children internalize public speech from caregivers and transform it into private or inner speech, which eventually plays an important role in the regulation of behavior. Children's self-regulatory development is derived from the internalization of language that promotes academic functioning (See also Zimmer & Schunk, 2011; Lee, Lan, Wang & Chiu, 2008; Bukatko & Daehler, 2004). Therefore, developmental psychologists have typically provided young children with self-verbalization training, which is a high level of self-management (Zimmerman & Schunk, 2011).

Visual cues for time perception.

External time cues are important for young children to manage with time. Visual cues have been widely applied as a time indicator in DG studies and have demonstrated to be an effective tool to assist time perception. Droit-Volet (1994) applied a row of small green bulbs which turned red in succession in five seconds as an external cue for the passage of time. Children at the age of three were trained with this visual cue to press a button for five seconds to get a reinforcer (i.e., the projection of a color slide with zoo animals with music) in four training sessions. The results showed that the presence of the visual cue increased the efficiency of

children's performance as compared to the no-treatment control group. Droit-Volet and Wearden (2002) applied the visual stimuli in the short duration (200-800 millisecond) or long duration (400-1600 millisecond) with either a repetitive flickering circle or a constant circle. Children of three, five and eight years of age were required to classify each duration in terms of "short" or "long". The result showed that children were more sensitive to flickers compared to the constant visual stimulus (Droit and Wearden, 2002). Considering the difficulty of observing and reproducing the duration of light bulbs lighting up in succession or circles flickering as a means of measuring time, especially when the exact amount of external information is not available, sequence numbers which are already embedded in young children's minds and showed on the timer could be used as a more feasible chronometer.

In summary, according to Vygotsky's scaffolding theory, concrete, external, and visible resources should be provided when helping a young child learn new skills (Vygotsky, 1978; Stone, 1998). Visual supports, such as a timer, also have been successfully employed as an assistance with daily routine in behavior management with children who have social impairments (e.g., autism) (Roa & Gagie, 2006; Thieman, & Goldsten, 2001). Timers applied as a visual time indicator to enhance participants' ability in delay tasks are easy to access and may increase children's confidence in waiting by gaining a sensation of actual time consumed and how much time remained.

Chapter 2. The Current Study

The Purpose of the Study

The purpose of the study was to research how a scaffolded approach to waiting with auditory and visual cues to determine the passage of time could help young children delay gratification. It had been found that children who overestimate time were not willing to wait to get a deferred reward (Sargent, 2014). As a result, perception of time could result in different performances on delaying gratification. It was predicted that an increase in accuracy of time perception with visual and auditory cues (i.e., scaffolds) could help young children to delay gratification. Furthermore, understanding the role of time perception in DG could provide further insights into DG, as well as point to new teaching strategies regarding time perception education for children who lack the ability to delay gratification.

Research Questions and Hypothesis

In this Section, the hypotheses of this study were listed corresponding to each research questions as followed.

Research Question 1: How does time perception predict the ability to delay gratification? i.e., will the groups with visual and auditory cue have different performance comparing with the control group?

Hypothesis 1: Improvement in time perception will enhance the ability to delay gratification, thus the groups with visual and auditory cue will delay longer than the control group.

Research Question 2: Will young children using visual cues to estimate the passage of time have better ability to delay gratification than a no-treatment control group?

Hypothesis 2: Young children using visual cues to estimate the passage of time will have better ability to delay gratification than a no-treatment control group.

Research Question 3: Will young children using auditory cues to estimate the passage of time have better ability to delay gratification than a no-treatment control group?

Hypothesis 3: Young children using auditory cues to estimate the passage of time will have better ability to delay gratification than a no-treatment control group.

Research Question 4: Which cues, visual or auditory, will create longer wait time in the DG task?

Hypothesis 4: There will be no significant difference between auditory and visual cues with regard to waiting times in the DG task.

Data Analysis Strategies

In this study, the independent variables were the visual and auditory cues provided during the DG tasks (i.e., treatment conditions). The dependent variable in the study was the capacity to wait (measured in seconds and minutes) across the delayed gratification conditions (i.e., auditory, visual, and no-treatment control).

Descriptive statistics was used to describe the wait time for the three groups (auditory, visual and no-treatment control). One-way ANOVA was used to compare the mean wait times (in seconds) across the auditory cue and visual cue and no-treatment groups. A post hoc analyzes (Scheffé's test and Bonferroni's test) were followed for pairwise comparisons. An independent t-test was used to compare the mean length of time between the males and females. A value of $P < 0.05$ was considered statistically significant.

Chapter 3. Method

Participants

Nan Shan day care center in Zhuhai, China, was selected for this study. Zhuhai was located on the southern coast of Canton province. Due to the early superiority of the economic development policy launched by the central government, immigrants from other provinces moved in and made up 80% of the population in this city (Xie, 2013), which made it an extraordinary diversity. The tuition of this day care was in the middle range according to the tuition level in this city. Based on tuition and interview with teacher, majority of the children were from middle-class families and urban area. All of the participants were Han Chinese. In the official account, there were totally fifty-six ethnic groups in China. Han Chinese was the dominant ethnic group constituting and representing 92% of the population of Mainland China (Han, 2010), sharing the mainstream culture of the country (e.g., Westernized dressing styles, speaking Mandarin and using Chinese characters) . The other fifty-five groups, referred to as “ethnic minorities” who had unique characteristics from the dominant Han Chinese (e.g., traditional costumes, spoken and written languages of ethnic minorities) (Hasmath, 2013), were not included in this study.

Informed parental consents for child participation were obtained for all student participants. The participants were twenty boys and twenty-one girls in this day care classroom. The age of the children in the class ranged from four years and nine months to six years one month. The children were randomly assigned into three groups (i.e., auditory, visual and no-treatment control) with approximately the same gender ratio.

All participants spoke Mandarin as a first language, which required that experiments were conducted in Mandarin.

Settings

According to the teacher's recommendation, a reward menu of three age-appropriate toys and academic materials was used, which included an iPad, Play-Doh with molds and a 3D book, i.e., 《Three Little Pigs》. Each participant chose a highly preferred item during the paired-stimulus preference assessment to be explained below in Procedures, and used the chosen item as the preferred reinforcer during the DG sessions.

The experimental room was a small meeting room containing only a chair and a table. Rewards were displayed on the table, i.e., an iPad, Play-Doh with molds and 3D book. A desk bell also was placed on the table and in reach of the child, in the case that the child wanted to terminate waiting. A digital video baby monitor was set up in order to observe participant's behavior during the task, as well as a camcorder to videotape every session for subsequent data collection and analysis. Apart from these objects, the room was empty to avoid distraction.

Procedures

The author of this research also served as the experimenter. In the week prior to the experiment, the experimenter spent two hours a day playing with each of the study participants. Familiarity allowed the children to build trust with the experimenter, minimize shyness around the experimenter, and be more at ease during the study, thus reducing reactivity. Prior to the start of the study, the experimenter made sure all the participants had had breakfast, lunch and snacks in the day care and made sure the participants had had the opportunity to use bathroom before the experiment began, to prevent feeling hungry or going to the bathroom from being intervening variables that would corrupt the experiment. There was an assistant to help bring the participants over to the experimental room. The assistant also help send them back to the classroom after the

experiment. During the experiment, the assistant was not present. The experimenter was the only one who collected, recorded, accessed and analyzed the video data.

Parenting styles questionnaire.

The forty-one parents of the child participants in the DG study responded to thirty items from the Chinese version of Parenting Styles and Dimensions Questionnaire (PSDQ; Robinson, Mandlco, Olsen, & Hart, 1995; Wu et al., 2002) aiming to assess authoritative, authoritarian and permissive parenting.

The authoritative subscale consisted of thirteen items taken from four subscales: (1) warmth/acceptance (e.g., “I have warm and intimate times together with my child.”); (2) reasoning/induction (e.g., “I explain the reasons behind my expectations.”); (3) democratic participation (e.g., “I consider my child’s preferences when I make plans for the family.”); and (4) easy-going/responsiveness (e.g., “I am responsive to my child’s feelings and needs.”).

The authoritarian subscale also consisted of thirteen items taken from four dimensions: (1) nonreasoning/punitive strategies (e.g., “When my child asks me why he/she has to do something I tell him/her it is because I said so, I am your parent, or because that is what I want.”), (2) directiveness (e.g., “I remind my child that I am his/her parent.”), (3) corporal punishment (or physical coercion) (e.g., “I spank my child when I don’t like what he/she does or says.”), and (4) verbal hostility (e.g., “I use threats as a form of punishment with little or no justification.”).

The permissive subscale consisted of four items from one dimension: withdrawal of disciplines (e.g., “I give into my child when he/she causes a commotion about something.”)

The parents rated the frequency of behaviors that they engaged in the different parenting practices. Scores ranged from “Never” to “Always” on a Likert-type five-point scale. The scores

were added up and divided by the number of questions in each section and the calculated score was the total score for that category. The highest score indicated the preferred parenting style.

Paired-stimulus preference assessment session.

At the beginning of each experiment, the paired-stimulus preference assessment (Fisher et al., 1992) was conducted to identify participant's most preferred item. The paired-stimulus preference assessment was used as it had been shown to be more effective in determining preference and it had elicited more consistent preference information than other assessments (Windsor, 1994).

During the paired-stimulus assessment, the three items on the reward menu (i.e., an iPad, Play-Doh with molds and a 3D book) were presented in pairs. Each item was paired once with every other item, in a randomized order for a total of three pairings. For each trial, two items were placed five inches apart and approximately one foot in front of the participant. The experimenter then asked, "Which one do you prefer?" The participant made a choice and was given thirty seconds to play with the chosen item. Participants who approached both items simultaneously were blocked and then were asked to make a choice again. Children were given thirty seconds to play with whatever item they chose. If a participant did not approach either item within five seconds, the experimenter prompted the participant to play with each item for five seconds and again placed the two items in front of the participant for another five seconds to choose from. Children were given thirty seconds to play with the chosen item.

Each item was presented at least once in different pairings and each participant made three choices. The number of times that each item was picked was recorded and converted into a

percentage of selection. The item with the highest selection percentage was used as the reinforcer during the experimental conditions.

Delay rules and understanding check.

Delay rules and understanding check were implemented after the paired-stimulus preference assessment to explain rules for the delay of gratification task as well as to check if the participants fully understand the rules and consequences of their performance (i.e., receiving the preferred reward for fifteen minutes). The experimenter explained like this:

“You know what? I have to leave the room and do some work. I will be back in ten minutes. If you want to have the ___ (naming the chosen reward) to play with for fifteen minutes, you will have to sit still in your chair until I get back. If you get off the chair during the time I’m outside, you will only get to play with the ___ (naming the chosen reward) for five minutes. If you can’t wait anymore, ring this bell on the table and I’ll come back. However, if you ring the bell, you can only have ___ (naming the chosen reward) for five minutes instead of fifteen minutes.”

Then the experimenter asked four questions to assess if the participant understood the rules:

Question # 1 “Can you tell me what you have to do to play with the ___(naming the chosen reward) for fifteen minutes instead of five minutes?”

Question # 2: “What do you do if you don’t want to wait anymore?”

Question # 3: “What happens if you ring the bell before I get back?”

Question # 4: “What happens if you get off the chair before I get back?”

If the participant could not understand the rules, the experimenter repeated the rules and checked again. If the participants could not comprehend accurately after a second trial, they would be excluded from the study.

Delay of gratification conditions.

The delayed gratification experiment consisted of manipulating three conditions: auditory cue, visual cue, and no-treatment control conditions.

Group 1 - auditory group.

A digital audio recorder was used in the auditory condition. The recorder was placed on the table, out of reach of the children. Teachers at the day care center noted that students at this age tended to skip counting when counting numbers greater than twenty, therefore auditory cue was provided to assist in sequential counting. A pre-recorded audio track of an adult counting was prepared prior to the experiment. The audio record was an adult counting along with the rhythm of the digital count-up timer used in the visual modality. It was played during the waiting period so that participants could count along. The audio recording stated in Mandarin: “Are you ready? Let’s start! (Beep) one, two, three, four... fifty-eight, fifty-nine, one minute, one, two, three, four... fifty-eight, fifty-nine, two minutes...” until it reached ten minutes, upon which a timer rang at the end, indicating termination of waiting. Prior to starting the recording, the researcher reminded participants to count along with the counting voice while waiting. The researcher also provided education of time concept at the start of the session, with the following:

“Ok. There are sixty seconds in a minute. So if you count from one to sixty, you have counted one minute. For two minutes, you need to count from one to sixty again. For example, we count

one, two, three, four and all the way up to fifty-eight, fifty-nine, one minute. We replace the number sixty with saying ‘one minute.’ And then again, one, two, three, four and all the way up to fifty-eight, fifty-nine, two minutes. Let’s try to count to two minutes following the recorder.”

The experimenter played the audio recording and counted with the participant for two minutes, then said: “We counted from one to fifty-nine two times, so that meant two minutes. If we repeat counting one to fifty-nine like that for ten times, that’s ten minutes.”

After this two-minute practice session, the paired-stimulus preference assessment was conducted. Then the experimenter began the “Delay Rules and Understanding Check”. Once the experimenter established that the participant understood the rules, the unchosen items were taken out of the room, leaving the chosen reward on the table, within view but out of reach. The ten-minutes waiting time began from the moment the experimenter turned on the recorder. The experimenter returned when the participant hit the bell, got out of his/her chair for more than ten seconds, or at the end of the ten minutes wait period.

Group 2- visual group.

In the visual condition, the participants were presented with a digital count-up timer. Education of time concept was provided at the beginning of the session so that participants knew how to read the timer. The experimenter showed the timer to the participant and explained:

“Do you know there are sixty seconds in a minute? We call the two numbers on the right side ‘seconds number,’ while the number on the left side is ‘minutes number’. When ‘seconds number’ go up to fifty-nine, that means one minute has passed and

then ‘seconds number’ starts over from one again. You will hear a ring when ten minutes are up. Let’s see how the timer works for two minutes.”

The experimenter set two minutes on the timer, and explained:

“See this? (pointing at the seconds number) When ‘seconds number’ reaches fifty-nine, that means one minute has passed. The minutes-number changed to one and the seconds-number starts over from one again.”

After a two-minute practice, the paired-stimulus preference assessment was conducted, followed by the “Delay Rules and Understanding Check.” Once the experimenter established that the participant understood the rules, the chosen reward was placed on the table, within view but out of reach. A desk bell was right in front of the child. Waiting time was scored from the moment the experimenter turned on a ten-minute timer. Then the experimenter left the room with the unchosen rewards. The experimenter returned either when the child signaled with the desk bell, got out of the chair for more than ten seconds or after ten minutes.

Group 3- no-treatment control group.

In the no-treatment control group, the paired-stimulus preference assessment was conducted, followed by the “Delay Rules and Understanding Check.” Once the experimenter established that the participant understood the rules, the unchosen items were taken out of the room; leaving the chosen reward on the table, within view but out of reach. The waiting time began from the moment the experimenter shut the door. The experimenter returned when the participant hit the bell or got out of his/her chair for more than ten seconds. Participants in the

control group waited for as long as they could without any external cues. Only the participants who waited more than ten minutes could get fifteen-minute playing time with the reward.

Reward and termination of the session.

At the end of the experiment, experimenter entered the room and praised the participant for his/her patience and said:

“You are such a patient child and you have waited for ten minutes. You did a great job! You can play ___ (naming the chosen reward) for fifteen minutes. I’ll set a fifteen-minute timer. When time is up, the timer will ring. Please give the ___ (naming the chosen reward) back to me when you hear the ring, ok?”

The experimenter also gave the participant compliment even if he/she could not achieve the full wait time of ten minutes and said:

“I heard your ringing bell (or You left your chair) and I know you are done, right? Anyway, you have waited for _ (naming the minutes that the participant had waited) minutes. You did a good job! But you understand that because you did not wait until I got back, you can play ___ (naming the chosen reward) for five minutes, ok? I’ll set a five-min timer and it will ring when five minutes are up. You will give it back to me when you hear the ring, right?”

The experimenter handed the chosen reward to the participant and allowed him/her to play until the timer rang.

Chapter 4. A Pilot Study

The Purpose of the Pilot Study

A pilot study tested the feasibility of implementing the proposed research study to delay gratification in three conditions: auditory, visual and no-treatment. The first purpose for the pilot study was to determine whether a ten-minute waiting time of delay of gratification was appropriate for four- and five-year-olds. The second purpose for the pilot study was to establish the observable behavioral criteria for children in the study delaying gratification and criteria for when they were not delaying gratification for the purposes of reliable observations during the actual study. The third purpose for the pilot study was to ascertain the feasibility of the proposed study and identify possible unexpected challenges in the application of the actual experimental conditions. The fourth purpose for this pilot study was to determine the rewards that children in the study would find most rewarding for them.

Participants

As in the regular study for the pilot study, participants from the United States (US) and China had to meet the following criterion: 1) be between the age of four to six years old, 2) experience no developmental delays as reported by the caregivers, 3) be of Asian ethnicity.

Nine children participated in the pilot study (see Table 1). Four children (i.e., three boys and one girl) from Hilltop Child Development Center (HCDC) in Lawrence, Kansas and five children (i.e., three boys and two girls) from Zhuhai, Guangdong Province, China participated in the pilot study. Among these nine children, two HCDC children and five Chinese children participated in the no-treatment control group. Two children from the HCDC participated in the

auditory and visual conditions respectively. The reason why a total of seven children was placed in the control group was to determine whether the ten-minute waiting period was appropriate.

Table 1

Number of children in each experimental condition in the pilot study

	Control Group	Auditory Group	Visual Group
US	2	1	1
China	5	0	0

Settings and Procedures

All physical settings and procedures employed in the pilot study were identical to the ones in the proposed study in order to control the testing environments. Experiments with the children in the U.S. were conducted in the meeting room of HCDC. The children in China were studied in the meeting room in Huasheng Industrial Area, Zhuhai, Guangdong Province. Both rooms were reserved in advance so that no interruptions would occur during the experiment.

Discussion of Results

Children in both treatment conditions were able to wait the entire test duration of ten minutes to receive their rewards. Only one child in the control group made full wait (i.e., ten minutes, fourteen seconds). Children in the control group averaged seven minutes and twenty-four seconds before they terminated the experiment (e.g., left their chair or rang the bell signaling a desire to terminate).

One female HCDC participant in the control group squatted on the chair while waiting

and then walked out of the experimental room at six minutes, sixteen seconds reporting that she did not want to stay alone any more. Three participants in the control group in China also left the chair within ten minutes as a sign of termination. Another Chinese participant in the control group terminated by reaching out for the iPad reward, unlocking it and starting to play. These five control group participants are all examples of children who terminated their session early, however, these participants used various self-distraction strategies to increase their wait time. They sang songs, talked to themselves or played with their fingers and hair while they waited. Only one participant who made full wait (i.e., ten minutes, fourteen seconds) in the control group in China stood up and touched the reward several times, but he sat back down in the chair afterwards, so he was not terminated.

It should be noted that one U.S. HCDC child in the control condition reported that he needed to use the restroom at two minutes, fourteen seconds, resulting in the termination and missing data for this participant. Consequently, a protocol was established whereby participants were asked to use the bathroom prior to the study.

As a result of these observations, it was determined that permissive behaviors would include waiting alone in the experimental room with patience and without getting upset or throwing temper tantrum, not getting out of the chair for more than ten seconds, squatting or squirming in the chair, turning or looking around, minimal movement and self-verbalization.

Table 2 and Table 3 showed the frequency, percentage and ranking of reward selection in children in the pilot study. In the U.S., all HCDC participants chose the iPad (100%) as their reward for delayed gratification whereas Chinese participants demonstrated a more equal and diverse selection of rewards when presented with the choices of iPad, Play-Doh, and a 3D book.

Table 2

Frequency of Reward Selection in U.S. vs. China in the pilot study

	iPad	Play-Doh	3D Book
US	4	0	0
China	2	2	1

Table 3

Frequency, percentage, and ranking for preferred rewards in the pilot study

Item	Frequency of selections	Percentage of selections	Rank
iPad	6	60.00%	1
Play-Doh	5	50.00%	2
3D Book	4	40.00%	3

Findings from the pilot study suggested that the auditory and the visual treatments were feasible as represented to help extend delay of gratification, and that a minimum ten-minute waiting period would be appropriate for children at this age for these three conditions.

Chapter 5. The Results of the Current Study

Description of Sample by Sex

There were a total forty-one participants in the study. As shown in Table 4, twenty-one female participants (51.2%) and twenty males (48.8%) were randomly assigned into three groups. Chi-Square test results showed that there was no significant difference in gender distribution for the total of all three groups (Pearson Chi-square value=0.053, p=0.974).

As can be observed, all three groups were approximately matched in size and in sex representation.

Table 4

Sex distribution in all three groups

	Female	Male	Total
Audio	7 (50.0%)	7 (50.0%)	14 (100.0%)
Visual	7 (50.0%)	7 (50.0%)	14 (100.0%)
Control	7 (53.8%)	6 (46.2%)	13 (100.0%)
Total	21 (51.2%)	20 (48.8%)	41 (100.0%)

Age (in months) Distribution for the Sample by Treatment Group

Descriptive statistics for mean age (in months) of the participants was summarized in Table 5. Mean age in the audio group was five years five months (65.64 months); SD=4.069. In the visual group, mean age was five years seven months (67.79 months); SD=2.665. In the control group, mean age was five years four months (64.77 months); SD=4.419. The overall mean age was five years six months (66.10 months); SD=3.897.

The one-way ANOVA, $F(2,38)=2.305$, $p=.114$, suggested no significant difference in mean age for the total of all three groups.

Table 5

Mean age (in month) for Experimental Condition

Group	n	Mean	SD	Range
Audio	14	5 years 5 months (65.64)	4.069	1 year 3 months (15)
Visual	14	5 years 7 months (67.79)	2.665	10 months
Control	13	5 years 4 months (64.77)	4.419	1 year 4 months (16)
Total	41	5 years 6 months (66.10)	3.897	1 year 4 months (16)

Results of Paired-Stimulus Preference Assessment

The results of the Paired-Stimulus Preference Assessment (see Table 6) showed that Play-Doh was the item the participants chose most (68.29%), followed by the 3D book (43.90%) and the iPad (37.80%).

Table 6

Frequency, Percentage and ranking for Stimulus Preferences

Item	Frequency of children selecting each item	Percentage of children selecting each item	Rank
Play-Doh	56	68.29%	1
3D book	36	43.90%	2
iPad	31	37.80%	3

Mean, SD, Median, Mode, and Range of Waiting Time (in seconds) for the Total of All Three Groups (maximum ten minutes)

Table 7 showed the mean, SD, Median, Mode, and Range of waiting time (in seconds) in each group and for the total of all three groups.

Mean waiting time in the audio group was 9 minutes 50 seconds (590.07 seconds). SD=20.38, Median=10 minutes (600 seconds), Mode=10 minutes (600 seconds), Range=1 minute 1 second (61 seconds).

Mean waiting time in the visual group was 7 minutes 45 seconds (465.21 seconds). SD=2 minutes 20 seconds (140.18 seconds), Median=7 minutes 59 seconds (479 seconds), Mode=10 minutes (600 seconds), Range=6 minutes 35 seconds (395 seconds).

Mean waiting time in the control group was 6 minutes 9 seconds (369.15 seconds), SD=3 minutes 13 seconds (193.35 seconds), Median=5 minutes 30 seconds (330 seconds), Mode=10 minutes (600 seconds), Range=8 minutes 56 seconds (536 seconds).

The overall mean waiting time was 7 minutes 57 seconds (477.39 seconds), SD=2 minutes 41 seconds (161.37 seconds), Median=9 minutes 18 seconds (558 seconds), Mode=10 minutes (600 seconds), Range=8 minutes 56 seconds (536 seconds).

Table 7

Mean, SD, Median, Mode, Range of waiting time (in seconds) in each group and for the total of all three groups

	n	M	SD	Median	Mode	Range
Audio	14	9 min 50 sec (590.07)	20.38	10 min (600)	10 min (600)	1 min 1 sec (61.00)
Visual	14	7 min 45 sec (465.21)	2 min 20 sec (140.18)	7 min 59 sec (479.00)	10 min (600)	6 min 35 sec (395.00)
Control	13	6 min 9 sec (369.15)	3 min 13 sec (193.35)	5 min 30 sec (330.00)	10 min (600)	8 min 56 sec (536.00)
Total	41	7 min 57 sec (477.39)	2 min 41 sec (161.37)	9 min 18 sec (558.00)	10 min (600)	8 min 56 sec (536.00)

Mean, Median, Mode, and Range of Waiting Time (in seconds) for the Total of All Three Groups by Sex (maximum ten minutes)

Table 8 showed the mean, median, mode and range of waiting time (in seconds) for the total of all three groups by sex.

For male participants in the audio groups, mean waiting time was 9 minutes 45 seconds (585.29 seconds), SD=25.72, Median=10 minutes (600 seconds), Mode=10 minutes (600 seconds), Rang=1 minute 1 second (61 seconds). For male participants in the visual group, mean waiting time was 6 minutes 39 seconds (399.57 seconds), SD=2 minutes 48 seconds (168.23 seconds), Median=7 minute 1 second (421 seconds), Mode=10 minutes (600 seconds), Range=6 minutes 35 seconds (395 seconds). For male participants in the control group, mean waiting time was 5 minutes 45 seconds (344.67 seconds), SD=3 minutes 7 seconds (187.01 seconds), Median=5 minutes 22 seconds (322 seconds), Mode=1 minute 40 second (100 seconds), Range=8 minutes 20 seconds (500 seconds).

For female participants in the audio group, mean waiting time was 9 minutes 54 seconds (594.86 seconds), SD=13.61, Median=10 minutes (600 seconds), Mode=10 minutes (600 seconds), Range=36. For female participants in the visual group, mean waiting time was 8 minutes 50 seconds (530.86 seconds), SD=1 minute 4 second (64.97 seconds), Median=8 minute 7 seconds (487 seconds), Mode=10 minutes (600 seconds), Range=2 minutes 9 seconds (129 seconds). For female participants in the control group, mean waiting time was 6 minutes 30 seconds (390.14 seconds), SD=3 minutes 30 seconds (210.97 seconds), Median=8 minutes 1 second (481 seconds), Mode=10 minutes (600 seconds), Range=8 minutes 56 seconds (536 seconds).

Table 8

Mean, Median, Mode, Standard Deviation and Range of waiting time (in seconds) among three groups by sex

	n	M	SD	Median	Mode	Range
Audio_Male	7	9 min 45 sec (585.29)	25.72	10 min (600.00)	10 min (600.00)	1 min 1 sec (61.00)
Visual_Male	7	6 min 39 sec (399.57)	2 min 48 sec (168.23)	7 min 1 sec (421.00)	10 min (600.00)	6 min 35 sec (395.00)
Control_Male	6	5 min 44 sec (344.67)	3 min 7 sec (187.01)	5 min 22 sec (322.00)	1 min 40 sec (100.00)	8 min 20 sec (500.00)
Audio_Female	7	9 min 54 sec (594.86)	13.61	10 min (600.00)	10 min (600.00)	36.00
Visual_Female	7	8 min 50 sec (530.86)	1 min 4 sec (64.97)	8 min 7 sec (487.00)	10 min (600.00)	2 min 9 sec (129.00)
Control_Female	7	6 min 30 sec (390.14)	3 min 30 sec (210.97)	8 min 1 sec (481.00)	10 min (600.00)	8 min 56 sec (536.00)

Mean Differences of Waiting Time (in second) between Males and Females (maximum ten minutes)

Table 9 showed the mean difference in waiting time (in seconds) between males and females for the three groups. Mean waiting time of females was 8 minutes 25 seconds (505.29 seconds), SD=2 minutes 29 seconds (149.50 seconds), Median=10 minutes (600 seconds), Mode=10 minutes (600 seconds), Range=8 minutes 56 seconds (536 seconds). Mean waiting time for the male was 7 minutes 28 seconds (448.10 seconds), SD=2 minutes 51 seconds (171.84 seconds), Median=8 minutes 48 seconds (528 seconds), Mode=10 minutes (600 seconds), Range=8 minutes 20 seconds (500 seconds).

Results from an Independent Sample t-test (t statistics=1.138, p=.262) showed no significant difference in mean waiting time (in seconds) between males and females.

Table 9

Mean differences of waiting time (in second) between males and females

	n	M	SD	Median	Mode
Female	21	8 min 25 sec (505.29)	2 min 29 sec (149.50)	10 min (600.00)	10 min (600.00)
Male	20	7 min 28 sec (448.10)	2 min 51 sec (171.84)	8 min 48 sec (528.00)	10 min (600.00)

Group Effect

Descriptive statistics in Table 10 showed that the audio group had the longest mean waiting time (in seconds) which was 9 minutes 50 seconds (590.0714 seconds). Mean waiting time in the visual group was 7 minutes 45 seconds (465.2143 seconds) and in the control group was 6 minutes 9 seconds (369.1538 seconds). The mean waiting time across three group was 7

minutes 57 seconds (477.3902 seconds).

Table 10

Descriptive statistics for mean waiting time (in seconds) for all three groups

	n	M	SD	Std. Error	95% CI	
					LL	UL
Audio	14	9 min 50 sec (590.07)	20.38	5.44752	578.3028	601.8401
Visual	14	7 min 45 sec (465.21)	2 min 20 sec (140.18)	37.46473	384.2766	546.1519
Control	13	6 min 9 sec (369.15)	3 min 13 sec (193.35)	53.62487	252.3153	485.9924
Total	41	7 min 57 sec (477.39)	2 min 41 sec (161.37)	25.20145	426.4562	528.3243

Note. CI = confidence interval; LL = lower limit, UL = upper limit.

Table 11 presented the number of full wait participants vs. non-full wait participants by experimental condition.

Table 11

Number of full wait participants vs. non-full wait participants by experimental condition

	Auditory	Visual	Control
Full-wait	11	5	3
Non-full wait	3	9	10

One-way ANOVA, $F(2,38)=8.895$, $p=.001$, suggested that there was a significant difference in mean waiting time across the three groups of participants.

To Further determine the pairwise difference in mean waiting time, Post Hoc tests (Scheffe and Bonferroni) were used.

The results of both Scheffe and Bonferroni Post Hoc tests (see Table 12) suggested that there was a significant difference in mean waiting time between audio and control group (Scheffe: $p=.001$; Bonferroni $p=.000$). Participants in audio group had a longer mean waiting time than those in the control group (difference=220.9 seconds). There was no significant difference in mean waiting time between audio and visual group, or between visual and control group.

Table 12

Post Hoc tests (Scheffe and Bonferroni) for mean difference in waiting time (in seconds) across the three groups

		Mean		Sig.	95% CI		
Group		Difference	Std. Error		LL	UL	
Scheffe	Audio	Visual	124.85714	51.64421	.066	-6.7053	256.4195
		Control	220.91758*	52.62799	.001	86.8490	354.9862
	Visual	Audio	-124.85714	51.64421	.066	-256.4195	6.7053
		Control	96.06044	52.62799	.203	-38.0081	230.1290
	Control	Audio	-220.91758*	52.62799	.001	-354.9862	-86.8490
		Visual	-96.06044	52.62799	.203	-230.1290	38.0081
Bonferroni	Audio	Visual	124.85714	51.64421	.062	-4.4916	254.2059
		Control	220.91758*	52.62799	.000	89.1048	352.7304
	Visual	Audio	-124.85714	51.64421	.062	-254.2059	4.4916
		Control	96.06044	52.62799	.227	-35.7524	227.8732
	Control	Audio	-220.91758*	52.62799	.000	-352.7304	-89.1048
		Visual	-96.06044	52.62799	.227	-227.8732	35.7524

* $p < .05$.

Chapter 6. Discussion and Conclusion

General Findings

The purpose of the study was to investigate how a scaffolded approach to waiting using auditory or visual cues to determine the passage of time could help young children delay gratification. The main finding of the experiment showed that the auditory modality had the longest delaying time. A significant difference was observed in the waiting time between the auditory treatment and control group (Scheffe: $p=.001$; Bonferroni: $p=.000$). There was no significant difference in mean waiting time between auditory and visual group perhaps due to the rather small sample in this study. It should be noted anecdotally, however, that the mean waiting time in the auditory group was two minutes, five seconds longer than that in the visual group. The visual group did not show a significant difference from the control group, though participants in the visual group had longer mean waiting times as compared to the control group.

In the previous study of external cues in a delay of gratification task, the results showed that children displayed better abilities to delay gratification when given visual cues (i.e., stickers) compared to auditory cues (i.e., verbal encouragement) (Lee, 2014). One explanation for this result may be suggested in a study by Lee (2014). In Lee's (2014) study, an adult was present throughout the process and gave prompts (i.e., handing out the stickers) in an incremental interval serving as a strong visual stimulus. On the other hand, the experimenter in the present study stepped out of the room and the child waited alone with the timer in the visual treatment thus perhaps serving as a weaker visual stimulus to the child. Most participants distracted themselves to pass the time by looking around. Few viewed the timer consistently throughout the ten minutes, further reducing the visual stimulus value. Consequently, the visual stimulus in the

current study may not have been as salient as the Lee (2014) study wherein the participants were rewarded with stickers as visual reinforcers by a researcher who was present in the room. It should be noted that unlike the participants in this study, the participants in Lee's (2014) study were young children with autism, who needed more focus on the visual cue as well as salient visual stimuli may have been necessary for them.

The theory of delay gratification assumes that children who are able to tell time will be better able to delay gratification (Sargent, 2014). For children at this age, whose attentional abilities are considered limited, the visual cues may need more salience to gain young children's attention than are required for the processing of auditory cues (Droit-Volet, Meck & Penney, 2007). Children presented with the auditory cue were better able to understand how much time passed during the experiment and mostly followed counting along with the tape. In addition, Rammsayer (2010) noted that children in "filled intervals" (i.e., a duration filled by actions) had better duration discrimination than the ones experiencing "empty intervals" (e.g., an empty duration between two discrete actions). Without an adult giving prompts (visual or auditory) at intervals, the waiting task for the visual modality in this study had more tendency to act as an "empty interval". Children in the auditory group could either count along with the tape, or overhear the time passing on the tape, which made the auditory modality in this study served as "filled interval". This may explain why participants in the auditory condition had more clues for time passage and waited longer than the ones in the visual group.

Anecdotal observations made during the experiment showed that young children at this age have already adopted some positive self-distraction strategies during waiting, e.g., singing songs, pretending to play piano on the table, making ponytails, doing selfies, engaging self-talk, etc. These phenomena were observed in all three groups, especially in the control group that had

no external cues available while waiting. However, none of the participants in the visual group spontaneously employed the counting strategy, but the ones in the auditory group who were explicitly instructed to count were all using the counting strategy during the task. This observation was identical with Wilkening's (1987) findings.

There were three participants who waited for the full wait time (ten minutes) in the control group. The first full-wait boy started to talk to himself at six minutes thirty-eight seconds: " I really want to ring the bell. But if I ring I can only play (Play-Doh) for five minutes. I should wait. But ten minutes is too long and I have to check on a clock. (He looked around) But where is the clock? There's no time here." This boy finally waited for ten minutes and eight seconds. The second girl who waited for eleven minutes and forty-seven seconds was making a silly face on the desk bell and playing with zippers on her clothes. The third boy who waited for ten minutes and eleven seconds pretended to play piano on the table.

It should be noted that children at this age may adopt private speech as a self-regulation strategy. Vygotsky (1962) believed that language may play a critical role in young children's cognitive development. Typically from the age of three, young children develop private speech to plan activities and strategies. Vygotsky also believed that extensive use of the private speech could aid social competence and self-regulation of behaviors. Private speech is overt, while at around the age of seven, private speech is transformed into covert inner speech.

It also should be noted that a girl in the visual group rang the bell at five minutes, fourteen seconds and told the experimenter that she had already waited for ten minutes.

These phenomena showed that children at this age already have some knowledge about time, though they don't have a very clear concept about time durations. In addition, they also came up with the idea that they should wait with a clock. These results suggest that education on

time concept is necessary to facilitate delaying ability for four- and five-year-olds and that salient visual stimuli in showing the passage of time are important.

Discussion of Parenting Styles and Dimensions Questionnaire (PSDQ)

According to parents of the forty-one children who participated in filling out the PSDQ results, thirty-nine of the parents reported themselves as subscribing to the Authoritative parenting style. The two remaining parents reported themselves as one being an Authoritarian and the other one as Permissive.

Historically, Chinese parenting has been described as “controlling” and “authoritarian” (Chao, 1994). The change in parenting styles occurred with changes in societal development in recent years. The one-child policy was enacted in 1979 in China to limit population growth. The parents of the first generation of children born under the one-child policy were mostly born in the 1950s and went through the ten-year cultural revolution starting in 1966 (Clark, 2008). They did not receive good educations, let alone sufficient knowledge about child rearing (Deng, 1997). Meanwhile, China has experienced rapid economic and social development because of Chinese economic reforms since 1978, compared to the years of famine these 1950s parents had experienced during their early childhoods (Chen, 1997). Under these new circumstances, these 1950s parents tended to be willing and able to offer extensive supplies and benefits that they themselves were denied in their early childhoods. Consequently, their children who were born under the one-child policy were sometimes described as capricious and self-centered (Zhang, 2001). However, these children born under the one-child policy were better educated, raised with diverse values and more open to the international influence compared to their parents (Xie, 2004; Fong, 2006), and they are now reaching parenthood. Due to the incremental release of

restrictions on the flow of information from abroad, Chinese parenting styles of this new generation have been undergoing changes because of a more open society and influences from the outside world. Zhao (2011) summarized the changes that Chinese families have experienced in recent decades: 1) Better financial status and more supply of educational sources; 2) Greater variety of family structures (e.g., multi-national families, step families, single-parent family, families with left-behind children, etc.) yielding greater variety of education concepts; 4) the change of family functions (e.g., from cultivation, multiply to social, entertainment). Consequently, families in the past believed “the more children, the more labor” while the present-day parents prefer fewer children to be able to afford more sources for education and personal development. Family concepts have also been transitioning from authoritarian to open-minded and democratic, from controlling to interactive (Zhao, 2013).

However, the child with Authoritarian parents and the child with Permissive parents both revealed a poorer delay of gratification compared to their peers with Authoritative parents. The child of authoritarian parents could wait three minutes, twenty-five seconds in the visual condition, with four minutes, twenty seconds difference lower than the mean time in the visual condition (i.e., seven minutes, forty-five seconds). The child of permissive parents waited three minutes, twenty-seven seconds in the control group and was also two minutes, forty-two seconds lower than the mean time in the control group (i.e., six minutes, nine seconds). They both also showed lower waiting time compared to the overall mean time for the total of all three groups, which was seven minutes, fifty-seven seconds.

In addition, no sex difference was revealed in this study. Male preference has been common in older generations due to the reliance on male labor in traditional agrarian economy and the goal of continuing patrilineal lineage (Zhou, C., Wang, & Zhou, X.D., 2012; Das Gupta

et al., 2003, Fong, 2002), which raises the question of the influence of higher education, more tolerance resulting in the “spoiled phenomenon” for boys. Nevertheless, there was evidence showing that male preference has been weakening nationwide, especially among the younger peers (Fong, 2002). Studies have suggested that the one-child policy contributed to a greater level of gender equality in educational attainment, because the families with only one girl fully invested in her education and future development compared to the families with male siblings in the past (Lee, 2012; Zhang, 2009). The birth ratio is also improving for girls and the value of girls is increasing tremendously, almost equal to the status of boys in the urban area (Fong, 2002). As a result, the male preference may not apply much today and there may be less difference in how males are treated in parenting than females. This may help explain the reason why no sex difference was revealed in this study. Nevertheless, female participants performed a slightly longer mean waiting time (i.e., eight minutes, twenty-five seconds) than their counterparts did (i.e., seven minutes, twenty-eight seconds).

This study was done during the one-child policy in China. The assumption was made that each participant was the only child in the family. Verification of that assumption was not possible due to the possibility that parents of the participants may not be willing to volunteer information about a delicate issue like this because of the cultural and political reasons in the country.

Discussion of Rewards Selections

Of the three rewards provided in the study, Play-Doh was the most selected reward for the participants in China (68.29%). In the second place was a 3D book (43.90%), followed by the iPad (37.80%). Quite a few children mentioned that the iPad was not good for their eyesight, or

mentioned that their mom said they should not play with the iPad for more than 5 minutes. One child mentioned there was an iPad at home but he never played with it. Since grandparents lived with his family (which was common in China), they always took him to the community playground when he wanted to watch TV at home. In comparison, children in the U.S. chose iPad 100% of the time. Play-Doh is still an expensive imported toy in China and the day care has a limited supply of Play-Doh because it is easy to get color-mixed, dirty and dried, or leave stains on the carpet. The novelty of the reward may explain why children in China showed greater interest in play-Doh. Several children also mentioned that they had never seen a 3D book before and this selection had aroused their curiosity. As a result, we may surmise that on one hand, Chinese parents might have restrictions on children playing with electronic toys, consequently, their children may pay more attention to alternative toys that fit in with their parents' toy guidelines.

Limitation

This study was conducted with a small sample of forty-one participants which may not be fully representative of all four- and five-year-olds. This study has been done in South China, so further studies would need to be done to determine the generalizability of results in China and elsewhere. It was possible that children who completed the experiment went back to the classroom and talked about their experiences in the experimental room with their peers who were also in the study. This may have skewed participants' expectations and behaviors during the study. The parenting questionnaire was also based on subjective responses and it may not reflect the true educating phenomenon at home. The visual cue in this study was not salient enough to gain young children's attention, which might be the reason for poorer ability to delay

gratification in the visual group compared to in the auditory group.

Future Concerns

First, the salience of the visual cue (e.g., flashing lights) for young children should be taken into consideration in the future study. Second, an adult experimenter providing the visual cue during the experiment might also play a role in the differential findings, thus increasing the stimulus magnitude of the visual condition study. Third, this study should be replicated with a larger sample and in different regions of China. A contrasting group studied in the U.S. would also be interesting. Fourth, there may be different results if two or more participants were completing the task at the same time and the result also may be different in an environment with more distractions. The experimental room in this study was specially designed to reduce distractions and control outside variables. Fifth, the study was conducted during the one-child policy. Two-child policy was put in effect since October 27, 2015, a relatively short time after the completion of the study. Different findings might be found in China now because of this potential change in family structure. It would be an interesting research question to test.

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Appendix A

IRB ID: STUDY00002101 Approval Period 2/23/2015 to 2/22/2016
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Parent Consent Form

Understanding Time Concept to Help Delay Gratification in Young Children

Background

I am a graduate student in Dept. of Psychology and Research in Education in the University of Kansas. I am conducting a study as part of my requirements for the master's degree in education at the University of Kansas. If you and your child could participate, it would be highly appreciated. The study is about delay of gratification in early childhood, which is a useful skill for children and is appreciated by parents. Improvement of the ability to delay gratification in young children will result in subsequent academic success, better social competence, better emotional coping strategies and so on. Your participation will help to investigate more information and new skills to facilitate children's ability to delay gratification.

Introduction

The Department of Psychology and Research in Education at the University of Kansas supports the practice of protection for human subjects participating in research. The following information is provided for you to decide whether you wish your child to participate in the present study. You may refuse to sign this form and not allow your child to participate in this study. You should be aware that even if you agree to allow your child to participate, you are free to withdraw at any time. If you do withdraw your child from this study, it will not affect your relationship with this school, the services it provides to you.

Purpose of the study

The purpose of the study is to research how a scaffolded approach to waiting with auditory and visual cues to determine the passage of time could help young children delay gratification.

Procedures

The Participants for this study will be 45 students in the five-year-old class in Nan Shan day care in Zhuhai, Guangdong Province, China. Prior to the start of the study, parents of the child participants will be asked to fill out 30 items in the Chinese version of "Parenting Styles and Dimensions Questionnaire". The questionnaire is expected to take approximately 10 to 15 minutes to complete. For protecting your confidentiality, an envelope will be provided along with the questionnaire, you should seal your questionnaire in it before you take it back to the teacher in the class within three days. The experimenter will also be at the school to collect it.

The participants will be randomly assigned into one of the three groups (i.e., auditory, visual and no-treatment control) during the experiment. The whole session for each participant will be around 20 to 30 minutes. Prior to the start of the study, the experimenter will make sure all the child participants have had breakfast, lunch and snacks in the day care and will make sure the participants have had the opportunity to use bathroom before the experiment begins.

A digital video baby monitor will be set up in order to observe participant's behavior during the delay of gratification, as well as a camcorder to videotape every session for subsequent data collection and analysis. Only the principle investigator will be transcribing the recordings, and have access to the recordings. The video will be stored in a safety box at experimenter's home at Rm. 201, Bld. 154, Hua Fa New Town, Zhuhai, Guangdong Province, China. And they will be erased in December 2015, upon submission of the final thesis.

The participants will be asked to choose a desired reward through the paired-stimulus assessment. They can play with the reward for fifteen minutes if they wait alone for more than ten minutes. The participants will be randomly assigned into three waiting conditions. In the auditory condition, the participants will wait with an audio track of counting seconds and minutes on a digital recorder. Participants in the visual condition will wait with a digital timer. There will be no external cues for control group during waiting. The participant will be asked to wait alone in the room with the delayed reward. The experimenter will return when the participant hits the desk bell, gets out of his/her chair for more than ten seconds, or at the end of the ten minutes wait period.

Risks

There will be no risk in the process of this study.

Benefits

Through this study, you may find some new ideas to support your child and facilitate the ability to delay gratification in daily life, without getting your child frustrated or out of control. You will also have a better understanding of the parenting style that you adopt.

Participant confidentiality

All of the participants' forms will be marked with a code number only; participants' names will not appear on their response sheets. You and Your child's name will not be associated in any publication or presentation with the information collected about your child or with the research findings from this study. You and your child's identifiable information will not be shared. Only group results will be included in subsequent publications.

Permission granted on this date to use research results is restricted to the use of group data only. By signing this form you give permission for the use and disclosure of the group data collected in this study. No individual child data will ever be used or disclosed for any purpose in the future.

Refusal to sign consent and authorization

You are not required to sign this Consent and Authorization form and you may refuse to do so without affecting your right to any services you are receiving at the Nan Shan Day Care. However, if you refuse to sign, your child cannot participate in this study.

Canceling this consent and authorization

You may withdraw your consent to allow participation of your child in this study at any time. You also have the right to cancel your permission to use and disclose further information collected about your child, in writing, at any time, by sending your written request to: Yan Wang,

Rm 201, Bld. 154, Huafa New Town, Zhuhai, Guangdong, China 519080. Or: Yan Wang, 208 Joseph R. Pearson Hall, 1122 West Campus Rd., Lawrence, Kansas 66045-3101, USA. Or: email to y375w030@ku.edu

If you cancel permission to use your or your child's information, the researchers will stop collecting additional information about your child. However, the researcher may use the information that was gathered before she received your cancellation, as described above.

Questions about participation

Please feel free to contact the principle investigator with any questions you may have concerning the study. Please call her or email her at the address below.

Participant certification:

I have read this Consent and Authorization form. I have had the opportunity to ask, and I have received answers to, any questions I had regarding the study. I understand that if I have any additional questions about my child's rights as a research participant, I may call the principle investigator, Yan Wang, at +86 18902877122 or email to y375w030@ku.edu. I may also call the faculty supervisor, Robert Harrington PhD., at +001 785 864 9709 or email to rgharrin@ku.edu.

Please check whether you agree to permit your child to participate in the study and complete the questionnaire. **Please return this parental consent form to the teacher in the class within three days.**

1) I AGREE to permit my child to participate in the study and complete the Parenting Style and Dimension Questionnaire questionnaire. By my signature I affirm that I am the parent who is at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____	_____	_____
Print Participant's Name	Date	Parent/Guardian Signature

2) I DO NOT AGREE to permit my child to participate in the study or complete the Parenting Style and Dimension Questionnaire. By my signature I affirm that I am the parent who is at least 18 years old and that I have received a copy of this Consent and Authorization form.

_____	_____	_____
Print Participant's Name	Date	Parent/Guardian Signature

Researcher Contact Information

Yan Wang
 Principle Investigator
 Rm 201, Bld 154
 Hua Fa New Town
 Zhuhai, Guangdong, China 519080
 y375w030@ku.edu
 +86 18902877122

Robert Harrington
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 School of Education
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Appendix B

家长-监护人同意声明

IRB ID: STUDY00002101 Approval Period 2/23/2015 to 2/22/2016
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幼儿对时间观念的理解与延迟满足的关系

介绍

本项对实验对象的保护政策由堪萨斯大学教育心理系支持并实施。以下提供给您信息将由您来决定是否同意您的小孩参与这项研究。您可以拒绝小孩参与本项研究并拒绝签署本声明。即使您签署了同意书，也可以在任何时候撤回你的同意书。您拒绝参与本项研究并不影响您和学校的任何关系。

研究目的

本项研究的目的是利用听觉和视觉的线索帮助幼儿建立时间观念，进而帮助幼儿提高延迟满足的能力。

实验过程

实验对象是中国广东省珠海市南山幼儿园五岁班的幼儿。他们会被随机分配到以下三组的其中一组（听觉组，视觉组，对照组）。每个实验对象的实验时间大约为 20 到 30 分钟。实验者会确定所有的实验对象都在校吃过早餐或午餐，并在实验开始之前带他们去上厕所。

视频监控器会在安装在实验室以便观察实验者在实验过程中的行为，同时还有一部录像机记录视频，以便日后的数据收集与分析。主实验者会保管保险箱钥匙，并有权处理视频资料，所有视频资料会存储在主实验者家里的保险柜并在 2015 年 12 月完成毕业论文时全部删除。主试验者家庭住址:广东省珠海市华发新城 154 栋 201 房。

实验者的家长会被请求填写一份“家长教育形态问卷”，此问卷一共有 30 道问题。为了保护您的隐私,您可以将问卷放入附送的信封之内封好,让小孩带回班级。该问卷大概需要 10 到 15 分钟来完成。

在实验的开始，实验者会让实验对象选择一个最具吸引力的玩具。然后实验者被随机分为三组，第一组听觉组的实验对象会在一段时间录音中等候，第二组视觉组会在等候的时候会有一个计时器，第三组为无任何外在线索的控制组。只要实验者能独自等候 10 分钟，就能有 15 分钟的玩具玩耍时间，否则，只能玩 5 分钟。如若实验对象敲响铃子，或者离开座位超过 10 秒，或者 10 分钟到，实验者都会立即回到实验室，实验结束。

益处

通过本次实验，您可能会发现一些新的方式来帮助您的孩子在日常生活中发展延迟满足能力，而不会让他因失去耐心而崩溃沮丧或者完全失控。您也可以更了解自己的教育形态。

实验对象的保密性

您和您孩子的名字，以及关于本次实验的结果都不会出现在任何发布的文章或者讲座上，实验者会使用实验代号来代替名字。您和您孩子的任何可识别信息都不会被公开。接下来的论文发布仅包括群体数据。

您所签署的同意仅针对公开和使用本次实验提取的群体数据/信息。任何个人信息都不允许在将来以任何目的予以公开使用。

学院否认声明

本次实验不会造成任何人员伤害。本次实验无任何风险。

拒绝签署同意书及授权

你可以选择拒绝签署本同意书，您孩子所接受的任何教育和服务都不会有影响。不过如果您拒绝签署，您的孩子就不会参与本次实验。

撤销同意及授权

您可以在任何时候撤销您的同意和授权。您也有权撤销对您小孩所采集信息的利用，您可以写信至：中国广东省珠海市华发新城 154 栋 201 房，王艳（收），519080 或者 Yan Wang, 208 Joseph R. Pearson Hall, 1122 West Campus Rd., Lawrence, Kansas 66045-3101, USA. 或者发电子邮件至 y375w030@ku.edu

如果您撤销您的同意书，不再同意使用您和您小孩的信息，实验者会停止收集关于你们的信息。但是，在收到您的撤销声明之前，如上所述，您的信息依然会被使用。

对于参与的疑问

如果您对此次参与有任何疑问，请尽管按照以下电话或者电子邮件方式联系主实验者。

参与者授权

我已经阅读这项同意和授权书，关于本次实验任何问题，我已有机会提问并已得到解答。我理解如果我对于孩子在参与本次实验过程中的权益还有任何问题，我可以联系 18902877122, 或者发送电子邮件至 y375w030@ku.edu, 或者联系研究主管 Robert Harrington, 拨打电话+001 785 864 9709 或发送邮件至 rgharrin@ku.edu.

1) 我同意让我的孩子作为实验对象参与本次研究并填写家长教育形态调查问卷。本人已年满 18 周岁，并已收到同意书的拷贝文件。

家长姓名（正楷）

日期

家长/监护人签名

2) 我不同意参与本次试验。本人已年满 18 周岁，并已收到同意书的拷贝文件。

家长姓名（正楷）

日期

家长/监护人签名

王艳

Robert Harrington

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Appendix C

Parenting Styles Questionnaire

Please rate how often you engage in the different parenting practices, listed below. Scores range from “Never” to “Always” on a 5-point scale. At the end of each section, add up the scores and divide it by the number of questions in that section. The calculated score is your total score for that category. The highest score indicates your preferred parenting style.

Authoritative Parenting Style

1. I am responsive to my child’s feelings and needs:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
2. I take my child’s wishes into consideration before I ask him/her to do something:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
3. I explain to my child how I feel about his/her good/bad behavior:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
4. I encourage my child to talk about his/her feelings and problems:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
5. I encourage my child to freely “speak his/her mind”, even if he/she disagrees with me:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
6. I explain the reasons behind my expectations:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
7. I provide comfort and understanding when my child is upset:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
8. I compliment my child:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
9. I consider my child’s preferences when I make plans for the family (e.g., weekends away and holidays):

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
10. I respect my child’s opinion and encourage him/her to express them:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
11. I treat my child as an equal member of the family:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
12. I provide my child reasons for the expectations I have for him/her:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------
13. I have warm and intimate times together with my child:

Never	1	2	3	4	5	Always
-------	---	---	---	---	---	--------

Scoring: Total score / 13 =

Authoritarian Parenting Style

1. When my child asks me why he/she has to do something I tell him/her it is because I said so, I am your parent, or because that is what I want:
 Never 1 2 3 4 5 Always
2. I punish my child by taking privileges away from him/her (e.g., TV, games, visiting friends):
 Never 1 2 3 4 5 Always
3. I yell when I disapprove of my child's behavior:
 Never 1 2 3 4 5 Always
4. I explode in anger towards my child:
 Never 1 2 3 4 5 Always
5. I spank my child when I don't like what he/she does or says:
 Never 1 2 3 4 5 Always
6. I use criticism to make my child improve his/her behavior:
 Never 1 2 3 4 5 Always
7. I use threats as a form of punishment with little or no justification:
 Never 1 2 3 4 5 Always
8. I punish my child by withholding emotional expressions (e.g., kisses and cuddles):
 Never 1 2 3 4 5 Always
9. I openly criticize my child when his/her behavior does not meet my expectations:
 Never 1 2 3 4 5 Always
10. I find myself struggling to try to change how my child thinks or feels about things:
 Never 1 2 3 4 5 Always
11. I feel the need to point out my child's past behavioural problems to make sure he/she will not do them again:
 Never 1 2 3 4 5 Always
12. I remind my child that I am his/her parent:
 Never 1 2 3 4 5 Always
13. I remind my child of all the things I am doing and I have done for him/her:
 Never 1 2 3 4 5 Always

Scoring: **Total score** / 13 =

Permissive Parenting Style

1. I find it difficult to discipline my child:
 Never 1 2 3 4 5 Always
2. I give into my child when he/she causes a commotion about something:

- | | | | | | | | |
|----|------------------------------------|---|---|---|---|---|--------|
| | Never | 1 | 2 | 3 | 4 | 5 | Always |
| 3. | I spoil my child: | | | | | | |
| | Never | 1 | 2 | 3 | 4 | 5 | Always |
| 4. | I ignore my child's bad behaviour: | | | | | | |
| | Never | 1 | 2 | 3 | 4 | 5 | Always |

Scoring: Total score / 4 =

Parenting Styles: On the lines below you can record the rank order of your preferred parenting styles:

- 1)Score:
- 2)Score:
- 3)Score:

Based on: Robinson, C., Mandleco, B., Olsen, S. F., & Hart, C. H. (1995). Authoritative, authoritarian, and permissive parenting practices: Development of a new measure. *Psychological Reports*, 77, 819-830.

Appendix D

家长教育形态问卷

请按照您最常用的教育方式评分。评分标准按照“从不”到“经常”，以5分制评分。每部分总分相加再除以题数，计算所得分数就是这部分的总分，最高分代表您最常用的教育形态。

权威式教育形态

1. 我对孩子的感受和需求有回应。

从不 1 2 3 4 5 总是

2. 我要求孩子做的事情会考虑他/她的愿望。

从不 1 2 3 4 5 总是

3. 我对孩子好的/坏的行为解释我不同的感受。

从不 1 2 3 4 5 总是

4. 我鼓励孩子说出他/她的感受或者困难。

从不 1 2 3 4 5 总是

5. 我鼓励孩子自由“表达他/她的意见”，即使他/她的意见跟我有分歧。

从不 1 2 3 4 5 总是

6. 我会解释我提出要求的原因。

从不 1 2 3 4 5 总是

7. 孩子不开心的时候我会提供安慰和理解。

从不 1 2 3 4 5 总是

8. 我会表扬我的孩子。

从不 1 2 3 4 5 总是

9. 我做家庭计划的时候会考虑孩子的喜好（比如周末和假期出游活动）

从不 1 2 3 4 5 总是

10. 我尊重孩子的意见，鼓励他/她表达意见。

从不 1 2 3 4 5 总是

11. 我把孩子当作家庭平等的一员对待。

从不 1 2 3 4 5 总是

12. 我会解释要求他/她做某件事的原因。

从不 1 2 3 4 5 总是

13. 我和孩子享有温暖和亲密的时间。

从不 1 2 3 4 5 总是

评分： 总分 _____ / 13 =

独裁式教育形态

1. 当孩子问我为什么他/她必须做某件事时，我告诉他/她因为我这样吩咐了，我是家长，或者因为我想他/她这么做。

从不 1 2 3 4 5 总是

2. 我惩罚孩子的方式是剥夺他/她的权利（比如，看电视，玩游戏，去朋友家玩）

从不 1 2 3 4 5 总是

3. 如果我不喜欢他的行为，我会大声呵斥。

从不 1 2 3 4 5 总是

4. 我在孩子面前发过脾气。

从不 1 2 3 4 5 总是

5. 当我不喜欢他/她的行为或言语，我会打他/她。

- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
6. 我会批评孩子，以帮助他/她改进。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
7. 我会用威胁作为惩罚，而不提供原因。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
8. 我以不再提供情感支持来惩罚孩子（比如亲吻和拥抱）
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
9. 如果他/她的行为达不到我的期望，我会公开批评他/她。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
10. 我觉得自己很难改变孩子对事物的想法和感受。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
11. 我觉得很需要指出孩子过去所作的错误行为，以确保他/她不会再犯。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
12. 我提醒孩子我是他/她的家长。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|
13. 我提醒孩子我正在和已经为他/她做的所有事情。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|

评分： 总分____ / 13 =

纵容式教育形态

1. 我感觉很难约束孩子。
- | | | | | | |
|----|---|---|---|---|------|
| 从不 | 1 | 2 | 3 | 4 | 5 总是 |
|----|---|---|---|---|------|

2. 孩子一吵闹我就会退让。

从不 1 2 3 4 5 总是

3. 我很溺爱我的孩子。

从不 1 2 3 4 5 总是

4. 我忽视孩子错误的行为。

从不 1 2 3 4 5 总是

评分： 总分 ____ / 13 =

家长教育形态总结：

1) _____ 评分：

2) _____ 评分：

3) _____ 评分：

Appendix E
Paired-Stimulus Preference Assessment Form

List of stimulus items

1. Ipad
2. Play-Doh
3. 3D Book

Preference Assessment

Place items two at a time in front of child. Say, "Which one do you prefer". Circle the number picked. Pair each item with each other item as indicated by number. Determine percentage of preference based on number of times chosen divided by number of trials.

Trial # Stimulus item

1. 1-2
- 2 1-3
3. 2-3

Percent of Trials Chosen for Each Item

Stimulus Item	Number of times chosen /	Number of trials	=	Percent of trials chosen
1.) _____	_____ /	_____	=	_____
2.) _____	_____ /	_____	=	_____
3.) _____	_____ /	_____	=	_____

Rank Order of Stimulus Items

1. _____
2. _____
3. _____