

Explicit and Implicit Measures of Weight-related Attitudes in Young Children: Associations  
with Perspective Taking and Executive Function

by

Sarah Michelle Hutchison  
MSc, University of Victoria, 2010  
BA, Athabasca University, 2008

A Dissertation Submitted in Partial Fulfillment  
of the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

in the Department of Psychology

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## **Supervisory Committee**

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**Supervisor**

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Dr. Vivienne Temple (School of Exercise Science, Physical and Health Education)  
**Outside Member**

## **Abstract**

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Weight-based stigmatization refers to negative beliefs and weight-related attitudes that are demonstrated through rejection, bias, stereotypes, and prejudice towards individuals because they are overweight or obese. With weight stigma prevalent and on the rise, assessment of factors associated with weight stigma is important in developing effective interventions for children. The goal of this study was to investigate weight stigma in relation to perspective taking skills and executive function (EF). Sixty-two 4- to 7-year-olds were administered measures of weight stigma (explicit and a Weight Implicit Association Test; Weight IAT), perspective taking skills, and EF. As expected, most children demonstrated the stereotype that fat was bad on explicit and implicit measures. Results showed that explicit weight stigma increases with age, and perspective taking skills and EF were not associated with weight stigma. The findings suggest that weight stigma increases with age and that early intervention is needed to reduce weight stigma.

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## **Dedication**

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## Chapter 1: Introduction

Being overweight is considered to be “one of the most stigmatizing and least socially acceptable conditions in childhood” (p. 1818, Schwimmer, Burwinkle, & Varni, 2003). Weight-based stigmatization<sup>1</sup> refers to negative beliefs and weight-related attitudes that are demonstrated through rejection, bias, stereotypes, and prejudice towards individuals because they are overweight or obese<sup>2</sup> (Puhl & Latner, 2007). Research suggests that not only is stigma based on weight prevalent and on the rise, it poses significant risks for poor physical and emotional functioning (Eisenberg, Neumark-Sztainer, Haines, & Wall, 2006; Puhl & Suh, 2015). For instance, Puhl, Luedicke, and Heuer (2011) found that the majority of adolescents (84%) reported they had seen overweight peers teased during physical activities (i.e., gym class) at school, which was consistent with prior work that overweight students avoid physical activity due to weight criticism and teasing (Bauer, Yang, & Austin, 2004; Faith, Leone, Ayers, Heo, & Pietrobelli, 2002; Storch, Milsom, DeBraganza, Lewin, Geffken, & Silverstein, 2007). Weight stigma is as important a problem as discrimination against children with disabilities or racial discrimination, and if this prejudice is not addressed the same sources of bias will harm future generations of overweight and obese children (Puhl & Latner, 2007).

It is important to consider explicit and implicit measures of weight stigma as research suggests that stereotypes can be separated into two underlying processes: (a) controlled, conscious and explicit processes; and (b) automatic, unconscious, and implicit processes

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<sup>1</sup> Weight stigmatization is also known in the literature as weight stigma, weight bias, negative stereotypes of obesity, fat stereotypes, obesity stigmatization, body size stigmatization, weight discrimination, weight-based victimization, anti-fat prejudice, body size stigmatization attitudes (BSSA), anti-fat beliefs, among others. Throughout the paper I will use the term weight stigma for simplicity.

<sup>2</sup> Throughout the dissertation, I use the term “overweight” when making distinctions between categories of body sizes, and use “obese” or “obesity” only when used by other researchers in terms of its official classification, a body mass index of 30 or more. One main reason is that in colloquial discourse, people more commonly refer to being somewhat or very “overweight”, rather than making refined, diagnostic categorizations of themselves and others.

(Devine, 1989; see Killen, McGlothlin, & Henning, 2008, for a review of studies using explicit and implicit measures with children). The majority of studies has focused on explicit (e.g., self-report) measures of weight stigma; however, more recently, there has been a marked shift toward examining the influence of controlled and automatic processes on weight stigma in child and adult samples (e.g., Brewis & Wutich, 2012; Roddy & Stewart, 2012; Solbes & Enesco, 2010). Studies have found that attitudes and stereotypes can operate unconsciously (implicit) which are distinguishable from conscious cognition at the neural (e.g., Cunningham et al., 2004) and behavioural levels (e.g., Dovidio, Kawakami, & Gaertner, 2002). The practice of judging people on the basis of the groups they belong to (e.g., race, gender, sexuality, weight) continues to persist despite universal condemnation, and these judgments are related to a range of explicit behaviours such as hiring decisions (Bertrand & Mullainathan, 2004; Dovidio & Gaertner, 2000; Pingitore, Dugoni, Tindale, & Spring, 1994) or whether to shoot a suspected criminal (Correll, Park, Judd, & Wittenbrink, 2002; Payne, 2001). Explicit measures of weight stigma have been administered to children and weight stigma has been demonstrated in children as young as two years of age (e.g., Turnball, Heaslip, & McLeod, 2000). Research has demonstrated that overweight children are targets of stigma from a very young age, and additional work is needed to understand how to reduce weight stigma. Unfortunately, interventions to reduce weight stigma among children have had limited success (Anesbury & Tiggemann, 2000; Bell & Morgan, 2000; Fitzgerald, Heary, & Roddy, 2013), and there is a need to develop interventions to reduce obesity without blaming the individual for their weight status (Adler & Stewart, 2009).

One way to develop more effective interventions for weight stigma is to examine other forms of prejudice. Perspective taking skills and cognitive processes may be factors deserving of research attention. For instance, perspective taking skills have been associated with diminished

expression of stereotypes (Galinsky & Moskowitz, 2000), and the persistence of gender stereotyping has been traced to the cognitive operations that support components of the person perception process (e.g., Bodenhausen & Macrae, 1998; Fiske & Neuberg, 1990). Further, individuals tend to think about others categorically (i.e., based on group membership), a social-cognitive tactic that dominates response generation and information processing (Bodenhausen & Macrae, 1998; Brewer, 1988; Fiske & Neuberg, 1990; Kunda & Spencer, 2003; Macrae & Bodenhausen, 2000). Thus, in this study I investigated the relation between perspective taking skills, cognitive factors (Executive Function, EF), and weight stigma in young children. The study contributes to our understanding of the relation between stereotyping, perspective taking skills, and EF. Further, if we can better understand the factors related to this prejudice at an early age then this information can be used to develop more effective early education interventions for kindergarten or elementary school to reduce weight stigma. This developmental period may be a particularly important one to examine these associations, as some research suggests that weight stigma may increase as children age (Chalker & O’Dea, 2009; Crystal, Watanabe, & Chen, 2000; Greenleaf, Chambliss, Rhea, Martin, & Morro, 2006; Turnbull, Heaslip, & McLeod, 2000).

In this chapter, I provide background information on weight stigma, followed by a brief review of weight stigma and perspective taking skills. Then theories of prejudice and stereotype formation are discussed to provide context for the review on weight stigma and EF. The background information and theories provide the basis for deriving the hypotheses explored in this study. Finally, I outline the current study.

## **Background Information**

In this section I briefly review empirical studies on weight stigma, how it is typically measured (explicit and implicit measures), age-related differences in weight stigma, and the relation between weight stigma and body weight. For each subsection, I will first review explicit measures of weight stigma then implicit measures of weight stigma.

**Explicit measures.** The systematic assessment of explicit weight stigma against overweight children first occurred in the early 1960s. Two methods were used in this line of research. The first method had participants evaluate a set of figures. Richardson, Goodman, Hastorf, and Dornbusch (1961) asked 10- and 11-year-olds to rank a standard set of drawings of children who differed only with respect to physical disability (no physical condition, crutches, wheelchair, hand amputation, facial disfigurement, being overweight). Children were shown these figures matched on children's gender. The figures were placed in random order in front of children, and the experimenter asked, "Which child do you like best?". Children pointed to one drawing, which was removed. The experimenter then asked, "Which child do you like next best?". This process continued until a complete ranking was obtained. Results showed that the overweight figure ranked last of the six pictures and was rated as being the least likeable. Other studies using similar assessments of attitudes showed bias among a range of samples including children (Solbes & Enesco, 2010), adults, and adults working with disabled children (Goodman, Dornbusch, Richardson, & Hastorf, 1963; Maddox, Back, & Liederman, 1968; Richardson & Royce, 1968). More recently, Latner and Stunkard (2003) used the same figures and procedures from the classic 1961 study with fifth and sixth graders. Results showed that the overweight figure was given the lowest mean ranking (4.97) and the majority of children (70.1%) ranked the overweight figure last or second to last. Further, there was a significant decrease in the ranking

of the overweight figure from the 1961 study (4.56) to the 2003 study (4.97), suggesting that weight stigma by children may have increased over the 40 year period.

The second method involved assigning adjective pairs (e.g., quiet/ loud) to a set of figures (e.g., thin, average, and overweight figures). When asked to assign negative and positive adjectives to the three figures, 6- to 11-year-olds ascribed unfavourable characteristics to the overweight figure (e.g., dirty, lies, lazy), and when children were asked who they preferred to look like, both girls and boys preferred not to look like the overweight figure (Staffieri 1967, 1972). Further, 86% of 5- and 6-year-olds said they did not want to look like the overweight figure (Lerner & Gellert, 1969). Additional studies have found that more negative personality constructs are associated with the under- and over-weight body builds than the average body builds in children (e.g., Stager & Burke, 1982), in adolescents, and adults (e.g., Collin & Plahn, 1988). In these early studies, children as young as five years of age were able to identify stereotypes (Lerner & Gellert, 1969; Lerner & Korn, 1972; Staffieri, 1967); however, the validity of these early studies has been questioned because the forced choice format used in the measurement of the stereotypes may produce misleading results (Jarvie, Lahey, Graziano, & Framer, 1983; Lerner, Knapp & Pool, 1974). For instance, an adjective such as “lazy” was presented and the participant assigned it to only one of the body builds regardless of whether the adjective did or did not fit. In other words, participants were not allowed to assign the characteristic to all the figures.

Instead of using the forced choice format, Stager and Burke (1982) developed a different method to measure weight stigma of children and adolescents. Children were administered a series of semantic differential rating scales all using the same 12 adjective pairs used by Staffieri (1967). For instance, children were shown a scale that looked like this: quiet: 3; 2; 1; 0; 1; 2; 3;

loud, and children circled a value. Ratings were obtained for self concept and the body build (thin girl, fat girl, thin boy, fat boy). Using discriminate function analysis, results showed that fat children were described as having fewer friends, more often teased, less good looking, braver, and stronger than thin children, and that stereotypes were invariant across grade level and gender.

The adjective task has been modified by multiple researchers and invariably produces the same results, an unfavourable representation of the overweight figure in 4- to 11-year-olds (Brylinsky & Moore, 1994; Cramer & Steinwert, 1998; Musher-Eizenman, Holub, Miller, Goldstein, & Edwards-Leeper, 2004; Margulies, Floyd, & Hojnoski, 2008; Solbes & Enesco, 2010). Preschoolers endorsed anti-fat and pro-thin bias regardless of whether the task used stories (Cramer & Steinwert, 1998; Harrison, 2009; Solbes & Enesco, 2010; Spiel, Paxton, Yager, 2012), photographs of children (Meers, Koball, Oehlhof, Laurens, & Musher-Eizenman, 2011), or “rag dolls” (Dyrenforth, Freeman, & Wooley, 1978). One exception was a study with a sample of African American children that did not find a significant difference between figures (Margulies et al., 2008). The authors suggest the reason why they did not find a significant difference may be because African Americans often experience overweight and obesity in their cultural group; thus, African American children in the sample may be more accepting of overweight children.

**Implicit measures.** The adjective task and the evaluation of figures tasks can be described as explicit measures of attitudes; however, expressed attitudes can be contaminated or influenced by extraneous factors such as self-preservation bias (Spence, 2005). Children’s self-reports are subject to distortion by impression management, a lack of introspective access (Brody, Rozek, & Muten, 1985; Richman, Berry, Bittle, & Himan, 1988), and social desirability exerts a stronger

influence on attitude expression during childhood and into adolescence (Heyman & Legare, 2005; Rutland, Cameron, Milne, & McGeorge, 2005). In adults, positive but weak correlations have been observed between explicit and implicit measures, especially in socially sensitive domains such as stereotypes (e.g., Hofmann, Gawronski, Gschwendner, Le, & Schmitt, 2005). This dissociation may be due to motivational differences as implicit measures are considered to be less susceptible to social desirability (Cvencek, Meltzoff, & Greenwald, 2011). Further, it is important to measure implicit and explicit attitudes in the same study with children as early developmental experiences may influence implicit more than explicit cognition (Liben & Bigler, 2002; Rudman, 2004).

There are several implicit measures of attitudes for preschool and young children including memory recall, ambiguous situations task, human figure drawing, and the implicit association test (IAT) (for review, see Cvencek, Meltzoff, & Baron, 2012). The IAT is a computerized task developed by Greenwald, McGhee, and Schwartz (1998) for measuring implicit attitudes in adults. It is a sorting task in which words are presented on a computer screen, and the participant is required to rapidly sort the words by pushing one of two keys on a keyboard. Reaction times are recorded, and a difference in reaction times is thought to reveal underlying associations between pairs of items.

There are also several implicit measures for assessing weight stigma which are beyond the scope of the current study (for review, see Morrison, Roddy, & Ryan, 2009). A weight attitude IAT has been used with adults and requires individuals to classify stimuli representing fat, slim, good, and bad as fast as they can in a timed test. In one set of trials, good words and slim words share a response key, similarly, bad words and fat words share the other response key (Task A). For individuals with preferences for thin individuals, this would be a very fast and

easy task, called a congruent task, as it matches their attitudes. In another set of trials, two of the response assignments are reversed, such that good words and fat words share one response key, similarly, bad words and slim words share the other key (Task B). For individuals with preferences for thin individuals, this would be more difficult task, called an incongruent task, as it does not match their attitudes. The IAT is based on the principle that it is faster and easier to give the same response to items belonging to two categories if they are more strongly associated in memory than if they are not. Individuals with more positive attitudes toward thin individuals (i.e., thin = good) should respond faster in the congruent trials (Task A) than the incongruent trials (Task B).

One study with 199,329 10- to 60- year-olds used a Weight IAT and found that 69% of the sample preferred thin people and 12% implicitly preferred fat people; there were little to no differences across age groups (Nosek et al., 2007). Most studies have also demonstrated an implicit weight stigma in adults (Anselmi, Vianello, & Robusto, 2011; Grover, Keel, & Mitchell, 2003; Schwartz, Chambliss, Brownell, Blair, & Billington, 2003; Teachman & Brownell, 2001; Teachman, Gapinski, Brownell, Rawlins, & Jeyaram, 2003), however, one study found that women in Paraguay expressed explicit weight stigma and did not demonstrate implicit weight-stigma, suggesting that implicit weight stigma may vary across different socioecological contexts (Brewis & Wutich, 2012).

More recently, studies have started to extend downward to late childhood and adolescence to understand implicit attitudes toward a variety of topics. The Child IAT was created to examine how implicit attitudes develop in 5- to 18-year-olds to examine race attitudes (Baron & Banaji, 2006). Several modifications were undertaken to make the IAT child appropriate, including using a large response button (colour matched with each side of the

screen) instead of standard keyboard, in addition to using pictures and sound to communicate concepts. The Child IAT was administered to Caucasian 6-year-olds, 10-year-olds, and adults. The same level of implicit racial bias was observed in all three age groups, and explicit measures of racial bias decreased with age, with 6-year-olds having the highest level of racial bias and adults self-reporting egalitarian attitudes towards Caucasians and African Americans. Similarly, Rutland and colleagues (2005) administered a racial IAT to children and found that the IAT score was not affected by children's concerns for self-preservation or knowledge of social norms. Following the development of the Child IAT, several researchers have used similar paradigms to measure implicit attitudes of children over four years of age on a variety of topics including: race (Newheiser, Dunham, Merrill, Hoosain, & Olson, 2014; Newheiser & Olson, 2012), religion (Heiphetz, Spelke, & Banaji, 2013), math stereotypes (Cvencek, Meltzoff, & Greenwald, 2011; Steffens, Jelenec, & Noack, 2010), nature (Bruni, & Schultz, 2010), weight stigma (Roddy & Stewart, 2012; Solbes & Enesco, 2010; Thomas, Burton Smith, & Ball, 2007), among others.

In a similar vein, the Preschool IAT (PSIAT) was developed for 3- to 6-year-olds to be more age appropriate by making it more effective for children who cannot not yet read (e.g., audio and visual of words), by reducing working memory demands (e.g., visual reminders), and by sustaining children's attention during the task (e.g., shorter protocol) (Cvencek, Greenwald, & Meltzoff, 2011). The PSIAT was administered to 65 4-year-olds to measure implicit gender attitudes. The findings showed strong in-group attitudes, girls had more positive attitudes toward girls and boys had more positive attitudes towards boys. Further, implicit and explicit measures of gender were significantly correlated and each predicted unique variance in parent reports of gendered activities (e.g., playing with trucks vs. dolls). The PSIAT demonstrates promising psychometric characteristics (Cronbach's alpha .85-.88) and has a low attrition rate (14%), which

was comparable to the 5-10% attrition rate in IAT experiments with adults. Administering a Weight IAT to 3- to 7-year-olds, Thomas et al. (2007) observed thin preferences, indicated by mean response times being significantly shorter on congruent pairings (thin and good, fat and bad) than incongruent pairings (thin and bad, fat and good) regardless of age. Similar results were also found with older children (Roddy & Stewart, 2012; Solbes & Enesco, 2010).

There are several limitations of using the IAT. For example, the IAT may be sensitive to demand effects (i.e., adult participants produce desired IAT scores if they think that the experimenter expects them to; De Houwer, Beckers, & Moors, 2007). Numerical values of the IAT have also been questioned (e.g., Blanton & Jaccard, 2006a; b; c) and this issue has been addressed by Greenwald and colleagues (e.g., Greenwald, Nosek, & Sriram, 2006; Greenwald, Rudman, Nosek, & Zayas, 2006). Brendl, Markman, and Messner (2001) examined the inference of prejudice in a series of experiments using an IAT with clearly positive and negative categories to nonwords. Results showed that participants changed their response criterion during the IAT, suggesting that response patterns can have multiple causes (e.g., familiarity with items), and that the IAT cannot be used to infer prejudice. However, despite these limitations, a meta-analysis found that the IAT has predictive validity independent of explicit measures, and the IAT tends to be a more sensitive predictor of behaviour (e.g., discrimination) than explicit measures (Greenwald, Poehlman, Uhlmann, & Banaji, 2009)

**Age-related differences in weight stigma.** I first summarize studies that have examined age-related differences in explicit weight stigma and then implicit in weight stigma. Growing evidence indicates that explicit weight stigma behaviour starts early; however, studies that have explored weight stigma in relation to age have been mixed. Some studies suggest that weight stigma increases during specific developmental periods, and others suggest that weight stigma

decreases during specific developmental periods. For instance, one study with 2- to 5-year-olds demonstrated that weight stigma in children as young as 2 years of age, with older children (45-60 months) demonstrating significantly higher rates of weight stigma than the younger children (30-44 months) (Turnball, Heaslip, & McLeod, 2000). In addition to toddlers demonstrating preferences for healthy weight children, they also demonstrate other social preferences. In one study, a group of Caucasian 3-year-olds marginally preferred toys endorsed by a same-race child than a different race child (Shutts, Banaji, & Spelke, 2010), and two studies with 3-year-olds demonstrated gender bias (Shutts et al., 2013; Shutts et al., 2010).

Another study with preschoolers found that weight stigma significantly increased between 3- to 5-year-olds (Cramer & Steinwert, 1998). In a similar vein, preschoolers tend to select their own racial group in choice tasks, assign positive attributes to their ingroup, and negative attributes to their outgroup (Aboud, 1988; Aboud & Amato, 2001; Cristol & Gimbert, 2008). This favouritism has been demonstrated extensively in many countries such as the United States, Canada, Britain, Spain, among others (for review, see Hailey & Olson, 2013).

Among older children, Sigelman, Miller, and Whitworth (1986) found that weight stigma significantly increased with age in 4- to 8-year-olds, and weight stigma also increased in 4- to 11-year-olds (Wardle, Volz, & Golding, 1995). In boys, cross-sectional studies have documented significant increases in weight stigma between 8- to 12-year-olds (Lawson, 1980) and between 4- to 20-year-olds (Lerner & Korn, 1972). Weight stigma has been consistently observed in other cross-sectional studies with elementary children and youth ranging from 7- to 16-year-olds (e.g., Chalker & O'Dea, 2009; Greenleaf et al., 2006; Kraig & Keel, 2001; Richardson et al., 1961), although these studies did not examine age-related differences and instead focused on gender or racial differences.

Evidence also suggests that age effects may not increase linearly, that age effects may not be present at all, and that weight stigma may actually decrease with age. For example, one study with preschoolers, first graders, third graders, and fifth graders found that the majority preferred the healthy to the overweight stimulus child; however, this difference was only significant for the first graders (Adams, Hicken, & Salehi, 1988). Another study with kindergarteners, first graders, second graders, third graders, and fourth graders found that weight stigma was present in the first or second grade and appeared to develop in a linear fashion. However, there may be some fluctuation during this developmental period as quadratic and cubic trends were approaching significance, suggesting that weight stigma may not develop in a linear fashion (Brylinsky & Moore, 1994). The authors concluded that a larger sample size would be needed to explore exactly how weight stigma may change with age during elementary school. Research on racial attitudes in 6- to 10-year-olds also seems to demonstrate a non-linear pattern as ingroup favouritism appears to follow a curvilinear pattern, peaking around 5 to 7 years and then declining around age 8 to 10 years with no developmental trend found in adolescence (for a meta-analytic review of age trends, see Raabe & Beelmann, 2011).

One study did not find an increase of weight stigma in 7- and 12-year-olds (Tiggemann & Wilson-Barrett, 1998), whereas other studies have suggested weight stigma may decrease with age. For instance, a study with 7- to 17-year-olds found that weight stigma was greater among younger children (Gray, Simon, Janicke, & Dumont-Driscoll, 2011), and another study with 6- to 11-year-olds found that weight stigma significantly decreased with age, especially among 10- and 11-year-olds (Solbes & Enesco, 2010). Another study with fifth graders and eleventh graders in Japan and the United States found that, in both countries, more eleventh graders demonstrated less weight stigma than fifth graders (Crystal, Watanabe, & Chen, 2000). Rand

and Wright (2000) had fourth graders, fifth graders, adolescents, university students, and middle-age adults rate body size figures (9 figures ranging from very thin to obese), and found that children rated significantly fewer body sizes as acceptable compared to all other groups. Further, adolescents rated significantly fewer body sizes as acceptable compared to university students and middle-age adults; however, there were no significant differences between university students and middle-age adults. More recently, college students ranked overweight figures more favourably than elementary children (Latner, Stunkard, & Wilson, 2005; Latner & Stunkard, 2003).

Taken together these studies tentatively suggest that explicit weight stigma may peak during childhood, decrease during adolescence and early adulthood, and remain constant into middle-age adulthood. Latner and Schwartz (2005) suggested that the initial increase in weight stigma during childhood may be related to internalization and awareness of cultural norms about weight, followed by a decrease in weight stigma during adulthood. However, these changes in weight stigma may coincide with changes in perspective taking skills and EF that occur from the preschool period to adulthood. All studies on weight stigma have been cross-sectional which limits the ability to determine the extent to which weight stigma changes throughout childhood, adolescence, and adulthood (Puhl & Latner, 2007).

Compared to explicit attitudes, implicit attitudes seem to be stable across development. For example, an IAT measuring racial prejudice in children have not found age differences, with age effects being strong in children as young as 6 years of age and remaining unchanged until 18 years of age (e.g., Baron & Banaji, 2006; Degner & Wentura, 2010; Newheiser & Olson, 2012; Rutland et al., 2005). Studies using Weight IAT have also not found age differences in 6- to 11-year-olds (Solbes & Enesco, 2010). However, one study suggests that ingroup preferences may

interact with social learning about the status of one's own group. For example, Hispanic children as young as five years of age demonstrated no preference for their ingroup compared to the Caucasian majority, and similar results were obtained from older Hispanic children and adults (Dunham, Baron, & Banaji, 2007). Further, the same Hispanic children demonstrated ingroup preference when their group was compared to African Americans, suggesting that implicit attitudes were sensitive to whether the outgroup was socially advantaged or not. In sum, whereas implicit attitudes appear to be stable over time, explicit attitudes may peak during middle childhood.

**Relations between weight stigma and body weight.** I first summarize studies that have examined relations between explicit weight stigma and body weight and then the relation between implicit weight stigma and body weight. There is evidence that overweight and obese children are just as likely to endorse explicit negative stereotypes and attitudes about obesity as average weight children. Among preschoolers, Cramer and Steinwert (1998) found that weight stigma persisted regardless of children's body weight. There does not seem to be a relation between weight stigma and children's Body Mass Index (BMI) as two studies with preschoolers did not find a significant association between BMI and weight stigma (Margulies et al., 2008; Musher-Eizenman et al., 2004). BMI did not affect ratings of overweight targets in 7- to 9-year-olds (Kraig & Keel, 2001), and another study with 9-year-old girls did not find a relation between body weight and weight stigma, even though one-third of the girls were overweight and 14% were categorized as obese (Davison & Birch 2004). Similar findings have emerged in other studies with children (Counts, Jones, Frame, Jarvie, & Strauss, 1986; Latner et al., 2007; Latner, Stunkard & Wilson, 2005; Tiggemann & Anesbury, 2000) and adults (Crandall 1994; Latner et al., 2005; Neumark-Sztainer, Story & Harris, 1999; Wang, Brownell, & Wadden, 2004). Taken

together, these studies suggest that overweight and obese children may be internalizing negative stereotypes and attitudes, and there should be no differences in weight stigma between young children who are a healthy weight, overweight, or obese.

However, overweight or obese adolescents and adults may be more or less likely to endorse negative stereotypes and attitudes about obesity. Puhl et al., (2011) assessed 1555 adolescents and found that adolescents with lower BMI expressed more weight stigma than adolescents with higher BMI, even when controlling for gender, age, race, and grades. One study with a larger sample of adults detected a modest association between weight stigma and body weight (Schwartz, Vartanian, Nosek, & Brownell, 2006), and two studies have found that women who were overweight or had a higher body mass index tend to demonstrate less weight stigma (Holub et al., 2011; Teachman, et al., 2003). In sum, some studies with adults have found an association between explicit weights stigma and body weight and other studies have not.

The relation between implicit weight stigma and body weight has also been explored in a few studies. A study with 510 respondents (aged 12 to 70 years) who completed an online Weight IAT showed that healthy and obese respondents implicitly preferred thin people to fat people (Anselmi et al., 2011). However, studies with adults have also found that that having a higher BMI was associated with lower levels of implicit weight stigma (Swartz et al., 2003; Teachman & Brownell, 2001). Studies with children have not measured BMI in relation to implicit weight stigma (Roddy & Stewart, 2012; Solbes & Enesco, 2010; Thomas et al., 2007). In sum, it seems there are no differences between overweight or obese children and adolescents compared to their healthy peers in explicit weight stigma, and it is currently unknown if any differences would emerge on measures of implicit weight stigma.

## **Theories of Prejudice and Stereotype Formation: Why Study Cognition and Social Cognition?**

Weight stigma can be considered an ingroup bias (e.g., “healthy kids like me are smart, other children who are fat are lazy”), and there are a number of cognitive, affective, and motivational structures and processes that may underlie ingroup bias (for reviews, see Dovidio, Hewstone, Glick, & Esses, 2010; Nelson, 2009). Research on children’s intergroup attitudes tend to attribute them to early socialization processes via parents, the school, peers or the media (e.g., Smith & Mackie, 2007; Latner, Rosewall & Simmonds, 2007), but does not typically investigate cognitive factors. As an exception, Devine’s (1989) model on automatic versus controlled components of intergroup attitudes includes cognition. Specifically, it assumes that children acquire stereotypes through socialization experiences before developing the flexibility or the cognitive ability to critically assess the validity or acceptability of these beliefs. Some limitations of this model is that it does not specify the nature, sources or timing of these early socialization experiences (Degner & Dalege, 2013)

Another theory, the social-cognitive developmental theory (SCDT; Aboud, 1988; 2008), is a neo-Piagetian theory that suggests that prejudice at different ages is based on parallel developmental changes in children’s information processing (from affective to perceptual to cognitive) and attention (from self to groups to others). Specifically, the theory suggests that intergroup attitudes peak in 5- to 7-year-olds and decline due to emergence of new social and cognitive abilities (e.g., Doyle & Aboud, 1995). For instance, social abilities include perspective taking skills. The term perspective taking frequently refers to cognitive processes that result in knowledge about others (Eisenberg, Fabes, & Spinrad, 2006).

More recent accounts have adopted a multifaceted approach to children's development of ingroup attitudes. For example, social identity development theory (SIDT; Nesdale, 1999, 2001a, 2004; Nesdale et al., 2007) draws heavily on self-categorization theory (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) and social identity theory (Tajfel & Turner, 1979). Nesdale suggests that intergroup biases in early childhood are based on self-categorization, biased social comparisons, and ingroup identification (similar to adults) and emerges in children as soon as they develop the social and cognitive abilities for social comparison, self-identification, and social categorization around the age of 5 or 6 years (Nesdale & Flessner, 2001b). Thus, early childhood is an optimal developmental period to examine weight stigma as SIDT postulates that these changes in cognition may contribute to the development of ingroup bias.

In addition to Devine's model, the SCDT, and SIDT, other researchers have suggested that cognitive factors may be related to the development of stereotypes and prejudice. Specifically, social categories (e.g., race, gender, age) are believed to reside in long-term memory and inhibitory mechanisms are likely to play a role in person perception (Macrae & Bodenhausen, 2000). Further, higher cognitive processes, also known as executive function (EF), affects the regulation of stereotypical responses (Macrae, Bodenhausen, Schloerscheidt, & Milne, 1999). Thus, it is important to investigate the relation between weight stigma, perspective taking, and EF.

### **Weight Stigma and Perspective Taking Skills**

For the purpose of the present study, I adopt Selman's (1980) framework, according to which perspective taking consists of the developing capacity to integrate and differentiate social perspectives. Specifically, Selman described five levels of perspective taking. Each level consists of two parts: concepts of persons (i.e., the individual's understanding of internal

complexity; e.g., undifferentiated) and concepts of relations (i.e., how viewpoints are understood and coordinated; e.g., egocentric). The review is limited to the first three levels as the last two levels are beyond the age range of the sample.

*Level 0: Undifferentiated and Egocentric Perspective Taking (Age 3-6)*<sup>3</sup>. Selman and Byrne (1974) suggested that before level 0, children display no physical differentiation between the self as an individual and other individuals. In level 0, children do not clearly differentiate psychological and physical characteristics of individuals (undifferentiated). Children do not know that another individual may interpret a situation differently (egocentric).

*Level 1: Differentiated and Subjective Perspective Taking (Age 5-9)*. Children understand that there is a difference between psychological and physical characteristics of a person and thoughts, opinions or feelings are unitary and not mixed (differentiated). However, children are not able to preserve their own perspective while simultaneously taking on the perspective of another person (subjective).

*Level 2: Self-reflective/ Second-person and Reciprocal Perspective Taking (Age 7-12)*. In level 2, children become aware that they can take another person's perspective on his or her own actions and thoughts, in addition to the realization that others can do so as well (self-reflective). Children now understand the infinite possibility of perspective taking (e.g., I know that she knows that I know that she knows... etc.) (reciprocal). Selman's stage theory illustrates how perspective-taking ability develops throughout childhood and adolescence, with some individuals never reaching the highest levels of perspective taking (Selman, Beardslee, Schultz, Krupa, & Podorefsky, 1986).

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<sup>3</sup> Selman (1980) notes that all age-norms are approximate

One study has linked Selman's level of perspective taking to age-related changes in stereotypes. Rutland et al. (2005) proposed that older children are more aware of social norms against explicit prejudice and are externally motivated to suppress their prejudice. By contrast, children younger than 8 years of age are relatively poor at integrating and coordinating various psychological perspectives such as first-, second-, and third-person perspectives (Selman 1971, 1980) and less likely to suppress their prejudice. Two experiments examined implicit and explicit racial prejudice in 6- to 16-year-olds and manipulated public accountability (i.e., one group told they were being videotaped and the video may be watched later by adults). Results showed that 6-year-olds aware that discrimination was wrong and were able to suppress their explicit bias when under heightened public accountability, suggesting that 6-year-olds have awareness of social norms and are able to take the perspectives of others. Thus, to improve our understanding of relations between perspective taking skills and explicit attitudes, additional research is needed with young children.

### **Weight Stigma and Executive Function**

Weight stigma is demonstrated through stereotypes and prejudice towards individuals because they are overweight. As there is a lack of research on models of weight stigma, it is necessary to examine the literature on racial bias and stereotypes. Comparing weight stigma and racial bias is appropriate because they are both forms of social prejudice. Further, a qualitative study compared weight stigma and racial bias with African American adolescent girls because weight stigma and racial bias are often studied separately, and found that weight stigma was more hurtful and personal than racial bias (Neumark-Sztainer, Story, & Faibisch, 1998). Growing evidence illustrates the importance of executive function (EF) to regulate prejudiced behaviour (e.g., Klauer, Schmitz, Teige-Mocigemba, & Voss, 2010; Stewart, von Hippel, &

Radvansky, 2009). Thus, in this section I first define EF, then review the literature on racial prejudice and stereotypes in relation to general EF, and the three components of EF (working memory/ updating, inhibition, cognitive flexibility/ shifting). As there is more empirical support for a relation between inhibition and prejudice, there is less emphasis on working memory and cognitive flexibility (shifting). Examples of how these studies on racial prejudice or stereotypes may be related to weight stigma are presented as well. This section concludes with a brief discussion on why EF, and not other domains of cognitive functioning, is particularly important to examine.

Executive function (EF) refers to a family of top-down mental processes needed when you have to pay attention and concentrate because relying on instinct would be less than ideal or impossible (Diamond, 2013). Most researchers agree that in adults there are three components of EF: working memory (updating), shifting (cognitive flexibility, set shifting, mental flexibility, flexibility), and inhibition (e.g., Miyake et al., 2000). The latter component is often separated into different types of inhibition (e.g., Friedman & Miyake, 2004; Nigg, 2000) which will be discussed in more detail in the section on inhibition. EF has been associated with school readiness, quality of life, and mental health (for review, see Diamond, 2013).

One way to clarify the structure of EF is through the use of confirmatory factor analysis (CFA), which uses a priori hypotheses to specify tasks to load on underlying latent variables, and then the model is evaluated to determine how well it fits the data. The advantage of using CFA is that it extracts only the variance that is common to all the tasks intended to measure the same process, rather than using individual tasks to represent the factor. Miyake and colleagues (2000) distinguished three EF factors based on a literature review: shifting between mental sets, inhibition of prepotent responses, in addition to updating and monitoring representations in

working memory. They designed tasks to measure each component and administered these tasks to adults. The CFA demonstrated that the different tasks loaded on the inhibition, shifting, and updating factors (i.e., working memory). Further, the different latent factors were significantly correlated, which indicated a diversity (i.e., different factors are distinguishable empirically) and unity (yet, they are related) model of EF.

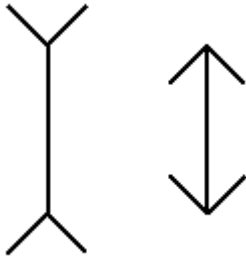
However, attempts to replicate the three factor structure of EF have been mixed in studies with preschool and school age children. CFA studies with preschoolers tend to support a unitary factor of EF (e.g., Hughes, Ensor, Wilson, & Graham, 2010; Wiebe, Espy, & Charak, 2008; Wiebe et al., 2011; Willoughby, Blair, Wirth, & Greenberg, 2010). In some of these studies a two factor solution (working memory and inhibition) still fit the data well, but rejected because a unitary factor was more parsimonious (Wiebe et al., 2008; 2011). Further, one CFA study has found the two factor solution, working memory and inhibition, fit the data better than a unitary model (Miller, Giesbrecht, Müller, McInerney, & Kerns, 2012). Among school age children, some researchers have found a three factor model (e.g., Lehto, Juujärvi, Kooistra, & Pulkkinen, 2003; Rose, Feldman, & Jankowski, 2011), whereas other researchers have found a two factor solution (working memory and shifting; Huizinga, Dolan, & van der Molen, 2006; van der Sluis, de Jong, & van der Leij, 2007).

**General executive function.** Several studies have investigated EF without differentiating among EF components, whereas other studies have examined the relation between specific components of EF (working memory, inhibition, cognitive flexibility) and forms of social prejudice (e.g., racial bias). I first review the generic studies and then review studies that have focused on specific components of EF. Recent experimental and neuroimaging studies provide evidence for an association between EF and racial bias. One way to measure racial prejudice is

the Weapons Identification Task (WIT, Payne, 2001), which primes participants with a pictures of either an African American or Caucasian and requires the participants to quickly categorize target objects, tools, and guns. Studies have shown that responses to guns are more accurate and faster following an African American prime than a Caucasian prime (Payne, 2001; 2005; Payne, Shimizu, & Jacoby, 2005).

There are two processes that may account for race bias: the *illusionary perception hypothesis* and the *executive failure hypothesis*. First, the illusory perception hypothesis suggests that participants misperceive objects in what amounts to a perceptual illusion and assumes that stereotypes are used as cues to resolve perpetual ambiguity (Payne, Shimizu, & Jacoby, 2005). For instance, when participants view the classic Mueller-Lyer illusion (see Figure 1), most participants assert that the left line looks longer, when the line on the right is slightly longer. One explanation for this illusion is that most situations in daily life, lines flanked by concave angles (e.g., the left arrow) recede away from us in depth (e.g., the corner of a room); conversely, lines flanked by convex angles (e.g., the right arrow) jut out toward us (e.g., the near corner of a table). In a similar vein, the illusionary perception hypothesis suggests that race cues provide a context in which the mind uses to “fill in” aspects of the scene while it transforms raw sensation into the perception of a meaningful object. Thus, when a person is shown an African American face (the race cue), this activates assumptions that result in the interpretation of some objects as weapons.

**Figure 1. The Mueller-Lyer illusion**



The *executive failure hypothesis* suggests that errors in perception can occur even when the perception of the object is intact, but people do not execute actions as they intend. EF is needed to plan and carry out selective behaviours to complete a goal. In order to complete the goal, there may be a need to override responses that are inappropriate and suppress distracting information. Using the Weapons Identification Task as an example, when race stereotypes are activated by the race cue (the African American face), there are two different streams of information that are available as bases for making a response: the actual target item or the accessible stereotype. The executive control performs a gating function by allowing the appropriate information to control the actions (the actual target object) and inhibiting the active stereotype. However, it is possible the executive control may fail, which means the active stereotype is not suppressed, and the participant may impulsively “select” weapon even when he or she perceives the object actually to be a tool. Thus, the executive failure hypothesis suggests that there is a lack of coordination between the eye, brain, and hand, which may cause participants’ actions to be biased even though they may be aware they have made an error (Payne et al., 2005).

To test whether racial bias was associated with the illusory perception hypothesis or the executive failure hypothesis, Payne and colleagues (2005) administered the Weapons Identification Task to undergraduate students. Participants were asked to respond twice to each item: once under time pressure (when executive control is limited, fast responses) and once at

their own pace (when participants had ample opportunity to control their responses). In the first experiment, participants were asked to rate their confidence in their judgment on a six point scale during the second response. In the second experiment, participants were asked to classify the item again as a weapon or tool during the second response. If participants' errors were due to a visual illusion, then their reports during the first response (gun or tool) should match their reports during the second response (certain or not certain the response was correct, gun or tool).

However, if participants' errors were due to executive failures, then their first response should be stereotypical, but not their second slower response. Further, their confidence judgment should discriminate between correct and incorrect responses, and their second response should be highly accurate even when their first response was incorrect. Results showed that participants did stereotypical patterns of misidentification during the fast conditions (i.e., indicating gun instead of tool when primed with an African American picture); however, when participants responded to the same item more slowly, all racial bias disappeared. The authors conclude that the illusionary hypothesis cannot be ruled out, but the results did support the proposal that racial bias was explained by executive failure.

Another reason why EF has been linked to racial bias is based on data from neuroimaging studies. Cunniff et al. (2004) found that when African American and Caucasian faces were presented too quickly to be consciously detected, African American faces evoked stronger amygdala responses than Caucasian faces. However, when the faces were presented more slowly, the difference in amygdala activation decreased, and African American faces evoked stronger activation in the prefrontal cortex and anterior cingulate cortex, which are brain areas associated with EF. These results are consistent with those of Richeson et al. (2003) who found that participants who had the strongest race bias on the Implicit Association Test (IAT) had

higher activation in similar EF regions in response to African American relative to Caucasian faces. IAT is a task intended to measure automatic associations by measuring changes in participants' performance on an objective task, rather than relying on self-reports (explicit associations) (Greenwald, McGhee, & Schwartz, 1998). Richeson and colleagues (2003) used a version of IAT that required participants to categorize White names, Black names, Positive words, and Negative words as quickly as possible by pressing one of two marked response keys. These two studies suggest that negative attitudes can be controlled and areas associated with EF may be involved in this control. Together, these lines of research illustrate the importance of EF to regulate prejudiced behaviour. Thus, EF may also be related to weight stigma among young children.

**Working memory (updating).** Working memory refers to the ability to hold information in mind and manipulate it (Baddeley & Hitch, 1994). Working memory is distinct from short-term memory as short-term memory is limited to holding information in mind. Working memory has been associated with social stereotypes. One study found that that higher working memory capacity was associated with greater control of a negative stereotype (Lambert, Seigmiller, Stefanucci & Watson, 2013). Thus, individuals with higher working memory capacity may be less likely to express other negative stereotypes such as “fat people are lazy”. However, more empirical evidence is needed to substantiate this claim as only one study has linked working memory and stereotypes.

**Inhibition.** Inhibition refers to the deliberate overriding of dominant or prepotent responses (Miyake & Friedman, 2012). However, there are several ways of distinguishing between different components of inhibition according to inhibition dimensions (Harnishfeger, 1995), or effortful control (Nigg, 2000). Friedman and Miyake (2004) have suggested three

inhibition related functions: Prepotent Response Inhibition, Resistance to Distractor Interference, and Resistance to Proactive Interference. The most relevant component of inhibition in relation to weight stigma is Prepotent Response Inhibition as it is the most common component of inhibition studied in relation stereotypes and other forms of prejudice (e.g., Payne, 2005; Richeson & Shelton, 2003; von Hippel, Silver & Lynch, 2000). Prepotent Response Inhibition refers to the ability to deliberately suppress dominant, automatic, or prepotent responses, and common tasks used to access this function are: Stroop task, Stop-signal, and Antisaccade task. In general, qualitative changes in different aspects of inhibition, including interference control and prepotent response inhibition, during the first six years of life are followed by more gradual changes that extend into adolescence and adulthood (Müller & Kerns, 2015).

Growing evidence suggests that inhibition skills are related to the expression of stereotypes and prejudice. Devine (1989) developed an influential model of prejudice and suggested that stereotypes become over-learned because of their societal prevalence and are activated when a person encounters individual members of the stereotyped group. Prejudiced individuals endorse the stereotypic thoughts that are automatically activated; conversely, non-prejudiced individuals inhibit those thoughts and replace them with more egalitarian beliefs.

Several models of stereotyping and prejudice have suggested that there is a role for unintended activation and intentional inhibition. For example, Gilbert and Hixon (1991) found that stereotyped activation is not inevitable; however, once stereotypes are activated, distracted participants (i.e., those who had to perform a simultaneously a verbal and non-verbal task) were more likely to apply them in judgment than participants who were not distracted (i.e., only performed the verbal task). These results suggest that effortful inhibition processes may be important for preventing activated stereotypes from influencing judgment. Further,

Bodenhausen (1990) found that when people are off-cycle in their circadian rhythm, they are more likely to apply stereotypes. Taken together, these results suggest that individuals may prevent themselves from relying on stereotypes by effortfully inhibiting them. Extending this research to weight stigma, it may be that when a stereotype is activated (e.g., a person sees a picture of an overweight individual) and cognitive resources are low (e.g., multi-tasking, lack of sleep), a person may be more likely to make negative judgments about an overweight person and it would require higher inhibition skills to generate more empathetic judgments. Thus, young children, who have lower inhibition skills compared to their peers, may be more likely to demonstrate higher weight stigma.

There is also evidence that inhibition may modulate the automatic expression of stereotypes. Payne (2005) conducted a series of experiments using the Weapons Identification Task to measure automatic stereotype activation with non-African American undergraduate students and used the performance on the antisaccade task to measure inhibition. The antisaccade task requires participants to inhibit a reflexive response to a target on the screen. To measure social judgments, participants completed the impression formation task, which required them to read a biographical sketch of an African American man and evaluate the target (e.g., degree to which the target possessed specific traits such as polite, lazy, etc.). Participants with higher inhibition skills showed the same level of automatic stereotype activation as those with lower inhibition skills; however, those with higher inhibition were less likely to express negative social judgments. Thus, inhibition skills (the ability to focus attention on relevant information and avoiding interference) served as a gatekeeper between automatic stereotype activation and overt discrimination. Again, this suggests that young children with high inhibition skills would be less likely to express negative social judgments about overweight people (i.e., weight stigma).

Further support for the idea that younger children with lower inhibition skills may demonstrate higher weight stigma comes from research with older adults. For instance, older adults typically exhibit greater prejudice toward a variety of social groups than younger adults and it was assumed this was due to older adults coming of age during more prejudiced times (for review, see Radvansky, Copeland, & von Hippel, 2010). However, von Hippel et al. (2000) found that increases in prejudice and stereotyping in older adults appeared to be a function of inhibition deficits. Specifically, older adults were more likely to rely on stereotypes than younger adults, and age differences were mediated by performance on an inhibition task (a reading task that required the participant to ignore distracting text). Older adults were also more prejudiced than younger adults and in that case, age differences were partially mediated by inhibition skill. These results suggest that being nonprejudiced required people to continually engage in stereotype suppression, which would require high inhibition skills.

To elucidate whether this age difference in stereotype inhibition occurs during the initial encoding process, Radvansky et al. (2010) conducted a series of experiments with younger and older adults to explore age-related changes in stereotypical inferences during comprehension of narrative texts. They concluded that older adults failed to inhibit stereotypes at the encoding stage, rather than a failure in another stage of processing stereotypical inferences. In other words, differences in inhibition are related to the expression of stereotypes and prejudice during encoding processes. Thus, preschoolers who have lower inhibition skills may be more likely to rely on stereotypes and prejudice when making judgments about overweight individuals.

In addition to how differences in inhibition are associated with controlling negative stereotypes, activating negative stereotypes may deplete inhibition. Richeson and Shelton (2003) used the Stroop test to demonstrate a relation between interference control and racial attitudes.

According to resources depletion theory, executive attention is limited and renewable resource that can be depleted temporarily (Baumeister, Muraven, & Tice, 2000; Engle, Conway, Tuholski, & Shisler, 1995), and these processes are needed to combat the expression of negative attitudes and stereotypes that may come to mind unintentionally and automatically. Thus, it was hypothesized that individuals who have high levels of racial bias deplete more cognitive resources after interracial contact. After interactions with an African American partner, Caucasian research participants showed impairment on a Stroop task, a common measure of interference control. The Stroop task requires participants to work through three forms containing 100 elements. In the first form, participants are asked to read aloud the words “RED”, “GREEN” and “BLUE” ordered randomly and printed in black ink. In the second form, participants are asked to read aloud the colour of strings of “XXXX” printed in blue, red or green ink. The third form introduces the interference because participants are required to read aloud the colour of the ink and ignore the words “RED”, “GREEN” and “BLUE”.

Results showed that the impairment on the Stroop task was greatest for participants who demonstrated strong racial bias on an implicit measure of race attitudes. The authors concluded that poorer performance on the Stroop task by those who had higher racial bias was due to the interaction with the African American partner which caused a depletion of EF. In a similar vein, these results suggest that adults who have higher levels of weight stigma and subsequently interact with an overweight person may experience resource depletion and demonstrate impairment on an inhibition task.

In addition to studies with younger and older adults, inhibition may be related to prejudice in children. Some of these studies have used Piagetian conservation tasks, which arguably tap into inhibitory processes. Specifically, conservation tasks can be considered

cognitive inhibition tasks because Houdé and colleagues (Houdé & Guichart, 2001; Houdé et al., 2011; Poirel et al., 2012) have suggested that the inhibition of the length-equals-number heuristic (i.e., longer alignments contain more objects than shorter ones) is important to pass Piaget's number-conservation task. In a similar vein, conservation of quantity tasks include the familiar clay and water manipulation (Bernstein & Cowan, 1975). These tasks include inhibition skills because the tasks require children to keep in mind that some properties are conserved or invariant after an object (e.g., lump of clay) is changed in form (e.g., rolled out). In other words, children have to inhibit the bigger is more heuristic (i.e., rolled out clay is more than a lump of clay) in order to pass the tasks (i.e., rolled out clay is the same amount as a lump of clay).

One study with 2- to 10-year-olds found that children who had mastered conservation tended to demonstrate less prejudice (Clark, Hocevar, & Dembo, 1980). By 9 years of age most children have mastered most conservation tasks (Gulko, Doyle, Serbin, & White, 1988), but because some children are prejudiced even after mastering conservation tasks, other cognitive skills may account for decreases in prejudice (Doyle & Aboud, 1995). Taken together, these studies with adults and children suggest that differences in inhibition among young children may influence the expression of weight stigma.

**Cognitive flexibility (shifting).** Cognitive flexibility requires and builds on inhibition (deactivate a previous perspective or rule) and working memory (to keep information in mind and manipulate it) (Diamond, 2013; Jacques & Marcovitch, 2010). Cognitive flexibility has been associated with stereotypes and prejudice in adults (Henry, Baynes, & von Hippel, 2009), however, evidence with children has been mixed. Classification tasks are one paradigm to measure cognitive flexibility (Anderson, 1998; Bennett & Müller, 2010; Smidts, Jacobs, & Anderson, 2004). Inhelder and Piaget (1964) introduced sorting and classification tasks as

measures of flexibility and the tasks require children to sort picture cards or toys on one dimension (e.g., shape) and then on another dimension (e.g., colour). Children are assigned scores based on adequacy of the card sort and justification (e.g., Golbeck, 1983). Bigler and Liben (1993) tested 4- to 9-year-olds and showed that higher classification skills were negatively associated with stereotyped racial responses. Further, in another study, 5- to 10-year-olds were administered the classification task and a measure of gender stereotyping, and children with higher cognitive flexibility responded with more egalitarian gender attitudes (Bigler & Liben, 1992). Conversely, one study did not find a relation between cognitive flexibility and prejudice. Patterson and Bigler (2006) conducted an experimental study with preschoolers who were assigned to either a classroom that had teachers use colour groups to label children and organize the class room or to the control classroom that had teachers ignore the colour groups. After three weeks, the authors administered the classification task to preschoolers and they did not find evidence that classification skill level affected intergroup attitudes. Thus, the evidence on the relation between cognitive flexibility and weight stigma is mixed.

In sum, there are no studies that have directly explored weight stigma in relation to cognitive factors in young children. EF was associated with other forms of prejudice and stereotypes in young children, children, adolescents, and adults. Of the three ER components, inhibition seems to be the most promising component to investigate as an influential model of prejudice suggests that inhibition plays a key role in the suppression of stereotypes and the activation of more egalitarian beliefs (Devine, 1989). There are no theoretical models to support associations between prejudice, working memory, and cognitive flexibility. Further, compared to inhibition, there is less empirical evidence to support associations between weight stigma,

working memory and cognitive flexibility. Thus, the current study focuses on the relation between inhibition and weight stigma.

Other domains of cognitive function, such as intelligence quotient (IQ) or verbal ability, are also important to consider. Unfortunately, to the best of my knowledge, studies that have assessed weight stigma in young children have not measured IQ or verbal ability (Cramer & Steinwert, 1998; Harriger et al., 2010; Margulies et al., 2008; Meers et al., 2011; Musher-Eizenman et al., 2004; Sigelman et al., 1986; Turnbull et al., 2000; Worobey & Worobey, 2014). Measuring IQ may be useful to understand weight stigma and many common measures of intelligence include working memory. For example, the backward digit span is part of the Working Memory Index of the Wechsler Intelligence Scale for Children 4th Edition (WISC-IV; Wechsler, 2003). However, the common measures of intelligence ignore other EF components (Brydges, Reid, Fox, & Anderson, 2012). Friedman and colleagues (2006) measured IQ using the Wechsler Adult Intelligence Scale (WASI) and measured EF using a battery of EF tasks (working memory, inhibition, and flexibility) in adults and found that intelligence was strongly related to working memory, but inhibition and flexibility were not. The authors conclude that “traditional measures of intelligence are missing some fundamental supervisory functions” (p. 178), suggesting that it may be more beneficial to administer an EF battery rather than a measure of intelligence because the former could be considered more comprehensive.

Verbal ability may also be an important to consider in relation to weight stigma and EF. Extensive research has demonstrated a relation between EF and verbal ability in preschoolers (e.g., Carlson, White, & Davis-Unger, 2014; Garson, Bryson, & Smith, 2008; Hughes & Ensor, 2007; Müller, Jacques, Brocki, & Zelazo, 2009). It could be that children who have high verbal abilities are able to effectively use internal speech to regulate behaviour and make them more

likely to inhibit weight stereotypes. Thus, the relation between verbal ability and weight stigma or any other form of prejudice (e.g., race, gender) has not been studied before. Thus, measuring verbal ability may be useful to understand the relation between weight stigma and inhibition.

### **Overview of the Current Study**

The present study examined (a) age-related differences in explicit and implicit weight stigma, (b) the relation between explicit and implicit weight stigma, and (c) the associations between explicit weight stigma, implicit weight stigma, perspective taking skills and inhibition. To describe development, it is necessary to examine normative development (i.e., typical patterns of change) and ideographic development (i.e., individual variation) (Scarr, 1992). The current study focused on ideographic development as I wanted to examine individual variations in weight stigma, perspective taking skills and inhibition skills with age. To date, the majority of research with implicit weight stigma measures has been conducted with adults (Anselmi et al., 2011; Brewis & Wutich, 2012; Grover et al., 2003; Nosek et al., 2007; Schwartz et al., 2003; Teachman & Brownell 2001; Teachman et al., 2003) or children older than six years old (Roddy & Stewart, 2012; Solbes & Ebesco, 2010). One study with 3- to 7-year-olds measured implicit weight stigma, but did not measure explicit weight stigma (Thomas et al., 2007). Thus, administering implicit and explicit measures of weight stigma to young children is a unique feature of this study.

Further, the associations between explicit weight stigma, implicit weight stigma, perspective taking skills, and inhibition in young children have not been examined before. Perspective taking skills have been studied in relation to racial attitudes, yet it has not been studied in relation to weight stigma. In a similar vein, inhibition has been studied in relation to racial bias and other stereotypes, yet it has not been studied in relation to weight stigma. This

gap in the literature is especially relevant considering interventions to reduce weight stigma in children have not been effective. Bell and Morgan (2000) used a medical explanation for obesity (i.e., “problem with his/ her gland”) through the use of videos and found that explaining obesity had a minimal positive impact on third to sixth graders’ behaviour and attitudes toward a peer presented as obese. In a similar vein, Anesbury and Tiggemann (2000) used another explanation for obesity (i.e., a child cannot control their weight due to metabolism and storage of fat) through the use of pictures. In addition to reducing weight stigma, the researchers also wanted to reduce controllable beliefs which refers to the popular belief that eating too much and exercising too little are the major causes of obesity even though there is increasing evidence that several factors (e.g., genetics, metabolism, sociocultural factors) that contribute to obesity. The intervention reduced the amount of controllability beliefs that children assigned to weight; however, levels of weight stigma did not decrease. More recently, Fitzgerald, Heary, and Roddy (2013) asked fourth graders, fifth graders, and ninth graders to read one of three vignettes of an overweight peer which varied in terms of the explanation on why the peer was overweight: biological, environmental, or no causal information. Children in the biological condition rated the overweight child more favourably than children in the environmental condition; however, information on overweight had no impact on behavioural intentions (e.g., eating lunch with an overweight peer). Thus, because these interventions were not successful, it is important to measure explicit and implicit weight stigma in relation to perspective taking skills and inhibition because it may identify profiles of children who are more likely to demonstrate weight stigma.

The present study included 4- to 7-year-olds and this developmental period is particularly important because it coincides with a change in perspective taking skills, which may allow them to suppress stereotypes about overweight or obese individuals. For example, 3- to 6-year-olds’

role taking skills tend to be egocentric (i.e., unaware of any perspective other than their own), and 6- to 8-year-olds tend to engage in social-informational role taking (e.g., people have perceptions that are different from their own) (Selman, 1971; 1976). It is also important to measure inhibition because it may be that young children with lower inhibition skills would be more likely to rely on stereotypes and prejudice when making judgments about overweight individuals. If that is the case, then future interventions should focus on improving inhibition skills.

There are several possible trajectories that could describe whether or not children demonstrate weight stigma during development. For instance, some children may never develop weight stigma, some always demonstrate weight stigma, and some may demonstrate weight stigma at a younger age but then, due to the influence of other factors, not demonstrate weight stigma at an older age. There are several factors that are beyond the scope of the current study that may contribute to the development or decline of weight stigma in children, such as the influence of parents, teachers, the media, among others (Puhl & Heuer, 2009; Puhl & Latner, 2007; Puhl, & King, 2013). For the current study, I focus on the relation between explicit and implicit weight stigma and increases in perspective taking skills and inhibition skills during early childhood

### **Study Hypotheses**

Based on the literature reviewed above, this study address three main hypotheses that link two predictors, perspective taking skills and inhibition, with two outcomes, explicit and implicit measures of weight stigma.

**Hypotheses 1: Age-related differences in explicit and implicit weight stigma.** I predicted that (a) explicit measures of weight stigma would decrease with age (Solbes & Enesco, 2010),

(b) implicit weight stigma would remain stable across age (e.g., Nosek et al., 2007; Solbes & Enesco, 2010; Teachman & Brownell, 2001), and (c) the association between implicit and explicit measures of weight stigma would be higher in younger children (age 4 and 5 years) than older children (age 6 and 7 years) (Solbes & Enesco, 2010).

**Hypotheses 2: Associations between explicit weight stigma, implicit weight stigma, and predictors.** I expected that (a) the correlation between explicit weight stigma and perspective taking skills would be significantly larger than the correlation between implicit weight stigma and perspective taking skills, and (b) the correlation between explicit weight stigma and inhibition would be significantly larger than the correlation between implicit weight stigma and inhibition. These hypotheses are supported by evidence that implicit measures of weight stigma would remain stable across age (e.g., Nosek et al., 2007; Solbes & Enesco, 2010; Teachman & Brownell, 2001), while explicit measures of weight stigma, perspective taking and inhibition change with age. Thus, limited variability in implicit weight stigma scores make it less likely to find associations with other predictors such as perspective taking skills and inhibition. Further, explicit measures of attitudes, perspective taking and inhibition all seem to involve controlled and conscious processes, which are dissociated from implicit measures of attitudes that seem to be tapping into unconscious and automatic processes. Thus, because implicit weight stigma are tapping into unconscious instead of conscious processes, it would not be correlated with measures tapping into conscious processes.

**Hypotheses 3: Linking explicit weight stigma with predictors.** I posited that (a) perspective taking skills would predict a significant amount of variance in explicit weight stigma after controlling for inhibition, age, and verbal ability, (b) inhibition would predict a significant amount of variance in explicit weight stigma after controlling for perspective taking skills, age,

and verbal ability, and (c) perspective taking skills would moderate the relation between explicit weight stigma and inhibition after controlling for age and verbal ability.

## Chapter 2: Method

### Participants

Sixty-four 4- to 7-year-olds were recruited via word of mouth, advertisements on parent websites (e.g., KidsInVancouver.com, Craigslist, Kijiji), social media (e.g., Facebook), posters in the community, and advertising in local school boards. Two children were excluded because after the testing appointment, one parent reported a diagnosis of a developmental disorder (Attention Deficit Hyperactivity Disorder, ADHD) and one parent reported that the child was not yet four years of age (3.8 years). All children were tested in British Columbia or Alberta. See Table 1 for demographic characteristics. The final sample consisted of nineteen 4-year-olds, fourteen 5-year-olds, sixteen 6-year-olds, and thirteen 7-year-olds. Upon contact with the experimenter, parents received a copy of the study consent form which outlined the research study. Parents were asked whether their child had any diagnosed learning disabilities or disorders (e.g., autism, ADHD) and children were not invited to participate if there were any diagnoses. Parents then had the opportunity to confirm their participation by scheduling a testing session.

**Table 1. Participant Demographic Characteristics**

<i>Chronological Age (Years)</i>	
M (SD)	5.81 (1.13)
Range	4.04- 7.89
<i>Gender</i>	
Male	33
Female	29
<i>Maternal Education (total number of years)</i>	
M (SD)	17.29 (2.91)
Range	12- 26
<i>Ethnicity<sup>a</sup></i>	
Canadian	32
Multiple	13
Chinese	7
European	3

East Indian	3
Persian	2
Filipino	1
Mexican	1

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<sup>a</sup>Participants self-identified their ethnicities.

## **Materials**

Stimuli for the weight related tasks were adapted from the Collins (1991) figure array for children (see Appendix A). The figures were two inches tall and were edited to change the colour of clothing and hair for: the Anti-fat Prejudice task (see Appendix B), the Friendship Selection Task (see Appendix C), the Weight IAT (see Appendix C), and the Weight Stigma Perspective Taking task (see Appendix E). The inhibition measures (Go/No-Go, Boy-Girl Stroop) were administered using a touch screen monitor (for a detailed description of administration procedures see Miller et al., 2012; Müller, Kerns, & Konkin, 2012).

## **Procedures**

The present study used a within-person cross sectional design. The testing session began with a familiarization period (approximately 5 minutes), during which the experimenter conversed with the child and parent in order to reduce any anxiety surrounding the testing session. Parents were asked to sign the consent form, fill out parent questionnaires including the family demographics form (see Appendix F), and sign the compensation form. Next, the experimenter explained the visual schedule to children and checked off tasks as they were completed. At the beginning of the testing session, children were asked for their verbal assent. All children were then administered the PPVT-4, the Anti-fat Prejudice task, the Friendship Selection task, the Perspective Taking task, the Weight Stigma Perspective Taking task, the Weight IAT, the Boy-Girl Stroop, and the Go/No-Go. A fixed task order was chosen to separate tasks of similar cognitive demand (for further justification, see Carlson & Moses, 2001). At the

mid point of testing, children were given the option to take a break and were encouraged to stand, use the washroom, have a snack, or talk with the parent or experimenter. Additional breaks were given if needed. At the end of the testing session, children were thanked for their time and invited to choose a small gift (\$2 in value) for participating. Testing sessions lasted approximately 45 minutes.

All task instructions were given orally. Testing sessions were held in the child's home, at Simon Fraser University psychology department, or a local public library, depending on parent preference.

### **Parent Questionnaire**

In addition to the tasks administered to children, parents (or caregivers) were given a demographics form to measure ethnicity and to rule out any learning disability, neurological disorders, or psychiatric conditions in their child.

### **Study Tasks**

Tasks were administered to measure verbal ability, explicit measures of weight stigma, perspective taking skills, implicit measure of weight stigma, and inhibition skills.

#### **Verbal ability.**

*The Peabody Picture Vocabulary Test (PPVT-4).* The PPVT-4 (Dunn & Dunn, 2007) was administered using the standard method to assess children's level of receptive vocabulary. Raw scores (ceiling item- number of errors) were used in the analyses. The PPVT-4 test provides extremely reliable scores, with all reliability and validity coefficients in the .90s range, and is appropriate for 2- to 90-year-olds (Dunn & Dunn, 2007).

### **Explicit measures of weight stigma**

*Anti-fat Prejudice task.* The Anti-fat Prejudice task is a measure of weight stigma (Musher-Eizenman et al., 2004) that employs 6 adjective pairs with positive adjectives on one end of the scale and negative adjectives on the other end of the scale (nice/mean, smart/stupid, has friends/has no friends, neat/sloppy, cute/ ugly, and quiet/loud). The adjective pairs were read to children, who then placed each body figure (thin, average, and overweight, matched on children's gender and presented in random order) at the point on the scale where they thought the figure belongs. Children placed each figure in one of the 7 boxes along the top of the scale. Children began with practice items using the adjective pair of hard/soft and pictures of a rock, a ball, and a teddy bear. If a child did not complete the practice item successfully, the instructions were clarified and the items were repeated by that child. Responses were score so that higher scores indicated more positive associations for each target figure. In a previous study, Cronbach's alpha was .66 for underweight items, .74 for average figure items and .60 for overweight figure items (Margulies et al., 2008). The Anti-fat Prejudice task has been used with 4- to 10-year-olds (Brylinsky & Moore, 1994; Cramer & Steinwert, 1998; Musher-Eizenman et al., 2004; Margulies et al., 2008; Staffieri, 1967).

One limitation of the Anti-fat Prejudice task is that two of the 4-year-olds in the current study did not seem to understand the task. All children correctly passed the practice and the majority of children appeared to understand the task as they consistently rated figures in a similar way regardless of the order of presentation. However, I noticed two of the 4-year-olds seemed to be following the same pattern during the practice and the test trials. For instance, the first figure administered was assigned the most positive characteristic, the second figure administered was assigned the most negative characteristic, and the third figure administered was assigned

something in between the two extremes. This is the same pattern in which the practice trial items were administered, which suggests (a) that these children may not have understood the task and were defaulting to the response order made during the practice trials or (b) they do not use body shape as a way to categorize figures. Following a response pattern has not been noted in previous research using this task with 3-year-olds (Cramer & Steinwert, 1998; Margulies et al., 2008) or 4-year-olds (Musher-Eizenman et al., 2004).

Given the possibility that following a pattern on the Anti-fat Prejudice task was related to performance on other tasks, children who did not follow a pattern were likely children with higher cognitive skills. To test this ad hoc hypothesis, the sample was dichotomized into two groups of children: those who did not follow a pattern and those who did follow a pattern. T-tests were calculated on all study variables to determine if there were any group differences between children who did not follow a pattern and children that did follow a pattern. Because of the exploratory nature of this analysis, no Type 1 error corrections were made. Despite a liberal alpha set at .05, there were no significant differences. Further, when these two children were excluded and all analyses were conducted again, there were no significant changes in the results. Thus, it was appropriate to retain the data from these two children.

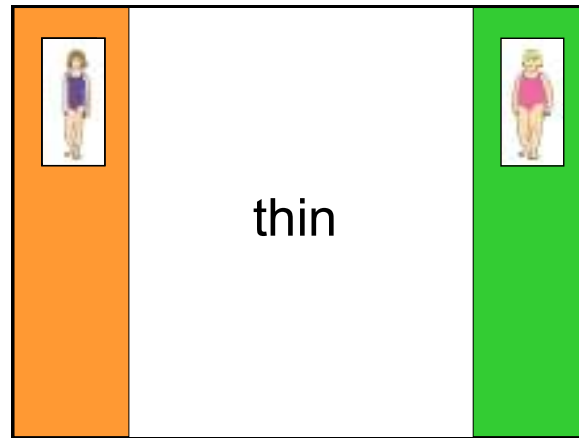
***Friendship Selection task.*** The Friendship Selection Task (Musher-Eizenman et al., 2004) required children to look at 18 figures (3 overweight girls, 3 average-size girls, and 3 thin girls, and 3 overweight boys, 3 average-size boys, and 3 thin boys; see Appendix B). Children were instructed to circle the three children with whom they would most like to play. Thus, they could select three friends of the same gender and same body size. They were also asked to select one figure they would want to have as their best friend from all 18 figures. Preferences were recorded and the frequency of choice were recorded for each target figure. Reliability and

validity cannot be reported because it has not been established. The Friendship Selection task has been used with 4- to 6-year-olds (Musher-Eizenman et al., 2004), 6- and 7-year-old boys (Staffieri, 1967) and similar tasks using either photographs or silhouettes of children who ranged in weight status have been used with kindergarteners (Lerner & Gellert, 1969) and first graders (Goldfield & Chrisler, 1995).

### **Implicit measure of weight stigma.**

*Weight IAT.* Instructional and stimulus presentation and the recording of children's responses were conducted on a Dell D820 laptop computer running Python 2.6 code with the Expyriment library (Krause & Lindemann, 2013). Stimuli were four schematic figures of average-weight and overweight boys and girls, from figures 4 and 7 of Collin's (1991) set of figures varying the colour of their clothing and hair. To measure implicit weight stigma, children were administered an Implicit Association Test (IAT) in a child-oriented version (adapted from Baron & Banaji, 2006; Cvencek, Greenwald, & Meltzoff, 2011). Children were seated at a table in front of the laptop (15.5 inch diagonal widescreen). The keyboard was enclosed in a wooden box with two large response buttons on the top of the box (5.5 x 4 x 1/5 inch) that were colour-coded, one orange and one green. An orange and green stripe (3 inch wide) appeared at the left and right edges of the computer screen (see Figure 2). These colours indicated to children which of the two buttons to push to provide a correct response (e.g., the correct response for a stimulus on "the green side" would be the green button).

### **Figure 2. Weight IAT Block 1 Screen**



*Figure 2.* Child's view of the screen used for the Weight IAT Block 1. During this block, children categorize word stimuli (*fat* and *thin*) which are assigned two response buttons, one operated with the left hand and one operated with the right hand. Stimuli are presented one at the time in the centre of the screen. The presentation of each stimulus on the screen is synchronized with the sound presentation through the speakers. Coloured stripes on either side of the screen (one orange and one green) contain visual reminders for each of the two categories. The child's task is to sort the stimuli as soon as they appear in the centre of the screen by pressing one of the response buttons.

To eliminate the need for reading, all words and instructions were digitally recorded by the experimenter as 16-bit .wav files. This use of recording by a female native English speaker is customary in past IAT research with children (Baron & Banaji, 2006; Cvencek, Greenwald & Meltzoff, 2011; Dunham et al., 2006). Words also appeared on the screen written in black, thereby serving as a cue for children to respond. Similarly, the onset of each picture was synchronized with a short beep sound. That way, each trial included an audio presentation (i.e., spoken word or beep sound) and a visual presentation (i.e., written word or picture). The intertrial interval, between the response and the next stimulus, was 500 ms. For each of the four concepts (i.e., *fat*, *thin*, *good*, *bad*), children had visual reminders that remained in view during each task. The reminders for *good* and *bad* words appeared as "happy" and "sad" faces, respectively. The reminders for *fat* and *thin* were one of the "thin girl" stimuli and one of the "overweight girl" stimuli. Using one example stimuli was preferred over using a collage of all

four stimuli (e.g., Cvencek et al., 2011) because (a) one example stimuli was used by Baron and Banaji (2006) for a race IAT with young children and (b) it was thought it would make the screen appear less overwhelming for young children and it would match the number of reminders for the word trials (happy vs. sad face; see Figure 3 for comparison).

**Figure 3. Weight IAT Block 3 and 4 Screen**

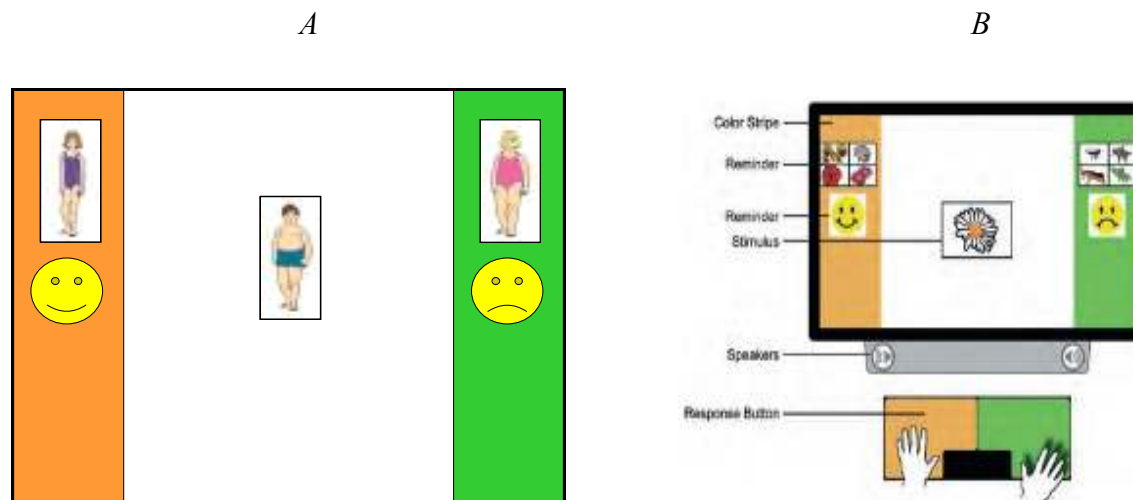


Figure 3. *A*: Child's view of the screen used for the Weight IAT Block 3 and 4. During these blocks, children categorize stimuli from four categories (*fat*, *thin*, *good*, and *bad*). As before, these categories are assigned two response buttons, one operated with the left hand and one operated with the right hand. *B*: Child's view of the apparatus used for the flower-insect attitude Preschool Implicit Association Test (PIAT). Reproduced with permission from Cvencek, Greenwald, & Meltzoff (2011).

To reduce the need for children to sustain their attention for a long period of time, the standard IAT length of 180 trials (Greenwald, Nosek, & Banaji, 2003) was reduced by 20%. Each task involving the discrimination between two concepts consisted of 16 trials, and each task involving the discrimination among four concepts consisted of 24 trials, for a total of 144 trials. To ensure that children understood and completed each Weight IAT, the experimenter was present during the session to observe and record any issues with the task. An instructions screen was presented at the beginning of each block. Children were told at the end of each instruction

screen, “Keep a hand above each button and press as soon as you know the answer. Correct answers and speed are both important”. Category reminders placed at the top right and top left of the computer screen (see Figure 3) signified the correct and error response. In blocks where *thin* and *good* word shared the left response key, (and *fat* and *bad* words shared the right response key), pressing the left button constituted the correct response for pictures of *thin* figures and *good* words, while pressing the right button constituted the correct response for pictures of *fat* figures and *bad* words (see Fig. 3). In these blocks, pressing the right button constituted an error response for pictures of *thin* figures and *good* words, and pressing the left button constituted an error response for pictures of *fat* figures and *bad* words. Error responses (i.e., hitting the wrong button) were followed by a red question mark that appeared below the stimulus. Following an error response, children could not advance to the next trial until they provided the correct response. Latency was recorded to the occurrence of the correct response, thereby creating a built-in error penalty. This definition of what constitutes correct and error responses, as well as the use of a built-in error penalty, is standard in IAT research with adults (Greenwald et al., 2003).

In block 1, children first practiced sorting *fat* figures and *thin* figures ( $n = 16$  trials). For example, they responded to *fat* figures by pressing the left response button and responded to *thin* figures by pressing the right response button. Using the words, *fat* and *thin*, are considered to be more sensitive compared to other terms (e.g., ‘chubby’ or ‘heavy’) employed in the study of implicit attitudes toward overweight individuals. As noted by Govan and Williams (2004), these terms have a pejorative connotation, which could contaminate the results of the test. Children were shown a positive feedback screen after completion of every block (e.g., shown a picture of a happy face and told, “Good job!” or “You are doing great!”). Using the visual schedule,

children were told after the first block that this game had seven parts and that the experimenter would check off each box after each part so children could track their progress. This addition to the procedures was developed by the experimenter to motivate children to finish the task.

In block 2, children practiced sorting *good* words (*good, happy, fun, and nice*) and *bad* words (*bad, yucky, mean, and mad*) using the two response buttons ( $n = 16$  trials). In comparison with the typical IAT employed with adult samples, only four, as opposed to twelve target stimuli were employed, thus decreasing the number of stimuli to be processed by children. This modification was intended to make the IAT easier for young children.

In block 3 (i.e., ‘stereotype congruent’), children practiced double-categorization trials, with the *thin* figures and *good* words receiving one response key (i.e., the orange key), and with the *fat* figures and *bad* words receiving the alternative response key (i.e., the green key) ( $n = 16$  trials). For blocks 3, 4, 6, and 7, presentation alternated between picture and word stimuli from one trial to the next. Block 4 was the same as block 3, but with more trials ( $n = 32$  trials).

In block 5, children practiced sorting *fat* figures and *thin* figures ( $n = 16$  trials), similar to block 1, except the target stimuli switched sides. Instead of responding to the *fat* figures by pressing the left response button, children were required to press the right button. Instead of responding to the *thin* figure by pressing the right response button, children were required to press the left button.

In block 6, (i.e., ‘stereotype incongruent’), children practiced double-categorization trials, with the *fat* figures and *good* words receiving one response key (i.e., the orange key), and with the *thin* figures and *bad* words receiving the alternative response key (i.e., the green key) ( $n = 16$  trials). Block 7 was the same as block 6, but with more trials ( $n = 32$  trials). The order of the two instructional conditions, thin figures and good words first (i.e., ‘stereotype congruent block’,

Version A) or fat figures and good words first (i.e., ‘stereotype congruent block’, Version B), was counterbalanced. Children within each age group were randomly assigned to Version A or Version B of the Weight IAT to prevent one age group from receiving one version more frequently than another.

The task is based on the assumption that the stronger the association between target (e.g., *thin*) and attribute (e.g., *good*) categories, the greater the speed and accuracy with which participants respond. Errors and response latencies were recorded in milliseconds. Thus, if responses are on average faster and more accurate on stereotype congruent than incongruent trials, this suggests implicit bias towards the stereotype. The psychometric properties of the adult version of IAT have been extensively examined and are widely acknowledged (Greenwald et al., 2003, 2009). Future research needs to establish the psychometric properties of the child friendly version of the IAT; however, given the consistency between the typical adult version and the current modified Weight IAT it is anticipated that both measures are broadly similar in this respect. The Weight IAT is relatively long (144 trials, approximately 6 minutes) for four-year-olds and as a speeded categorization task is trying for some children. Thus, the experimenter administered it near the end of the task battery; such that attrition still left data from other tasks (for justification see Dunham, Baron, & Carey, 2011). Weight IAT scores were computed following the standard protocol for the improved scoring algorithm recommended by Greenwald and colleagues (2003). A variation of Cohen’s *d* index was obtained by calculating the difference between the mean response latencies for the blocks within each Weight IAT and dividing that difference by its associated pooled standard deviation.

## Perspective Taking Skills

*Perspective Taking task.* This is the often cited Holly dilemma, which was one of several dilemmas piloted and refined by Selman and Byrne (1974). This open-ended sociomoral dilemma is appropriate for 4- to 10-year-olds and is intended to tap into lower stages of role taking (Selman, 1976). Children were told the following story:

Holly is an 8-year-old girl who likes to climb trees. She is the best tree climber in the neighbourhood. One day while climbing a tree she falls off the bottom branch but does not hurt herself. Her father sees her fall, and is upset. He asks her to promise not to climb trees any more, and Holly promises. Later that day, Holly and her friends meet Sean. Sean's kitten is caught up in a tree and cannot get down. Something has to be done right away or the kitten may fall. Holly is the only one who climbs trees well enough to reach the kitten and get it down, but she remembers her promise to her father. (Selman, 1976, pp. 302)

Children were asked questions that focused on relations among perspectives: (a) "Does Sean know why Holly cannot decide whether or not to climb the tree?", (b) "What will Holly's father think?", and (c) "Will he understand why if she climbs the tree?". These questions correspond to three structural aspects of role taking: (a) the subject's own point of view, (b) the different viewpoints of each character, and (c) the relationships among the various perspectives (Selman, 1976). The experimenter recorded children's responses and probed for explanations using "Why?", "Why not?", "Why is that important?", or "What difference does that (characteristic) make?". The general principle in probing questions during the interview was to continue with follow up questions until the participants repeats themselves or show marked signs of waning attention (Damon & Hart, 1982).

Based on children's responses, their perspective taking skills were categorized as either: undifferentiated (1), egocentric (2), differentiated (3) or subjective (4), with higher scores indicating better perspective taking skills. Children were scored at the highest level of role taking clearly exhibited (Selman & Byrne, 1974). For instance, if children used reasoning indicative of a 1 on the first and second question, but used reasoning indicative of a 3 on the last question, she or he received a score of 3.

Undifferentiated refers to individuals who 'do not clearly differentiate physical and psychological characteristics of persons... [and there is] confusion between acts and feelings or between intentional and unintentional behaviour' (pg. 31, Selman, 1980). For instance, for second question (What will Holly's father think?) one child (#51) said, "That we're not smart... [experimenter asked "why is that?"] ... because we'll get hurt". This response received an Undifferentiated score of 1 because the child uses the term "we", which suggested the child does not seem to be able to separate him- or herself from the characters in the story. Further, the responses to the other two questions did not suggest a higher level of role taking; thus, the child received an Undifferentiated score of 1. Another child (#54) responded to the third question (Will he [the father] understand why if she climbs the tree?) with, "Because the cat was stuck up there". This response received an Undifferentiated score of 1 because there was confusion between acts. Only Holly and Sean knew the kitten was in the tree, the father did not know the kitten was in the tree. Thus, the father did not know that "the cat was stuck up there". The responses to the other two questions did not suggest a higher level of role taking; thus, the child received an Undifferentiated score of 1.

Egocentric refers to when individuals differentiate physical characteristics but not psychological characteristics, 'subjective perspectives are undifferentiated and that another may

interpret the same situation differently is not recognized' (pg. 31, Selman, 1980). For instance, for the first question (Does Sean know why Holly cannot decide whether or not to climb the tree?) one child (#19) said, "Because she will fall from the tree". For the second question (What will Holly's father think?), the child said, "She will climb the tree and she will hurt herself". For the third question (Will he understand why if she climbs the tree?) the child said, "Because she will fall too". These responses received an Egocentric score because the child described what will physically happen to Holly, but did not describe any of her psychological characteristics (i.e., what Holly thinks or feels). The child also does not consider what any of the other characters (e.g., Holly's father or Sean) will do or think. Thus, the child received an Egocentric score of 2.

Differentiated refers to 'the clear differentiation of physical and psychological characteristics of persons... thought, opinion, or feeling states within an individual, however, are seen as unitary and are not mixed' (pg. 32, Selman, 1980). For instance, for the first question (Does Sean know why Holly cannot decide whether or not to climb the tree?) one child (#41) said, "No, because she did not tell him". For the second question (What will Holly's father think?), the child said, "No, she can't climb trees". For the third question (Will he understand why if she climbs the tree?) the child said, "No, because he does not know". These responses received a Differentiated score because: (a) the child correctly identifies that Sean does not know about the interaction between Holly and her father, (b) the child correctly identifies what Holly's father thinks about her climbing trees, and (c), the child correctly identifies that Holly's father does not know about the kitten in the tree. Thus, the child received a Differentiated score of 3.

Subjective refers to when 'subjective perspectives of self and others are clearly differentiated and recognized as potentially different.... [and], relating of perspectives is

conceived of in a one-way, unilateral terms, in terms of the perspective of and impact on one actor' (pg. 32, Selman, 1980). Selman explains that there is a one-way conception of relating interpersonal causality and perspectives (e.g., a gift makes someone happy). When there is any evidence of a two-way reciprocity it is limited to the physical (e.g., a child who is hit will then hit back). For instance, for the third question (Will he understand why if she climbs the tree?) one child (#23) said, "Yes, because Holly will talk to him and the father will say it's okay". This response received a Subjective score because there was evidence of limited two-way reciprocity. There was a physical action, "Holly will talk to him" and there was a response to that action, "the father will say it's okay". The response did not receive a Differentiated score because not only does this response (and the responses to the other two questions) demonstrate that there was a clear differentiation of physical and psychological characteristics of persons, but the response to the third question suggested a limited two-way reciprocity. Thus, because children were scored at the highest level of role taking clearly exhibited (Selman & Byrne, 1974), the child received a Subjective score of 4.

***Weight Stigma Perspective Taking task.*** This task is intended to measure perspective taking skills. Children were told, "Now we are going to play a new game with pictures. Before we start, do you know what it means to be a friend to another person?". Children were expected to say something like "a friend is someone who they spend time with", "someone they like to hang out with", or "someone they play games or do activities with". If children were unable to describe a friend the experimenter would say, "A friend is someone that you like to spend time with and perhaps play games or do activities with either at school or after school or on the weekend. Does that sound like a friend to you?". Once children either accurately defined the word friend or agreed with the definition of a "friend," the task would start.

Children were shown the same overweight figure from the Anti-fat Prejudice task (matched on gender) and were told the following: “This is Judy/ Michael. Would you be friends with a bigger person like Judy/ Michael?”. As with the previous task, the experimenter recorded children’s responses and probed for explanations using “Why?”, “Why not?”, “Why is that?” or “What difference does that (characteristic) make?”. Then the experimenter asked, “Would other children your age be friends with someone like Judy/ Michael who is bigger than them?” The experimenter recorded children’s responses and probed for explanations using the same questions.

Based on children’s responses, their perspective taking skills were categorized as either: lower perspective taking skills (1), moderate perspective taking skills (2), or higher perspective taking skills (3). Lower perspective taking skills refers to when children’s responses to the first and second questions were the same or similar, as they think that other people have the same perceptions as they do. For instance, one child (#33), gave this gave this response to the first question (Would you be friends with a bigger person like Judy/ Michael?), “No. [prompt<sup>4</sup>] “Because she is a little fat”. For the second question (Would other children your age be friends with someone like Judy/ Michael?), the child said, “No. [prompt] Because she is a little fat”. Thus, the child was given a score of 1. Moderate perspective taking skills refers to when there were differences between initial responses, suggesting that their attitudes may be different from their peers, but corresponding justification was not provided. For instance, one child (#18), gave this answer to the first question “No. [prompt] I don’t know”. For the second question, the child said “Yes. [prompt] I don’t know”. Thus, this child was given a score of 2 as I wanted to provide credit to those children who could acknowledge different perspectives (self vs. others)

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<sup>4</sup> The experimenter asked questions like, “Why?” or “Why not?” or “Why is that?” or “What difference does that (characteristic) make?”

but who could not clearly articulate them. There are several possibilities for why justification was not provided such as: (a) low verbal skills, (b) being afraid to answer honestly to a stranger or adult, or (c) something else that I am not aware of. Higher perspective taking skills refer to when there were differences between initial responses, suggesting that their attitudes may be different from their peers, and corresponding justification was provided. For instance, one child (#25), gave this answer to the first question “No. [prompt] Too fat. I don’t like to be friends with fat people”. For the second question, the child said “Maybe. [prompt] Some children will and some children won’t”. The child was able to differentiate between self and other children with corresponding justification; thus, this child was given a score of 3.

For the Weight Stigma Perspective Taking task, the wording may have been too ambiguous for some young children in the current study to understand. Rather than using the word “fat” during the task, I chose to use the word “bigger” because I thought the word “fat” may make children feel uncomfortable, which in turn could make them less likely to elaborate in their responses. Unfortunately, a few children ( $n = 5$ ) assumed that “bigger” meant older as that was their rationale for not wanting to be friends with “Judy” or “Michael”. Given the possibility that children who misunderstood the word “bigger” as being older on the Weight Stigma Perspective Taking task may have lower cognitive skills, this ad hoc hypothesis was tested by dichotomizing the sample into two groups of children: those who understood the word and those who misunderstood the word. T-tests were calculated on all study variables to determine if there were any group differences between children who understood the work and children who misunderstood the word. Because of the exploratory nature of this analysis, no Type 1 error corrections were made. Despite a liberal alpha set at .05, there were no significant differences. Further, when these five children were excluded and all analyses were conducted again, there

were no significant changes in results. Thus, it was appropriate to retain the data from these five children.

### **Inhibition measures.**

For inhibition measures, my interpretation for acceptability of the reliability focuses on the intra-class correlations (ICC) and the partial correlations controlling for age (following Müller et al., 2014). Specifically, ICC values between .60 and .74 as good, and ICC values above .75 as excellent (Cicchetti, 2001). Kuntsi and colleagues (2001) suggest the more conservative criterion of .45 as an acceptable level of re-test reliability for squared partial correlations ( $pr^2$ ).

**Boy-Girl Stroop.** The Boy-Girl Stroop (Kerns & McInerney, 2007; adapted from Diamond, Kirkham, & Amso, 2002) is a computerized task designed to measure inhibition. Children were instructed to say “boy” when a picture of a cartoon girl appears on the screen and to say “girl” when a picture of a cartoon boy appears on the screen. A short practice session preceded the task and corrective feedback was provided as needed. The task consisted of 20 pictures, with each type of picture appearing 10 times and never more than three times in succession. In one study, reliability as measured using ICC for Boy-Girl Stroop was not good (ICC = .28) and reliability measured using squared partial correlations controlling for age was below an acceptable level ( $pr^2 = .14$ ) (Müller et al., 2012). Validity for the Boy-Girl Stroop is supported by a CFA study with preschoolers that found that Boy-Girl Stroop loaded on to the same latent variable as other measures of inhibition (Miller et al., 2012). The Boy-Girl Stroop was used with 3- to 6-year-olds (e.g., Miller et al., 2012) and is developmentally appropriate for 7-year-olds as variants of the stroop test have been used with children, adolescents, and adults (e.g., Comalli, Wapner, & Werner, 1962). Performance was measured by the number of

commission errors (i.e., number of times pictures were incorrectly labelled on first response), and lower scores indicated better performance.

**Go/No-Go.** The Go/No-Go (Kerns & McInerney, 2007) is a measure of inhibition, in which children must touch a target stimulus and refrain from touching a non-target one. This task is a child friendly version of the traditional Go/No-Go Task (Lapierre, Braun, & Hodgins, 1995) and was adapted for a study of EF in school-aged children (Archibald & Kerns, 1999). The Go/No-Go consisted of four blocks. During the first block, children were shown a dog every second for 60 seconds. Children were asked to touch the screen every time a dog appeared to develop a proponent response to dogs and this block was not scored. The second, third, and fourth block consisted of 50 trials and presented a dog and a koala to children. In the second block, children were asked to only touch the koala and not the dog. This required children to withhold her or his proponent response to the dog. In the third block, children were asked to touch only the dog and not the koala. This required children to withhold his or her proponent response to the koala. In the fourth block, children were asked to touch only the kola, not the dog. This required children to withhold her or his prepotent response to the dog. One study found that reliability as measured using ICC for Go/No-Go commissions was not good (ICC = .41) and reliability measured using squared partial correlations controlling for age was below an acceptable level ( $pr^2 = .12$ ) (Müller et al., 2012). However, validity for Go/No-Go commissions was supported by a CFA study with preschoolers that found Go/No-Go commission errors loaded on to the inhibition factor (Miller et al., 2012). This task has been used with 3- to 6-year-olds (e.g., Miller et al., 2012) and is developmentally appropriate for 7-year-olds as variants of the Go/ No-Go have been used with 7- to 11-year-olds (e.g., Kim, Iwaki, Imashioya, Uno, &

Fujita, 2007). Inhibition was measured with total commission errors (i.e., pressing for a non-target stimulus) and lower scores indicated better performance.

### **Ethical Approval**

This study was approved by the University of Victoria Research Ethics Board and was in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

## Chapter 3: Results

In the following sections, I first describe the analytic strategies and screening procedures applied to all variables. Then I describe individual measures and strategies used to reduce data for the different constructs assessed in this study. The last section will be dedicated to hypotheses testing.

### General Analytic Considerations

**Missing data in child measures.** Data for child measures was missing because the child refused to complete a task or the experimenter decided to move on without completing the task in order to maintain the child's motivation. This only occurred on the task which challenged children's attention skills, the Weight IAT. Seventeen children were not able to complete the entire Weight IAT (27.4%; including fourteen 4-year-olds, one 5-year-old, and two 6-year-olds). This task was especially difficult for nineteen 4-year-olds as most of them ( $n = 14$ ; 74%) did not finish the entire Weight IAT. Overall, missing data represented 3.4% of responses from children.

Missing data on the Weight IAT may have been related to children's cognitive skills. Specifically, that children with complete data were likely to be children with higher cognitive skills, thus, additional analyses were conducted. To test this ad hoc hypothesis, the sample was dichotomized into groups of children who completed the Weight IAT and children who did not complete the Weight IAT. T-tests were calculated on all demographic and study variables to determine if there were any group differences between completers and non-completers. Because of the exploratory nature of this analysis, no Type 1 error corrections were made. Groups differed on: age  $t(60) = 6.13, p < .0001$ ; verbal ability  $t(60) = 3.89, p < .0001$ ; the Friendship Selection Task  $t(60) = -2.09, p < .05$ ; Perspective Taking task  $t(60) = 3.01, p < .01$ ; and the Boy-

Girl Stroop  $t(60) = -3.19, p < .05$ . In sum, non-completers were characterized as being younger, having lower verbal ability, less likely to select an overweight figure as a friend, lower perspective taking skills, and performing less well on a cognitive task intended to measure inhibition.

Missing data resulting from non-completion was also problematic because it affected 27% of the sample on the Weight IAT. Thus, these missing data should be considered missing not at random (MNAR). To confirm MNAR, missing value analyses was conducted using SPSS. An expectation maximization (EM) technique was used and the chi-square statistic for testing whether values are missing completely at random (MCAR) is referred to as 'Little's MCAR test'. The Little's MCAR test conducted for this study showed that the data are not missing at random,  $\chi^2(10, N = 62) = 19.14, p < .001$ . Thus, in subsequent analyses that included the Weight IAT score as one of the variables, pairwise deletion was used. Inputting missing values (e.g., Maximum Likelihood estimation, Expectation Maximization, etc.) for the Weight IAT task would be misleading, especially for interpreting results for the 4-year-olds.

**Normality.** All variables were screened for outliers, skewness, and kurtosis. The data were first converted to z-scores and screened for significant outliers using a critical value of  $+/- 3.29$  (Tabachnick & Fidell, 2013). For the EF tasks, two outliers were identified on the Go/No-Go commission score variable and one outlier was identified on the Boy-Girl Stroop. Examination of the paper files revealed that these children understood and were engaged in the tasks. However, their response patterns suggested that they had genuine challenges with these tasks. Based on the assumption that these children's true score were extreme on these two tasks, their outlier values were replaced with the highest remaining score plus one (for justification see Tabachnick & Fidell, 2013; pg. 77). Replacing these extreme scores with less extreme values

attenuated the problems of normality for these two variables. All remaining variables were reasonably distributed (i.e., values of skewness and kurtosis below 2), with only minor departures from normality.

**Setting.** Because children were tested in either in the child's home ( $n = 45$ ) or outside the child's home such as a university lab ( $n = 11$ ), preschool ( $n = 5$ ), and library ( $n = 1$ ), all variables were screened for differences related to setting. Comparison of group means (home vs. outside home) for all study variables, with alpha set at .05 revealed no significant differences. Thus, data from the two groups were combined for analyses.

### **Descriptive Data**

**Anti-fat Prejudice task.** On a scale of one to seven (with seven being the most positive rating), children's adjective ratings (nice/mean, smart/stupid, has friends/has no friends, neat/sloppy, cute/ ugly, and quiet/loud) averaged 4.39 ( $SD = 1.39$ ) for the thin figure, 5.05 ( $SD = 1.49$ ) for the average figure, and 3.13 ( $SD = 1.37$ ) for the overweight figure (see Table 2 for mean ratings for thin, average, and overweight figures for each adjective pair). In a repeated-measures analysis of variance, Mauchly's test indicated that the assumption of sphericity had been violated  $\chi^2(2) = 7.20, p < 0.05$ , therefore multivariate tests are reported ( $\epsilon = .90$ ). The results show that children's average ratings of each figure were significantly different from one another,  $V = .45, F(2,60) = 24.07, p < .001, \eta_p^2 = .45$ . The adjective ratings for the overweight figure were significantly lower than those for the thin figure,  $t(61) = 5.65, p < .001, r = .59$ , and the average figure,  $t(61) = 6.40, p < .001, r = .63$ . The adjective ratings for the thin figure were also significantly lower than the average figure,  $t(61) = 2.48, p < .05, r = .63$ . For the Anti-fat Prejudice Task score, children's average ratings for the overweight figure were used, with higher scores associated with more positive ratings (see Table 3 for descriptive statistics on all tasks).

**Table 2. Mean (SD) Ratings for Thin, Average, and Overweight Figures for each Pair**

Adjective Pair	Thin Figure	Average Figure	Overweight Figure
Nice/ mean	4.34 (2.69)	5.18 (2.60)	3.87 (2.49)
Smart/ stupid	4.64 (2.52)	5.22 (2.49)	2.74 (2.33)
Has friends/ has no friends	4.34 (2.66)	4.55 (2.68)	3.45 (2.54)
Neat/ sloppy	4.56 (2.67)	5.26 (2.44)	2.87 (2.32)
Cute/ ugly	4.27 (2.54)	5.00 (2.42)	2.69 (2.47)
Quiet/ loud	4.13 (2.57)	5.10 (2.53)	3.16 (2.38)

**Table 3. Descriptive Statistics for Performance on Tasks by Age Group**

Task	Age group				Total (n = 62)
	4-year-olds (n = 19)	5-year-olds (n = 14)	6-year-olds (n = 16)	7-year-olds (n = 13)	
Anti-fat Prejudice					
Mean (SD)	3.76 (1.37)	2.73 (1.10)	2.73 (1.15)	3.14 (1.65)	3.13 (1.37)
Range	1.00-6.17	1.00-4.50	1.00-4.50	1.00-7.00	1.00-7.00
Friendship Selection					
Mean (SD)	.58 (.61)	.21 (.43)	.25 (.58)	.08 (.56)	.31 (.53)
Range	0-2	0-1	0-2	0-2	0-2
Perspective Taking					
Mean (SD)	1.58 (.84)	1.43 (.76)	2.19 (.98)	2.23 (1.24)	1.84 (.99)
Range	1-3	1-3	1-3	1-4	1-4
Weight Stigma PT					
Mean (SD)	1.53 (.70)	1.93 (1.00)	2.50 (.82)	2.23 (.93)	2.02 (.91)
Range	1-3	1-3	1-3	1-3	1-3
Boy-Girl Stroop					
Mean (SD)	3.11 (2.21)	2.07 (1.49)	1.56 (1.32)	1.85 (1.41)	2.21 (1.77)
Range	1-8	0-5	0-5	0-5	0-8
Go/No-Go					
Mean (SD)	2.47 (2.50)	2.07 (1.77)	2.00 (2.10)	1.31 (1.25)	2.02 (2.02)
Range	0-8	0-5	0-8	0-3	
PPVT-4 (raw score)					
Mean (SD)	97.95 (15.98)	110.00 (19.55)	123.19 (19.72)	139.77 (10.38)	115.95 (22.74)
Range	72-128	79-144	90-148	125-154	72-154

*Note.* Weight Stigma PT = Weight Stigma Perspective Taking task; PPVT-4 = Peabody Picture Vocabulary Test Forth Edition (raw score); \* $p < .05$ , \*\*  $p < .01$ .

**Friendship Selection task.** Across three trials, children chose thin figures as friends 40% of the time. Average figures were chosen as friends 50% of the time and overweight figures were chosen as friends 10% of the time. Children selected significantly fewer overweight figures as friends than either thin figures,  $t(61) = 5.88, p < .001, r = .60$ , or average figures,  $t(61) = 8.12, p < .001, r = .72$ . In the selection of best friend, the thin figure was chosen by 24% of children, the average figure was chosen by 68% of children, and the overweight figure was chosen by 8% of children. For the Friendship Selection Task score, children's frequency for selecting the overweight figure was used, with higher scores associated with more frequent selection of overweight figures (see Table 3).

**Weight IAT.** As mentioned previously, the sample size for performance on the Weight IAT was smaller ( $n = 45$  instead of 62) due to the high rates of attrition in 4-year-olds. Children's average latencies in millisecond for congruent trials (i.e., Thin/ good + Fat/ bad) was 1950.42 ( $SD = 681.45$ ) and for incongruent trial (i.e., Thin/ bad + Fat/ good) was 2178.85 ( $SD = 899.12$ ). A Weight IAT score (D) (Greenwald et al., 2003) was calculated by comparing children's response speed in one instructional condition relative to the other instructional condition. As typical in IAT research with adults, the standard D-as-is measure was used as the unit of analysis. This measure makes use of build-in error penalties as described in detail by Greenwald and colleagues (2003). Children's average Weight IAT effect was significant ( $D = .28, SD = .44, t(44) = -2.48, p < .05$ , revealing a relative positive association between thin and positive attributes, compared to fat and negative attributes. It was confirmed that of the 45 children who completed the Weight IAT, 32 children obtained a positive score (71.1%) suggesting a preference for thin figures and 13 children obtained a negative score (28.8%) suggesting a preference for overweight figures.

**Perspective Taking and Executive Function tasks.** Descriptive statistics for the perspective taking tasks and the EF tasks are in Table 3 grouped by age. Correlations among age, verbal ability, weight stigma, perspective taking, and EF reported in Table 4.

**Table 4. Bivariate Correlations among Measures of Age, Verbal Ability, Weight Stigma, Perspective Taking and EF**

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Age	-	.70**	-.22	-.32*	.32*	.35**	-.31*	-.22 <sup>a</sup>	.24
2. PPVT-4		-	-.12	-.13	.33*	.32*	-.21	-.07	.23
3. Anti-fat Prejudice			-	.27*	-.01	-.10	.10	-.02	-.04
4. Friendship Selection				-	-.09	-.28*	.09	.15	-.03
5. PT					-	.13	-.24	-.15	-.14
6. WSPT						-	-.31*	.07	-.13
7. Boy-Girl Stroop							-	.26*	-.13
8. Go/No-Go								-	.04
9. Weight IAT									-

*Note.* Age = in years, PPVT-4 = Peabody Picture Vocabulary Test Forth Edition (raw score); PT = Perspective Taking Task; Weight Stigma PT = Weight Stigma Perspective Taking task; Weight IAT ( $n = 45$ ) \*  $p < .05$ , \*\*  $p < .01$ .

<sup>a</sup>  $p = .09$

**Composite scores.** For the preliminary analyses I determined whether it was appropriate to calculate: (a) an Explicit Weight Stigma Composite score, (b) a Perspective Taking Composite score, and (c) an Inhibition Composite score. The explicit weight stigma tasks were the Anti-fat Prejudice task and the Friendship Selection task, these two scores were associated,  $r = .27$ ,  $p < .05$ ; thus, these scores were standardized and added to create an Explicit Weight Stigma Composite score used in subsequent analyses. The perspective taking tasks were the Perspective Taking task and the Weight Stigma Perspective Taking task, these two scores were not associated,  $r = .13$ ,  $p > .05$ . It was expected that these tasks would be at least moderately correlated, thus, subsequent analyses were conducted with these two tasks entered separately. The inhibition tasks were the Go/No-Go and the Boy-Girl Stroop, these two scores were

associated,  $r = .26, p < .05$ ; thus, these scores were standardized and added to create an Inhibition Composite score used in subsequent analyses.

### Statistical Tests of Study Hypotheses

**Hypotheses 1: Age-related differences in explicit and implicit weight stigma.** I expected that (a) explicit measures of weight stigma would decrease with age, (b) implicit weight stigma would remain stable across age; and (c) the association between implicit and explicit measures of weight stigma would be higher in younger children than older children. To test these hypotheses, I conducted bivariate correlation analyses using the Explicit Weight Stigma Composite score and Implicit Weight Stigma score. For the Explicit Weight Stigma Composite, higher scores indicate a more positive attitude toward overweight figures and lower scores indicate a more negative attitude toward overweight figures. The association between age and the Explicit Weight Stigma Composite was  $r = -.34, p < .01$ , suggesting that with age, children are more likely to demonstrate less positive attitudes toward overweight figures. As such, the first part of hypothesis 1 was not supported. However, the second part of hypothesis 1 was supported as I did not find a significant association between age and Implicit Weight Stigma as measured using the D score from the Weight IAT task, with positive values indicating higher levels of weight stigma,  $r = .24, p > .05$ .

To test the third part of hypothesis 1, that the association between implicit and explicit measures of weight stigma would be higher in younger children than older children, the sample was divided into younger and older children using a median split instead of comparing 4- and 5-year-olds to 6- and 7-year-olds. A median split was used because only a subset of the sample was able to complete the Weight IAT ( $n = 45$ ) and the majority of 4-year-olds ( $n = 14$ ) were not able to finish the Weight IAT. Thus, children between 4.00 and 6.36 years of age were placed

into the younger age group ( $n = 23$ ) and children between 6.37 and 7.89 years of age were placed into the older age group ( $n = 22$ ). Bivariate correlational analyses were conducted to compare the associations between the Implicit Weight Stigma score and the Explicit Weight Stigma Composite score. Results showed that the bivariate correlations between implicit and explicit weight stigma was  $r_1 = .11$  for the younger group and  $r_2 = -.19$  for the older group. To test whether these correlation coefficients between younger and older children were significantly different, I converted these correlations to z scores using Fisher's z transformation (Fisher, 1921;  $z_{r1} = .11$ ;  $z_{r2} = -.19$ ) and to make the sampling distribution normal. Following this, I calculated a z difference score between the two correlations following Field (2009, pg. 191),  $Z_{\text{Difference}} = 1.00$ ,  $p > .05$ . Thus, the association between implicit and explicit measures of weight stigma was not significantly higher in younger children than older children. Thus, the third hypothesis was not supported.

**Hypotheses 2: Associations between explicit weight stigma, implicit weight stigma, and predictors.** I posited that (a) the correlation between explicit weight stigma and perspective taking skills would be significantly larger than the correlation between implicit weight stigma and perspective taking skills; and (b) the correlation between explicit weight stigma and inhibition would be significantly larger than the correlation between implicit weight stigma and inhibition. To test the first part of hypothesis 2, I used a t-test to determine whether the difference between two dependent correlations from the same sample was significant. Because it was not appropriate to calculate a Perspective Taking Composite score (see section on composite scores), analyses were conducted with the Perspective Taking task and the Weight Stigma Perspective Taking task entered separately. First, I tested whether the association between the Explicit Weight Stigma Composite score ( $x$ ) and the Perspective Taking task score ( $y$ ) was

significantly higher than the association between the Implicit Weight Stigma score ( $z$ ) and the Perspective Taking task score ( $y$ ) (see Table 5 for correlations among measures). The t-test was computed using the formula described by Field (2009, pg. 192),  $t$  (observed) = 0.34. Then this computed value was checked against the appropriate critical value with  $N - 3$  (in this case 42 as sample size was 45),  $t$  (critical) = 2.02. Contrary to the first part of hypothesis 2, results showed that the association between explicit weight stigma and the perspective taking task was not significantly higher than the association between the implicit weight stigma and the perspective taking task.

**Table 5. Bivariate Correlations Among Weight Stigma, Perspective Taking Tasks, and Inhibition**

Measure	1.	2.	3.	4.	5.
1. Explicit Weight Stigma Composite	-	-.05	-.07	-.24	.13
2. Implicit Weight Stigma		-	-.14	-.13	-.04
3. Perspective Taking Task			-	.13	-.25
4. Weight Stigma Perspective Taking task				-	-.15
5. Inhibition Composite					-

Note.; \*  $p < .05$ .

The same procedures were followed for the Weight Stigma Perspective Taking task, see Table 5 for correlations among measures. The t-test was computed again,  $t$  (observed) =  $-.51 < t$  (critical) = 2.00. Again, contrary to the first part of hypothesis 2, results showed that the association between explicit weight stigma and the weight stigma perspective taking task was not significantly higher than the association between the implicit weight stigma and the weight stigma perspective taking task.

To test the second part of hypothesis 2, that the correlation between explicit weight stigma and inhibition would be significantly larger than the correlation between implicit weight stigma and inhibition, the same procedures as outlined for the first part of hypothesis 2 were

followed. However, in this case the Inhibition Composite score ( $y$ ) was substituted for the perspective taking task, see Table 5 for correlations among measures. The t-test was computed again,  $t(\text{observed}) = .77 < t(\text{critical}) = 2.00$ . Contrary to the hypothesis, results showed that the correlation between explicit weight stigma and inhibition was not significantly larger than the correlation between implicit weight stigma and inhibition.

**Hypotheses 3: Linking explicit weight stigma with predictors.** I expected that (a) perspective taking skills would predict a significant amount of variance in explicit weight stigma after controlling for age, verbal ability, and inhibition; (b) inhibition would predict a significant amount of variance in explicit weight stigma after controlling for perspective taking skills, age, and verbal ability; (c) perspective taking skills would moderate the relation between explicit weight stigma and inhibition after controlling for age and verbal ability. To test these three hypotheses, I conducted a series of hierarchical regressions.

For the first part of hypothesis 3, that perspective taking skills would predict a significant amount of variance in explicit weight stigma after controlling for age, verbal ability, and inhibition, a three step hierarchical regression was conducted with explicit weight stigma as the dependent variable. Age and verbal ability were entered at step 1, the Inhibition Composite score was entered at step 2, and the two perspective taking tasks were entered at step 3. Intercorrelations between the multiple regression variables are reported in Tables 4 and 5, the regression statistics are in Table 6. The hierarchical multiple regression revealed that at step 1, age and verbal ability contributed significantly to the regression model,  $F(2,59) = 4.26, p < .05$  and accounted for 12.6% of the variation in explicit weight stigma. After entry of the Inhibition Composite score at step 2, the total variance explained by the model as a whole was 12.6%,  $F(3,58) = 2.79, p < .05$ . The introduction of the Inhibition Composite score did not explain any

additional variance in explicit weight stigma after controlling for age and verbal ability ( $R^2$  Change = .00;  $F(1,58) = 0.00, p > .05$ ). After entry of the Perspective Taking task and the Weight Stigma Perspective Taking task at step 3, the total variance explained by the model as a whole was 14.7%,  $F(5,56) = 1.94, p > .05$ . The introduction of the Perspective Taking task and the Weight Stigma Perspective Taking task explained additional 2.1% in explicit weight stigma after controlling for age, verbal ability, and Inhibition Composite score ( $R^2$  Change = .02;  $F(2,56) = .69, p > .05$ ). In the final model, age was the only predictor variable that was statistically significant ( $\beta = -.41, p < .05$ ). In sum, the first part of hypothesis 3 was not supported.

**Table 6: Hierarchical Regression Model 1 of Explicit Weight Stigma**

Variable	B	SE B	B	<i>t</i>	R	R <sup>2</sup>	Δ R <sup>2</sup>
Step 1					.36	.13	.13
Constant <sup>a</sup>	2.37	1.09		2.17*			
Age	-0.63	0.24	-.45	-2.63*			
Verbal Ability	0.01	0.01	.16	.92			
Step 2					.36	.13	.00
Constant	2.35	1.15		2.05*			
Age	-0.62	0.26	-.45	-2.47*			
Verbal Ability	0.01	0.01	.16	.91			
Inhibition Composite score	0.00	0.13	.01	.06			
Step 3					.38	.15	.02
Constant	2.41	1.15		2.09*			
Age	-0.58	0.26	-.41	-2.25*			
Verbal Ability	0.01	0.01	.17	.98			
Inhibition Composite score	0.01	0.13	.01	.04			
Perspective Taking task	0.05	0.21	.03	.21			
Weight Stigma Perspective Taking task	-0.27	0.23	-.15	-.15			

*Note.*  $N = 62$ , Age (in years); Verbal Ability = Peabody Picture Vocabulary Test (raw score); \* $p < .05$ .

<sup>a</sup>Constant values are reported so readers can construct the full regression model if needed

For the second part of hypothesis 3, inhibition would predict a significant amount of variance in explicit weight stigma after controlling for perspective taking skills, age, and verbal ability, a three step hierarchical regression was conducted with explicit weight stigma as the

dependent variable. Age and verbal ability were entered at step 1, the two perspective taking tasks were entered at step 2, and the Inhibition Composite score was entered at step 3.

Regression statistics are reported in Table 7. The hierarchical multiple regression revealed that at step 1, age and verbal ability contributed significantly to the regression model,  $F(2,59) = 4.26$ ,  $p < .05$  and accounted for 12.6% of the variation in explicit weight stigma. After entry of the two perspective taking tasks at step 2, the total variance explained by the model as a whole was 14.7%,  $F(4,57) = 2.46$ ,  $p > .05$ . The introduction of the two perspective taking tasks explained additional 2.1% variance in explicit weight stigma after controlling for age and verbal ability ( $R^2$  Change = .02;  $F(2,57) = 0.71$ ,  $p > .05$ ). After entry of the Inhibition Composite score at step 3, the total variance explained by the model as a whole was 14.7%,  $F(5,56) = 1.94$ ,  $p > .05$ . The introduction of the Inhibition Composite score did not explain any additional variance in explicit weight stigma after controlling for age, verbal ability, and the two perspective taking tasks ( $R^2$  Change = .00;  $F(1,56) = .01$ ,  $p > .05$ ). In the final model, age was the only predictor variable that was statistically significant ( $\beta = -.41$ ,  $p < .05$ ). In sum, the second part of hypothesis 3 was not supported.

**Table 7: Hierarchical Regression Model 2 of Explicit Weight Stigma**

Variable	B	SE B	B	<i>T</i>	R	R <sup>2</sup>	Δ R <sup>2</sup>
Step 1					.36	.13	.13
Constant <sup>a</sup>	2.37	1.09		2.17*			
Age	-0.63	0.24	-.45	-2.63*			
Verbal Ability	0.01	0.01	.16	.92			
Step 2					.38	.15	.02
Constant	2.42	1.10		2.21*			
Age	-0.58	0.25	-.41	-2.37*			
Verbal Ability	0.01	0.01	.18	1.00			
Perspective Taking task	0.04	0.21	.03	.21			
Weight Stigma Perspective Taking task	-0.27	0.23	-.15	-1.17			
Step 3					.38	.15	.00
Constant	2.41	1.15		2.09*			
Age	-0.58	0.26	-.41	-2.25*			

Verbal Ability	0.01	0.01	.17	.98
Perspective Taking task	0.05	0.21	.03	.21
Weight Stigma Perspective Taking task	-0.27	0.23	-.15	-1.16
Inhibition Composite score	0.01	0.13	.01	.04

*Note.*  $N = 62$ , Age (in years); Verbal Ability = Peabody Picture Vocabulary Test (raw score),  $*p < .05$ .

<sup>a</sup>Constant values are reported so readers can construct the full regression model if needed.

To test the third part of hypothesis 3, perspective taking skills would moderate the relation between explicit weight stigma and inhibition after controlling for age and verbal ability, a hierarchical multiple regression was conducted with explicit weight stigma as the dependent variable. Testing moderation required the calculation of the Interaction term (Inhibition Composite score x the Perspective Taking Composite Score). However, because it was not appropriate to calculate a Perspective Taking Composite score (see section on composite scores), analyses were conducted with the Perspective Taking task and the Weight Stigma Perspective Taking task entered separately. To avoid multicollinearity and to make the interpretation of the result more clear, all variables used in the regression were standardized and intercorrelations between the variables are reported in Table 8. Age and verbal ability were entered at step 1, the Inhibition Composite score and the Perspective Taking task were entered at step 2, and the Interaction term (Inhibition Composite score x the Perspective Taking task) was entered at step 3, regression statistics are in Table 9. The hierarchical multiple regression showed that at step 1, age and verbal ability contributed significantly to the regression model,  $F(2,59) = 4.26, p < .05$  and accounted for 12.6% of the variation in explicit weight stigma. After entry of the Inhibition Composite score and the Perspective Taking task at step 2, the total variance explained by the model as a whole was 12.7%,  $F(4,57) = 2.07, p > .05$ . The introduction of the Inhibition Composite score and the Perspective Taking task explained additional 0.0% variance in explicit

weight stigma after controlling for age and verbal ability ( $R^2$  Change = .00;  $F(2,57) = 0.03$ ,  $p > .05$ ). After entry of the Interaction term (Inhibition Composite score x the Perspective Taking task) at step 3, the total variance explained by the model as a whole was 12.7%,  $F(5,56) = 1.63$ ,  $p > .05$ . The introduction of the Interaction term (Inhibition Composite score x the Perspective Taking task) explained additional 0.0% in explicit weight stigma after controlling for age, verbal ability, and the two perspective taking tasks ( $R^2$  Change = .00;  $F(1,56) = .02$ ,  $p > .05$ ). In the final model, age was the only predictor variable that was statistically significant ( $\beta = -.45$ ,  $p < .05$ ). In sum, the second hypothesis was not supported.

**Table 8: Intercorrelations between Standardized Multiple Regression Variables**

	EWS	Age	PPVT	Inhibition	PT	WSPT	Inter 1	Inter 2
EWS	-	-.34**	-.16	.127	-.05	-.09	-.03	.15
Age		-	.71**	-.34**	.27*	.01	-.02	.08
PPVT			-	-.17	.16	.00	.04	-.04
Inhibition				-	-.28*	.05	-.42**	-.11
PT					-	-.35**	-.41**	.20
WSPT						-	.27**	.00
Inter 1							-	-.21
Inter 2								-

*Note.*  $N = 62$ ; For ‘Inhibition’, lower scores indicate better performance, EWS = Explicit Weight Stigma Composite score; Age (in years); PPVT = Peabody Picture Vocabulary Test (raw score); Inhibition = Inhibition Composite score; PT = Perspective Taking task; WSPT = Weight Stigma Perspective Taking task; Inter 1 = Interaction score 1 (Inhibition Composite score x Perspective Taking task), Inter 2 = Interaction score 2 (Inhibition Composite score x Weight Stigma Perspective Taking task); \* $p < .05$ , \*\* $p < .01$ .

**Table 9: Hierarchical Regression Model 3 of Explicit Weight Stigma**

Variable	B	SE B	B	$T$	R	$R^2$	$\Delta R^2$
Step 1					.36	.13	.13*
Constant <sup>a</sup>	0.00	0.19		.00			
Age	-0.71	0.27	-.45	-2.63*			
Verbal Ability	0.25	0.27	.16	.92			
Step 2					.36	.13	.00
Constant	0.00	0.20		.00			
Age	-0.71	0.29	-.45	-2.46*			
Verbal Ability	0.24	0.28	.15	.84			
Inhibition	0.01	0.13	.01	.10			

Perspective Taking task	0.05	0.21	.03	.22			
Step 3					.36	.13	.00
Constant	-0.01	0.21		-.05			
Age	-0.72	0.30	-.45	-2.43*			
Verbal Ability	0.25	0.29	.15	.85			
Inhibition	0.00	0.15	.00	.03			
Perspective Taking task	0.03	0.23	.02	.14			
Interaction score 1	-0.03	0.18	-.02	-.15			

*Note.*  $N = 62$ , Age (in years); Verbal Ability = Peabody Picture Vocabulary Test (raw score); Inhibition = Inhibition Composite score; Interaction score 1 = (Inhibition Composite score x Perspective Taking task); \* $p < .05$ .

<sup>a</sup>Constant values are reported so readers can construct the full regression model if needed.

A final hierarchical regression was conducted following the same procedures as describe above, except the Weight Stigma Perspective Taking task was substituted for the Perspective Taking task, regression statistics are in Table 10. The hierarchical multiple regression showed that at step one, age and verbal ability contributed significantly to the regression model,  $F(2,59) = 4.26, p < .05$  and accounted for 12.6% of the variation in explicit weight stigma. After entry of the Inhibition Composite score and the Weight Stigma Perspective Taking task at step 2, the total variance explained by the model as a whole was 14.7%,  $F(4,57) = 2.45, p > .05$ . The introduction of the Inhibition Composite score and the Weight Stigma Perspective Taking task explained additional 2.0% variance in explicit weight stigma after controlling for age and verbal ability ( $R^2$  Change = .02;  $F(2,57) = 0.68, p > .05$ ). After entry of the Interaction term (Inhibition Composite score x the Weight Stigma Perspective Taking task) at step 3, the total variance explained by the model as a whole was 17.0%,  $F(5,56) = 2.29, p > .05$ . The introduction of the Interaction term (Inhibition Composite score x the Weight Stigma Perspective Taking task) explained additional 2.3% of variance in explicit weight stigma after controlling for age, verbal ability, and the two perspective taking tasks ( $R^2$  Change = .02;  $F(1,56) = 1.56, p > .05$ ). In the final model, age was the only predictor variable that was statistically significant ( $\beta =$

-.42,  $p < .05$ ). In sum, based on the two hierarchical regressions, the third hypothesis was not supported.

**Table 10: Hierarchical Regression Model 3b of Explicit Weight Stigma**

Variable	B	SE B	B	<i>T</i>	R	R <sup>2</sup>	Δ R <sup>2</sup>
Step 1					.36	.13	.13*
Constant <sup>a</sup>	0.00	0.19		.00			
Age	-0.71	0.27	-.45	-2.63*			
Verbal Ability	0.25	0.27	.16	.92			
Step 2					.38	.15	.02
Constant	0.00	0.19		.00			
Age	-0.65	0.29	-.41	-2.26*			
Verbal Ability	0.29	0.28	.18	1.05			
Inhibition	0.00	0.13	.00	.00			
WSPT	-0.24	0.21	-.15	-1.17			
Step 3					.41	.17	.02
Constant	.04	0.20		.20			
Age	-0.66	0.29	-.42	-2.31*			
Verbal Ability	0.31	0.28	.20	1.14			
Inhibition	0.06	0.14	.06	.41			
WSPT	-0.21	0.21	-.13	-1.01			
Interaction score 2	0.17	0.14	.16	1.25			

*Note.*  $N = 62$ , Age (in years); Verbal Ability = Peabody Picture Vocabulary Test (raw score); Inhibition = Inhibition Composite score; WSPT = Weight Stigma Perspective Taking task; Interaction score 2 = (Inhibition Composite score x Weight Stigma Perspective Taking task); \* $p < .05$ .

<sup>a</sup>Constant values are reported so readers can construct the full regression model if needed.

## Chapter 4: Discussion

The aim of this study was to investigate the relations between weight stigma, perspective taking skills, and EF in typically developing young children. This study extends previous research on weight stigma by assessing weight stigma (explicit and implicit) in addition to the relations between weight stigma and perspective taking skills and EF skills, and controlling for verbal ability and age. In this chapter, I will first summarize my findings with regard to my three hypotheses. Following this I will compare the main findings of this study to previous research and discuss weight stigma in relation to other forms of stigma (eating disorders, race, gender), which will provide the basis for explaining why some of the hypotheses were not supported by the data.

### Summary of Findings

Overall, the results of this investigation provided evidence that most children in the sample had negative attitudes toward other children who are overweight and these attitudes seem to become more negative with age. These negative attitudes were demonstrated using measures of explicit and implicit weight stigma. Comparing explicit and implicit measures of weight stigma was an important component of this research, although the main purpose was to determine whether perspective taking skills or executive function (EF) could explain these negative attitudes in young children.

**Hypotheses 1: Age-related differences in explicit and implicit weight stigma.** For the first part of hypothesis one, I expected that explicit measures of weight stigma would decrease with age. However, the opposite was true; the evidence suggests that explicit weight stigma increases with age. For the second part of hypothesis one, I expected that implicit weight stigma would remain stable across age. In support of this hypothesis, I did not find a significant

association between age and implicit weight stigma. For the third part of hypothesis one, I expected that the association between implicit and explicit measures of weight stigma would be significantly higher in younger children than older children. However, this was not the case; there was no significant difference in the association between implicit and explicit weight stigma in younger children compared to older children.

**Hypotheses 2: Associations between explicit weight stigma, implicit weight stigma, and predictors.** For the first part of hypothesis two, I expected that the correlation between explicit weight stigma and perspective taking skills would be significantly larger than the correlation between implicit weight stigma and perspective taking skills. However, contrary to what was posited, the correlation between explicit weight stigma and the two perspective taking tasks were not significantly larger than the association between implicit weight stigma and perspective taking tasks. For the second part of hypothesis 2, I expected that the correlation between explicit weight stigma and inhibition would be significantly larger than the correlation between implicit weight stigma and inhibition. Contrary to the hypothesis, the correlation between explicit weight stigma and inhibition was not significantly larger than the correlation between implicit weight stigma and inhibition.

**Hypotheses 3: Linking explicit weight stigma with predictors.** For the first part of hypothesis three, I expected that perspective taking skills would predict a significant amount of variance in explicit weight stigma after controlling for age, verbal ability, and inhibition. However, this was not the case as perspective skills did not predict a significant amount of variance in weight stigma. For the second part of hypothesis three, I hypothesized that inhibition would predict a significant amount of variance in explicit weight stigma after controlling for perspective taking skills, age, and verbal ability. Contrary to the hypothesis, inhibition did not

account for a significant amount of variance in weight stigma. For the third part of hypothesis three, I expected that perspective taking skills would moderate the relation between explicit weight stigma and inhibition after controlling for age and verbal ability. However, this was not the case; perspective skills did not moderate the relation between explicit weight stigma and inhibition.

### **Linking the Current Study with Previous Research**

In the following section, I compare the main findings of this study to previous research, and suggest explanations for any differences. Following this I discuss similarities and differences between weight stigma, racial bias and gender stereotypes and I will conclude with discussing each of my three hypotheses in relation to previous research.

**Explicit weight stigma.** Consistent with previous research, children in this study assigned more negative characteristics to the overweight figure than to thin or average figure during the anti-fat task (Brylinsky & Moore, 1994; Cramer & Steinwert, 1998; Holub, 2008; Margulies et al., 2008; Meers et al., 2011; Musher-Eizenman et al., 2004; Staffieri, 1967; Stager & Burke, 1982; Worobey & Worobey, 2014). Cronbach's  $\alpha$  was .49 for the thin figure items, .62 for the average figure items, and .58 for the overweight figure items. These result are similar to Margulies and colleagues (2008) who used this same task with preschoolers and reported Cronbach's  $\alpha$  was .66 for underweight items, .74 for average figure items and .60 for overweight figure items.

Further, children in this study preferred average-sized figures to thin and overweight figures, which is consistent with other studies (Brylinsky & Moore, 1994; Cramer & Steinwert, 1998). The negative attitudes that children had in the anti-fat task were further demonstrated in their selections of potential friends. Overweight figures were chosen less often than thin or

average figures as desirable playmates, and were almost never chosen as a best friend ( $n = 6$ ). These findings are consistent with other studies with children (Cramer & Steinwert, 1998; Musher-Eizenman et al., 2004). Performance on the Anti-fat Prejudice task was associated with the performance on the Friendship Selection task (see Table 4), suggesting convergent validity between these two measures of explicit weight stigma.

**Implicit weight stigma.** Children in this study demonstrated implicit weight stigma, similar to another study with 3- to 7-year-olds (Thomas et al., 2007) and other studies with older children (Roddy & Stewart, 2012; Solbes & Enesco, 2010). Specifically, children's average Weight IAT effect was significant,  $D = 0.28$ , which is comparable to the findings by Roddy and Stewart (2012), who reported a Weight IAT score of  $D = 0.24$ , and Solbes and Enesco (2010), who reported a Weight IAT score of  $D = 0.35$ . The psychometric properties of the Weight IAT were satisfactory. Internal consistency of the Weight IAT was obtained by correlating Weight IAT measures computed from odd-numbered versus even numbered trials (Cvencek et al., 2011). Comparable to Cvencek et al., (2011), the internal consistency of the Weight IAT was satisfactory, Cronbach's alpha,  $\alpha = .78$ .

The Weight IAT task was especially difficult for the nineteen 4-year-olds as most of them ( $n = 14$ ; 74%) found the task too challenging. This attrition rate was higher than reported in previous studies with adults (5-10%; Cvencek et al., 2011), 3-year-olds (50%, Thomas et al., 2007), 4-year-olds (14% overall in two experiments, Cvencek et al., 2011; 10%, Thomas et al., 2007), or 4- to 6-year olds (30%, 21%, Dunham et al., 2011). I will discuss these discrepancies for each study in turn. One explanation for this discrepancy with the study by Thomas and colleagues (2007) pertains to task design. The Weight IAT in the present study consisted of 144 trials and required children to press a colour-coded response button to match one side of the

computer screen. Conversely, the Weight IAT used by Thomas and colleagues consisted of 100 trials and required children to touch one side of a touch screen monitor. Reducing the number of trials may have made the task easier for 4-year-olds to complete because it was shorter in duration.

Further, there are important differences between the standard button-press procedure and the touch-screen procedure that make the touch-screen paradigm easier. The button-press procedure requires matching one button to one stimulus and the other button to another stimulus. Conversely, the touch-screen procedure requires simply touching the stimuli on the screen. The touch-screen is easier to use because instead of having to detect the matching stimuli *and* remember to press a specific button, the task is to simply touch the correct stimuli. Thus, these changes from a typical IAT task by Thomas and colleagues may have made it easier for the 4-year-olds to complete the task. Whether these procedural differences (touch-screen vs. button-press) account for the lower attrition rate for the IAT is an interesting question for future research.

It is worth noting that LoBue and Mathews (2013) tested these two paradigms with adults using a visual search task and found that both methodologies (i.e., button press or touch-screen) yielded the same pattern of results (i.e., faster responding to threatening stimuli such as snakes and spiders than flowers and mushrooms). However, there was little or no relation in behavioural responding between the two, suggesting that the cognitive and perceptual processes may differ between paradigms. The authors conclude that the button-press procedure is preferred if the experimenter's goal is to study subtle characteristics such as automatic responses. As the IAT is intended to measure implicit and automatic responses, using a touch-screen may

not be appropriate for administering an IAT, and this is an important task for future research to examine with children.

Dunham et al. (2011) reported a 30% attrition rate for 4- to 6-year olds for the first experiment and a 21% attrition rate for 4- to 6-year olds for the second experiment. Both of these rates are lower than the current study (74%); however, closer examination of these studies revealed a few important differences. First, the four-year-olds in the current study were younger than the 4-year-olds in the Dunham et al.'s two experiments. The youngest participant in the current study was 4 years and less than one month old; whereas, the youngest participant in either of Dunham et al.'s experiment was 4 years and six months old. Second, for both experiments in Dunham et al. (2011), there were disproportionately fewer 4-year-olds in the sample compared to 5- or 6-year olds. For experiment one, there were six 4-year-olds (total  $n = 33$ ) and five 4-year-olds in experiment two (total  $n = 43$ ). Third, the age distributions of the 19 children in both experiments who either did not complete the task or met the exclusion criteria were not reported. As it is not possible to calculate the attrition rate for the 4-year-olds, it precludes cross-study comparison. However, based on my experience with testing a range of young children on the IAT, I suspect that the majority, if not all, the 4-year-olds in both experiments were unable to complete the IAT and attrition rates for only the 4-year-olds would be higher than 30% or 21%. Taken together, the attrition rate for the two experiments was lower than in the present study because the 4-year-olds in the two experiments were older, there were fewer of them, and the attrition rate for only 4-year-olds was not reported.

Cvencek et al. (2011) reported an overall 14% attrition rate for the two experiments with four-year-olds, which is lower than the attrition rate for the four year olds in the current study (74%). One difference between the two studies is that, as described previously, Cvencek and

colleagues used a collage of four example stimuli, conversely, the current study used one example stimuli (see Figure 2) because (a) it was consistent with Baron and Banaji (2006) Race IAT with young children, (b) it would match the number of reminders for the word trials (happy vs. sad face), and (c) it made the computer screen appear less overwhelming due to a reduction of stimuli on the screen. However, it is possible that providing four visual reminders may have made the task easier for 4-year-olds. Cvencek and colleagues postulate that using multiple visual reminders may reduce demands on retaining multiple stimuli in working memory during the task. Thus, this possibility is deserving of future research attention, especially if IAT studies continue to be used with preschoolers.

A final explanation is that the higher attrition rate was due to fatigue from previous tasks. The present study administered the Weight IAT as the sixth out of eight tasks. In contrast, Thomas and colleagues (2007) administered only two IAT tasks (Insect-flower, Weight), Cvencek and colleagues (2011) administered the IAT as the second out of two tasks, and Dunham and colleagues (2011) administered the IAT as the last of four tasks. Thus, the 4-year-olds in the present study may have become fatigued during the IAT task despite breaks in between some of the tasks. Additional research is needed to examine this possibility. Administering the IAT to children can be challenging, as one research study noted, “In our pilot research we found it difficult to obtain usable data from children younger than 12” (p. 99, Bruni et al. 2010). Thus, it may not be possible to prevent a high attrition rate in preschoolers.

**Perspective Taking tasks.** Children’s performance on the perspective taking tasks significantly improved with age, which is consistent with studies with preschoolers (Farrant, Devine, Maybery, & Fletcher, 2012), children (Fitzgerald & White, 2003; Krebs & Gillmore 1984; Selman & Bryne, 1974), and adolescents (Quintana, Castaneda-English, & Ybarra, 1999).

The Weight Stigma Perspective Taking task was a novel approach to measure perspective taking skills in children. The Weight Stigma Perspective Taking task was developed in the spirit of Piaget's (1929) clinical method and Selman's perspective taking tasks to explore: (a) children's justifications of whether or not they would be friends to person who is bigger than them and, (b) their justifications of whether or not other children would be friends to a child who is bigger than them. As the Weight Stigma Perspective Taking task has not been used previously, comparisons to other studies are limited. Results from a qualitative study seem to be consistent with results from the first question in the Weight Stigma Perspective Taking task used in the current study. Chalker and Dea (2009) interviewed 8- to 10-year-olds and showed seven figures of various sizes that were matched to children's gender. One of the interview questions was, "Do you think you would like to be friends with him/ her? Why/ Why not?". For the overweight figures, some children answered by saying that they would like to be friends because "she's lonely", or "cos probably he doesn't have any friends", and other children answered saying they would not like to be friends because "she'll probably be mean" or "they look like big tough girls... [who will] eat our food".

Performing a qualitative analysis for the Weight Stigma Perspective Taking task along the lines of Chalker and Dea (2009) is beyond the scope of the current study. However, I observed that 7-year-olds in the current study gave similar justifications as the 8- to 10-year-olds in Chalker and Dea's (2009) study. For instance, some children answered by saying that they would like to be friends because "she looks like she doesn't have any friends and I want to be her friend. Because people might make fun of her and I don't like it when that happens" (#55, 7-year-old girl), or "because he looks sad. Because he does not have friends" (#64, 7-year-old boy). Other children answered that they would not like to be friends because "he might squish

you” (#27, 7-year-old boy) or “Because she is older and I like younger kids to play with (#29, 7-year-old girl). Harper (1999) suggests that what kind of playmate children select as friends depends on several factors, such as whether they believe the child will be able to perform the desired activity. This is also consistent with some of the justifications for why some child refused to be friends with a “bigger person like Michael/ Judy”. For example, one 7-year-old boy who played soccer on a regular basis explained that he would not be friends with “Michael” because, “I don’t know if he would want to play soccer every day” (#3). In sum, it seems that children’s responses on the traditional perspective taking task by Selman (1974) and the new Weight Stigma Perspective Taking task are similar to those observed in previous research.

**Executive Function.** The measures of inhibition used in the current study showed similar age trends and correlational patterns as in previous studies. In the current study, children’s number of commission errors on the Boy-Girl Stroop was similar to other studies using the same task with typically developing preschoolers (Baron, Kerns, Müller, Ahronovich, & Litman, 2012; Müller et al., 2012; Miller et al., 2012; Miller, Müller, Giesbrecht, Carpendale, & Kerns, 2013). Commission errors were significantly negatively associated with age, which is consistent with other studies using the same task with typically developing preschoolers (Baron et al., 2012; Müller et al., 2012). In the current study, there were no significant associations between the Boy-Girl Stroop and verbal ability. These results are in line with several studies that reported no relation between a similar Stroop-like task, the Day-Night task, and verbal ability (e.g., Lewis, Dozier, Ackerman, & Sepulveda-Kozakowski, 2007; Rasmussen, Wyper, & Talwar, 2009; Rhoades et al., 2009). The Day-Night task (Gerstadt et al., 1994) has been used extensively with 3- to 7-year-olds (for a review see, Montgomery & Koeltzow, 2010). Taken

together, these studies suggest that children's performance on the Boy-Girl Stoop in the current study was similar to previous research and was an appropriate task to measure inhibition skills. For the Go/No-Go task, children's number of commission errors was similar to other studies using the same task with preschoolers (Baron et al., 2012; Müller et al., 2012; Miller et al., 2012; Miller, Müller, Giesbrecht, Carpendale, & Kerns, 2013). Commission errors were not significantly associated with age, which is consistent with another study using the same task with young children (Müller et al., 2012) and is consistent with other studies using variants of the Go/No-Go with young children (age 5-7 years; Torpey, Hajcak, Kim, Kujawa, & Klein, 2011) and older children (e.g., Brocki & Bohlin, 2004; Cragg, Fox, Nation, Reid, & Anderson, 2009; Johnstone et al., 2007; Jonkman, 2006; Maguire, White, & Brier, 2011). A lack of developmental change on the Go/No-Go task may be due to task insensitivity rather than a true indication of a lack of differences in inhibition between children of different ages (Cragg & Nation, 2008). In the current study, there were no significant associations between commission errors and verbal ability on the Go/No-Go task. These results are consistent with the original study of this version of the Go/No-Go with older children, in which there was no significant association between commission errors and a measure of verbal IQ (Archibald & Kerns, 1999). In addition, performance on the Boy-Girl Stoop was associated with the performance on the Go/No-Go task (see Table 4), suggesting convergent validity between these two measures of inhibition. In sum, the pattern of findings and comparison with results from previous studies suggest that the tasks used in this study were generally valid measures of explicit weight stigma, implicit weight stigma, perspective taking skills, and executive function.

**Comparing the study's hypotheses to previous research.** In this section, I will discuss research related to each of the three main hypotheses. Where possible, I will briefly compare research on different types of stigma including weight, race, and gender.

*Hypotheses 1: Age-related differences in explicit and implicit weight stigma.* For the first part of hypothesis one, I expected that explicit measures of weight stigma would decrease with age. However, the opposite was true, the current study found that explicit weight stigma increased age. This finding is consistent with studies with preschoolers (Cramer & Steinwert, 1998; Turnball et al., 2000), children (Lawson, 1980; Sigelman et al., 1986) and a study with 4- to 20-year-olds (Lerner & Korn, 1972). These results are in contrast with studies suggesting weight stigma may not increase linearly (Brylinsky & Moore, 1994), that age effects may not be present at all (Tiggemann & Wilson-Barrett, 1998), and that weight stigma may actually decrease with age (Crystal et al., 2000; Gray et al., 2011; Latner et al., 2005; Latner & Stunkard, 2003; Rand & Wright, 2000; Solbes & Enesco, 2010). There are also several studies that have measured weight stigma but did not report age related differences (e.g., Chalker & O'Dea, 2009; Greenleaf et al., 2006; Kraig & Keel, 2001; Richardson et al., 1961).

As reviewed above, as there is limited research on weight stigma, it was necessary to draw from research that examines other types of attitudes such as racial or gender attitudes. Racial attitudes of 6- to 10-year-olds demonstrated a non-linear pattern as ingroup favouritism appears to follow a curvilinear pattern, peaking in 5- to 7-year-olds and then declining in 8- to 10-year-olds (for a meta-analytic review of age trends, see Raabe & Beelmann, 2011). Gender stereotypes appear to follow a similar pattern. Gender stereotype knowledge (e.g., boys play with trucks) increases between the ages of 3 and 5 years, conversely, stereotype flexibility (e.g., boy associated with trucks, but girls can play with trucks as well) follows a U-shaped trajectory

(Banse, Gawronski, Rebetez, Gutt, & Morton, 2010). Stereotype flexibility decreases between the ages of 2 and 7 years, with the lowest level between the ages of 5 and 7 years, and then increases between the ages of 7 and 12 years, reaching ceiling levels between the ages of 10 and 12 years. One possibility is that weight stigma will follow a similar pattern to racial and gender attitudes, it may increase in 4- to 7-year-olds and then decrease in 8- to 12-year-olds due to higher levels of stereotype flexibility. Alternatively, weight stigma may increase in 4- to 7-year olds and remain constant as weight stigma is considered to be more socially acceptable than race or gender stigma (see below).

In sum, the relation between explicit weight stigma and age has yielded mixed results. Our understanding of weight stigma is complicated by several issues including the age of interest (preschoolers vs. children vs. adolescents vs. adults), the specific tasks used (adjective tasks vs. friendship tasks vs. ranking figures), and inconsistency of reporting (age effects reported vs. not reported). For instance, the adjective tasks, the friendship task, and the ranking figures task are all intended to measure weight stigma; however, despite strong face validity, previous research has not demonstrated the reliability and the validity of these tasks (e.g., Musher-Eizenman et al., 2004; additional limitations of these tasks are discussed below).

*Part B.* For the second part of hypothesis one, I expected that implicit weight stigma would remain stable across age. In support of this hypothesis, there were no significant associations between age and Implicit Weight Stigma. While consistent with the predictions, these findings must be interpreted cautiously given the problems inherent in testing a null hypothesis. These results are consistent with a Weight IAT administered to 6- to 11-year-olds, which found that as children grew older the level of implicit weight stigma did not significantly change (Solbes & Enesco, 2010). Two other studies that administered a Weight IAT to children

did not report age effects (Thomas & Ball, 2007; Roddy & Stewart, 2012). A Weight IAT administered to adults also did not find significant differences with age (Nosek et al, 2007; Teachman & Brownell, 2001).

Further, IATs measuring racial prejudice in children have not observed age differences, with implicit racial bias being strong in children as young as 6 years of age and remaining stable over the lifespan (e.g., Baron & Banaji, 2006; Degner & Wentura, 2010; Dunham, Baron, & Banaji, 2008; Newheiser & Olson, 2012; Rutland et al., 2005). Despite robust evidence suggesting developmental invariance of implicit intergroup bias, Baron (2015) suggests that change may be occurring in the level of representations of group preferences and in the processes that form and maintain these preferences. For instance, implicit attitudes of younger children may be due to internalized sense of membership in one's own group, whereas implicit attitudes of older children may be due to internalization of the superior cultural standing of their own group (i.e., change at the representational level and not the processing level). Thus, the current study found implicit attitudes were not significantly associated with age, but it may be premature to conclude that developmental invariance is a key characteristic of implicit weight attitudes in children.

*Part C.* For the third part of hypothesis one, I expected that the association between implicit and explicit measures of weight stigma would be significantly higher in younger children than older children. This hypothesis was based on results from Solbes and Enesco (2010), who found that for the youngest group (mean age 6.9 years) of participants the Weight IAT was associated with two of the three explicit weight stigma measures (positive adjectives attributed to average figures and negative adjectives attributed to overweight figures) and there were no associations between the Weight IAT and the explicit measures for the two older groups

of participants (mean age 8.9 and 10.8 years). However, there were no significant differences in the correlations between the two age groups. The correlation between implicit and explicit measures of weight stigma was  $r = .11$  ( $p > .05$ ) in the younger children (age 4-6 years), which is consistent with an experiment involving four-year-olds that included implicit and explicit measures of flowers-insect attitudes ( $r = .22$ ,  $p > .05$ ; Cvencek et al., 2011). Two experiments with 4- to 6-year-olds also did not find significant associations on implicit and explicit measures of gender attitudes ( $r = .35$ ,  $p > .05$ ;  $r = .15$ ,  $p > .05$ ) (Dunham et al., 2011). Taken together, these studies suggest that a non-significant association between implicit and explicit measures can be expected in young children.

Results from the current study showed that the correlation between implicit and explicit measures of weight stigma in the older children (age 6-7 years) was  $r = .19$ ,  $p > .05$ . A lack of significant associations between implicit and explicit measures has also been reported in other studies measuring attitudes toward different topics, one study with 6- to 16-year-olds on racial attitudes ( $r = .01$ ,  $p > .05$ ; Rutland et al., 2005), another study with 9- to 11-year-olds on aggression ( $r = .18$ ,  $p > .05$ ; Grumm, Hein, & Fingerle, 2011), another study with 10- to 12-year-olds on attitudes toward nature ( $r_s = -.02$ - $.12$ ;  $p_s > .05$ ; Bruni & Schultz, 2010), and another study with 10- to 13-year-olds on bullying ( $r = .06$ ,  $p > .05$ ; van Goethem, Scholte, & Wiers, 2010). To rule out the possibility that differences could be found between 4- and 5 year olds and 6- and 7-year-olds, post-hoc analyses revealed that when the children were grouped by age instead of using a median split a similar pattern was found. The correlation between implicit and explicit measures was  $r = .17$ ,  $p > .05$  in the younger children (age 4-5 years,  $n = 16$ ) and was  $r = -.18$ ,  $p > .05$  for the older children (age 6-7 years,  $n = 29$ ).

It was expected that with age children would become more aware of social norms (e.g., it is wrong to exclude overweight individuals) and would suppress explicit weight stigma, similar to how race stigma is suppressed with age. Thus, it was expected that the correlation between explicit and implicit weight stigma would decrease with age. However, there are two main possibilities to explain why age differences were not found. First, as described above, the age groups between the current study and the study conducted by Solbes and Enesco (2010) are different, 4- to 7-year olds and 6- to 10-year olds respectively. One possibility is that the correlation between explicit and implicit weight stigma would decrease in older children (e.g., in children older than 7 years of age).

Second, another explanation for the low correlation between implicit and explicit attitude measures is that there are fundamental differences between implicit and explicit attitudes. Further, these differences between implicit and attitudes do not change with age. Several studies with adults have suggested that implicit and explicit attitudes are related but unique constructs (Nosek & Smyth, 2007; for review see Lane, Banaji, Nosek, & Greenwald, 2007; Nosek, 2007). In addition, more robust implicit and explicit correlations tend to emerge under particular conditions. For instance, higher correlations emerge in adults when more relevant self-report measures are used such as asking individuals to report their automatic feelings rather than their explicit attitudes (Ranganath, Smith, & Nosek, 2008; Smith & Nosek, 2011). Correlations in adults are also higher when the domains are less socially sensitive (e.g., consumer vs. racial attitudes; Nosek, 2005) and when adults are encouraged to be honest in their self reports (Olson, Fazio, & Hermann, 2007). These studies suggest that individuals are at least partly aware of their automatic associations; however, insufficiently reliable, relevant, and sensitive measures often obscure this fact (for review see, Uhlmann et al., 2008). For instance, I may have obtained

higher correlations between implicit and explicit attitudes if I had instructed children to answer honestly or to answer using their automatic “gut” feeling. There is evidence that these modifications may moderate the strength of the association in adults, however, more work remains to be done on this topic with children.

In summary, low correlations between implicit and explicit measures were consistent with previous research with preschoolers and young children. There are two main reasons to explain why significant age differences in associations between implicit and explicit attitudes were not found: (a) weight stigma is different from other forms of stigma (see below), and (b) regardless of age, implicit and explicit measures tap into very different processes. It is worth noting that Solbes and Enesco (2010) do not provide an explanation for why significant correlations were found in only the 6- and 7-year olds, they only note that other studies carried out in other domains with children (e.g., racial attitudes) did not find correlations between explicit and implicit measures.

***Hypotheses 2: Associations between explicit weight stigma, implicit weight stigma and predictors.*** For the first part of hypothesis two, I expected that the correlation between explicit weight stigma and perspective taking skills would be significantly larger than the correlation between implicit weight stigma and perspective taking skills. Selman (1976) suggested that perspective taking development is related to four general areas of functioning: (a) children’s social problem solving such as playing games with other children, (b) children’s communication and persuasive skills, (c) children’s understanding of fairness, justice, and moral development, and (d) children’s understanding of the feelings of others such as sympathy or empathy. Of these four aspects, the latter is the focus of this study. It was expected that children with higher levels of perspective taking skills would be less likely to demonstrate weight stigma. This hypothesis

was exploratory as, the best of my knowledge, none of the studies that have measured implicit and explicit attitudes have also measured perspective taking skills. Other experimenters have suggested that perspective taking skills should be investigated to understand racial bias (Lam, Guerrero, Damree, & Enesco, 2011); thus, it was reasonable to expect that perspective taking skills would provide information to better understand weight stigma.

Contrary to what was posited, the correlations between explicit weight stigma and the two perspective taking tasks were not significantly larger than the correlations between implicit weight stigma and perspective taking tasks. I will discuss each part of this hypothesis in turn, first the relation between explicit weight stigma and the two perspective taking tasks, then the relation between implicit weight stigma and the two perspective taking tasks, and finally an explanation of why the former association was not significantly larger than the latter association. The association between explicit weight stigma and the Perspective Taking Task was very low ( $r = -.07, p > .05$ ). The association between explicit weight stigma and the Weight Stigma Perspective Taking Task was marginally significant ( $r = -.24, p = .06$ , observed power = .61), and in the predicted direction (i.e., higher perspective taking skills was associated with lower explicit weight stigma).

There was no association between perspective taking skills and explicit weight stigma, which was unexpected as perspective taking skills have been linked to age related changes in racial stereotypes (Rutland et al., 2005) and prosocial moral judgement (Eisenberg, Zhou, & Koller, 2001). In terms of intergroup relations, perspective taking also reduces stereotype expression and in-group bias toward older adults and African Americans (Galinsky & Moskowitz, 2000; Vescio, Sechrist, & Paolucci, 2003). There are three main possibilities to

explain why the current study did not find significant associations between perspective taking skills and explicit weight stigma.

First, weight stigma may be considered more socially acceptable than racial or gender stigma. There is ample evidence of weight stigma being more socially acceptable in adults in comparison to race stigma or gender stigma (e.g., Andreyeva et al., 2008; Bellizzi, & Hasty, 1998; Puhl, Andreyeva, & Brownell, 2008); however, there are only a few studies that have examined these relations in children. For instance, Richardson and Royce (1968) replicated Richardson et al.'s classic (1961) study (described above), however, they added a second stimulus set of pictures with African American children in addition to Caucasian children. Results showed that the obese figure was again ranked last, regardless of skin colour and across racial groups of children (Caucasian, African American, and Puerto Rican). These results suggest that children are more likely to demonstrate weight stigma than racial stigma. There are also higher rates bullying based on weight than bullying based on race in children (for review, see Puhl & King, 2013). Further, parents perceived bullying based on weight to be more common than bullying due to race or other reasons (Puhl, Luedicke, & DePierre, 2013). Qualitative research with African American adolescents found that those who experienced weight and racial stigma reported that weight stigma was experienced as more hurtful and personal than racial stigma (Neumark-Sztainer et al., 1998). One study examined peer victimization and found that adolescents reported bullying based on weight to be more common than bullying due to race or sexual orientation (Puhl, Luedicke, & Heurer, 2011). Another study with adolescents found that reports of weight stigma, but not racial stigma, were associated with elevated ambulatory blood pressure even after controlling for typical determinants of blood pressure such as BMI, sex, race, mood, among others (Matthews, Salomon, Kenyon, & Zhou,

2005). These authors suggest that the extent of perceived responsibility may be related to these results, as race is not a controllable attribute, however, body weight is perceived to be a controllable attribute. In sum, weight stigma is currently socially acceptable, overt, and prevalent; conversely, race stigma is generally considered not socially acceptable so individuals are less likely to take the perspective of an overweight individual.

Weight stigma may also be considered more socially acceptable in children compared to gender stigma. For instance, a national survey in the United States with teachers and school staff found that bullying in children and adolescents based on weight was perceived to be more common than bullying due to gender, sexual orientation, or disability (Bradshaw, Waasdorp, O'Brennan, & Gulemetova, 2011). Notably, there is more research with children comparing weight stigma with race than gender stigma. Taken together, these studies suggest that if weight stigma is considered socially acceptable (e.g., it's okay to make fun of or blame fat people), then there may be less motivation to inhibit stereotypical responses (e.g., fat people are lazy) and take the perspective of the "other" (e.g., what would it be like to be fat?). It is possible that there is a threshold for finding an association between stereotypes and perspective taking. In other words, only specific types of stigma (e.g., ones that are socially unacceptable like race) would be strongly associated with perspective taking skills. Additional research is needed to substantiate this possibility in young children and to better understand the developmental course for different types of stigma in young children.

Second, the current study did not find a strong association between perspective taking skills and explicit weight stigma due to the content of the two perspective taking tasks. The Weight Stigma Perspective Taking task had a higher correlation with explicit weight stigma ( $r = -.24$ ) than the Perspective taking task ( $r = -.07$ ). These results suggest that a stronger relation is

more likely to be found if there is content overlap between explicit weight stigma and the type of perspective taking task, a perspective taking task that is on the same topic (e.g., weight) instead of a perspective taking on a different topic (e.g., climbing a tree). Further, it may have been more difficult for children to take the perspective of abstract characters (e.g., Holly, Sean, and Holly's father) than to take the perspective of other children their age (e.g., their friends).

Another explanation for this discrepancy is that there are substantial differences in adults' willingness and tendency to take others' perspective (Davis, 1994), and children, likewise, do not always use the perspective taking skills that they possess (Eisenberg, 1996). For instance, Fennis (2011) found that the effects of perspective taking on prosocial behaviour are more pronounced when self-control resources are high rather than low. Would similar effects be obtained if weight stigma was used as an outcome variable? For example, it may be that taking the perspective of a member of a less desirable social group (e.g., an overweight person) may result in more weight stigma particularly when self-regulation resources are low. The current study administered the two perspective taking skills after the PPVT and two explicit weight stigma tasks, which may have depleted self-control resources in children and may have led to an underestimation of children's perspective taking skills. This possibility awaits future research. The association between implicit weight stigma and the Perspective Taking Task was low ( $r = -.14, p > .05$ ) and the association between implicit weight stigma and the Weight Stigma Perspective Taking Task was also low ( $r = -.13, p > .05$ ). These associations were expected (as described previously) because implicit weight stigma is tapping into unconscious instead of conscious processes; it would not be correlated with measures tapping into conscious processes, such as perspective taking skills.

*Part B.* For the second part of hypothesis two, I expected that the correlation between explicit weight stigma and inhibition would be significantly larger than the correlation between implicit weight stigma and inhibition. Stronger correlations between inhibition would reflect the greater influence of control processes on explicit than implicit processes (e.g., Cunningham et al., 2001; Devine, Plant, Amodio, Harmon-Jones, & Vance, 2002; Fazio & Olson, 2003; Greenwald, McGhee, & Schwartz, 1998; Hofmann et al., 2005). In other words, individuals with lower EF skills, such as younger children, will have less capacity to modify their explicit responses (Payne, 2005). Similar to the first part of hypothesis 2, as this was the first study to assess explicit attitudes, implicit attitudes, and inhibition, comparisons to other studies are limited. However, other researchers have acknowledged a link between explicit attitudes and EF. Olson and Dunham (2010, p. 242) suggest that early childhood is characterized by increasing EF skills and the emergence and development of the explicit system. As reviewed previously, there is also empirical evidence with children and adults that differences in inhibition skills may influence the expression of explicit race stigma (e.g., Clark et al., 1980; Payne, 2005; Richeson & Shelton, 2003; von Hippel et al., 2000).

Contrary to the hypothesis, the correlation between explicit weight stigma and inhibition was not significantly larger than the correlation between implicit weight stigma and inhibition. I will discuss each part of this hypothesis in turn, first the relation between explicit weight stigma and inhibition, then the relation between implicit weight stigma and inhibition, and finally an explanation of why the former association was not significantly larger than the latter association. The association between explicit weight stigma and inhibition was low ( $r = .13, p > .05$ ), and in the opposite direction as predicted. When I controlled for age, the partial correlation between explicit weight stigma and inhibition was even slightly lower,  $r = .02, p > .05$ . One

explanation for this discrepancy between what was expected and what was found is that the hypothesis was based on previous research on race stigma (Clark et al., 1980; Payne, 2005; Richeson & Shelton, 2003; von Hippel et al., 2000) which may not generalize to other types of stigma such as weight stigma. As mentioned previously, weight stigma is more socially acceptable than race or gender stigma. One way to test this possibility would be to measure weight stigma, race stigma, and inhibition skills in children and test whether inhibition skills would be associated with race stigma and gender stigma, but not weight stigma.

Another reason why I did not find a high association between explicit weight stigma and inhibition may be due to weight stigma being more socially acceptable than other types of stigma. If weight stigma is considered socially acceptable (e.g., it's okay to make fun of or blame fat people), then there is less motivation to inhibit a stereotypical responses (e.g., fat people are lazy). One way to test this possibility would be to measure awareness of social norms in relation to both weight and race stigma. For instance, researchers could ask children, "There are two groups of people in the world. One group thinks fat people are lazy or stupid and the other group thinks that fat people are neither lazy nor stupid. Which group do you think has more people?"<sup>5</sup>. Then the same question would be asked in relation to race, "There are two groups of people in the world. One group thinks African Americans are lazy or stupid and the other group think that African Americans are neither lazy nor stupid. Which group do you think has more people?". For weight stigma, I would predict that greater awareness of social norms (e.g., children who responded that most people think fat people are lazy or stupid) would be associated with higher levels of weight stigma and lower levels of inhibition. For race stigma, I would predict that higher awareness of social norms (e.g., children who responded that African Americans are not

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<sup>5</sup> As this question involves number conservation skills it may not be appropriate for children younger than 4 to 5 years of age.

lazy or stupid) would be associated with lower levels of race stigma and higher levels of inhibition. Thus, no significant associations between explicit weight stigma and inhibition may be because (a) weight stigma is different from race stigma and (b) there may be other variables (e.g., social awareness) that may account for differences between the current study and previous research on race stigma. The association between implicit weight stigma and inhibition was low ( $r = -.04, p > .05$ ). This low association was expected as implicit weight stigma is tapping into unconscious instead of conscious processes; it would not be correlated with measures tapping into conscious processes, such as inhibition.

***Hypotheses 3: Linking explicit weight stigma with predictors.*** For the first part of hypothesis three, I posited that perspective taking skills would predict a significant amount of variance in explicit weight stigma after controlling for age, verbal ability, and inhibition. However, this was not the case as perspective skills did not predict a significant amount of variance in weight stigma. As mentioned previously, despite empirical evidence suggesting a link between perspective taking skills and explicit weight stigma (e.g., Eisenberg et al., 2001; Galinsky & Moskowitz, 2000; Lam et al., 2011; Rutland et al., 2005; Vescio et al., 2003), the two perspective taking tasks did not account for a significant amount of variability in explicit weight stigma after controlling for age, verbal ability, and inhibition. As all three parts of hypothesis three were exploratory, no comparisons to previous research can be made. Due to the lack of significant associations between the two perspective taking tasks and the two explicit weight stigma tasks in general (reasons for the weak relations are discussed above), the only exception was a significant negative association between the Weight Stigma Perspective Taking task and the Friendship Selection task, it was not surprising that controlling for age, verbal ability, and inhibition skills did not account for a significant amount of variance.

*Part B.* For the second part of hypothesis three, I hypothesized that inhibition would predict a significant amount of variance in explicit weight stigma after controlling for perspective taking skills, age, and verbal ability. Contrary to the hypothesis, inhibition did not account for a significant amount of variance in weight stigma. Due to the lack of significant associations between inhibition tasks and the explicit weight stigma tasks (reasons for weak relations are discussed above), it was not surprising that controlling for age, verbal ability, and perspective taking skills did not account for a significant amount of variance.

*Part C.* For the third part of hypothesis three, I expected that perspective taking skills would moderate the relation between explicit weight stigma and inhibition after controlling for age and verbal ability. The moderation model tests whether the prediction of a dependent variable (Y) by an independent variable (X) differs across levels (e.g. strength and/ or direction) of a third variable (Z). Moderation effects are usually discussed as an interaction between variables, with the effects of one variable depending on the levels of the other variable in the analysis. Analyzing moderation effects for prevention programs has the advantage that it allows researchers to examine the generalizability of the model across different settings or groups and to select variables that may reduce or improve the programs ability to alter mediating variables (Hoyle & Robinson, 2003). However, in the current study perspective skills did not moderate the relation between explicit weight stigma and inhibition. Results showed that perspective taking did not have an effect on the strength of association between children's inhibition skills and explicit weight stigma. A non-significant moderating effect may be due to other unmeasured variables (Little, 2013). For instance, measuring and including social norm awareness in the analysis may have revealed perspective taking skills as a significant moderator between explicit weight stigma and inhibition.

Although small, the sample size is comparable to those obtained in previous studies in this area of research with young children (Baron & Banaji, 2006; Cvencek et al., 2011; Dunham et al., 2011; Margulies et al., 2008; Musher-Eizenman et al., 2004). Further, an a-priori power analysis was conducted prior to data collection. Based on the assumption that measures of explicit weight stigma, perspective taking and inhibition may need to be entered separately if composites could not be developed, and stipulating (a) a conservative effect size ( $r^2$ ) of .15, (b) a desired statistical power of .8, and (c) a probability level ( $\alpha$ ) of .05, it was determined that a hierarchical regression with seven predictors (age, verbal ability, Boy-Girl Stroop, Go/No-Go, Perspective Taking Task, Weight Stigma Perspective Taking Task, and the interaction term). would require a sample size of 60. Thus, a sample size of 62 children was appropriate to conduct all hierarchical regressions in the current study.

In sum, the only significant predictor to emerge from the current study was age; perspective taking skills, inhibition, and the interaction between perspective taking skills and inhibition did not explain a significant amount of variance in weight stigma. It was hoped that if one or both of the constructs were successful in predicting weight stigma, that this information could be used to develop anti-bullying interventions, especially given that there has been success with training perspective taking skills (Marsh, Seafica, & Barenhoim, 1980) and EF skills (e.g., Diamond, & Lee, 2011). The current study did not provide evidence that perspectives taking skills or inhibition skills are related to explicit weight stigma, however, it would be premature to conclude that these constructs are unrelated to weight stigma based on the results from this study. It is possible that: (a) other tasks intended to measure perspective taking skills may be related to explicit weight stigma, (b) other tasks intended to measure inhibition or other components of EF

may be related to weight stigma, or (c) parent reports of perspective taking skills or EF skills  
may be related to weight stigma.

## Chapter 5: Conclusion

The goal of the study was to determine whether perspective taking skills or executive function (EF) could explain individual differences in children's explicit and implicit weight stigma. Using tasks to measure perspective taking and EF, I did not find associations between these two constructs and weight stigma in young children. In this section, I provide an overall evaluation of this study, propose future research directions, and provide an overall summary.

### Study Evaluation

There are several strengths and unique features to this study. First, previous research has typically used one measure of explicit attitudes (e.g., Cvencek et al., 2011; Baron & Banaji, 2006); however, I administered two measures of explicit weight stigma for a more comprehensive understanding of children's bias. Second, my study extended previous research by administering implicit and explicit measures of weight stigma to a younger age group. Two studies administered explicit and implicit measures of weight stigma to 6- to 13-year-olds (Roddy & Stewart, 2012; Solbes & Enesco, 2010), and one study administered only a Weight IAT to 3- to 7-year-olds (Thomas & Ball, 2007). Third, previous research has examined perspective taking skills in relation to other outcomes such as prosocial behaviour and learning, among others; however, I chose to assess perspective taking skills in relation to weight stigma using a traditional task (Selman's Holly task) and a novel task that measured perspective taking skills using a task with weight-related content. Fourth, several studies have explored weight stigma and other variables related to the child's environment, such as parenting beliefs or the influence of media, however, I chose to administer two EF tasks intended to measure inhibition. Lastly, unlike previous studies on this topic, I assessed verbal ability as it has been strongly associated with EF.

There are also limitations of the study that need to be addressed, including the characteristics of the sample and the measures used. First, as with the majority of research, I was relying on a convenience sample which does not represent the entire population. Second, there are also limitations related to the measures that were used in the study. In the following paragraphs I will discuss each task in turn.

**Explicit weight stigma.** For the Anti-fat Prejudice task, as discussed above, two of the 4-year-olds seemed to be following the same pattern during the practice and the test trials. However, additional analyses demonstrated it was appropriate to retain them in the sample. One limitation of the Friendship Selection task was that it was structured in a forced choice format and not presented as a rating scale. For instance, Penny and Haddock (2007) asked 5- to 10-year-olds to rate how much they would like to be friends with the character using a four point scale: no, probably not, maybe and yes. As children in the current study rejected the overweight figure more on the Friendship Selection task than on the Anti-Fat Prejudice task, using a rating scale may have been a more sophisticated approach. Using a rating scale may have provided more variability in children's responses and may have improved the relations between the two tasks. However, the current study did not alter the Friendship Selection task to include a ranking scale because it would have prevented cross-study comparisons and it may have been difficult for the younger children, especially the 4-year-olds, to understand a rating scale.

There are also potential limitations to both the Anti-fat Prejudice task and the Friendship Selection task. It is possible that these tasks may under- or over-estimate weight stigma in children. Juvonen (1991) found that children reported more negative reactions to actual classmates and more positive reactions (e.g., liking, sympathy) to hypothetical deviant peers that included overweight peers. These results suggest that children's responding using hypothetical

figures may underestimate actual weight stigma. Conversely, the use of line drawn figures may overestimate weight stigma in children. Some researchers have criticized the use of line figures for the abstract nature of the stimuli (Swami, Salem, Furnham, & Tovée, 2008a, 2008b), especially for preschoolers (Worobey & Worobey, 2014). Meers and colleagues (2011) compared line drawn figures and photographic figures for the adjectives task in preschoolers and found that using line figures elicited more anti-fat bias than photographic figures. Thus, the line figures used in the present study may have overestimated weight stigma in the 4- to 5-year-olds. However, the use of line figures for the present study was appropriate for the following reasons: (a) it makes it easier to make cross-study comparisons if researchers use the same method consistently, and (b) the results from Meers and colleagues' study have yet to be replicated with preschoolers and older children.

One final limitation of the explicit measures used in the current study is that, despite strong face validity, previous research has not demonstrated the reliability and the validity of the Friendship Selection task (as noted by Musher-Eizenman et al., 2004) or the Anti-fat Prejudice task. When more than one explicit weight stigma task is used, typically only descriptive statistics are reported which limits our understanding of whether these tasks are tapping into the same underlying construct or not. However, despite these limitations, it was decided to use these two tasks instead of developing new measures of explicit weight stigma in order to allow for cross-study comparisons.

**Implicit weight stigma.** One limitation of using the IAT is that published test-retest reliability is often low (e.g., Cunningham, Preacher, & Banaji, 2001). Stability coefficients with adults generally range from about .50 to .70 (for review, see Nosek, Greenwald, & Banaji, 2007); however, to date, only one study with children examined test-retest reliability with different

versions of the IAT and in this study it was found that the stability coefficient was lower ( $r = .20-.29$ ) in 5<sup>th</sup>-grade children than typically found with adults (Andrews, Hampson, Greenwald, Gordon, & Widdop, 2010). Unfortunately, examining test-retest reliability was beyond the scope of the current study. However, as the calculated Cronbach's alpha was reasonable, this suggests that children's responses on the Weight IAT developed for the current study were consistent.

**Perspective Taking tasks.** There are a few limitations of the perspective taking tasks. For Selman's Perspective Taking task, to improve developmental sensitivity it would have been beneficial to modify the standard vignette for the Holly task to include three dimensional figures (matched to children's gender) to represent the characters as previous research has suggested that these modification may facilitate the task for preschoolers (Getz, Goldman, & Corsini, 1984; Mize & Ladd, 1988). However, I decided not to use pictures because I was concerned pictures may distract children from the story and I wanted to follow the procedures as described by Selman and colleagues in the original studies (Selman, 1980; Selman & Byrne, 1974).

For the Weight Stigma Perspective Taking task, as described above, five of the children interpreted the word "bigger" to mean older; however, additional analyses demonstrated it was appropriate to retain them in the sample. Further, some children's responses suggested that they clearly understood that "bigger" referred to being overweight as these children said they would "not be friends with fat people". Thus, using the word "bigger" instead of "fat" seems to be an appropriate way to describe the stimuli in the task.

**Inhibition tasks.** One main limitation of the present study concerns the measurement of EF more generally. For instance, EF tasks have been criticized for measuring several components and also non-executive components such as basic memory or perception (Jurado & Rosselli, 2007). Further, the complexity of EF is not easily captured within two performance-

based tasks. It is recommended to use either confirmatory factor analysis (CFA) or structural equation modeling (SEM) to generate latent variables or factors, respectively, to test in relation to measures of bias (for an example see Ito et al., 2015). However, it was decided that administering nine EF tasks (3 working memory, 3 inhibition, 3 flexibility) that would be required for CFA or SEM analyses, in addition to the other measures in the current study during one session would have been too taxing for preschoolers or young children. Thus, based on a literature review on racial and weight bias, it was decided that inhibition was the most promising EF component to investigate and two inhibition tasks were selected.

**Omission of BMI data.** A final limitation to this study is the lack of data collected regarding children's bodyweight and height to calculate BMI, which has been proposed to influence weight stigma. There were three main reasons for this omission. First, BMI is a generally a poor indicator for body composition as children undergo significant changes in body composition during development (Sondike, Copperman, & Jacobson, 2000; Troiano et al., 1995). Second, collecting this personal information may have caused reluctance of preschools, daycares, schools, and caregivers to participate. Third, collecting data on children's bodyweight and height would bring up ethical considerations as weighing children may have been intrusive and may have called attention to children's own body size. Thus, it was decided that BMI information would not be collected. One alternative to consider in future research is to indirectly measure BMI by training experimenters in visually assessing children's weight status (for example see, Nguyen & Malti, 2014), which is less invasive than the traditional BMI method.

### **Directions for Future Research**

Some suggestions for future research have already been noted. In this section I will first discuss the need for psychometric data and the benefits of longitudinal research with a wider

variety of tasks. Following this I will discuss possible links to self-regulation research, children's perceptions of discrimination, and moral reasoning. One pressing issue is the lack of psychometric data on the majority of the tasks in this study. The challenges to such research are great, such as determining appropriate test-retest periods, measuring several age groups, or administering several measures intended to tap into the same underlying construct; however, the benefits are greater. Research on these measures will not only expand our knowledge about explicit weight stigma, implicit weight stigma, perspective taking skills, and EF, it will also provide empirical foundation for prevention programs to reduce weight stigma.

Longitudinal research would assist with understanding age related changes and it would elucidate the direction of influence among weight stigma, perspective taking skills, and EF. In addition, researchers should consider using a wider variety of tasks, something which was beyond the scope of the current study. For instance, a recent study by Ito and colleagues (2015) used a larger battery of EF tasks (working memory, cognitive flexibility, inhibition) in relation to explicit and implicit bias. Specifically, they administered a battery of EF tasks, three racial implicit bias tasks, and several measures of explicit racial bias to 485 undergraduate students over two sessions. Unfortunately, bivariate correlations between the three inhibition tasks (Stroop, Antisaccade, Stop-Signal) are not reported in relation to the explicit and implicit measures, so these results cannot be directly compared to the current study. However, results showed the highest correlations between the Weight IAT D-score and the Shifting-specific ability (also referred to as cognitive flexibility), rather than the Common EF or the Updating-specific ability (also referred to as working memory). Common EF refers to the ability to use and maintain task goals to influence lower level processing and includes more than just inhibition as the latent variable had significant loadings from all nine EF tasks (Miyake &

Friedman, 2012). An association between cognitive flexibility and implicit measures has also been found in adults (Klauer et al., 2010); however, as there were no explicit measures administered, comparisons to the current study cannot be made.

In addition to using more EF tasks, researchers should also consider multiple methods of assessment such as performance-based measures, informant rating scales for teachers, and observational methods. The advantage of using behaviour scales is that they capture the application and coordination of EF processes in a day-to-day context (Toplak, West, & Stanovich, 2013). Classroom observation is an opportunity to explore ecological validity as children may demonstrate low levels of weight stigma in a structured assessment and then express weight stigma at a higher or lower frequency when engaging with other children in everyday settings. Conducting research within school settings does have limitations as it is labour intensive and requires special considerations for how to conduct standardized observations. However, some studies with preschoolers (e.g., Booren, Downer, & Vitiello, 2012) or school age children (e.g., Wilton, Craig, & Pepler, 2000) provide a detailed account of how researchers can structure and measure behaviour during specific observation periods.

**Weight stigma and social neuroscience.** An alternative avenue for future research is applying social neuroscience to the development of implicit and explicit weight bias. Research examining neural substrates has documented that select brain areas are involved in implicit social cognition. For instance, the amygdala has been associated with explicit and implicit evaluative processes, the anterior cingulate cortex (ACC) has been associated with response conflict, temporoparietal attention networks have been associated with explicit and implicit categorization processes, and the prefrontal cortex has been associated with the exertion of behaviour control (for review, see Ito, 2010). Studies examining the unique contributions of different brain areas

may provide more information on the interplay between implicit and explicit processing during task performance (e.g., Amodio et al., 2004, 2008; Beer et al., 2008).

Despite the limitations of social neuroscience (Carpendale, Sokol, & Müller, 2010), including the challenge that it is difficult to put young children in fMRI scanners, one study with preschoolers demonstrates a promising approach to apply social neuroscience to developmental questions. Cowell and Decety (2015) administered short vignettes to preschoolers that depicted pro- and anti-social behaviours and measured event-related potential (ERP) using electroencephalography (EEG). Results showed that preschoolers' preferences for pro- over anti-social others was due to attentional processes and cognitively controlled evaluation of others' behaviours. Further, the second part of the study required preschoolers to share resources with a hypothetical child. Results also showed that controlled processes activated during the vignettes predicted preschoolers' generosity toward a hypothetical child. In sum, this study suggests that because neuroimaging techniques such as fMRI cannot be used with preschoolers, other techniques such as ERP technology can provide more information on the activation of specific brain regions in preschoolers.

Social neuroscience has also led to the development of theoretical models of implicit cognition, which might be fruitfully applied to research on weight stigma. In brief, there are two types of models, generalized dual-processing models and formal models. The former involves the emergence of generalized, domain-dependent dual-process models; the latter involves the development of formal processing models that quantify and describe the contributions of distinct processes to performance on cognitive tasks (for review, see Payne & Gawronski, 2010). For instance, one formal process model is the process dissociation (PD) model, which is used to separate implicit and explicit memory processes (Jacoby, 1991). Payne's (2001) study

successfully applied this model to separate automatic and controlled influences in a priming task (described previously).

Lastly, social neuroscience could be used to understand behaviour within the context of social interaction and the broader cultural setting. For example, Cowell and Decety's (2015) study with preschoolers did not record ERP's during children's actual prosocial responding, thus, it would be interesting to explore whether these same neurocognitive processes are involved in children's real time sharing interactions with another individual (e.g., parent, adult, peer). Further, to examine explicit weight stigma the body size of the adult or peer could be manipulated (e.g., overweight adult and healthy adult) to examine whether there would be differences in activation patterns in the brain during the social interaction. Results from an fMRI study with Caucasians found that activation was significantly greater in response to photographs of black faces than white faces in several prefrontal cortex (PCF) regions (Richeson et al, 2003). It would be interesting to explore whether similar activation patterns would emerge for photographs of fat as compared to thin individuals.

There have been some neuroimaging studies which have examined social influences such as culture (for review, see Han & Northoff, 2008). For instance, in an fMRI study, Caucasians in the United States and native Japanese participants in Japan were shown photographs of Caucasian and Japanese that expressed different emotions (fearful, angry, happy or neutral) (Chiao et al., 2008). Fearful faces from the participants' own culture were associated with greater activation in the right and left amygdala than fearful faces from the other culture and not other faces. These results suggest that individuals have heightened arousal to, or vigilance for, fear expressed by members' of their own cultural group. To apply these findings to weight stigma, researchers could examine whether the activation patterns for fat and thin faces would be

different depending on whether the faces were from the same culture or a different culture.

Taken together, these two studies provide evidence for how social neuroscience could be applied to the examination of weight stigma.

Future research may also aim to identify whether specific EF skills are involved in implicit and explicit processing. For instance, explicit and implicit measures of weight stigma could be adapted to neuroimaging to examine whether regions associated with aspects of EF such as dorsomedial prefrontal cortex (PFC) demonstrate increased activation during explicit or implicit processing. Furthermore, performance on explicit and implicit measures of weight stigma could be correlated with measures that tap different aspect of EF that were not included in the present study, such as cognitive flexibility. Neuroimaging techniques are the best current tool to gain insight into brain function and there seem to be several interesting theoretical questions that could be answered in relation to explicit and implicit weight stigma.

**Weight stigma and self-regulation.** The current study examined EF in relation to weight stigma, and an emerging topic in the field of psychology is the integration of research on self-regulation (SR) from the perspective of social and personality psychology and research on EF from the perspective of cognitive psychology. There are many definitions of SR that differ in theoretically important ways. SR can refer to the self altering its own inner states or responses (Baumeister, Schmeichel, & Vohs, 2007), or it can be broadly defined as goal-directed behaviour (Hofmann, Schmeichel, & Baddeley, 2012). One main reason why SR is relevant for explicit and implicit weight stigma is that there seems to be evidence accumulating that demonstrates both the contributions of automatic and unconscious processes in SR and the deliberate and conscious efforts at SR. However, most researchers have typically focused on the latter.

Fitzsimons and Bargh (2004) suggest that the role of consciousness in a range of cognitive and motivational operations (e.g., ignoring distractions, managing conflicts between goals, flexibly responding to situations) may be less important than previously thought, and that SR can be automatic. The auto-motive model of SR (Bargh, 1990; Bargh & Gollwitzer, 1994) describes how goal pursuit can proceed outside conscious awareness similar to how other social knowledge structures (e.g., attitudes and stereotypes) have been shown to become automatically activated in the presence of relevant environmental features such as racial features or the object of the attitude in question. Fitzsimons and Bargh (2004) provide examples of automatic regulation of cognition (e.g., memory, working memory, selective attention), emotion (e.g., self-esteem, emotional responses) and behaviour (e.g., word priming before a group task) to suggest the existence of nonconscious SR in everyday life (e.g., people as nonconscious triggers of SR). It is also possible that individuals are making decisions (likely unconsciously) regarding how to allocate a limited resource when they exert self-control (Muraven, Shmueli, & Burkley, 2006).

It is possible that consistent and frequent goal pursuit may lead to a reduction of conscious involvement and may become automatic; yet, many of the experiments intending to measure automatic SR are based on priming paradigms which makes it difficult to determine whether goals, a key aspect of SR, are involved in guiding the behaviour rather than simple cognitive-behaviour links. For example, Bargh, Chen, and Burrows (1996) found that when individuals were subliminally primed with members of a group who are associated with hostility via a stereotype (pictures of African American faces), they acted more aggressively. These effects do not involve goal pursuit and the processes that yield these effects are not inherently self-regulatory. Further, others have also argued that SR cannot be assumed when there is no evidence of goal pursuit (Förster & Jostmann, 2012). Unconscious SR needs to be substantiated

by additional evidence as it is a controversial topic. One possibility is to examine whether unconscious SR is different from implicit attitudes, as there seems to be parallels between these two constructs. To my knowledge this possibility has not been explored.

Another reason why EF and SR should be studied in relation to weight stigma is because SR and EF may be linked in several ways (for review, see Hoffman, Schmeichel, & Baddeley, 2012). Some researchers categorize behaviours such as SR, planning, and problem solving as “macrolevel skills”; conversely, others examine more “microlevel components” such as working memory and response inhibition (Senn, Espy, & Kaufman, 2004). In the neuropsychological literature, skills such as developing strategies for problem solving, inhibiting appropriate behaviours, modifying strategies after receiving feedback, and applying strategies to a variety of problem solving situations are referred to as EFs; these same skills that are labelled executive processes in the cognitive literature are labelled SR in the developmental literature (Landry & Smith, 2010). Further, SR has been considered by some to be synonymous with EF (Banfield, Wyland, Macrae, Munte & Heatherton, 2004).

Further, EF and SR have been associated with various clinical, developmental and health related outcomes. SR is important because most social and personal problems have some element of SR dysfunction (e.g., drug addiction, money problems, crime, underachievement) and individuals with good SR are more likely to have more positive outcomes (e.g., better relationships, fewer psychological problems, fewer overeating and drinking problems, etc.; Baumeister, Schmeichel, & Vohs, 2007). EF is also important because it has been implicated in various developmental disorders such as autism spectrum disorder and Attention-Deficit Hyperactivity Disorder (Zelazo & Müller, 2010) and researchers have found that performance on EF tasks is predictive of school readiness and school achievement (Müller, Liebermann, Frye, &

Zelazo, 2008). Health problems have been associated with SR dysfunction such as obesity and disordered eating (Graziano, Calkins, & Kean, 2010; Neumark-Sztainer, van den Berg, Hannan, & Story, 2006; Strauman, Vookles, Berenstein, Chaiken, & Higgins, 1991) and EF dysfunction such as obesity and substance abuse (Li, Dai, Jackson, & Zhang, 2008; Lokken, Boeka, Austin, Gunstad, & Harmon, 2009; Riggs, Spruijt-Metz, Chou, & Pentz, 2012; Verdejo-Garcia et al., 2010).

One way to conceptually link SR and EF with weight stigma, is to use two of the five methodological approaches described by Hofmann et al. (2012): (a) EF as a process moderator, and (b) EF as a process mediator. To illustrate, a research paradigm that treats EF as a process moderator could ask the question, is explicit weight stigma a more appropriate predictor of regulating other forms of prejudice (e.g., race or gender) among people low in inhibitory control? Alternatively, a research paradigm that treats EF as a process mediator could ask the question, does attending an explicit weight stigma intervention improve inhibition skills and does this intervention translate into better self-control skills in general? There are several other research questions that could be generated to explore the relations between SR, EF, and weight stigma, but these are just two examples intended to stimulate possible avenues for future research.

**Children's perceptions of weight discrimination.** Another avenue of future research is children's perspective of weight discrimination. In general, understanding children's perceptions of discrimination is important for theoretical reasons (e.g., may effect identity formation, peer relations, academic achievement) and for applied reasons (e.g., informing interventions, promoting tolerance) (Spears Brown & Bigler, 2005). Early research on children's perceptions of discrimination focused on race (e.g., Radke & Sutherland, 1972; Verkuyten, Kinket, & van der Weilen, 1997) and more recent research focused on gender (Spears Brown & Bigler, 2004);

however, there is no research on children's perceptions of weight discrimination, and there are only a few studies on adults' perceptions of weight discrimination (e.g., Carr & Friedman, 2005; Puhl, Andreyeva, & Brownell, 2008; Schafer, & Ferraro, 2011).

A developmental model on children's perceptions of discrimination dovetails nicely with the current study. Spears Brown and Bigler (2005) proposed that children acquire cognitive and cultural skills that allow them to perceive discrimination by approximately 6 years of age.<sup>6</sup> Specifically, there are three cognitive factors that facilitate perceptions of discrimination: (a) cultural cognition which refers to knowledge of group categories, knowledge of group stereotypes, and understanding of the social implications of stereotypes; (b) social cognition which refers to the understanding that others have different cognition from one's own, that individuals can display incongruous cognitions and behaviour and that social systems can reflect the bias of its individual members; and (c) classification skills which refers to the ability to classify individuals along more than one dimension simultaneously and to understand the hierarchical nature of categories, including social categories. For the current study, some aspects of cultural cognition are pertinent to explicit weight stigma (e.g., knowledge of grouping figures by weight, fat vs. thin) and some aspects of social cognition are pertinent to perspective taking skills (e.g., understanding that one's perspective is different from that of others). Spears Brown and Bigler's developmental model and the current study are similar as both are drawing on similar sources for social cognition/ perspective taking skills (Selman, 1976; Selman & Byrne, 1974, respectively) and cognition/ EF (Inhelder & Piaget, 1964). One minor difference is that the current study used measures of inhibition rather than cognitive flexibility (i.e., classification skills). In sum, there is ample empirical evidence from the last five decades that children and

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<sup>6</sup> The authors admit that it is possible for children slightly younger than 6 years of age to perceive discrimination.

adults show negative attitudes toward overweight individuals. However, research has not examined discrimination perceived by overweight children and the prevalence of these experiences in healthy children, which may be useful for developing more effective interventions for weight stigma. Further, Spears Brown and Bigler's developmental model may be a useful way to structure this endeavour. Thus, this topic is deserving of research attention for theoretical and applied reasons.

**Weight stigma and moral reasoning.** One final avenue of future research is to explore weight stigma in relation to moral reasoning. Historically, Piaget (1932) focused on children's practical moral life and how children became aware of morality through social interaction (Carpendale, 2009). This was followed by Kohlberg's global stage model of moral development (Kohlberg, 1969), which posited that first children justify acts as wrong or right based on either consequences to the self (pre-conventional), then based on group norms (conventional), and then based on a justice perspective (post-conventional). Kohlberg's stages of moral judgment have been linked to Piaget's stages of cognitive development and Selman's stages of perspective taking (see Muuss, 1982, Figure 2). However, studies on contextual variation have contested broad stages of moral development (e.g., Turiel, 1998) and more recently there has been increasing interest in moral evaluations to exclude others based on group membership such as gender (Killen & Stangor, 2001; Park, Lee-Kim, Killen, Kim, & Park, 2011), race (Brenick & Killen, 2014; Killen, 2007; McGlothlin & Killen, 2006) or nationality (Malti, Killen, & Gasser, 2012). However, only one study has examined older children's and adolescents' moral reasoning about social exclusion based on weight (Nguyen & Malti, 2014). Results showed that most children considered weight-based social exclusions to be wrong for moral reasons, with exclusion being more acceptable in athletic contexts (e.g., running a race) than academic

contexts (e.g., selecting members for a science project) or social contexts (e.g., inviting children to a birthday party). Further, older children were more accepting of weight-based exclusions in athletic contexts than academic contexts or social contexts than younger children.

To examine moral reasoning related to weight, the social reasoning developmental perspective developed by Rutland, Killen, and Abrams (2010) could be applied, which includes social domain theory (SDT; Turiel, 1983; 1998; 2006) and social identity theory (SIT; Tajfel & Turner, 1986). SDT has identified three categories of reasoning: moral (fairness, rights, equality), psychological (personal choice), and societal (conventions, social norms, traditions, authority). SIT proposed that group identification and belongingness form a core component of self-concept and self-esteem. In brief, the social reasoning developmental (SRD) perspective suggests that intergroup contact can promote moral reasoning about intergroup relations. Developmental research suggests that intergroup contact can reduce implicit and explicit forms of bias. For instance, Turner, Hewstone, and Voci (2007) examined attitudes of Caucasian majority status in 8- to 11-year-olds toward individuals of Pakistani, Indian, or Bangladeshi ethnic origin in the United Kingdom. Caucasian children who reported more cross-ethnic friendship with those in the ethnic minority group demonstrated more positive implicit out-group attitudes on the IAT. Other studies have shown intergroup contact can reduce implicit bias (e.g., Margie, Killen, Sinno, & McGlothlin, 2005; McGlothlin & Killen, 2005, 2006) or explicit bias (e.g., Crystal et al., 2008; Killen, Kelly, Richardson, Crystal, & Ruck, 2010).

Taken together, these studies suggest two main possibilities for future research. First, Nguyen and Malti (2014) found that 9-year-olds were less accepting of weight-based exclusion in athletic contexts than 13-year-olds. If these measures were adapted to be sensitive for younger children (i.e., less than 9 years of age), would similar results be found? This would provide more

information on the developmental relation between weight based exclusion and moral reasoning. Second, because the studies described above are cross-sectional, it is challenging to determine whether having cross-group friendships result in more positive attitudes toward other groups, or if children's positive attitudes are responsible for children's pursuit of more cross-group friendships. The SRD perspective could be applied by measuring children's attitudes toward overweight children and asking children to select the body size of their best friend twice during a seven month period to determine whether there is a casual relation between cross-group friendships and intergroup contact. For theoretical reasons, the SRD perspective is useful as it draws on theory relatively unknown in social psychology (i.e., SDT) (Rutland & Killen, 2015), and the SRD perspective may be also useful for applied applications such as interventions to reduce implicit and explicit weight stigma. Thus, as the current study demonstrated explicit weight stigma increased with age, future research on the relations to moral reasoning is warranted.

### **Final Summary**

Weight stigma is widespread and considered to be socially acceptable in society. Overweight individuals are typically perceived as lazier, less competent, and lacking self-discipline compared to average weight individuals (e.g., Cramer & Steinwert, 1998; Musher-Eizenman et al., 2004; Puhl & Latner, 2007). Research over the past five decades has established that most individuals have an explicit and implicit preference for thin figures than overweight figures, and these preferences have been linked to discrimination. Despite this, we still know little about the factors that are related to these preferences or how these preferences may change with age in children. A few studies have examined environmental factors (media, parent attitudes, among others) and individual differences such as gender and control

attributions. Studying weight stigma is also important as obesity rates among children in Canada have substantially increased during the past 25 years. The Canada Health Survey (1978/1979) found that 15% of 2- to 17-year-olds were considered overweight or obese and the Canadian Community Health Survey (2004) found that this rate had increased to 26%, which was similar to the combined overweight/ obesity rate of 27% in 2- to 17-year-olds reported by the American National Health and Nutrition Survey (NHANES, 1999-2002) ( Shields, 2008). Thus, due to limited knowledge on factors associated with weight stigma and due to higher rates of obesity in children, addressing weight stigma is an important part of obesity prevention and treatment.

The current study found that 4- to 7-year-olds do endorse more negative attitudes toward overweight figures than toward thin or average figures, both explicitly and implicitly. Further, weight stigma emerged in children as young as 4 years of age and became more negative with age, which highlights the importance of early intervention. Contrary to what was expected, perspective taking skills and EF were not related to weight stigma. However, it is possible weight stigma may be related to (a) other tasks intended to measure perspective taking skills, (b) parent reports of perspective taking skills, (c) parent reports of EF skills, (d) other tasks intended to measure inhibition, or (e) other tasks intended to measure EF (e.g., cognitive flexibility).

The treatment and prevention of obesity is a substantial challenge and must include the discussion of weight stigma. For young children, previous initiatives to reduce weight stigma have been unsuccessful and it is possible that by focusing on attributes or personal responsibility, these initiatives may actually teach or reinforce the obesity stereotypes they are aiming to change. As the current study found a preference for the average figure, it may be useful to teach children the value of diversity and difference, which would meet the aim of promoting healthy lifestyles without further stigmatizing overweight children and adults.

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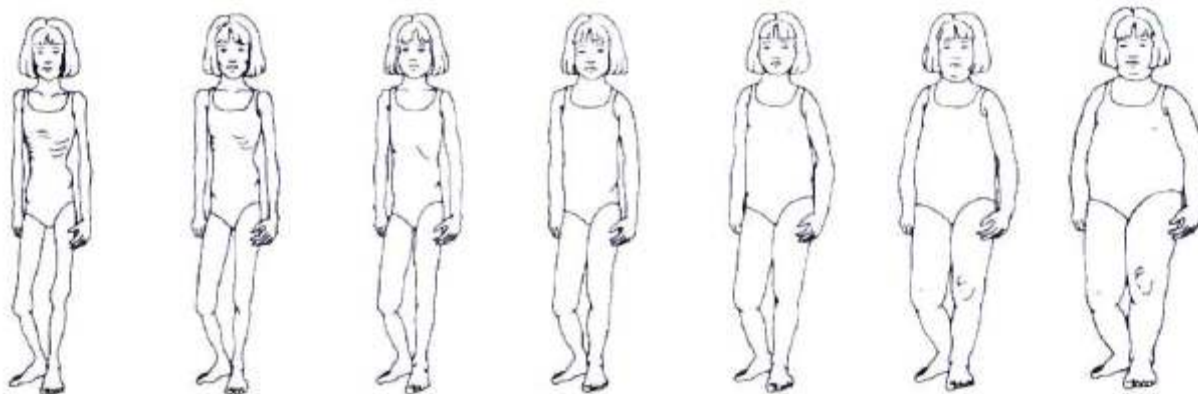
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## Appendices

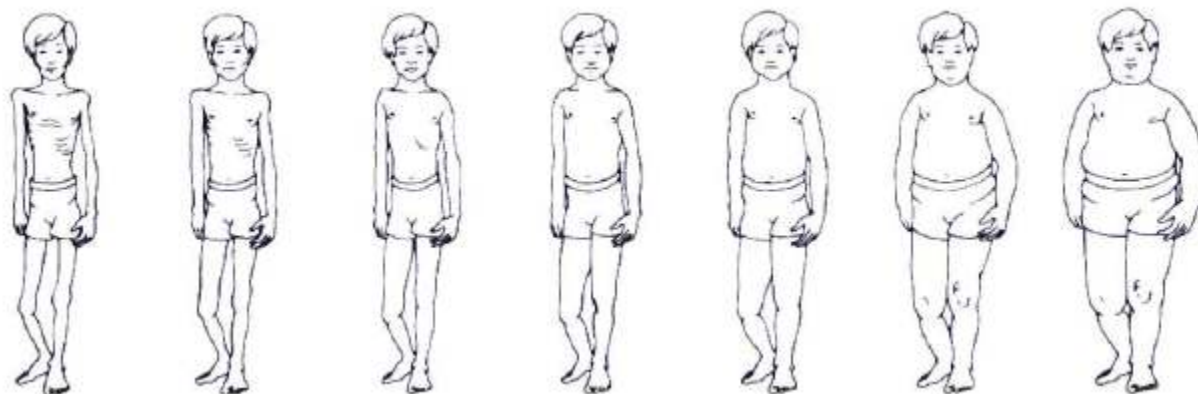
### Appendix A: Collin (1991) Figures



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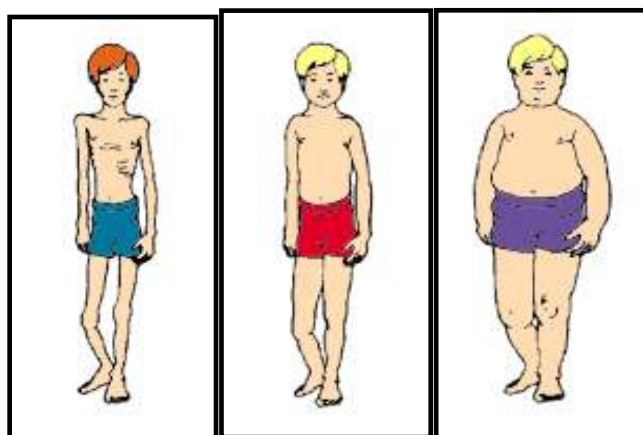
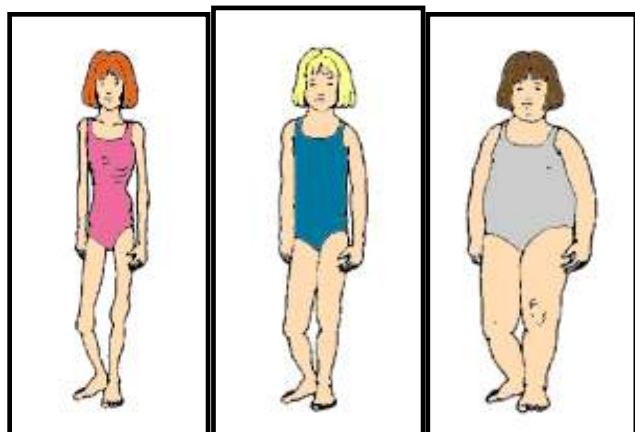
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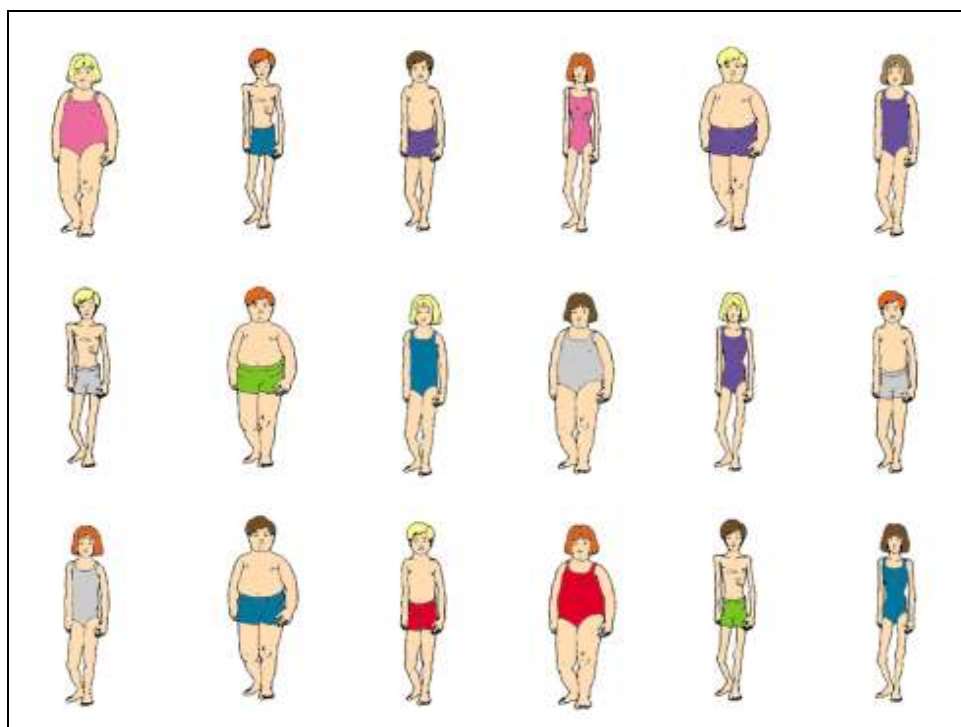
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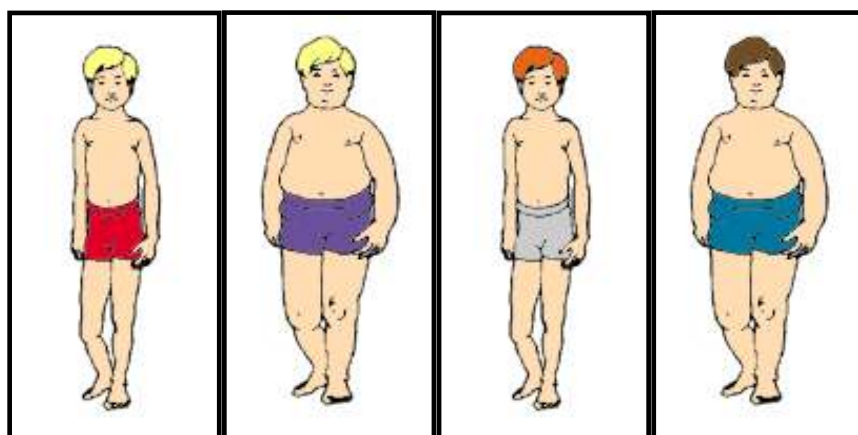
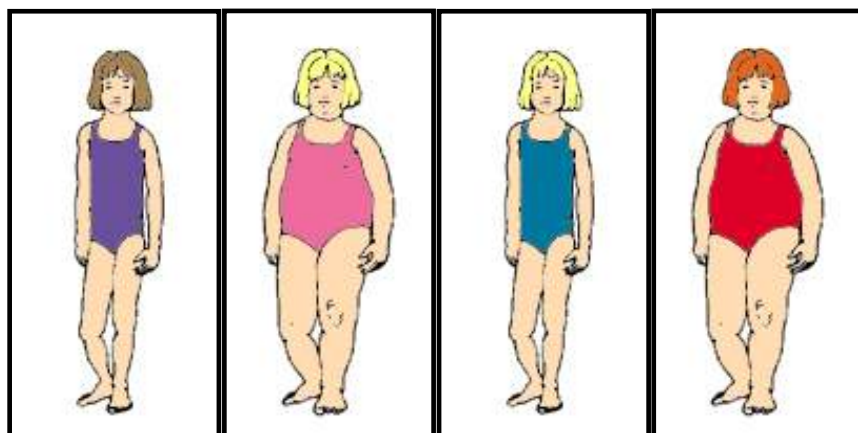
\* Figures that were used in the current study, used without permission from Collins (1991)

**Appendix B: Figures used in the Anti-fat Prejudice task**

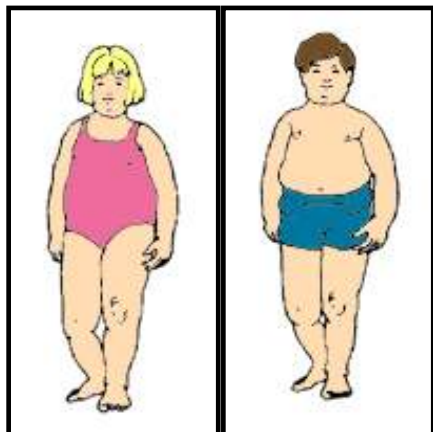


**Appendix C: Figures used in the Friendship Selection task**

**Appendix D: Figures used in the Weight IAT**



**Appendix E: Figures used in the Weight Perspective Taking task**



## Appendix F: Family Demographics Form

Name of Child: \_\_\_\_\_  
 Name of Caregiver: \_\_\_\_\_  
 Relationship to child: \_\_\_\_\_  
 Child's date of Birth: \_\_\_\_\_  
 Child's location of Birth (Country): \_\_\_\_\_  
 Family ethnicity (e.g., African American, Canadian, Chinese, etc): \_\_\_\_\_  
 Gender of child:  Male  Female  Transgendered  
 Handedness of child:  Right  Left

### Developmental History

Has your child ever been suspected of having a neurological disorder, psychiatric condition or developmental delay (e.g., ADHD, anxiety, learning disorder, etc)?  Yes  No  
 If yes, please describe: \_\_\_\_\_

Does your child speak any other language in addition to English?  Yes  No  
 If yes, what languages does your child speak: \_\_\_\_\_  
 If yes, is he/ she bilingual (i.e., speak 2 or more languages equally well)?  Yes  No

### Demographic Information

Caregiver 1:  Mother  Father  Legal Guardian  Other: \_\_\_\_\_  
 Caregiver 1's education level (number of years including elementary and high school): \_\_\_\_\_

Caregiver 2:  Mother  Father  Legal Guardian  Other: \_\_\_\_\_  
 Caregiver 2's education level (number of years including elementary and high school): \_\_\_\_\_

Approximate annual family income (please select one):

- Less than \$20,000  \$110- 139,999  
 \$20-49,999  \$140- 169,999  
 \$50-79,999  Greater than \$170,000  
 \$80- 109,999

Would you like a copy of the summary of results from the study?  Yes  No  
 If yes, please leave email address

Would you like to be contacted for future phases of study?  Yes  No  
 If yes, please leave phone number