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The prediction of preschool children's weight from family environment factors: Gender-linked differences

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ABSTRACT

The main objective of this study was to test an explanatory model predicting preschool girls' and boys' body weight from certain child variables (food intake, sedentary behaviors, and eating habits), as well as family variables (interaction during mealtime and level of family financial resources allocated to meeting children's eating needs). A randomized stratified subsample of parents was selected from a larger study (*Quebec Longitudinal Study of Child Development, QLSCD-1998–2002*), with a breakdown of 581 girls and 611 boys of 4 years of age. Children's skin fold ratio, weight, height, and Body Mass Index (BMI) were recorded. Questionnaires were administered to parents (usually the mother). Using structural equation modeling (SEM) separately for girls and boys, the family environment model of healthy weight development was tested. Results yielded a good fit of the model for both genders. For boys, significant predictors of body weight in the model were family food insecurity and conflicts during mealtime. Healthy eating was predicted by food insecurity, mealtime conflicts, and sedentary behaviors. Mealtime conflicts predicted sedentary behaviors. For girls, none of the variables predicted body weight, however food insecurity predicted less healthy eating. These results outline the importance of prevention and intervention within families with young children.

1. Introduction

Epidemiological data reveal that obesity prevalence rates in preschool children are estimated to be at about 8 to 11% (Timmons, Naylor, & Pfeiffer, 2007). These statistics are concerning because childhood Body Mass Index (BMI) and obesity predict long-term, chronic obesity (Evers, Arnold, Hamilton, & Midgett, 2007; Lake, Power, & Cole, 1997; Parsons, 2006; Vidailhet, 1998; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). Adiposity rebound in children is the normative point at which BMI reaches its lowest level and then begins to increase at around 6 years old (Heelan & Eisenmann, 2006). The timing of the adiposity rebound in children is critical, because if the increase in weight occurs prior to the age of six there is an increased risk for obesity (six times greater) later in development (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). There is also evidence that early onset of weight problems is associated with other health problems later in development, such as cardio-vascular diseases and diabetes (Athey, 2003; Wilkin et al., 2004; Wilkins, 2003). Yet, there are very few studies conducted with young children (Timmons et al., 2007). More research is needed to identify the factors associated with healthy weight development in preschoolers. In particular, we need to better understand how physical activity and healthy eating habits, the two most recognized factors associated with obesity (Cole, 2006; Cameron, Norgan, & Ellison, 2006; Harris, Kuramoto, Schulzer, & Retallack, 2009; Hill & Peters, 1998; Wardel, Guthrie, Sanderson, & Rapoport, 2001), interact with other factors such as family characteristics to predict healthy weight in young children.

1.1. Physical activity

Physical activity is defined as any physical movement resulting from skeletal muscle contraction (Goran, 1998). In contrast, sedentary activities can include watching TV/videos, playing video games, computer time, and reading. TV viewing is the most frequently studied sedentary activity among children and it is commonly used as a proxy for sedentary behavior (Must & Tybor, 2005). Timmons et al. (2007) suggest that there is a false assumption that young children tend to be sufficiently physically active, which may explain the underrepresentation of preschoolers in study sampling. Contrary to this notion, descriptive studies suggest that most preschoolers take only a few minutes each hour to be physically active (Benham-Deal, 2005; Danner, Noland, McFadden, DeWalt, & Kotchen, 1991; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004), which is far below the 2 h of structured and unstructured physical activity per day recommended by the National Association for Sport and Physical Education (2002). The amount of sedentary behaviors typical of this age group also

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exceeds the one-hour per day recommendation of the Canadian Paediatric Society (2002). For example, Canadian children between the ages of 2 and 11 years watch an average of 14.6 h of TV per week and approximately 2 h per day (Statistics Canada, 2003).

We further suggest, based on previous work (Lovsin, Tremblay, Zecevic & Seresse, 2008; Zecevic, Tremblay, Seresse & Lovsin, 2008) that elevated BMI during the preschool years might not be perceived by health care providers nor by parents as related to the development of obesity (i.e., 'baby fat will go away on its own'). In this sense, early screening and treatment are not likely to be initiated by parents or their physicians.

In young children, higher levels of physical activity have been associated with smaller gains in BMI (Moore et al., 2003), lower body fat ratios measured by skin fold thickness (Moore, Nguyen, Rothman, Cupples, & Ellison, 1995) and lower body fat later in adolescence (Kemper, Post, Twisk, & van Mechelen, 1999). The association between sedentary behaviors such as TV viewing and adiposity in preschoolers is less clear. Whereas Durant, Baranowski, Johnson, and Thompson (1994), found no association between TV viewing and BMI among preschool-aged children, Jago, Baranowski, Baranowski, Thompson, and Greaves (2005), identified that TV viewing became positively associated with BMI when children reached about 6 years of age. Further, Proctor and his colleagues' prospective study of children followed from the age of 4 to 11 years showed that children who watched the most TV during this timeframe had the greatest increases in body fat (Proctor et al., 2003). These mixed results regarding the impact of sedentary behaviors in young children might be explained by a moderating effect of eating habits, that is, the combined effect of unhealthy eating habits and sedentary behaviors such as TV watching would increase children's BMI whereas, good eating habits would counteract the negative effect of physical inactivity.

1.2. Eating behaviors

Parents have an important role to play in the promotion of healthy eating and the prevention of obesity by determining a child's food preference and physical activity habits (Birch, 1999; Birch & Fisher, 1998; Trost et al., 2003). Both child and parent characteristics have been documented in the acquisition of eating habits that increase the risk of overweight or obesity in children (Baranowski, Perry, & Parcel, 1997; Haire-Joshu, & Nanney, 2002; Rhee, 2008). In addition, research findings have shown the importance of parent–child interaction, communication, and role modeling provided by other family members (e.g., siblings, extended family members and friends) on the development of health practices (Baranowski, Perry, & Parcel, 1997).

There is also evidence that healthy eating behaviours acquisition depends on contextual influences such as access to food variety and financial resources (Badun, Evers, & Hooper, 1995; Haire-Joshu, & Nanney, 2002; Rhee, 2008). For example, it has been found that the quality of food consumed is lower in families with low socioeconomic status (Badun et al., 1995). Also, in preschool and older children, obesity has been found to be associated with not having breakfast every morning or not having healthy foods for breakfast (Ortega et al., 1998), which tends to occur more frequently in families of low socioeconomic status.

Parents may also influence their children's eating behaviours by structuring the home eating environment, providing the choice of food available, and modeling behaviours and attitudes towards food. In Canada, the Canada Food Guide (Health Canada, 2007) provides guidelines for the type of food and portions children should consume, but there is evidence that parents still lack knowledge about the causes of increased weight and obesity in children. For example, Tremblay, Lovsin, Zecevic, and Koren (submitted for publication) reported that parents perceived their children's above-average weight to be solely explained by the amount of sweets consumed and not due to any other eating habits. Similarly, Balew, Kuester, and Gillespie (2000) reported a negative correlation between soft drinks and real fruit juice and milk consumption in preschool children, and have suggested that parents might see these products as equivalent or having the same nutritive value. Other researchers (Birch & Fisher, 1998; Dubois & Girard, 2002; Tremblay & Larivière, 2009) have found an association between weight, eating behaviours and healthy eating. In preschool and older children, obesity was found to be associated with eating faster (Birch & Fisher, 1998). In support of the effect of eating speed on weight, Tremblay and Larivière (2009) reported weight gain in underweight child achieved in using an intervention which involved teaching parents strategies to increase their child's speed of eating as well as modifying behaviours such as playing with food, not staying seated during meals, being difficult with food, and refusing certain types of food. In a large sample, Dubois and Girard (2002) have also found correlations between such behaviours in 30 month-old children. These researchers found an association between unhealthy food consumption (less fruits and vegetables and more high fat and high sugar type of food) with higher levels of other behaviours such as being difficult with food, not having meals at a regularly scheduled time and eating too fast or too much.

Parents may also influence their children through their interactions with other family members (Rhee, 2008). There is compelling evidence that a child's home environment is critical to promoting healthy eating and exercise practices (Davison & Birch, 2001; Dennison, Erb, & Jenkins, 2002; Kitzmann, Dalton, & Buscemi, 2008; Zecevic et al., 2008). An increasing number of researchers have argued that the mealtime environment plays an important role in the acquisition of eating habits. Interestingly, more conflicts during meals were found in families with overweight children compared to families with normal-weight children (Wilkins, Kendrick, Stitt, Stinett, & Hammarlund, 1998; Zeller et al., 2007). It is possible that conflicts and negative interactions during mealtime elicit avoidance of mealtime by family members and other strategies to minimize time spent together. These avoidant strategies may include eating fast, watching television during meals, and not planning or preparing meals but rather consuming fast food. The effect of family conflict on weight gain is supported by the work of Boutelle, Birnbaum, Lytle, Muray, and Story (2003); which shows an association between poor diet (high fat and low in fruit and vegetables) and TV watching during meals.

1.3. Objective of the study

The aforementioned research findings reveal that although healthy eating habits and physical activity are the key factors in achieving and maintaining healthy weight, their acquisition and benefit depends upon several contextual factors such as family interaction and financial resources. Our literature review also reveals a paucity of research conducted with very young children. To date, few studies have investigated the role of individual, family, and financial factors in predicting body weight in very young children. Therefore, the objective of the current study is to test an explanatory model predicting preschoolers' weight based on identified home variables such as child's food intake, sedentary behaviors, eating habits, family mealtime interactions, and the impact family financial resources has on meeting their children's eating needs. The present study is the first of its kind to examine family environment factors affiliated with eating practices and behaviors in an early childhood sample. Our hypothesized model is presented in Fig. 1.

2. Method

2.1. Procedure

The Quebec Institute of Statistics (L'institut de la Statistique du Québec, ISQ) conducted the first phase of a longitudinal study on a cohort of 2120 Québec infants who were followed annually from