

The relationship between television viewing and obesity in young children: a review of existing explanations

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It has often been proposed that young (three to six years old) children's television viewing habits contribute to early-onset obesity. Three explanations that link television viewing patterns of young children with the development of obesity are considered. First, television viewing displaces time available for physical activity, reduces energy expenditure relative to energy intake and leads to obesity. Second, the cognitive immaturity of young children increases their susceptibility to persuasive intent of advertisements for foods of poor nutritional quality. Such food advertisements are broadcast often during children's television programmes and lead to unhealthy food preferences, and dietary imbalances associated with obesity. Third, activity displacement combined with susceptibility to persuasive intent of televised food advertisements predispose young children to early-onset obesity. Research evidence in support of each explanation is questionable, because of conceptual and methodological shortfalls in existing research. How future research might address shortfalls is considered.

Keywords: Advertising; Obesity; Physical activity; Sedentary behaviour; Television viewing

Introduction

Data collected worldwide point to an alarming increase in childhood obesity. Studies in both developed countries, for example, Australia (Baur, 2002) and developing countries, for example, People's Republic of China (Popkins *et al.*, 1995) show that the proportion of children who can be considered obese has continued to increase sharply over the past three decades. Outcomes of early obesity can predispose children to life-long health problems, including the early onset of type II diabetes, and

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early onset of risk factors associated with the later-life development of cardiovascular disease (Freedman *et al.*, 1999). Additionally, obesity in early childhood has been linked to ostracism and early development of low self-esteem (Schmitz *et al.*, 2002). Parallel to this rise in obesity among children of all ages is the apparent increase in sedentary leisure pursuits, because of increased access to all forms of electronic media, such as watching television, surfing the Internet and playing computer games. Watching television is a low-level activity, and is ubiquitous among young children in both developed and developing countries (see, for example, Larson & Verma, 1999). For Australian children's television consumption, see, for example, Jenvey (2003) (in which Australian children's usual play and leisure patterns in different social contexts were surveyed) and the Australian Bureau of Statistics' Survey of Australian children's usual leisure activities (Australian Bureau of Statistics, 2004). It is therefore not surprising that researchers have attempted to identify an association between television viewing and increasing levels of obesity among children in those countries. While some studies have investigated relationships between amount of time children spend playing computer games or accessing the Internet and the development of obesity (see, for example, Wake *et al.*, 2003), the majority of research has focused on adverse health outcomes for children that are associated with frequent television viewing from an early age (Anderson *et al.*, 1998).

Children who are obese

Obesity is assessed by calculating body mass index (BMI). To calculate children's BMI, their weight and height are measured and the BMI derived from dividing children's weight by their height squared. Children whose BMI exceeds 25–30 kg/m² are classified as overweight-obese (Cole *et al.*, 2000). Children's weight and height are compared with international norms established so that meaningful comparisons of children's growth can be made across different countries (Bar-On, 2002). There are separate norms for boys and girls, and each child's weight and height is compared with norms established for children of the same age. While the BMI provides a quick and internationally agreed-upon means of determining which children can be classified as obese, it is recommended that other parameters of children's growth be considered also in determining obesity (World Health Organisation, 1995). In addition to weight and height, the mid-upper-arm and mid-calf circumferences and skinfold thickness (subscapular and mid-upper arm) should also be obtained to ascertain, respectively, children's muscle mass and fat stores (World Health Organisation, 1995).

Amount of time children spend watching television

In a cross-national investigation of children's leisure pursuits, Larson and Verma found that the time spent by children of different ages, including young children five to eight year olds in different countries, ranged between one-and-a-half and two-and-a-half hours per day (Larson & Verma, 1999). Australian parents report similar amounts of television viewing (average 15 hours/week) among their children, including preschool

and early school-aged children (Wake *et al.*, 2003). This latter study also included time spent in computer-based activity, which was still much less than time spent watching television. Additionally, results from a survey of frequency and type of leisure activities of a sample of more than two million five-year-old to 15-year-old Australian children (Australian Bureau of Statistics, 2004) showed that watching television and videos was the most popular leisure activity of young Australians, with 98% of children engaged in that activity during their leisure time. In a two-week period during the school term, children spent, on average, 22 hours per fortnight watching television and videos. The time spent watching television and videos exceeded time spent in other leisure pursuits such as reading or playing electronic games (8 hours/fortnight), and in more physically active pursuits such as bike-riding (6 hours/fortnight) or skateboarding and rollerblading (5 hours/fortnight).

When these data are considered in addition to the time spent by children accessing other more recent forms of computer-based activities, it is reasonable to assume that young children are spending a sizeable proportion of their leisure time in sedentary, electronic media consumption. In fact, children persist in television viewing even with the advent of more personalised, interactive media such as the Internet and computer games. Thus, time spent accessing these more recent forms of electronic media occurs in addition to time spent watching television (Roberts *et al.*, 1999; Australian Bureau of Statistics, 2004). Owing to the fact that television has been part of children's leisure for several decades, there is a larger body of research investigating the impact of television viewing on young children's development than exists on more recent forms of computer-based technology taken up by young children.

Potential adverse impact of watching television on young children

It is proposed that the amount of time young children spend watching television displaces time that might be spent in other, more physically active, leisure pursuits (Dietz & Gortmaker, 1985). The second concern is related to programme and advertisement content of television watched by young children. Television content that is proposed to be associated with adverse developmental outcomes for children are programmes that include advertisements for food products of poor nutritional quality, contained in advertisements that are strategically placed during peak viewing times for children (Taras *et al.*, 1989). A third hypothesis proposes an interaction of sedentariness of television viewing and susceptibility of young children to the persuasive intent of advertisements for foods of poor nutritional quality that are frequently advertised during designated children's television viewing time contribute to early childhood obesity (Bar-On, 2002). Each of these concerns will be discussed more fully in the following sections.

Relationship between young children's television viewing and low physical activity levels

A relationship has been found between how many hours children spend watching television and how many hours they spend in physical activity (Dietz & Gortmaker, 1985;

Anderson *et al.*, 1998). The more time children spent watching television, the more overweight or obese they were. This finding led researchers to propose that television viewing supplants time spent in physical activity, thereby leading to reduced energy expenditure relative to energy intake, and the development of obesity (Gortmaker *et al.*, 1990). A weak but statistically significant association was found between hours of television viewing and reduced physical activity among three to four year olds (DuRant *et al.*, 1994), while another study showed no relationship between physical activity and television viewing among Mexican children living in Mexico City (Hernandez *et al.*, 1999). Anderson *et al.* (2001), in their follow-up study of the potential effects of television viewing in early childhood on negative developmental outcomes during adolescence in two cohorts of children in Massachusetts and Kansas, USA, found no relationship between frequent television consumption during early childhood and obesity during adolescence. In fact, the only association, a weak but statistically significant relationship, was found between obesity and hours of television viewing by adolescent girls, but not for boys. The authors interpreted these results as demonstrating that adolescent girls become more sedentary than do adolescent boys and potentially more active leisure time does become displaced with television watching (Anderson *et al.*, 2001). These equivocal results are not surprising, given the problem that, in large-scale epidemiological studies of factors that contribute to children's and adolescents' growth, it has been difficult to establish a link between physical inactivity and overweight and obesity (see, for example, Katzmarzyk *et al.*, 1998; Krassas *et al.*, 2001). Thus, the relationship between physical activity and television viewing remains to be clarified.

The absence of a clear relationship between time spent watching television and obesity among children is probably linked to methods of data collection of the amount and type of participants' leisure activities adopted commonly in these different studies. Many of the studies required children or their parents to keep a diary of their daily activities (for example, Anderson *et al.*, 2001 [early childhood phase of study]; Wake *et al.*, 2003), while other samples of children's activity levels are derived from a short-term and an ultimately limited sample of children's regular activity (for example, Australian Bureau of Statistics, 2004). Retrospective diary methods of information gathering have the potential problem of social desirability bias. That is, children and parents report what they should be doing rather than what they are actually doing, and diaries are completed retrospectively, sometimes several days after a reported activity took place. Furthermore, child respondents' perception of time may be inaccurate. Home or school daily data collection, completed by children, parents or teachers themselves, in the presence of researchers might overcome problems with diaries having to be completed retrospectively after too much time has elapsed. Such methods are, however, potentially intrusive into family life, are very labour-intensive and dictate large research budgets. Other potential methodological problems include differences in the way children's activity levels were characterised in these studies.

The diverse behaviours of which children's physical activity is comprised has led researchers to recommend that activities be stratified as high activity (e.g. running,

jumping, team sports), medium activity (e.g. walking round school playground during recess) and low activity (e.g. occasional movements during play activity) (Goran *et al.*, 1997). Other researchers note that the intensity of the activity may also affect the amount of energy expended during an activity (Strauss *et al.*, 2001).

Contradictory findings should also be considered in light of evidence indicating that young children who report that their usual play activity is watching television when at home alone or in the company of siblings and friends also report that they engage in outdoor-active play such as riding bicycles, playing sports or other vigorous games (e.g. chase) or all forms of rough-and-tumble play (Jenvey, 2003). Results of a large-scale survey of Australian children's leisure activities (Australian Bureau of Statistics, 2004) supports Jenvey's (2003) findings. Results of this survey showed that, while young children (five to eight years old) spent a lot of leisure time in sedentary activities such as watching television, playing computer games, and accessing the Internet, more than 60% of children of this age group also participated in organised sports and cultural activities that incorporated dancing and playing musical instruments. Larson (2001) notes that even young contemporary children have far more leisure time than children of previous generations, much of whose spare time was taken up with assisting with household chores and contributing to income-generating activities. As a consequence of increased technological assistance to reduce repetitive manual labour associated with feeding, transportation and providing a suitable home for children, this time has become 'free time', and there has been an attendant increase in time available for all forms of leisure-time activity, including time spent watching television (Larson, 2001).

Evidence also exists that certain inherited propensities to develop high leptin levels and fat mass are implicated in the development of obesity in early childhood (Comuzzi *et al.*, 2003). This latter finding suggests that some children will be more susceptible to early-onset obesity, and low levels of physical activity will have different consequences for children according to their inherited predispositions.

Thus, a direct relationship between inactivity resulting from frequent television viewing in early childhood and the development of obesity is not clearly established. Other factors, such as the amount and type of all leisure activities in which each child engages, and the level and intensity of the physical activity, together with inherited propensities that differentially predispose some children to the development of obesity in early childhood, need also to be taken into account when attempting to ascertain the reasons for increasing levels of obesity among young children. As well as the amount of time children spend watching television, it is also important to consider the content of the television that young children watch.

Food advertisements during designated children's television time and amount and type of food consumed by young children

Before considering the processes by which young children are influenced by advertisements on television, it is important to consider just how many food advertisements are placed during times when children are most likely to be watching. As much as 30%

of non-programme content during children's designated television time in both Australia and New Zealand (Hill & Radimer, 1997; Wilson *et al.*, 2006) contains advertisements for food, and the types of products advertised are of poor nutritional quality. That is, food types that are commonly referred to as 'snack foods' that can be purchased in attractive packaging at supermarkets and 'fast foods' made and sold at fast food outlets are frequently advertised during designated children's television times. The types of foods advertised to Australian and New Zealand children on television are similar to products advertised during peak periods of children's viewing in USA (see, for example, Kuribayashi *et al.*, 2001; Harrison & Marske, 2005) and for advertisement content on British television during times of peak viewing by young children (see, for example, Pine & Nash, 2003). Furthermore, foods advertised during children's television programmes were more likely to contain levels of salt, saturated fats and sugars that exceeded recommended daily allowances for children of the ages in the target audiences (Harrison & Marske, 2005), and contained highly processed foods that were low in dietary fibre (Wilson *et al.*, 2006). Kuribayashi *et al.* (2001) compared the contents of food advertisements placed in Saturday morning children's programmes with contents of food advertisements placed in Saturday evening adult programmes across four free-to-air US television stations. The food types advertised during periods of peak viewing by children were compared with types of food products advertised during periods of peak viewing by adults, it was found there were more food commercials shown during early morning children's programmes and they were more repetitious and took up a higher proportion of the overall programme time than food advertisements screened in the evenings during prime-time adult programming. Overall, food products advertised during Saturday morning programmes, a period of peak viewing by young children, contained significantly higher levels of sugar and saturated fat than products advertised during Saturday evening programmes, when the majority of the audience were adults (Kuribayashi *et al.*, 2001).

While it is important to establish the frequency of exposure of young children to certain foods types while they watch television, it is equally important to consider how such advertising might affect children's food preferences, eating patterns and general nutrition. The amount and type of food provided by parents and even older siblings to young children has been shown to be the most significant influence on the development of food preferences and eating patterns in early childhood (Cullen *et al.*, 2000; Jenvey & Jenvey, 2004). Thus, if parents usually purchase and consume so-called snack foods and junk foods, then such foods will be readily available to children in their homes. Messages contained in advertising content might reinforce young children's preference to consume foods that already are available in their home. Even when young children respond to the persuasive intent of the advertisements, it is not clear how young children might then influence their parents to purchase foods advertised on television when such foods are not usually provided by their parents or other family members and therefore not available in their homes. Taras *et al.* (1989) did show a more direct link between children's exposure to certain food advertisements on television and the types of foods they consumed. These authors had mothers of three to eight year olds complete a questionnaire in which data were collected on

children's television viewing patterns and the nature of their requests for certain food products that had been advertised on television. The more often children saw the television advertisements for certain food types, the more frequently they requested that their parents purchase the products. Different relationships were found for exposure to sporting goods advertisements and children's requests for sporting goods. The more television children watched generally, the less frequently they requested that their parents purchase sporting goods promoted in advertisements that they had watched on television. The design of this study did not control for other potential confounds in the data. For example, children who watch a lot of television are also exposed to advertisements for all sorts of products, but the type of food advertised (mostly snack, and processed packaged food) is relatively cheap, when compared with toys, and sporting goods and other products that are also frequently advertised during children's television programmes. It may simply be that more snack food was requested, and even purchased, and thus consumed by children, because of its cheapness relative to other advertised products. Information not included in Taras *et al.*'s results was how frequently parents acquiesced to children's requests, whether those foods were already available in children's households, and whether parents themselves consumed such food products.

It is proposed that the psychological processes that underlie children being influenced by the media about food, attitudes to food, diet and exercise involve the joint processes of imitation and modelling (Bandura, 1986). Children tend to imitate the behaviours of influential adults in their environment. Reinforcement of behaviours of influential others occurs vicariously. Children are rewarded by watching others being rewarded, and are likely to use these people as models upon whom they can base their own behaviour in the expectation that they themselves will be rewarded directly for similar behaviour. This process explains why children might show a preference for food advertised on television, especially if the food is endorsed by a favourite television character or an influential media or sporting personality. This process is understood well by corporate marketers, and is one of the reasons why popular actors, sporting and other media personalities are used for both questionable advertising campaigns (e.g. junk foods advertisements targeted at young children) as well as more prosocial campaigns that contain community service messages (e.g. support programmes for child cancer sufferers and road safety campaigns).

Additionally, these processes (imitation and modelling) also explain why parents, and mothers particularly act as important role models in the development of children's food preferences and eating habits, and there is evidence to support the influence of parent's modelling both healthy and unhealthy eating habits and food preferences. Among young children (e.g. three to eight year olds), parents or immediate family members are the most significant role-models for children's behaviours (Black *et al.*, 2001; Cullen *et al.*, 2000), and this understanding of the importance of parents and even grandparents modelling appropriate nutrition and exercise habits for their offspring has been incorporated into successful intervention programmes to improve young children's nutrition generally; their physical activity and to prevent or reverse early onset of overweight and obesity (see, for example, Black *et al.*, 2001).

Further evidence in support of parents' food provision, nutrition information and modelling of healthy eating patterns comes from an epidemiological study of contributing factors to the consumption of fruit and vegetables among 6–12 year olds. The most significant predictors of fruit and vegetable consumption among children was the availability and accessibility of fruits and vegetables for the children in their homes, together with their parents' intake of fruit and vegetables and parents' knowledge of dietary recommendations about children's nutrition (Blanchette & Brug, 2005). Additionally, in this study, a less significant association between low fruit and vegetable consumption by children was associated with television viewing, including food advertisements and the availability of convenience food at children's schools. Thus, these latter factors were far less predictive of poor nutrition than parental factors, and formed a complex of other factors, related to both availability of snack foods in places other than children's homes, and to lesser extent passive television consumption and exposure to food advertisements, the specific nature of which are not fully described in the study (Blanchette & Brug, 2005).

Thus, the extent to which young children are influenced by this mode of advertising is still dependent upon whether parents provide such food for their children, whether parents also model those poor dietary preferences and how well young children are able to persuade their parents to purchase snack foods and junk foods frequently advertised on television when they are not usually present in children's households.

Other cognitive processes of young children may also explain why young children, three to eight years old, are more susceptible to the persuasive intent of television advertising of products, including food products that are promoted on television. It is often the case that advertisements are embedded in thematically related children's television programmes and that their persuasive intent is not obvious to young children (Kunkel & McIlrath, 2003). It has been demonstrated that young children (younger than four or five years) have difficulty distinguishing advertising content from programme content on television, and that they do not understand the persuasive intent of the advertisements (Kunkel & McIlrath, 2003). As children mature cognitively, however, they understand better the persuasive intent of advertisements (Oates *et al.*, 2002); but the same authors noted that, in their studies, there was still a sizeable proportion (approximately 25%) of 10 year olds who were unaware of the persuasive intent of advertisements (Oates *et al.*, 2002). What is important to understand is what differentiates the 25% of four to five year olds who do understand the persuasive intent of advertisements from the 75% who do not. Similarly, it is important to find out why 25% of 10 year olds still did not yet understand the persuasive intent of advertisements, when compared with the majority of their age group who readily understood the persuasive intent of advertisements. To gain further insight into these associations, it seems important to consider whether 10 year olds who remain susceptible to the persuasive intent of television commercials have other cognitive delays in perspective taking or global cognitive functioning. Perhaps they watch television alone, lacking the company of adults or children or other social support networks where they might discuss the

content and function of advertisements they see in order to develop a more critical response to what they watch on television.

It is a much-replicated finding that television advertising, the intent of which is to influence young children to persuade their parents to purchase and consume products such as snack or junk foods, is placed frequently during programmes that attract large numbers of child viewers. There is also evidence that very young children are often unaware that the intent of advertisements is to persuade children to themselves purchase and consume their products or make requests to their parents to purchase such products. It was not established, however, that there is a direct link between types of products advertised to children during children's television programmes and children's and their parents' purchase and consumption of such food products as an explanation for early development of obesity in many children. It is more likely that certain children are influenced to consume nutritionally poor food only in households where such foods are already available to young children and where parents do not monitor what their young children watch on television and where parents, older siblings or even grandparents are responsive to young children's requests to buy foods, and those foods then are consumed by children in place of foods that provide a more balanced diet. Furthermore, it is also critical to find out whether young children who develop poor eating habits and food preferences from being exposed to excessive advertising of 'junk' food while watching television also engage less frequently in physically active leisure pursuits, the combined effect of which might be the development of early onset of obesity. That is, time displaced by watching television that could lead to reduced engagement in physical activity, together with increased exposure to junk food advertisements and increased parents' purchase and children's consumption of nutritionally poor food products, suggests a multidimensional process rather than a one-dimensional process that leads to early and sustained development of obesity in early childhood.

Despite the plausibility of the different explanations reviewed, results from research investigating an association between television and other passive media consumption and early onset of obesity in young children have been equivocal, and underlying mechanisms proposed to lead to obesity have not been delineated clearly by researchers. Potential methodological shortfalls in existing literature have been discussed. These shortfalls included failure of some studies to collect data on all children's leisure time activities; existing nutritional practices in the family context, especially types of foods provided by parents; parents' own level of physical activity; and eating habits and food preferences modelled by parents of young children.

Conclusion

The ubiquity, frequency and sedentary nature of television viewing that occupies a sizeable proportion of young children's leisure time in both developed and developing countries is considered by many researchers to be implicated in the increasing percentage of young children worldwide who are obese. Three commonly proposed explanations of the underlying processes that link television viewing to the

development of obesity in young children were evaluated. Among existing research findings there is insufficient evidence to support the proposal that television viewing displaces time available for more vigorous activity, reduced energy expenditure relative to energy intake and the development of early-onset obesity. Additionally, there was inconclusive evidence to support the proposition that young children are susceptible to persuasive intent of advertisements for food products of poor nutritional quality that appear frequently during children's television programmes, and that, in turn, contribute to unhealthy food preferences and eating patterns, and predispose young children to the early onset of obesity. An interaction of time displacement and susceptibility to develop preferences for unhealthy foods advertised when young children are most likely to be watching television was identified as a more plausible explanation of the proposed link between television watching and obesity in young children. It was recommended that future research address methodological shortfalls in existing studies, especially methods used to collect data on children's leisure activities and the need to include levels and intensity of children's physical activities. It was argued that there is a range of potential contributory factors to the development of obesity in early childhood. It was argued that future research needs to account for any inherited predisposition of some children to develop obesity in early childhood, to include the amount and type of food parents provide for their young children, to investigate parents' own nutrition practices and physical activity, and to investigate whether parents supervise their children's television viewing. Inclusion of all potential contributor variables should help to elucidate the complex interplay of factors that contribute to the onset of obesity in early childhood.

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