

To promote awareness of the risk factors that contribute to childhood obesity and assess the ability of parents to develop shared strategies to reduce such risks

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# **Executive Summary**

## **Summary of the project**

The current health status of Australian children is of great concern in terms of risk factors for lifestyle diseases such as obesity and other chronic conditions. Lifestyle changes have resulted in altered physical activity levels and food consumption patterns. There are a variety of socio-environmental influences on children's food-related behaviour and physical activity participation, including family and friends, schools and media marketing. This report focuses on the promotion of awareness of risk factors that contribute to childhood obesity and assesses the ability of parents to develop shared strategies to reduce such risks utilising a community development model.

## **Summary of main findings**

Unfortunately, there are limited reviews for the prevention of childhood obesity aimed specifically at primary school aged children. There also appear to be few published studies that report interventions directed specifically to parents; many used intermediaries such as schools to link with families. Although there is plenty of evidence to suggest that school-based interventions on primary school children work, some reviews reported difficulty in securing parents involvement in school-based interventions.<sup>1</sup>

This review built on a previous systematic review of reviews of the effectiveness of school-based strategies for prevention of obesity and for promoting physical activity and/or nutrition.<sup>2</sup> The series of reviews included in their work were integrated with the reviews that had been published prior to March 2002.

Four related reviews have been published since Micucci et al. published their review of reviews in March 2002. One review looked at interventions in mental health, physical activity and healthy eating amongst young people.<sup>1</sup> The second review reported on the effects of lifestyle interventions designed to treat obesity in children.<sup>3</sup> Another review looked at inventions at improving physical activity only,<sup>4</sup> whilst one review focused on improving nutrition only.<sup>5</sup> Kahn et al.<sup>4</sup> was the only review that focused solely in the community, as the other reviews were set in the school environment. Crawford et al.<sup>5</sup> discussed briefly community-wide interventions but complained that their search of this set of approaches were disappointing, were not well evaluated and did not have a strong explicit children's focus. It also should be mentioned that Crawford et al. was not typically a review but an 'evidence based health promotion research and resource project.'

This report provided information on the strategies that have been undertaken in Australia and internationally and their effectiveness. Most interventions have been very short, as have their evaluations. Nevertheless, as all children attend school, this has

proven to be the most successful setting to introduce interventions that promote 'healthy eating and physical activity' to primary school aged children. This report also gave suggestions for the optimal timing for parents to discuss with their children the issues pertaining to obesity and the healthy weight of children, however, again information was limited as most school interventions complained of difficulty in 'reaching parents.'

Strategies for improving children's food and activity behaviours in a school setting should take a Health Promoting School approach, including the school curriculum, ethos and environment.<sup>6</sup> This approach is a comprehensive framework to guide the development of programs and strategies that promote healthier eating and physical activity amongst children. Finally, there needs to be an introduction of more community-wide interventions that possess a strong explicit children's focus to the best approaches to promote healthy eating and physical activity.

# 1. Literature Review of Reviews

## 1.1 Introduction

### 1.1.1 Background

Lifestyle changes for children and adults in industrialised countries have resulted in altered physical activity levels and food consumption patterns. The combined effect of these changes has important implications for health status, with the complex interplay of factors contributing to adverse consequences on a population level. Reduced physical activity and a poor diet are linked with many lifestyle diseases, including obesity, type II diabetes, cardiovascular disease, osteoporosis and some cancers.

Obesity in particular has emerged as a high-profile health concern; due to increasing rates amongst children and worldwide. The World Health Organisation (WHO) acknowledges obesity as a global problem, not to be confined to the more affluent: 'The spectrum of problems seen in both developing and developed countries is having such a negative impact that obesity should be regarded as today's principal neglected public health problem.'<sup>7</sup> To date, the WHO organisation has identified a number of 'downstream' methods of treatment for obese and overweight individuals, mainly comprising primary care settings.<sup>7</sup>

In Australia, the trend towards an increasing proportion of overweight and obese mirrors the global picture (Refer to Appendix 1). Rates of overweight and obesity in Australian children have increased more rapidly over the past 10-15 years than in previous decades.<sup>8</sup> More recently, data of the prevalence of overweight children aged seven to 15 almost doubled from 1985 to 1995, while the obesity rate almost tripled.<sup>9</sup> Approximately 60% of obesity may be due to lifestyle factors such as unhealthy eating habits, decreased physical activity and increased sedentary behaviours.<sup>10</sup>

In the Australian Health and Fitness Survey (1985), 9.3% of boys and 10.6% of girls were overweight and a further 1.4% of boys and 1.2% of girls were obese. In the National Nutrition Survey (1995), overall 15.0% of boys (varied with age from 10.4% to 20%) and 15.8% of girls (varied with age from 14.5% to 17.2%) were overweight, and a further 4.5% of boys (2.4%-6.8%) and 5.3% of girls (4.2%-6.3%) were obese. The prevalence of overweight and obesity in the 1995 sample peaked at 12-15 years in boys and 7-11 years in girls. Compared with previous estimates from these samples, the revised prevalence data are slightly higher for the 1985 data and considerably higher for the 1995 data.<sup>11</sup>

The prevalence of non-overweight, overweight, obesity, and overweight and obesity combined for the Victorian component of the Australian Health and Fitness Survey, 1985, and the Health of Young Victorians Survey, 1997, is shown (separately for boys and girls 7-12 years) in Table 7 (Refer to Appendix 2). Approximately 17% of Victorian

boys and 19% of Victorian girls are now overweight; more than 5% of both sexes are obese.<sup>10</sup>

Children's increased consumption of energy-dense foods and their participation in more sedentary pursuits are the result of a complex interplay of influences, including family, friends, schools, the wider community, and market forces. These changes are associated with increased rates of obesity.<sup>12</sup> Physical activity levels and diet quality have many additional consequences for children's health and well being, including physical, mental and emotional aspects of health.<sup>13,14</sup>

Although rural/urban, socioeconomic, cultural and sex differences have been observed,<sup>8,15</sup> overweight and obesity amongst all Australian children is a significant health risk factor. For individual children, immediate psychosocial effects of childhood obesity may include social isolation, discrimination, and peer problems in childhood. By adolescence lower self-esteem, associated with increased rates of sadness, loneliness and nervousness have been reported.<sup>16</sup> Common physical health problems with long-term implications include advanced growth, hyperlipidaemia and glucose intolerance, and there is a wide range of less common problems.<sup>16</sup>

## **1.2 Importance of Primary School Aged Period**

### **1.2.1 Bodily changes**

A critical period refers to a developmental stage in a child's life in which physiologic alterations increase the risk of adult obesity.<sup>17</sup> The two critical periods during a child's development are adiposity rebound and puberty. Adiposity rebound is the term used to describe the time in a child's life (usually around 5 to 6 years of age) when body mass index (BMI) begins to increase following a steady reduction in BMI during the preschool years. The period of adiposity rebound may be the period in which behaviours related to food intake and activity, acquired in early childhood, begin to be expressed. The capacity of children to regulate their food intake is affected by maternal restraint and control of eating. For example, children whose mothers exert an increased control of food intake will be less capable of regulating their own food intake.<sup>18</sup>

Puberty is a period in which the location of body fat changes, and thereby may entrain the subsequent risks associated with obesity.<sup>18</sup> A variety of factors affect the preposition of body fat. Hereditary influences constitute a major factor,<sup>19</sup> as well as puberty, and perhaps the androgenic effects of puberty, predispose to central adiposity, particularly in males. Due to the fact that androgens are increased among girls during puberty, the sexual dimorphism in central fat deposition remains unclear.<sup>18</sup>

Whether early adiposity rebound and/or puberty play an independent causal role in later overweight and obesity, or whether they are simply early manifestation of an already-established pathway of behavioural and environmental risk, is yet to be proven. (Dr



Joanne Williams, PhD Scholar, Centre for Community Child Health, Melbourne, Victoria, Personal Communication).

### **1.2.2 Health consequences of childhood obesity**

There is a demonstrated association between childhood obesity and adult obesity.<sup>12</sup> Overweight and obesity are associated in later life with many disease and conditions such as coronary heart disease, stroke, type II diabetes and osteoarthritis.<sup>20</sup>

A lack of regular physical activity is associated with a higher mortality rate amongst adults of any age.<sup>21</sup> Up to 50 per cent of new type II diabetes cases are preventable by adequate engagement in physical activities.<sup>22</sup> A lack of physical activity may play a role in the formation of some cancers, for example breast cancer and colorectal cancer.<sup>6,23</sup>

Diets high in saturated fat have been associated with raised low-density cholesterol levels, an increased risk of coronary artery events, some types of stroke, type II diabetes and excess weight.<sup>24</sup> A strong link has also been demonstrated between diets containing sugar levels and the development of dental caries.<sup>25</sup> Diets high in salt, saturated fats and sugars, with inadequate consumption of fresh fruits and vegetables, may not contain sufficient levels of dietary fibre.<sup>12</sup> Low levels of dietary fibre are a risk factor for some types of cancer, including colorectal cancer.<sup>12</sup>

Continuous obesity from childhood into adulthood sets up the beginnings of insulin resistance and therefore abnormal glucose metabolism.<sup>26</sup> The Bogalusa Heart Study<sup>27</sup> found that more than 60 percent of overweight children have at least one additional risk factor for cardiovascular disease, and more than 20 percent of overweight children have two or more additional risk factors. These factors include raised blood pressure, higher levels of blood fats and higher levels of blood insulin.<sup>27</sup>

### **1.2.3 Social and psychological effects of childhood obesity**

A holistic view of health encompasses physical, mental, social, and spiritual aspects of health. The reciprocal relationship that exists between the physical and mental aspects of health is now well established. Overweight and obesity can impact negatively upon children's physical, psychological and social wellbeing. A child's self-esteem may be adversely affected, with further consequences for their physical health status.<sup>28</sup>

It has been shown that overweight and obese children have lower self-efficacy levels than non-obese children in regards to physical activity participation.<sup>29</sup> These children may therefore be less likely to participate in physical activity. It has been found that they are less likely to become involved in community organisations promoting physical activity.<sup>29</sup>

Negative attitudes towards overweight children have shown to emerge early<sup>30</sup> and may be difficult to change.<sup>31</sup> Research shows that children as young as six have expressed negative views towards images of overweight children.<sup>31</sup> Such views are often

expressed as verbal, emotional and physical abuse in the playground. Discrimination of overweight children in education, health care and social relationships is common, with evidence highlighting the existence of 'strong prejudice and even oppression against obese youngsters regardless of age, sex, race and socio-economic status.'<sup>30</sup>

The psychological impacts of this treatment may affect a child's ability to develop a healthy and confident self-image, and therefore affect their mental wellbeing well into adult life. When a child's role models, including parents, teachers and peers, provide a constant reminder of their inadequacy, this has serious and deleterious consequences for their mental health status.<sup>30</sup> Overweight children and adults are more likely to experience discrimination and/or victimisation, whether overt or covert in nature, and are more likely to suffer from depression, anxiety and loneliness.<sup>32</sup>

#### **1.2.4 Strategies to date**

A number of campaigns and programs have targeted healthy eating and physical participation; however many have focused on an individual behaviour change approach. Egger and Swinburn<sup>33</sup> suggest that the limitations of educational approaches to changing eating and physical activity patterns exist because cognitive factors and willpower based on knowledge, for example, are unlikely to effect any significant behaviour change in individuals. Eckersley<sup>34</sup> suggests that interventions are not dealing sufficiently with the underlying factors that are perhaps discouraging individuals from making healthier food and activity choices.

The interwoven influences on food and exercise behaviour have been explored,<sup>33</sup> along with the psychological, biological and environmental factors. Behavioural change for better health may lead to short term effects on food and activity-related decisions, but in an unsupportive environment, these changes are rarely sustainable.

Because all children attend schools and spend a large proportion of their time there, these are key settings in which to focus upon strategies to improve children's nutrition and physical activity participation. Recently, a large well-designed school based intervention targeting healthy eating demonstrated very modest findings in regards to its effectiveness.<sup>35</sup> In schools with high levels of supervision and improved physical environments, such as play equipment and open space available, programs directed at physical activity participation are effective at increasing participation.<sup>36</sup> However, due to an already crowded curriculum, there are potential problems with implementation and the ultimate sustainability of school-based interventions. Although some school-based interventions may show success in changing eating and exercise behaviours over the study period, these changes may not be sustained following the cessation of the program activities.<sup>37</sup>

## 1.3 Children's eating behaviours and physical activity

### 1.3.1 Family Influences

#### *Family demographics*

At 30 June 1997 there were 4.7 million children aged 0-17 years in Australia. More than 50, 000 children were affected by the divorce of their parents during 1997.<sup>38</sup> Children living with both parents have a higher rate of participation in organised sport (61%) than those living in one-parent families (51%).<sup>38</sup>

Children living in coupled families with both parents born from non English-speaking countries and children living with a single parent born from a non English-speaking country were least likely to participate in organised sport outside of school hours – participation rates were 38% and 39% respectively.<sup>38</sup>

When researching Australian children across different geographic location, there is a higher proportion of overweight and obese children living in urban areas overall. However, when looking at sexes separately, this relationship is more significant in males but not females. In rural areas there are 16% of overweight and obese males compared to 25% in urban areas.<sup>8</sup> (Refer to Appendix 3)

#### *Parents*

Parental obesity is a risk factor for future, if not present, obesity.<sup>39</sup> Overweight adolescents have a 70% chance of becoming overweight or obese adults and this increases to 80% if one or more parent is overweight or obese. In fact having overweight or obese parents far outweighs sedentary behaviours such as television viewing as a risk factor.<sup>10</sup> By the age of 17 years, the children of two obese parent are three times as fat as the children of two lean parents.<sup>39</sup> Therefore, before a child reaches adolescence is an important time to try to keep weight under control. (Dr Joanne Williams, PhD Scholar, Centre for Community Child Health, Melbourne, Victoria, Personal Communication)

The observation that many parents of obese young children may neither recognise nor feel concerned about a child's established weight problems suggests that many parents may also not perceive an impact on their child's health and well being. A study by Wake et al.<sup>16</sup> found that only 12% of parents were concerned about their child's weight. Furthermore, most parents of overweight and obese children did not report poor health or well being for their child (Refer to Appendix 4). This has implications for the early identification of such children and the success of prevention and intervention efforts.<sup>16</sup>

Despite changes in the social environment, women are still regarded as central to the provision of food, and are most likely to be the buyers and preparers of food in Australia.<sup>40</sup> Consequently, women and maternal education have been of greater interest. A study in Victoria<sup>41</sup> found that children of women with less than ten years of education

have a markedly higher prevalence of overweight and obesity (25% boys and 29% girls) (Refer to Appendix 3).

Communication between children and parents is an important ingredient in the development of good child-parent relationships and supports the healthy growth and development of children. Recognition of the importance of these relationships provides the impetus to develop healthy eating behaviours and an active lifestyle. Talking with families about nutrition aims to increase the awareness and understanding of nutrition and physical activity among families with young children. Doctors and other health professionals are well placed to facilitate this by discussing issues with parents, building confidence and providing resources.

Evidence from families with older children show that family food rules imposed at an early age may indeed predict healthier eating habits at adolescence. Recent studies have suggested less about the efficacy of family food rules *per se* and more about the importance of communicating them appropriately to children in a family setting, although this itself needs further research to be fully elucidated.<sup>42</sup>

Family food experiences provide for a range of theoretical explanations through which social arrangements may be examined. Mealtimes provide an opportunity where parents and offspring establish a pattern of questions and answers, which represents, and rehearses the power relationship between adults and children. This is especially the case when children refuse to eat.

Parental involvement in treatment programs is necessary for successful weight-loss in young children. Such findings imply that altered food patterns within the whole family, as well as parental reinforcement techniques (i.e. parental praise) and support of the child, are important factors in outcome success.<sup>43</sup> Furthermore, restrictive dieting may interfere with growth in childhood or encourage body image distortions. The focus should be on behaviour change and moderate fat restriction, rather than a diet-culture mentality of calorie counting.<sup>43</sup>

Socio-cultural influences are relevant to childhood overweight and obesity, with dietary habits and lifestyle behaviours undergoing transition as a result of migration. Children's genuine fondness and loyalty to food from their parents' culture of origin was evident in a study by Green et al.<sup>44</sup> The most predominant evidence of dietary acculturation for children was with school lunches and after-school snacks, which were commonly described as packed foods with high sugar and fat content.<sup>44</sup>

### *Children's diets*

Data suggests that the fruit and vegetable intakes of Australian children and adolescents are inadequate, falling well below recommended amounts.<sup>38</sup> The last 10 years has seen a decline in the amount of variety of fresh fruits and vegetables consumed by children and adolescents in Australia.<sup>45</sup> Data from the 1995 National Nutrition Survey<sup>38</sup> indicate that the most popular vegetable consumed by children and adolescents (aged 2 to 18 years) was potato, mostly consumed in fried form, contributing to a higher fat intake.

Fruit juice was the most commonly consumed form of fruit.<sup>46</sup> The lack of variety and freshness of fruits and vegetables consumed by Australian children is also of great concern. Data from the United States indicates similar trends amongst adolescents<sup>47</sup> manifesting as low vitamin and mineral intakes.

### *Leisure time physical activity and sedentary pursuits*

The Australian Bureau of Statistics, 'Children's participation in cultural and leisure activities'<sup>38</sup> has found that outside of school hours the most popular activity amongst children 5-14 years was watching television and videos, an activity undertaken by approximately 97 per cent of boys and girls.<sup>38</sup> There has been no change in children's television viewing over the last six years (2.5 hours TV/day), however, pay TV access had increased from 5% in 1996 to 19% in 2000. Boys (79%) and girls (58%) enjoyed playing computer and electronic games; whilst a smaller percentage (71% of boys and 56% of girls) enjoyed bike riding.<sup>38</sup> Internet usage triples from 8-10 to 14-16 years (Refer to Appendix 5).

From April 1999-2000, 1.6 million children (59%) participated outside of school hours in sport that had been organised by a school, club or association. Sixty-seven percent of children aged 9-11 years participated in organised sports, the highest participation rate amongst those surveyed. Children from non English-speaking countries had the lowest organised participation rates (47% boys, 26% girls). Older children played organised sport more frequently, with 57% of those 12 to 14 year olds who had participated compared to 36% of their 5 to 8 year old counterparts.<sup>38</sup>

The sports that were most popular with boys were outdoor soccer (20% participation rate), swimming (13%), Australian rules football (13%) and outdoor cricket (10%). For girls, the most popular sports were netball (18%), swimming (16%), tennis (8%) and basketball (6%).<sup>38</sup>

Over the year to April 2000, 10% of girls were involved in more than one of the selected organised cultural activities outside of school hours compared to 3% of boys. Participation for dancing was the highest organised cultural activity for children aged 6 years (13%). Participation in the other three activities surveyed (playing a musical instrument, singing and drama) peaked between 10 and 12 years of age.<sup>38</sup>

In the 12 months to April 2000, 30% of children aged 5 to 14 years did not participate in either organised sport or one of the four organised cultural activities outside of school hours. Of children aged 5 to 8 years, 39% were not involved in these organised sports or cultural activities compared with 23% of children aged 9 to 11 years. Nearly half (48%) of children born overseas in non-English speaking countries were not involved in these activities.<sup>38</sup>

It is suggested that an innate drive for central nervous stimulation in children is met primarily through engaging in physical activity and play.<sup>48</sup> However, there is a question as to whether children are able to meet this drive for sensory stimulation through alternatives means, for example the enthusiasm and enjoyment derived from playing

computer games.<sup>49</sup> The potential for visual and auditory stimulation to replace the sensory experiences of physical play has disturbing implications for long-term health.

### **1.3.2 Schools**

Because children spend a large proportion of their time in schools, these are key settings in which to focus upon strategies to improve children's nutrition and physical activity participation.<sup>50</sup> Traditional nutrition education has focused on the school curriculum rather than addressing the physical and social environments of the school. Today many schools are adopting the 'health promoting schools' philosophy. This concept encourages schools to address health in three areas: the curriculum, the social and physical environments, and the relationship between the school and the school community.<sup>51</sup>

#### *Hours of attendance*

School times can vary slightly but are basically 9.00 AM - 3.30 PM (some may start at 8.45 AM and finish 3.15 PM, but very few start any earlier). They have one hour for lunch and because of the mandate in government schools to undertake blocks of learning for literacy and numeracy this lunch time is often not until 1.00 PM. They still have a recess/play/little lunch time mid morning - usually about 10.45 -11.00 AM. Some schools have introduced the concept of "brain" foods which can be consumed during class time, at about 10.00am.

Obviously, a child who spends up to 7 hours per day at school for 40 weeks of the year is dependent on that setting for appropriate modeling, education, and a nutritious, developmentally appropriate, and adequate diet.<sup>52</sup> For teachers and child care staff, access to information and skills in nutrition and its application are important to the children's health. Older siblings, television, and peers also have shown to influence children's diets. Children themselves can exert control over the foods they eat.<sup>53</sup>

#### *Canteen practices*

Knowing about healthy eating is not enough to sustain good dietary habits throughout life. Rather we should focus on the promotion of environments conducive to healthy eating as this may enable children to make better food choices. School canteens are collectively Australia's largest take-away food outlet. Efforts to improve canteen menus in the past were prompted largely by dental considerations, but more recently general health implication and the guidelines on canteen menus set by the NHMRC have been recognised.<sup>54</sup>

School canteens are very well placed to provide a significant contribution to promoting health and nutrition. Students are becoming increasingly reliant on the school canteen to supply breakfast, lunch and snacks. Over 30% of students nutritional requirements are consumed whilst at school.<sup>50</sup> Students should have the opportunity to select nutritious meals and snacks which are consistent with the healthy eating guidelines. While

collectively comprising Australia's largest take-away food outlet, school canteens differ as they are in a unique position of being part of the education environment. They are able to reinforce the classroom concepts of nutrition and healthy eating.<sup>55</sup>

New guidelines issued to all public schools by the State Government call for an overhaul of Victorian school canteens. Education Minister Lynne Kosky said serving nutritious foods would improve student health and reduce the alarming rates of obesity. The guidelines have been developed after consultation with stakeholder organisations and nutritional experts and have also been influenced by the information obtained as a result of the Obesity Summit 'A Healthy Balance: Victorians Respond to Obesity'.

The purpose of these guidelines is to assist schools to move towards more healthy and nutritious eating practices for students over time. It is important that parents, teachers and students work together to support a whole-school approach to building a school culture in which students actively choose nutritious food and a healthy lifestyle. The guidelines, which cover food supplied in school canteens, at camps, at out of school hours care programs and in school dispensing machines, will assist schools to provide nutritious food and develop a culture that supports and promotes a healthy school environment. Students' families will also receive parents' guides to smart eating and are encouraged to be involved.

### *Curriculum*

The school system represents an affordable mass reach option for developed countries such as Australia. No other institution has as much continual contact with children and their families.<sup>56</sup> Teachers should be provided with reviews of nutrition education resources. Teachers are not always in a position to review resources in light of best practice nutrition education, particularly primary school teachers who look after all aspects of the curriculum. Teachers should also be given guidance on the appropriateness of resources to the different years of schooling. As the average age of teachers' increases, physical activity and nutrition education decreases in the classroom. Training for teachers should also be given high priority, which emphasises communication skills, needs assessment, assessment of materials for nutrition education, use of participatory teaching methods and evaluation needs.<sup>57</sup>

School-based nutrition education should focus not only on the provision of nutrition information, but also on the development of skills and behaviours related to areas such as food preparation, food preservation and storage; social and cultural aspects of food and eating; enhanced self-esteem and positive body image and other consumer aspects. All of these areas are conducive to healthier food choices. There is a wide array of teaching methods that can be used according to learning objectives: from classroom discussions, work-sheets and keeping food records; to shopping exercises, tasting, creating, or drama.<sup>58</sup>

Nutrition as a topic should be integrated into other subjects. Nutrition should be included in physical education, health education, science, home economics and life skills subjects.<sup>57</sup> There should be an emphasis on fun in the classroom and lessons should

teach the positive, appealing aspects of healthy eating patterns rather than the negative consequences of unhealthy eating patterns.<sup>55</sup>

### *Physical activity in schools*

There are no national data available on the participation rates of Australian children in school physical activity, indicating a need for further study in the area. Research indicated in metropolitan Melbourne utilising accelerometry measures indicated that over a 7-day monitoring period, 10-12 years engaged in 110-min moderate physical activity and 20 min vigorous intensity physical activity.<sup>59</sup> The findings also showed that 10-12 year olds spent approximately 500 minutes per day engaged in sedentary activity; which indicates that children may not be engaging in adequate active pursuits at school and may be spending much of their spare time in sedentary pursuits. In addition, it has been found that children engaging in predominantly sedentary activity during the school day are unlikely to compensate for this lack of activity after school hours.<sup>49</sup>

Participation in enjoyable sports and physical education at school may present an opportunity for children to engage in the highest activity levels of their school days.<sup>60</sup> However, a teacher can not force a student to 'engage' in an activity he or she finds difficult or uninteresting. If the normative behaviour of the group is such that children choose not to participate 'enthusiastically', school staff members need to work to overcome this cultural barrier to participation. Particularly in early adolescence, this barrier may be difficult to overcome.

Given the limited information available on child physical activity participation rates, it is thought that children are not participating sufficiently in physical activity at school, perhaps they are compensating for this outside school time. However, children were less likely to engage in active pursuits following a sedentary day at school. These literature findings suggest that opportunities for physical activity should therefore be maximised during school time.<sup>60</sup>

Children are more likely to travel to and from school by car than by any other mode of transport.<sup>61</sup> Parents' concerns about traffic danger, distance to school and 'stranger danger' are contributing to this phenomenon with most children now rarely or never permitted to go out unaccompanied, whether for travel to school or during leisure time. A study of children's school travel arrangements in Melbourne<sup>61</sup> found that approximately 60 percent of students were driven to school, 35 percent walked and the remainder used bicycles or public transport. Almost 90 percent of trips made to accompany Melbourne children on their daily commute to and from school are by car.<sup>38</sup>

### **1.3.3 Socio-environment influences**

Australian data indicate that children aged 5-11 years watch an average two and a half hours of predominantly commercial television each day.<sup>62</sup> Many Melbourne students nominated the media as their main source of nutrition information, with parents coming a close second.<sup>63</sup> There are numerous nutrition messages found on television, occurring



in both commercial advertising and entertainment programming. These messages may influence children and adults' food choices, also tempting viewers to snack more often.<sup>64</sup>

Parents are often pressured by children to supply foods high in sugar and fat in response to food advertising targeted at children.<sup>44</sup> Children watching a lot of television consume more snacks and are more likely to rate 'unhealthy' foods as healthier,<sup>64</sup> and their television viewing is positively related to their overall energy intake and requests for the purchase of foods featured on television.<sup>65,66</sup>

There is a demonstrated association between increased television viewing hours and increased energy intake, which tends to occur during or immediately after television viewing.<sup>65</sup> Although a logical conclusion for this may be the association of television viewing with snacking behaviour, this measure needs to take into account that many evening meals are consumed while watching television.<sup>67</sup> Video games and computer use have not been as well researched, and these activities (e.g. parlour games) may not be truly sedentary.<sup>10</sup> (Refer to Appendix 6)

Socio-environmental influences on children's food and activity related behaviour also include peer preferences and social norms,<sup>68</sup> family practices,<sup>69,70</sup> access to safe communities for play and travel,<sup>71</sup> and media messages.<sup>66</sup>

### **1.3.4 Socio-economic influences**

There is little consistency regarding the most appropriate ways in which to characterise socioeconomic status (SES), however, parental education and parental income appear to be the most commonly used determinant of dietary intake and physical activity.<sup>72</sup> Recent trends show that SES is a factor in the development of overweight and obesity among Australian school children (Refer to Appendix 3). Children of low SES may also be associated with nutritional deprivation and height retardation.<sup>73</sup>

It has been reported that mothers have an influence on the early eating patterns of children, with children of the most educated mothers having 'healthful' diets and children of the least educated and younger mothers having diets based on convenience foods.<sup>72</sup> A survey by Hupkens found that mothers across all social classes had food rules, but that middle class mothers have a greater tendency to limit unhealthy foods. In short, middle class was shown to be more restrictive and discriminating about children's eating habits. These differences may be due to variations in knowledge of unhealthy food habits between high and low SES.<sup>74</sup>

Much of the healthy eating literature has been relatively unconcerned with SES differences, consequently ignoring low SES groups, those people most exposed to disease risk.<sup>5</sup> A study by Baur<sup>43</sup> reported that families with middle and least educated mothers have previously been found to eat the evening meal together. However, the findings also showed that these families are more likely to watch television while eating the evening meal, a behaviour that may actually limit the opportunities to learn eating behaviours in this milieu.<sup>43</sup> Similarly, it has been suggested that watching television

during the evening meal may decrease family interactions and is associated with poorer eating choices.<sup>43</sup>

Women of low SES may exhibit dietary intakes less than recommended; however their children generally do not.<sup>74</sup> Studies in the UK and Canada of lone-mother families have suggested that women sacrifice their own nutritional wellbeing for that of the children.<sup>75,76</sup> However, these findings are not universal and in Australia studies of sole parents have found the overall dietary quality of the women to be as good or even better than the national average.<sup>77</sup> The apparent contradictory findings may reflect local conditions rather than overall trends. For example, child poverty in Australian sole parent families has reduced since the introduction of the child support scheme in the 1980s.<sup>42</sup>

### **1.3.5 Benefits of a healthy diet and regular physical activity**

It is important to highlight the substantial benefits for children participating in regular physical activity and eating predominantly healthy diets. Physical activity is required for growth and development, and plays a vital role in promoting muscle growth, bone formation and bone mineralisation.<sup>78</sup> Similarly, the USDH<sup>79</sup> reported that diet is related to growth and bone health. Healthy children are likely to embrace their educational experiences with a positive outlook.<sup>18</sup> In addition, physical activity is beneficial to the mental and emotional spheres of health.<sup>14,80</sup>

## **2. Methodology**

### **2.1 Aim**

To produce an evidence-based systematic review of reviews (of research literature) of strategies to address appropriate growth in children and healthy lifestyle behaviours, including maintaining a healthy weight and promoting physical activity for primary school aged children. This may include strategies targeted to parents, teachers, care givers, other community organisations and media or environmental strategies.

### **2.2 Sample**

Primary school aged children and their families.

## **2.3 Intervention types**

The intervention types will include strategies that:

- Prevent childhood obesity
- Promote healthy eating behaviours
- Promote physical activity
- Promote a healthier lifestyle
- Promote positive body image

## **2.4 Outcomes**

We are seeking interventions that increase healthy lifestyle behaviours, physical activity and healthy eating habits and reduce sedentary behaviours in primary school children.

The results for all outcomes reported in the reviews were summarised in a table for all the included studies. These have been grouped, and the methodological quality of the studies, as assessed by the authors, has been noted.

The reported outcomes may reflect the reviewers' inclusion criteria rather than the full range of outcomes considered in the included studies. For example, some of the reviews report only behavioural outcomes;<sup>1,3</sup> these include a more active lifestyle and healthier eating habits. Other reviews included a wider range;<sup>4,5</sup> these noted knowledge, attitudes and intentions specific to childhood obesity and more general outcomes such as positive attitudes towards physical activity and beliefs about body shape.

Reviews focusing on either physical activity or healthy eating habits only reported the effectiveness of the intervention on that particular activity even though the intervention may have aimed at all actions and the primary studies reported outcomes for both activities.

## **2.5 Inclusion Criteria**

We sought to include and review existing systematic reviews, as many reviews of the primary studies have been conducted and/or require a significantly larger resource base and length of time for their completion. Therefore, to be included in this review of reviews, reviews had to meet the following criteria of relevance and information provided.

Reviews must meet the following criteria: provide evidence of a systematic search, include quality assessment of research, include studies which used a comparison group or used a before and after study design, and report study details such as number of participants, content of interventions and settings (and approach, if provided).

### **2.5.1 Relevance**

The reviews had to include research literature of interventions that promoted healthy eating patterns, increased physical activity and decreased sedentary behaviour for primary school aged children. We included reviews that had either used a systematic review methodology, or were explicit in their methodology for the conduct and inclusion of studies that were included within their review. Reviews that included studies of childhood obesity prevention interventions in other settings were included only if it was possible to separate out the results of the school-based, home-based and community-based interventions.

### **2.5.2 Information provided**

It is crucial to have some information about the content of interventions to allow meaningful conclusions about their effectiveness and for comparisons between interventions to be made. Knowledge of the number of participants, their approach and setting, are important when considering the findings.

## **2.6 Exclusion Criteria**

### **2.6.1 Narrative reviews**

Reviews of childhood obesity interventions, which were concerned solely with population interventions targeted at age groups that were outside the age range. So, for example, reviews of programmes to reduce the risk of obesity in adolescence were excluded.

Reviews concerned solely with childhood obesity in high risk groups. To be included reviews needed to cover interventions provided for all primary school aged children rather to be confined to groups who suffered from an added risk of health problems – for example, reviews of programmes for children who suffer from mental illness.

## **2.7 Search Strategy**

### **2.7.1 Database searching**

A preliminary review of the literature identified by searching childhood obesity identified a wide range of terms used to describe interventions aimed at the promotion of healthy eating patterns and physical activity amongst primary school aged children. From these a broad search strategy was developed to identify relevant work from disciplines including nutrition, physical activity, education, psychology, health promotion and public health. The strategy was modified as necessary to search the following databases: Medline, Psyclit, Cinahl.

Searches were also made of the Cochrane Library (including the Cochrane Database of Systematic Reviews and the Database of Abstracts of Reviews of Effects (DARE), and the Cochrane Health Promotion and Public Health Field who maintain a database of international systematic review projects in this area of research.

### **2.7.2 Unpublished reviews**

Members of the Australian Child and Adolescent Obesity Research Network (ACAORN) were contacted to identify unpublished reviews.

### **2.7.3 Systematic reviews published but not in electronic journal**

Unpublished systematic reviews were excluded in this search due to the available time and the preference for peer-reviewed reviews.

### **2.7.4 Other sources**

A number of professional groups and individuals were contacted to identify other published and unpublished work.  
Cochrane Child Health Field

## **2.8 Analysis**

List of all reviews;

Campbell et al., 2001  
Dobbins et al., 1998  
Stone et al., 1998  
Ciliska et al., 1999  
McArthur 1998  
Roe et al.,  
Sahay et al., 2000  
Hursti & Sjoden, 1997  
Contento et al., 1995  
Resnicow & Robinson, 1997  
Meininger et al., 1998  
Shepherd et al., 2002  
Summerbell et al., 2002  
Kahn et al., 2002  
Crawford et al., 2003

Data to be summarised narratively in order to answer the main objectives of the review. We will summarise the quality, methods and outcomes of each review according to the main content areas: improvement in healthy lifestyle, prevention of childhood obesity, increase in physical activity and improvements in nutritional status or food intake.

## **2.9 Data Extraction**

All the relevant interventions focusing on childhood obesity prevention (i.e. promotion of physical activity and/or healthy eating habits) in each review were listed by programme title. Where no title was given, the first author's name was used to identify the study. Full names have been used where these were given, but many interventions are known only by their acronyms or abbreviations.

For each intervention, the domains used (curriculum, school ethos and environment, and parental and community links), the approach to the methods used (curricular components) and the personnel involved (parents or teachers) were all noted, based on the programme descriptions given in the review.

In the individual review summaries, the intervention contents are given as reported in that review.

## **3. Results**

This review builds on a previous systematic review of reviews; titled "The effectiveness of school-based strategies for the primary prevention of obesity and for promoting physical activity and/or nutrition, the major modifiable risk factors for type 2 diabetes."<sup>2</sup> The review was published in March 2002; therefore the series of reviews included in their work were integrated with the reviews that had been published prior to March 2002.

### **3.1 Pre March 2002 Reviews**

A description of the populations included, interventions, and results of the 11 included reviews are presented in Tables 1- 4.

One review reported on the primary prevention of obesity.<sup>72</sup> Two reviews looked at intervention at improving physical activity only;<sup>81,82</sup> six reviews focused on improving nutrition only;<sup>83,84</sup> and two reviews included studies that addressed both physical activity and nutrition.<sup>85,86</sup>

### **3.2 Post March 2002 Reviews**

A description of the populations included, interventions, and results of the 4 included reviews are presented in Table 5.

One review looked at interventions in mental health, physical activity and healthy eating amongst young people.<sup>1</sup> The second review reported on the effects of lifestyle interventions designed to treat obesity in children.<sup>3</sup> Another review looked at inventions

at improving physical activity only,<sup>4</sup> whilst one review focused on improving nutrition only.<sup>5</sup>

Shepherd et al.<sup>1</sup> conducted a review of the barriers to, and facilitators of, good mental health, physical activity and healthy eating amongst young people. There were 36 studies that met the inclusion criteria; 8 studies were specifically about healthy eating and 16 focused on physical activity. Nearly all the studies asked about young people's attitudes to physical activity, healthy eating or both. Attitudes to physical activity varied depending on the current level of activity of the young person, and attitudes to both topics were influenced by gender. There were some links between ideas about healthy eating and physical activity. For example, a cluster of negative images emerged linking fatness and spots with 'laziness' and fatty foods.

Looking specifically at the barriers to, and facilitators of, healthy eating and physical activity, the key findings were grouped under four headings – the school; practical and material resources; family and friends; and the self. A number of aspects of school provision for physical activity were identified as important. Young people in many of these studies held negative perceptions of physical education. Some of the problems identified were lack of choice of activities; embarrassment about appearance and unsuitable PE kit (particularly girls); and lack of skill at games. For a few, the presence of good PE teachers was mentioned as a facilitator. In relation to healthy eating, poor school meal provision was raised by some young people, who criticised the quality of the food and particularly the lack of choice. The cost of healthy options was also raised in some studies.

Summerbell et al.<sup>3</sup> carried out a review of the effects of a range of lifestyle interventions designed to treat obesity in children. Eighteen randomised-controlled trials (7 from the same research team in US) which have assessed the effects of programs to treat childhood obesity were identified. Summerbell found that there is currently limited quality data on the effects of programs to treat childhood obesity, and as such no generalisable conclusions can be drawn with confidence. Research investments will be required to enable a better understanding of a range of effective settings and strategies for the treatment of childhood obesity. Trials that are designed with enough power are required to provide the vital evidence of the effects of programs.

Kahn et al.<sup>4</sup> analysed the effectiveness of various approaches to increasing physical activity. Changes in physical activity behaviour and aerobic capacity were used to assess effectiveness. However, the review found that several crosscutting research issues about the effectiveness of all the reviewed interventions remain. For example, will a decrease in a sedentary activity (i.e. television watching) result in an increase in physical activity or will another sedentary activity be substituted? The review also found that physical activity is difficult to measure consistently across studies and populations, therefore reliable and valid measures are needed to facilitate assessment of effectiveness.

Crawford et al.<sup>5</sup> examined the effectiveness of interventions designed to promote and support healthy eating in childhood. Twenty-three studies met the inclusion criteria.

Crawford reported that there is plenty of evidence that school-based interventions on primary school children work, sometimes in the long term but that clearer definition of goals and methodologies is required. Few interventions directly involved families, many used intermediaries such as schools to link with families. Parents of young children often have problems about feeding their child and require help. The review also found that their search on community wide interventions were limited and did not have a strong children's focus. Clearly, there are major opportunities to design and evaluate community development approaches to supporting children's healthy eating.



## Pre-March 2002 Review Tables

**Table 1. Included Reviews - Obesity**

<b>Authors</b>	<b>Time Span</b>	<b>Inclusion Criteria</b>	<b>n</b>	<b>Population</b>	<b>Length of intervention</b>	<b>Results</b>
Campbell et al., 2001  Strong	1985-1999	Minimum of 3 month follow-up	6	Children	> 3 months	Limited data that prevented the combination of outcomes. Results were reported for individual studies only.

**Table 2. Included Reviews – Physical Activity Only**

<b>Authors</b>	<b>Time Span</b>	<b>Inclusion Criteria</b>	<b>n</b>	<b>Population</b>	<b>Length of intervention</b>	<b>Results</b>
Dobbins et al., 1998  Strong	1985-2000	Applicable to public health, studies measuring knowledge only were excluded, weak studies excluded	19	Children, adolescents	5 weeks – 6 years	Outcomes <ul style="list-style-type: none"> <li>• Physical activity rates (n=3): 33 % effective</li> <li>• Physical activity duration (n=6): 50 % effective</li> <li>• Television viewing (n=3): 67 % effective</li> <li>• Mean systolic BP (n=10): 30 % effective</li> <li>• Mean diastolic BP (n=9): 33 % effective</li> <li>• Mean blood cholesterol (n=8): 63 % effective</li> <li>• Body mass index (n=11): 42 % effective</li> <li>• Maximal oxygen uptake (n=2): 50 % effective</li> <li>• Pulse rate (n=6): 50 % effective</li> </ul>
Stone et al., 1998  Moderate	1980-1997	Quantitative assessment of PA, English only	14	Grades 3 to college	2 weeks – multi-year	Improvements in knowledge and attitudes when measured <ul style="list-style-type: none"> <li>• Out-of-school physical activity (n=11) 67%</li> </ul>

**Table 3. Included Reviews – Nutrition Only**

<b>Authors</b>	<b>Time Span</b>	<b>Inclusion Criteria</b>	<b>n</b>	<b>Population</b>	<b>Length of intervention</b>	<b>Results</b>			
Ciliska et al., 1999  Strong	1980-1998	Applicable to public health, intervention altered fruit and/or vegetable consumption, weak studies excluded	5	School-aged children	9 week – multi-year	Outcomes Increased fruit & vegetable intake • 3 yr. multi-pronged (n=2) 50% effective • 16 wk intensive multi-pronged (n=1) 0% • <10 wk curriculum (n=2) 0% effective			
McArthur 1998  Strong	1980-1998	Quantifiable measure of eating behaviour, children 9-11 years, the individual as unit of analysis	12	9-11 years of age	1 month – multi-year	Study	n	P value	ES(d)
						Coates, 1981	89	<0.01	0.94
						Coates, 1981	89	<0.01	0.9
						Bush, 1989	233	0.33	0.13
						Nader, 1989	103	0.02	0.39
						Nader, 1989	103	0.01	0.52
						Cohen, 1989	56	<0.01	1.69
						Cohen, 1989	164	<0.01	1.05
						Davis, 1995	842	0.03	0.08
						Davis, 1995	924	0.24	0.16
						Leupker, 1996	1130	<0.001	0.15
						Johnson, 1991	15	>0.25	0.83
						Hopper, 1996	80	<0.05	0.48
						ES(d) = effective size			

Roe et al.,  Strong	1985-1996	Studies measuring knowledge only were excluded, catering interventions excluded	21	5-18 years of age, university	Several days – multi-yr	<p>Results for minority populations only</p> <p>Outcomes</p> <ul style="list-style-type: none"> <li>• Classroom-based education (n=4)</li> <li>• total cholesterol (n=4) 33% effective</li> <li>• health knowledge (n=3) 33% effective</li> <li>• consumption dairy, desserts (n=3) 33% effective</li> <li>• dietary knowledge (n=3) 33% effective</li> <li>• fat intake (n=3) 33% effective</li> <li>• serum cholesterol (n=3) 33% effective</li> </ul> <p>Classroom-based nutrition education, PA, promotion &amp; food policy (n=2)</p> <ul style="list-style-type: none"> <li>• energy from sat. fat, sodium 50% effective</li> <li>• dietary knowledge 100% effective</li> <li>• anthropometric measures 100%</li> <li>• serum cholesterol 100% effective</li> </ul> <p>Classroom-based PA (n=1)</p> <ul style="list-style-type: none"> <li>• health knowledge 100% effective</li> <li>• dietary knowledge girls only</li> <li>• serum cholesterol girls only</li> <li>• cardiovascular fitness girls only</li> </ul> <p>School-based supplementation (n=1) ineffective</p> <p style="text-align: right;">PA = physical activity</p>
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Sahay et al., 2000  Moderate	1980-2000	Emphasis on nutrition, only studies grounded in established theory, outcome a dietary modification concerning fruit and vegetable, fibre or fat consumption	7	Primary school, High school	Not reported	Outcomes <ul style="list-style-type: none"> <li>• Direct education (n=2)</li> <li>• behavioural objectives – effective</li> <li>• attitude to dietary change – moderate effective</li> <li>• dietary behaviour – no effect</li> </ul> Direct education & media primary school (n=1) <ul style="list-style-type: none"> <li>• behavioural objectives – effective</li> </ul> Direct education & media high school (n=1) <ul style="list-style-type: none"> <li>• behavioural objectives – effective</li> </ul>
Hursti & Sjoden, 1997  Moderate	1980s early 1990s	Examined behavioural outcomes as well as other variables	24	Children and adolescents	Not reported	Outcomes All of part of Slice of Life/Hearty Health (n=5) <ul style="list-style-type: none"> <li>• dietary behaviour females knowledge 60% effective</li> </ul> Family involvement (n=1) <ul style="list-style-type: none"> <li>• eating behaviour school 100% effective</li> <li>• knowledge 100% effective</li> <li>• altered food preferences 100% effective</li> </ul> Curriculum-based (n=5) <ul style="list-style-type: none"> <li>• healthy eating co-interven (n=4) 50% effective</li> <li>• after follow-up (n=4) 25% effective</li> <li>• food choice co-interven (n=1) 100% effective</li> <li>• after follow-up (n=1) 0% effective</li> <li>• knowledge (n=2) 100% effective</li> </ul> Food service (n=4) <ul style="list-style-type: none"> <li>• knowledge (n=2) 100% effective</li> <li>• physiological outcomes (n=2) 50%</li> </ul>

						<p>effective</p> <ul style="list-style-type: none"> <li>• diet (n=2) 100% effective</li> </ul> <p>Screening &amp; curriculum (n=1)</p> <ul style="list-style-type: none"> <li>• decrease consumption high fat foods 100% effective</li> </ul> <p>Body Power Prog. &amp; parents (n=4)</p> <ul style="list-style-type: none"> <li>• knowledge 75% effective</li> </ul>
Contento et al., 1995		Evidence of instrument reliability and validity, excluded food service interventions, weak studies	40	School age	Not reported	<p>Behaviourally focused interventions</p> <ul style="list-style-type: none"> <li>• behavioural change (n=23) 79% effective</li> </ul> <p>General Nutrition Programs</p> <ul style="list-style-type: none"> <li>• Behavioural change (n=17) 23% effective</li> </ul>
Moderate						

**Table 4. Included Reviews – Physical Activity & Nutrition**

<b>Authors</b>	<b>Time Span</b>	<b>Inclusion Criteria</b>	<b>n</b>	<b>Population</b>	<b>Length of intervention</b>	<b>Results</b>																											
Resnicow & Robinson, 1997  Moderate	1980-1999	Broad-based CVD prevention, single risk factor excluded, employed a classroom health education component, if multi-component reported separate for school-based, knowledge and attitudes only excluded, nutrition not targeting CVD excluded	16	Grades 1-10	7 weeks – 5 years	<table border="0"> <tr> <td>Outcome</td> <td>effective/n</td> <td>weighted ER</td> </tr> <tr> <td>Diet</td> <td>35/141</td> <td>43%</td> </tr> <tr> <td>PA</td> <td>2/12</td> <td>42%</td> </tr> <tr> <td>Smoking</td> <td>10/13</td> <td>82%</td> </tr> <tr> <td>BP</td> <td>15/67</td> <td>13%</td> </tr> <tr> <td>Lipids</td> <td>16/60</td> <td>35%</td> </tr> <tr> <td>Fitness</td> <td>15/43</td> <td>37%</td> </tr> <tr> <td>Adiposity</td> <td>7/77</td> <td>23%</td> </tr> <tr> <td>Psychological</td> <td>58/89</td> <td>65%</td> </tr> </table> <p>PA = physical activity BP = blood pressure</p>	Outcome	effective/n	weighted ER	Diet	35/141	43%	PA	2/12	42%	Smoking	10/13	82%	BP	15/67	13%	Lipids	16/60	35%	Fitness	15/43	37%	Adiposity	7/77	23%	Psychological	58/89	65%
Outcome	effective/n	weighted ER																															
Diet	35/141	43%																															
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BP	15/67	13%																															
Lipids	16/60	35%																															
Fitness	15/43	37%																															
Adiposity	7/77	23%																															
Psychological	58/89	65%																															
Meininger et al., 1998  Moderate	1986-1999	Population wide, conducted in US, include anthropometric or physiological CVD risk factors including BP, lipid profile and/or obesity	10	Elementary, middle or high school	5 weeks – 5 years	<p>Results for minority populations only</p> <p>Outcomes</p> <ul style="list-style-type: none"> <li>• Body mass or skinfolds (n=9) 33% effective</li> <li>• Blood pressure (n=9) 33% effective</li> <li>• Lipid profile variable (n=7) 57% effective</li> <li>• Fitness level or heart rate (n=6) 67% effective</li> <li>• Increased exercise (n=5) 80% effective</li> <li>• Dietary intake (n=8) 75% effective</li> <li>• Knowledge (n=8) 100% effective</li> </ul>																											

## Post March 2002 Review Tables

**Table 5. Systematic Reviews of Research Literature**

Authors	Review Objective/s	n	Population Target	Population sub group	Intervention types/ Approaches	Outcomes	Effective-ness	Recommendations	Limitations
Shepherd et al., 2002	To analyse the barriers to, and facilitators of, good mental health, physical activity & healthy eating amongst young people.	7	Young people (11-21 years old)	Schools, community	Interventions related to the school, and interventions involving family & friends, the self, and practical and material resources.	Four outcome evaluations that addressed both healthy eating and physical activity were methodologically sound, and three that considered only healthy eating.	<p>Healthy eating &amp; physical activity: 4 effective</p> <p>Healthy eating only: 2 effective (plus 1 effective in males only)</p>	A 'whole school' approach (i.e. one involving all members of the school community in developing and implementing health-promoting changes in school organisation and structure) is most effective for increasing physical activity and healthy eating. Also by increasing the availability of healthy foods in schools alongside classroom activities and media campaigns.	Relatively fewer studies reported young people's views on healthy eating. No interventions addressed the root causes of parental concerns. Securing parents involvement in school interventions was sometimes problematic.



Summerbell et al., 2002	To assess the effects of a range of lifestyle interventions designed to treat obesity in children.	18	Children (>18years old)	Schools, hospitals	Lifestyle interventions (dietary, physical activity and/or behavioural therapy interventions).	To be included studies had to report one or more of the following PRIMARY outcomes; · Measured (not self-reported) weight and height · Estimates of overweight (in percent) and body mass index (BMI).	Most of the studies were too small to have the power to detect the effects of the treatment. The reviewers did not conduct a meta-analysis because so few of the trials included the same comparisons and outcomes.	Understand a better range of effective settings and strategies for the treatment of childhood obesity.	Most of the studies were too small to have the power to detect effectiveness. Also a meta-analyse was not conducted since so few studies found similar comparisons & outcomes.
Kahn et al., 2002	To evaluate the effectiveness of various approaches to increasing physical activity	94	Children & adolescents (5-18 years old)	Community	Informational, behavioural & social, & environmental & policy	“Point-of-decision” prompts to encourage stair use & community-wide campaigns. School-based physical education, social support in community settings, & individually-adapted health	Info. approaches to increasing PA: 2 reports effective  Behavioural & social approaches to increasing PA: 3 reports effective  Environmental &	Informational class room based health education, special focus on reducing television viewing & video game playing; family based social support; mass media campaigns	Physical activity is difficult to measure consistently across studies & populations.

						behaviour change. Creation of or enhanced access to places for physical activity combined with info. Outreach activities.	Policy approaches to increasing PA: 1 report effective		
Crawford et al., 2003 *	To assess the effectiveness of interventions designed to promote and support healthy eating in childhood.	23	Children aged 0-15 years	Schools, families, community	Educational, health promotion, settings-based, psychological, family, behavioural, & dietary counselling/ management	Changes in dietary intake and food variety. Changes in diet and nutrition knowledge that impacts on attitudes and beliefs and lifestyle.	School interventions: 11 effective  Families interventions: 6 effective	Classroom education with or without improved food services and parental involvement can have at least short-term effects on children's eating behaviours.	Difficult to compare the studies as most have different outcomes measured in different ways. Difficult to compare methodology

\*Not strictly a review

## Discussion and Future Directions

This review of review investigates the effectiveness of strategies that resource and support parents with primary school aged children to address appropriate growth in children and healthy lifestyle behaviours. The current health status of Australian children is of concern, in terms of risk factors for lifestyle diseases, such as obesity and other chronic conditions. Given that attitudes and behaviours are shaped by socio-cultural and environmental influences,<sup>68</sup> elements of these environments amenable to change require consideration.

Unfortunately, there are limited reviews for the prevention of childhood obesity aimed specifically at primary school aged children. There also appear to be few published studies that report interventions directed specifically to parents, many used intermediaries such as schools to link with families. Although there is plenty of evidence to suggest that school-based interventions on primary school children work, some reviews reported difficulty in securing parents involvement in school-based interventions.<sup>1</sup> Essentially stakeholders should be involved in community institutions and groups, and would want more of their current community building activities to be carried out in Victoria.

### Dilemmas in the promotion of healthy eating and physical activity

An awareness of the limitations of traditional health education that focus on knowledge and an individual behaviour change approach, requires us to consider the many socio-environmental factors that intervene between knowledge and appropriate health behaviours;<sup>33,87</sup> Many socio-environmental factors are structural and can only be addressed through policy changes and other forms of 'rule-making.' Such approaches have been successful in other areas of health promotion and public health, for example traffic safety, tobacco control, immunisation and food safety;<sup>24,88</sup> While these strategies have been effective, they can restrict individual freedoms and limit choice. This has led to the accusation that health promotion is part of the 'nanny state', the 'health police' and a 'health fascist' movement.

School programs that promote regular physical activity among young people could be among the most effective strategies for reducing the public health burden of chronic diseases associated with sedentary lifestyles.<sup>79</sup> Rule making for health is a successful strategy for improving physical activity participation.<sup>36,79</sup> Programs designed to increase participation in school physical education and sports have improved some measures of fitness, for example BMI and adiposity. However, these programs are difficult to maintain in the longer term, as they require high levels of supervision, adequate spaces and equipment for activity.<sup>36</sup> While positive changes in some fitness indicators were observed with short-term follow up measures, the sustainability of such specialised programs is questionable.

Compulsory physical activity participation in Victorian Schools would, in theory, provide children with additional bouts of vigorous physical activity. However, the 1996 mandate has had limited success in achieving the status.<sup>89</sup> Schools initially complied with the suggested minimum requirements, however, changes since then have seen schools reducing minimum participation time for students.<sup>89</sup> In addition, obese children may not enjoy group physical activities, such as school sports, because they may not perform as well as their leaner peers and in such circumstances individual exercise programs may be more appropriate.<sup>43</sup>

Parents sometimes discouraged participation in physical activity, and impose constraints on freedom during leisure time on grounds of safety, culture, and gender. It is important to recognise that concerns about child safety may have negative consequences for other areas of child development and wellbeing. For example, Furedi<sup>90</sup> argues that parents have become increasingly paranoid about their children's safety. This has led to restriction on children's ability to enjoy public spaces and freedom in the way that previous generations have. Furedi also explains that these restriction are becoming the social norm for 'responsible' parenting, and that those parents allowing their children the opportunity for independent experiences are sometimes frowned upon. The experiences of play, imagination and the opportunity to learn from one's mistakes are vital to a child's long term wellbeing and self-concept.<sup>90</sup>

Adults are spending less time in active leisure-time pursuits<sup>38</sup> and are consistently modeling this behaviour to children.<sup>29</sup> By focusing on the more organised and measurable sports activities among both adults and children, opportunities to promote less structured activities may have been neglected. Salmon et al.<sup>60</sup> found that the highest proportion energy expenditure in 10 to 12 years olds occurs in sport and physical education classes, household chores and bike riding.

It is important to initially specify the aims of therapy when dealing with an overweight or obese child. Baur<sup>43</sup> recommends that in regard to change in weight, "amelioration of weight gain, rather than substantial weight loss, may be appropriate." In some younger children weight maintenance may be more appropriate during a growth spurt.<sup>43</sup> It is important that parents realise that obesity is chronic disorder of energy balance, as the need for long-term changes in behaviour will then be more readily apparent. Small, achievable goals should be set, such as going for one walk per week and cutting down TV viewing from 4 to 3 hours per day.

In summary, the report found that:

Relying on knowledge acquisition strategies, for example teaching about healthy eating, will have little impact on eating behaviour. Unhealthy foods are too attractive, cheap, accessible, convenient, culturally normative and persuasively promoted and marketed and therefore for children, and many adults, there is no contest when it comes to food choice.

Socio-environmental factors are largely responsible for unhealthy eating and sedentary behaviour and therefore require socio-environmental approaches to create change. Options for the implementation of such strategies include policy and rule-making. These strategies have been proven to be acceptable to children, and are therefore effective.

## Conclusion and Recommendations

The review has identified the dilemma that exists between mandating for health and preserving the autonomy of individuals. While the debate continues regarding the issues of choice and regulation, at what point do 'interventions' become invasions? Eckersley<sup>34</sup> has suggested that we move forward with caution in the development of new strategies to improve child nutrition and physical activity, highlighting the potential threat of 'risk fatigue.' If we ask too much of people too often in terms of health decisions, their concerns may diminish to a level where motivation to change is lost.

Instead there is an urgent need to produce an environment that supports healthy eating and physical activity, and to better understand the potential forces promoting the development of childhood obesity in the Australian community. These potential forces include:

- The increased use of cars;
- The increase of sedentary behaviours such as watching TV and using computers;
- Energy-dense foods and foods with a high fat content becoming more readily available;
- A shift from the more traditional foods and eating patterns;
- Parents' perceptions that neighbourhoods are unsafe, because of child safety concerns;
- Changes in family work patterns so that parents are busier and may have less time to supervise children's diets.<sup>43</sup>

Australia was the first country worldwide to develop a national strategy for preventing overweight and obesity. The 1997 document *Acting on Australia's Weight: A Strategy for the Prevention of Overweight and Obesity in Australia* has recognized school children as an important target group for obesity prevention.<sup>43</sup> As previously stated, successful school-based prevention programs have had difficulty in sustaining results in the long term. Interventions will also need to occur at regional, state and national levels. Some examples of the sort of interventions that are needed include;

- Creating opportunities for planned and incidental activity in school and community environments (e.g. improve cycle-ways, safe parks and other places for children to safely play outdoors);
- Promoting the use of public transport;
- Encouraging private and public sector services to provide healthy food choices;
- Training school teachers and parents in such areas as physical activity and nutrition;
- Regulation of the type and amount of food advertising to which children are exposed;
- Improving the labeling of food products;
- Providing economic incentives for the production and distribution of fruit and vegetables.<sup>43</sup>

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## **Appendix 1**

**Table 6. Percentage of overweight and obese children and adolescents in selected countries.**

Country	Year	Boys overweight & obese (%) <sup>*</sup>	Boys obese (%) <sup>†</sup>	Girls overweight & obese (%) <sup>*</sup>	Girls obese (%) <sup>†</sup>
Netherlands	1980	5.5	0.3	6.5	0.3
Brazil	1989	4.7	0.1	15.2	2.0
Great Britain	1978–1993	9.6	0.9	11.7	1.2
Hong Kong	1993	11.7	3.1	9.8	1.8
Singapore	1993	10.5	1.7	7.0	1.0
Australia‡	1985	10.7	1.4	11.8	1.2
Australia‡	1995	19.5	4.5	21.1	5.3
USA§	1976–1980	14.9	3.4	15.1	4.3
USA§	1988–1994	22.1	7.0	24.0	8.2

<sup>\*</sup>% Overweight & obese corresponds to the reference values of Cole *et al.* equivalent to adult BMI of 25 kg/m<sup>2</sup> or more.<sup>5</sup>

<sup>†</sup>% Obese corresponds to the reference values of Cole *et al.* equivalent to adult BMI of 30 kg/m<sup>2</sup> or more.<sup>5</sup> Data adapted from Cole *et al.*<sup>5</sup>

<sup>‡</sup>Magarey *et al.*<sup>7</sup>

<sup>§</sup>Flegal *et al.*<sup>8</sup>

(Baur, 2002)

## Appendix 2

### **Table 7. Trends in overweight and obesity among young Victorian children**

*Proportion of boys and girls in each BMI category, including overweight and obese combined (O + O), for the 1985 and 1997 Victorian data sets*





	Nonoverweight	Overweight	Obese	O + O	Age-adjusted odds ratio (95% CI) for O + O <sup>1</sup>
	%	%	%	%	
<b>Boys</b>					
Age 7 y					
1985 <sup>2</sup> (n = 115)	83.5	13.9	2.6	16.5	1.00
1997 (n = 196)	80.1	17.4	2.6	19.9	1.24 (0.68, 2.28)
Age 8 y					
1985 <sup>2</sup> (n = 128)	93.8	6.3	0	6.3	1.00
1997 (n = 221)	80.2	14.0	5.9	19.8	3.73 (1.69, 8.20) <sup>3</sup>
Age 9 y					
1985 (n = 111)	83.8	15.3	0.9	16.2	1.00
1997 (n = 212)	78.8	15.6	5.7	21.2	1.40 (0.76, 2.56)
Age 10 y					
1985 (n = 123)	88.6	8.9	2.4	11.4	1.00
1997 (n = 227)	72.7	20.7	6.6	27.3	2.95 (1.57, 5.55) <sup>3</sup>
Age 11 y					
1985 (n = 115)	84.4	13.9	1.7	15.7	1.00
1997 (n = 180)	80.0	16.1	3.9	20.0	1.35 (0.72, 2.51)
Age 12 y <sup>4</sup>					
1985 (n = 57)	89.5	8.8	1.8	10.5	1.00
1997 (n = 90)	74.4	18.9	6.7	25.6	2.96 (1.12, 7.83) <sup>5</sup>
All years					
1985 (n = 649)	87.2	11.3	1.5	12.8	1.00
1997 (n = 1127)	77.9	17.0	5.2	22.1	1.94 (1.48, 2.54) <sup>3</sup>
<b>Girls</b>					
Age 7 y					
1985 <sup>2</sup> (n = 117)	83.8	14.5	1.7	16.2	1.00
1997 (n = 172)	72.7	18.0	9.3	27.3	1.94 (1.07, 3.52) <sup>4</sup>
Age 8 y					
1985 <sup>2</sup> (n = 134)	86.6	9.7	3.7	13.4	1.00
1997 (n = 221)	78.3	16.3	5.4	21.7	1.70 (0.94, 3.10)
Age 9 y					
1985 (n = 106)	84.9	13.2	1.9	15.1	1.00
1997 (n = 208)	73.1	22.1	4.8	26.9	2.13 (1.15, 3.96) <sup>4</sup>
Age 10 y					
1985 (n = 120)	87.5	10.0	2.5	12.5	1.00
1997 (n = 229)	76.4	17.5	6.1	23.6	2.21 (1.18, 4.12) <sup>5</sup>
Age 11 y					
1985 (n = 121)	89.3	9.1	1.7	10.7	1.00
1997 (n = 188)	76.1	19.2	4.8	23.9	2.38 (1.21, 4.67) <sup>5</sup>
Age 12 y <sup>4</sup>					
1985 (n = 48)	87.5	12.5	0	12.5	1.00
1997 (n = 76)	81.6	17.1	1.3	18.4	1.74 (0.60, 5.04)
All years					
1985 (n = 646)	86.5	11.3	2.2	13.5	1.00
1997 (n = 1094)	75.9	18.5	5.7	24.1	2.05 (1.57, 2.67) <sup>3</sup>

<sup>1</sup> Adjusted to exact calendar age where available; 1985 is the referent group.

<sup>2</sup> Exact calendar age not available.

<sup>3</sup>  $P < 0.01$ .

<sup>4</sup> Students in first 6 mo of calendar age only.

<sup>5</sup>  $P < 0.05$ .

(Booth et al., 2003)

## Appendix 3

**Table 8. Health of young Victorians Study, 1997: Proportion of boys and girls in each BMI category for each of the socio-demographic measures**

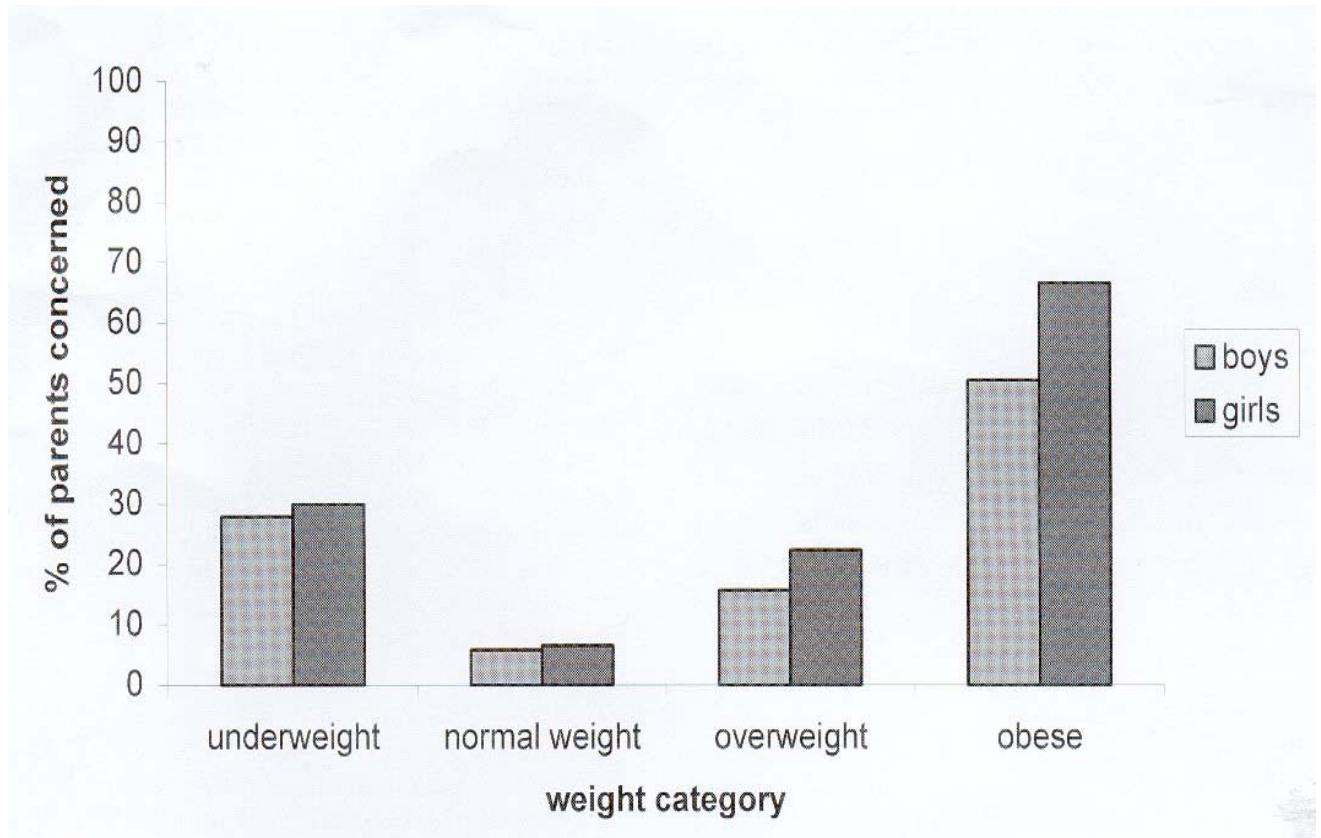


	Non-overweight (%)		Overweight (%)		Obese (%)		Overweight + obese (%)	
	Boys (n=1,140)	Girls (n=1,084)	Boys (n=229)	Girls (n=253)	Boys (n=76)	Girls (n=81)	Boys (n=305)	Girls (n=334)
<b>School year</b>								
Prep	82	80	12	15	6	5	18	20
1	82	75	17	15	2	10	19	25
2	81	74	15	19	5	6	20	26
3	79	78	13	17	8	5	21	22
4	74	75	20	20	6	5	26	25
5	76	75	19	19	6	7	24	25
6	79	77	16	19	4	4	21	23
					$\chi^2(12)=15.8$ $p=0.20$	$\chi^2(12)=10.6$ $p=0.56$	$\chi^2(6)=6.1$ $p=0.42$	$\chi^2(6)=3.1$ $p=0.79$
<b>SES</b>								
1 (low)	80	76	14	17	5	7	20	24
2	75	76	17	19	9	5	26	24
3	78	77	15	17	7	6	22	23
4	80	78	16	17	4	5	20	22
5 (high)	80	75	17	21	2	5	20	26
					$\chi^2(8)=13.5$ $p=0.10$	$\chi^2(8)=4.7$ $p=0.79$	$\chi^2(4)=3.5$ $p=0.47$	$\chi^2(4)=1.1$ $p=0.89$
<b>Geographic location</b>								
Urban	75	75	18	18	7	7	25	25
Rural	85	78	13	18	3	4	16	22
					$\chi^2(2)=18.8$ $p<0.001$	$\chi^2(2)=3.1$ $p=0.21$	$\chi^2(1)=16.8$ $p<0.001$	$\chi^2(2)=1.2$ $p=0.28$
<b>Maternal education</b>								
Year 10	75	71	17	20	8	8	25	29
Year 11/12	79	77	17	18	4	6	21	23
Tertiary	80	79	15	17	5	4	20	21
					$\chi^2(4)=9.3$ $p=0.06$	$\chi^2(4)=10.2$ $p=0.04$	$\chi^2(2)=3.1$ $p=0.21$	$\chi^2(2)=7.5$ $p=0.02$
<i>Notes:</i>								
<i>(a) includes Australia and the Americas</i>								

(Booth et al., 2001)

## **Appendix 4**

**Figure 1. Proportion of parents reporting concern about child's weight, by child BMI category**

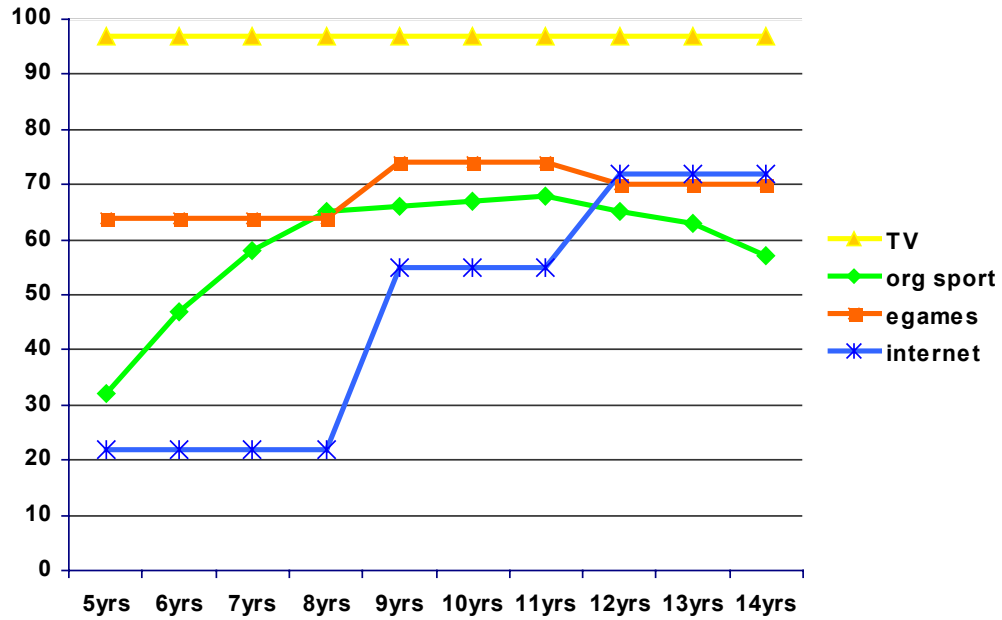


(Wake et al., 2002)



## Appendix 5

Figure 2. Participation in organised sport and sedentary pursuits (5-14 years)



(ABS, 2000)

## Appendix 6

**Table 9. Hours of television, video game/computer use and both combines (parent report)**

Activity	All children	Sex		Age (years)			
		Male	Female	5–6	7–8	9–10	11–13
Hours per week of television viewing (% of children) <sup>†</sup>							
<i>n</i>	2849	1438	1411	571	806	867	595
≤10	20	18	22	25	22	18	15
11–20	52	52	52	55	54	53	47
21–30	24	26	23	18	22	25	32
>30	3	3	2	1	2	3	5
Hours per week of video game/computer use (% of children) <sup>†</sup>							
<i>n</i>	2855	1441	1414	571	805	869	600
≤1.5	28	21	35	44	30	24	17
1.6–4.5	32	28	35	31	32	32	33
4.6–10.5	32	39	26	21	32	36	37
>10.5	8	11	4	4	6	8	12
Hours per week of television and video game/computer use combined (% of children) <sup>†</sup>							
<i>n</i>	2843	1435	1408	569	804	865	595
≤10	14	12	16	20	15	11	9
11–20	41	37	46	49	44	39	32
21–30	28	31	25	22	26	31	32
>30	17	21	13	9	14	18	27

<sup>†</sup>Percentages may not equal 100 due to rounding.

**Table 10. Child BMI z-scores by hours of television and video game/computer use (parent report)**

Activity	Mean child BMI z-score (SD)						
	All children	Sex		Age (years)			
		Male	Female	5-6	7-8	9-10	11-13
<b>Television (h/week)</b>							
≤10	0.36 (1.0)	0.47 (1.1)	0.26 (0.9)	0.33 (1.0)	0.37 (0.9)	0.37 (1.0)	0.34 (1.1)
11-20	0.49 (1.0)	0.56 (1.0)	0.42 (1.1)	0.44 (1.0)	0.52 (1.0)	0.53 (1.1)	0.42 (1.1)
21-30	0.65 (1.1)	0.74 (1.1)	0.55 (1.1)	0.74 (1.1)	0.70 (1.1)	0.68 (1.2)	0.55 (1.2)
>30	0.80 (1.1)	0.85 (1.1)	0.73 (1.2)	0.62 (0.7)	1.10 (0.9)	0.97 (1.2)	0.55 (1.2)
<i>F</i> -value	10.2	4.6	5.0	3.4	4.7	3.9	0.7
<i>P</i> -value	< 0.001	< 0.001	< 0.001	0.02	< 0.001	0.01	0.53
<b>Video game/computer use (h/week)</b>							
≤1.5	0.47 (1.1)	0.59 (1.1)	0.41 (1.0)	0.46 (1.0)	0.48 (1.0)	0.45 (1.1)	0.52 (1.2)
1.6-4.5	0.47 (1.1)	0.56 (1.0)	0.40 (1.1)	0.44 (1.1)	0.47 (1.0)	0.53 (1.1)	0.42 (1.1)
4.6-10.5	0.55 (1.1)	0.63 (1.0)	0.43 (1.1)	0.51 (1.0)	0.57 (1.0)	0.59 (1.1)	0.48 (1.1)
>10.5	0.64 (1.1)	0.62 (1.1)	0.67 (1.1)	0.60 (1.2)	0.95 (1.0)	0.76 (1.1)	0.32 (1.2)
<i>F</i> -value	2.2	0.4	1.1	0.2	3.4	1.6	0.6
<i>P</i> -value	0.09	0.73	0.36	0.87	0.02	0.18	0.64

BMI, body mass index.

(Wake et al., 2003)