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Assessment of eating behaviour in obese children of Bangor city

Attallah O. Qasem

Biomedical Research Unit, Sulaimani Polytechnic University, Sulaimani, Kurdistan Region, Iraq.

Corresponding Author: atta.kasem@spu.edu.iq

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Abstract

Obesity is a major health problem for people living in the UK, and it currently affects many children. The objectives of this study is to assess the psychometric measures of eating behaviour associated with obesity in primary school-aged children in the city of Bangor (North Wales, UK). Across-sectional survey of children's eating behaviours and their relationship to obesity was done in four primary schools in the city of Bangor (North Wales, UK).

The study utilized the method of cross-sectional survey of Wales's children's eating behaviour in association with obesity using two groups of children aged 7–8 years and 10–11 years through four junior schools in Bangor. It was assessed using the Child Eating Behaviour Questionnaire (CEBQ) and body composition was estimated using BMIs. Total of 153 children 81 were boys and 72 were girls. The statistical analysis used is based on multiple regression analysis with the dependent or predicted variable being BMI and the independent or predictor variables being food responsiveness, emotional under eating and exercise.

It was found that exercise was significant at p value< 0.042 and negatively associated with BMI, which means that there is a significant difference between exercise and BMI. Two behavioural characteristics derived from the CEBQ which are food responsiveness and emotional under-eating. This is statistically significant at p value <0.01 and positively associated with BMI, show that increase food responsiveness and emotional under-eating is different with increases of BMI.

The psychometric measures of children's eating styles obtained from CEBQ showed that exercise change as above, with BMI; that is children who were rated as having more exercise were more likely to have a lower BMI.

Key words: BMI, exercise, appetite, satiety, food responsiveness, under-eating.

Introduction

Obesity is now known as a worldwide epidemic condition (WHO, 2003) and has been predicted to become the largest drain on health service resources in the UK in the near future. Nonetheless, there are 14 million overweight school-age children in the European Union (EU), of whom three million are obese (International Obesity Taskforce, 2004a). The number of overweight children in the EU is rising by around 400,000 per annum, of whom 85,000 are obese (International Obesity Taskforce, 2004b).

In the UK, there are approximately one million obese individuals who are less than 16 years of age (Educari, 2004). Butriss (1995) showed a similar picture through a survey in the UK, with 75% of children aged 10-11 exceeding the recommended target level for percentage of energy derived from fat. Therefore, Wardle et al (2005) and Currie et al. (1997) have reported comparable results. Also, the Health Survey for England (HSE) illustrated the prevalence of obesity doubled between 1984 and 1994 among 4- 12 year olds children in England, rising from 0.6% to 1.7% in boys and from 1.3 to 2.6% in girls. In 2004; the Health Survey for England illustrated an overall increase in obesity amongst the number of children aged 2-10 who are obese from 9.9% in 1995 to 13.4% in 2004 (House of Commons Committee of Public Accounts, 2007).

A previous survey by Cameron and colleague (2006) showed that the consequences of childhood obesity in developed countries have extended into the most widespread nutritional disease.

In 2006, the National Institute for Health and Clinical Excellence NICE indicated morbidities in children and adolescents that include dyslipidaemia, hyperinsulinaemia, hypertension, psychosocial dysfunction, type 2 diabetes and asthma (NICE, 2006).

Many studies have presented evidence indicating that dietary habits acquired in childhood often continue during adulthood (e.g. Kelder, et al., 1994; Nicklas, 1995; Steptoe et al., 1995). As the severity of childhood obesity increases the risk of obesity throughout the growing age of the child, the persistence of childhood obesity into adulthood is the most significant concern (NICE, 2006).The risk factor of a number of chronic diseases in adult life such as heart disease, osteoarthritis, and some cancers are linked to childhood obesity (British Medical Association, 2005). Likewise, psychological problems such as rejection, shame, depression and stress are also more likely to occur in obese children than non-obese children (Reilly, 2003).

The UK Government has reacted to decreasing childhood obesity with a Public Service Agreement goal to stop increase in obesity among children below the age of 11 by 2010 (Department of Health, 2007a).

The present measure is aimed at primary school children from the reception year (ages 4–5 years) and (ages 10–11 years) by Primary Care Trusts (PCTs) (Department of Health, 2007b).

The Welsh Health Survey shows that the number of children under 16 who are classed as obese jumped by 3% in 2009. Recently one out of five children in Wales is obese (Brindley and Mail, 2010). This takes childhood obesity in Wales to near the peak suggested by the International Childhood Obesity Association (Brindley and Mail, 2010). Furthermore, Leigh (2010) shows that the proportion of children aged between (2 and 15) classed as obese increased to 19% in 2009 from 16% in 2008, which has led to the present situation where Wales has become the country with the highest childhood obesity rates in the world.

There is no clear explanation of the primary cause of overweight and obesity in children and adolescents, although dietary and/or physical activity patterns are likely to be important factors

to obesity (Janssen et al., 2005). Thus, the relationships between various dietary and physical activity and paediatric weight need to be determined (Janssen,et al., 2005).Wardle 2001suggest that obese children are behaves differently from non-obese children they prefer different types of food, eat for different reasons, and eat with a different style (Wardle, et al., 2001).

Materials and Methods

The cross-sectional survey was used in four primary schools of Wales's children's eating behaviour and their association with obesity using two groups of children aged 7–8 years and 10–11 years through four junior schools in Bangor. Child Eating Behaviour Questionnaire (CEBQ) been used and also body composition was estimated using BMIs. The study information was gained by the parents on behalf of their children. In total 153 parents gave their consent and information on 153 children was obtained of whom 81 were boys and 72 were girls. The statistical analysis used is based on multiple regression analysis with BMI as the dependent or predicted variable and food responsiveness, emotional under eating and exercise as the independent or predictor variables.

Participants

153 children's parents were recruited in this study and their children were classified in two age groups, 7–8 years and 10–11 years old, from four junior schools in Bangor (North Wales, UK). The children were approached by the staff at the school and asked them to take the questionnaires to their parents for their approval to participate in the survey. Seventy four of the children were in the first age group and 79 in the second age group, and their gender was 81 boys and 72 girls.

Measures

Two measures were used: the Children's Eating Behaviour Questionnaire (CEBQ) (Wardle, et al., 2001a) and the child's BMI. The CEBQ consists of 35 items and another item added by the researcher to make 36 items divided into seven subscales. The questions are answered by ticking one of the following five options (never, rarely, sometimes, often, always, numbered 0 to 4 respectively). The questions provide information on seven behavioural components (satiety/slowness in eating, fussiness, food responsiveness, enjoyment of food, drinking, emotional under-eating and over-eating). And a question on exercise was added to the questionnaire. Therefore, questions were probably ordered according to components, and some are "reversed" i.e., they go in the opposite direction from those of other measures of the same component. See Appendix A, B, for the specific components and the questions that be relevant to them.

Data analysis

SPSS version 18 was used to achieve data management and computations of descriptive and inferential statistics. In statistical testing a P – value of 0.05 or below was considered to indicate statistical significance.

The main analysis was in two stages, by using multiple regressions. Multiple regressions with entry were used to find out the relationship between several independent or predictor variables and a dependent or criterion variable.

The initial regression model is thus shown in Equation 2.

$BMI = \beta_0 + \beta_1$satiety/slowness etc+ $\beta_2$fussiness + $\beta_3$food responsiveness + $\beta_4$enjoyment of food + $\beta_5 drinking_i$ + $\beta_6$emotional under-eating + $\beta_7$emotional over-eating+ β_8 exercise + β_9 gender+ β_{10} two age groups+ ε	(Eq.2)

Results

About 310 children took the questionnaires for their parents' consent and 50% returned the questionnaires. This means that 153 pupil's parent who took part, of whom 81 were males and 72 were females. The Means of heights of the children b 12.17 cm2 to 13.23 cm, and their weights ranged from 12.09 kg to 30.23 kg as indicated in (Table 1).

Table 1: Shows the biographical data.

N	Boys	Girls	Means of Height (cm^2) Ranged	Means of Weight (kg) Ranged
153	81	72	12.1718-30.2338cm	12.0900-30.2338 kg

Table 2 shows that the F-ratio = 3.597. F is highly significant at 0.001 levels. Therefore the linear regression model as a whole is highly significant, which indicates that the combined effect of the independent variables is associated with the dependent variable BMI is highly significant as revealed in (Table 2). However, it was found that exercise was significant at 5% and negatively associated with BMI with coefficient (-0.471). This indicate that when exercise increases the BMI decease. Two behavioural characteristics derived from the CEBQ, food responsiveness and emotional under-eating were significant at 1% and positively associated with BMI, meaning that when food responsiveness and emotional under-eating increases so does BMI as shown in (Table 3).

The rest of the independent variables in the model appear to have no significant effects on BMI like and some have positive and others have negative coefficients like. When we use Stepwise method instead of Enter method in order to know relationship between the dependent variable BMI and the independent variables we obtain only three independent variables are selected, as having significant effects on BMI, these are food responsiveness, emotional under eating and exercise, as shown in (Table 4)

Table 2: Shows ANOVA[a] for model 1.

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	140.115	3	46.705	9.862	0.000[b]
Residual	705.655	149	4.736		
Total	845.770	152			

a) Dependent Variable: BMI kg/m2.
b) Predictors: (Constant), Exercise, 7-8=1,10-11=2, Food responsiveness, male 1, female 2, Emotional under-eating, Enjoyment of food, satiety/slowness, Desire to drink, Fussiness, Emotional over-eating

Table 3: Shows ANOVA[a] for model 1.

Model	Sum of Squares	df	Mean Square	F	Sig.
1					
Regression	170.949	10	17.095	3.597	0.000[b]
Residual	674.821	142	4.752		
Total	845.770	152			

a) Dependent Variable: kg/m2.
b) Predictors: (Constant), Food responsiveness, Emotional under-eating, Exercise

The stepwise regression Criteria used was Probability-of F- to enter ≤ 0.05 and Probability F-to- remove ≥ 0.1. Therefore, 3 independent variables in the model are more significant compared with the corresponding results of the full model; the effects of these 3 independent variables on BMI are significant with positive and negative coefficients.

Table 4: Shows coefficients for model 1.

Coefficients [a]					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	17.395	1.271	243	13.690	0.000
Food responsiveness	0.912	0.284	0.209	3.217	0.002
Emotional under-eating	0.799	0.299	0.160	2.676	0.008
Exercise	0.471	0.299		2.048	0.042

a) Dependent Variable: BMI kg/m2

Discussion

During the present study, the relations between BMI and the independent variables were analysed using multiple regression methods (Enter and Stepwise). As a whole is highly significant, where the p-value is less than 0.001. This means that the combined effect of independent variables on BMI is highly significant. In the present study, the effects of the ten independent variables on BMI show that only 3 variables, food responsiveness, emotional under eating and exercise, have significant or near significant effects on BMI. On the other hand, Webber et al. (2009) found that six independent variables had significant effects on BMI including food responsiveness. Noticeably, according to the current study results, there appears to be a significant relationship between food responsiveness, which means that when food responsiveness increases, then BMI also increases and conversely. Technically, it means that people with higher amounts of food responsiveness also tend to have higher BMIs.

This finding supports Webber et al. (2009) result, which showed that there is a positive relationship between food responsiveness and obesity. Epstein et al. (2007) showed that obese children were prepared to try comparatively harder to obtain more food than normal-weight children. Recently, another result showed that eating rich food at age 7 predicted weight gain prospectively over time (Hill, et al., 2009). Llewellyn, et al. (2008), and Webber et al. (2009) found that the speed of eating, as a potential indicator of obesity was higher in obese children.

When a child is upset the emotional state under eating could be the result of tiredness, anger behaviour which is related to the emotional and physical state of a child. Moreover, through the present study, the researcher found that emotional under-eating increases, and then BMI also increases. Our findings showed that children, who exhibited a higher level of 'emotional under-eating', were those who eat less when happy or sad and had a higher BMI. This result has been found in some previous studies.

According to other studies, Braet and Strien, (1997), emotional stress may act as an appetite stimulant for child eating behaviour, and also may lead to risk of developing obesity, which has a direct effect on children. Furthermore, predictors of emotional distress induce changes in eating behaviour are important because emotional disorder may cause overeating (Wadden and Stunkard, 2002, Rand and Stunkard, 1978). Emotional distress and other mood disorders are associated with both increased eating behaviour and obesity. Goodman and Whitaker (2002) found that stressed adolescents were two times more likely to become obese during the one-year follow-up than teens who did not suffer from depression. While in our study we considered only children up to age 11 years. In this study considered the effect of emotional under eating on BMI, which was significant and positive. While in our study we considered only children or lower to age 11 years. In this study even if this is a result of study which considered the effect of emotional status or disorder under eating on BMI, which was significant and positive.

Keith et al. (2006) identified that increase of emotional disorder may be a component of a large range of obesity risk factors and, thus may contribute to the rising occurrence of obesity (Renie and Jebb, 2005, Steptoe et al., 2004). During emotional stress some individuals increase their caloric intake, particularly of saturated fat and carbohydrate (Dallman et al., 2004, Yacono-Freeman and Gil, 2004). This is related to emotional under eating discussed in present work.

The eating behaviours disorder children often consist of periods of chronic dieting interrupted by episodic bingeing, and this exposes the children to the risk of weight gain. Polivy and Herman, (1999), Cattanach and Rodin (1988) showed emotional eating disorder and its effects on eating behaviour and obesity, which had a significant positive effect on BMI.

Nevertheless, the present study showed a negative significant relationship between the predictor variable Exercise and BMI and also agrees with present results.

This result agrees with many other studies which have shown that BMI increased significantly when

physical activity per day decreased (Marty et al., 2006, Patrick et al., 2004).Hill and others (1995) demonstrated that decreasing levels of physical activity would possibly reduce energy spending, and, if not coordinated with reduced food consumption, may produce significant energy imbalance and weight gain. Whereas, Bell et al. (2004) and Hill and Commerfod (1996) identified that a decrease in physical activity would lead to an obvious restriction in the energy expended and may lead to body weight gain. Also other studies, suggest that moderate to high levels of physical activity prevents weight gain and obesity (Di Pietro et al., 2004, French et al., 1994).Therefore, a low level of physical activity is associated with an increased risk of weight gain (Roberts et al., 1988, Griffiths et al,. 1990, Williamson et al., 1993).

Conclusions

Childhood obesity is an epidemic that continues to dramatically increase resulting in a large percentage of children developing diabetes, and parents cannot recognize when their own children overweight. Although obesity is not yet considered a disease by DSM-IV criteria, recent studies show that the number of obese children has increased medically. We conclude that assessment of exercise, food responsiveness and emotional under eating could be used as indicators of susceptibility to weight gain. Exercise and food responsiveness are in agreement with the results of other researchers however, emotional under eating agrees with some, but not all previous studies. A further study should be undertaken to further detect and quantify the effect of sport and exercise on child's eating behaviour and obesity, and also research necessary to explore the relationship between these factors and BMI in the future.

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Supplementary Materials

Index 1: Child Eating Behaviour Questionnaire (CEBQ)

Please read the following statements and tick the boxes most appropriate to your child's eating behaviour.

Question	Never	Rarely	Some times	Often	Always
1. My child loves food	☐	☐	☐	☐	☐
2. My child eats more when worried	☐	☐	☐	☐	☐
3. My child has a big appetite	☐	☐	☐	☐	☐
4. My child finishes his/her meal quickly	☐	☐	☐	☐	☐
5. My child is interested in food	☐	☐	☐	☐	☐
6. My child is always asking for a drink	☐	☐	☐	☐	☐
7. My child refuses new foods at first	☐	☐	☐	☐	☐
8. My child eats slowly	☐	☐	☐	☐	☐
9. My child eats less when angry	☐	☐	☐	☐	☐
10. My child enjoys tasting new foods	☐	☐	☐	☐	☐
11. My child eats less when s/he is tired	☐	☐	☐	☐	☐
12. My child is always asking for food	☐	☐	☐	☐	☐
13. My child eats more when annoyed	☐	☐	☐	☐	☐
14. If allowed to, my child would eat too much	☐	☐	☐	☐	☐
15. My child eats more when anxious	☐	☐	☐	☐	☐
16. My child enjoys a wide variety of foods	☐	☐	☐	☐	☐
17. My child leaves food on his/her plate at the end of a meal	☐	☐	☐	☐	☐
18. My child takes more than 30 minutes to finish a meal	☐	☐	☐	☐	☐
19. My child undertakes physical exercise	☐	☐	☐	☐	☐
20. Given the choice, my child would eat most of the time	☐	☐	☐	☐	☐
21. My child looks forward to mealtimes	☐	☐	☐	☐	☐
22. My child gets full before his/her meal is finished	☐	☐	☐	☐	☐
23. My child enjoys eating	☐	☐	☐	☐	☐
24. My child eats more when she is happy	☐	☐	☐	☐	☐
25. My child is difficult to please with meals	☐	☐	☐	☐	☐
26. My child eats less when upset	☐	☐	☐	☐	☐
27. My child gets full up easily	☐	☐	☐	☐	☐
28. My child eats more when s/he has nothing else to do	☐	☐	☐	☐	☐
29. Even if my child is full up s/he finds room to eat his/her favourite food	☐	☐	☐	☐	☐

30. If given the chance, my child would drink continuously throughout the day	□	□	□	□	□
31. My child cannot eat a meal if s/he has had a snack just before	□	□	□	□	□
32. If given the chance, my child would always be having a drink	□	□	□	□	□
33. My child is interested in tasting food s/he hasn't tasted before	□	□	□	□	□
34. My child decides that s/he doesn't like a food, even without tasting it	□	□	□	□	□
35. If given the chance, my child would always have food in his/her mouth	□	□	□	□	□
36. My child eats more and more slowly during the course of a meal	□	□	□	□	□