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Childhood locus of control and self-esteem, education, psychological distress, and physical exercise as predictors of adult obesity

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ABSTRACT

Objective: To investigate to what extent locus of control, self-esteem, psychological distress, physical exercise, as well as socio-demographic factors are associated with obesity in 42 year old adults in a longitudinal birth cohort study.

Method: The sample consisted of 5,645 participants born in Great Britain in 1970 and followed up at 10, 34, and 42 years with data on Body Mass Index measured at 34 and 42 years.

Results: There was an increase of adult obesity from 15.5% at age 34 to 21.2% at 42 years. Locus of control and self-esteem measured at age 10 years, psychological distress and educational qualifications assessed at age 34 years, and current occupational levels and physical exercise were all significantly associated with adult obesity at age 42 years. The associations remained significant after controlling for birth weight and gestation, maternal and paternal BMI, childhood BMI, and intelligence.

Conclusion: Childhood locus of control and self-esteem, educational qualifications, psychological distress, and physical exercise were all significantly and independently associated with adult obesity.

Keywords: Obesity, Childhood Locus of Control and Self-esteem, Education, Psychological Distress, Physical Exercise, Longitudinal.

Introduction

Obesity is a major risk factors for a number of chronic diseases, including cardiovascular diseases. In a recent study, Stevens and colleagues estimated trends between 1980 and 2008 in overweight and obesity prevalence for adults 20 years of age and older in 199 countries and territories. They found that the global, age-standardized, prevalence of obesity nearly doubled from 6.4% (95% uncertainty interval 5.7-7.2%) in 1980 to 12.0% (11.5-12.5%) in 2008. Half of this rise occurred in the 20 years between 1980 and 2000, and half occurred in the 8 years between 2000 and 2008 [1]. Obesity increasingly affects individuals' lives with social and economic as well as mental and physical health consequences [2].

There are many correlates and markers of adult obesity. These include sociological factors like social class, educational and occupational achievement; behavioural factors like exercise as well as psychological factors like personality. Some studies are strictly cross-sectional while others are longitudinal, the latter being more valuable in that they can indicate causality. Comparatively few studies have looked the relative power of different variables measured at different periods of time to predict adult obesity.

Previous studies on obesity have found an inverse relation between obesity and socioeconomic status [4]. Some studies show that obesity may influence socioeconomic status due to discrimination in the work place (affecting promotion and earnings) and other social settings [5]. Other studies found evidence to suggest that socioeconomic conditions may influence obesity and poor health in general [6-9].

Among the psychological factors related to obesity, previous research has shown there is significant association between obesity and depression, though the causal direction of this association is unclear [10]. It is likely that the association is bi-directional, as one of the poor coping strategies some depressed individuals tend to use is over consuming "comfort food", typically with high calorie food such as chocolates and potato chips, which may increase BMI

of these individuals. On the other hand, being overweight may cause social discrimination and hamper one's self-esteem, which in turn, may maintain or increase one's depression. Previous studies also show the significant associations between traits conscientiousness and neuroticism and adult obesity [11,12], and between childhood intelligence and adult obesity [15]. All indicate that more intelligent, emotionally stable and conscientious individuals are likely to lead a healthier life-style and thus are less likely to become overweight or obese [12,13].

Other studies have shown that there were significant associations between childhood neurological function and adult obesity [14], between childhood BMI and adult obesity [6-7], between maternal BMI and obesity [6], and between foetal and early life growth and BMI [9].

In this study we examine three psychological variables less researched in the obesity literature but extensively investigated elsewhere as correlates of mental and physical health: Locus of control, self-esteem and psychological distress. Locus of control [15], defined as whether the person perceives the reward as contingent on his own behaviour (internal locus of control) or independent of it (external locus of control) has been linked to various outcomes such as occupational attainment and financial well-being [16-17]. Those with internal locus of control tend to be more strongly motivated to exercise, plan and take responsibility for their actions. Internal vs external locus of control is associated with both mental and physical health. Thus it is logical that those who believe the weight is within their control are more likely not to become obese. Indeed a number of researchers have developed specific weight locus of control measures which have consistently been shown to relate to weight-related attitudes and behaviours [18].

Self-esteem [19] has been found a significant predictor of depression [20] and mental well-being [21-23]. There are also a number of studies going back many years which show a clear link between general as well as specific self-esteem and obesity [24,25] Most studies in this area have been cross-sectional hence it has been impossible to differentiate between cause

and correlation. However a recent meta-analysis of those longitudinal studies that exist has shown that both self-esteem is causally linked to obesity and vice versa [26]. Thus one predictor of adult obesity is possible low self-esteem in childhood.

This study also examined the relation of psychological distress or malaise on obesity. The concept of malaise includes two related themes. First, a physical condition of general bodily weakness or discomfort, often marking the onset of an illness. Second, a vague feeling of discomfort or unease which is related to psychological distress and depression. It has both state and trait features and may be considered a measure of minor psychiatric morbidity. However there is data to suggest that malaise is stable over time indicating it is trait-like, suggesting that malaise may be thought of as a trait, essentially a facet of neuroticism [27].

However, few studies have examined the effects of locus of control, self-esteem and psychological distress together on adult obesity. The aim of the study is to examine the associations between these three psychological variables assessed in childhood and obesity in adulthood, as well as examining the effects of a set of socio-demographic factors on adult obesity using a large, nationally representative sample in the UK.

Hypotheses

Based on the previous literature it is hypothesised that (i) Locus of control is significantly associated with adult obesity (internals will be less obese than externals); (ii) Self-esteem is significantly associated with adult obesity (high self-esteem protects against obesity); (iii) Education is significantly associated with adult obesity (education protects against obesity); (iv) Psychological distress/malaise is significantly associated with adult obesity (low psychological distress protects against obesity); (v) Physical exercise is significantly associated with adult obesity (those who exercise more are less likely to be obese); and (vi) All these five factors might be independently associated with adult obesity, after adjusting for birth

weight and gestation, maternal and paternal BMI, childhood BMI, and childhood cognitive ability.

Method

Participants

The study draws on a nationally representative cohort study: the 1970 British Cohort Study (BCS70). The study participants were recruited as part of a perinatal mortality survey. BCS70 comprises 16,571 individuals who were born in Great Britain in a week in April 1970 [28]. The following analysis is based on data collected at birth, age 10, age 34, and age 42. The analytic sample comprises 5,645 cohort members (49 per cent females), for whom complete data were collected at birth and the follow-ups at age 42 years. Analysis of response bias in the cohort data showed that the achieved adult samples did not differ from their target sample across a number of critical variables (social class, parental education and gender), despite a slight under-representation of the most disadvantaged groups [29].

Measures

1. *Parental Social Class* includes information on parental social class and parental education. Parental social class at birth was measured by the Registrar General's measure of social class (RGSC). RGSC is defined according to occupational status [30]. Where the father was absent, the social class (RGSC) of the mother's father was used. RGSC was coded on a 6-point scale: I professional; II managerial/technical; IIIN skilled non-manual; IIIM skilled manual; IV semi-skilled; and V unskilled occupations [31].
2. *Childhood Intelligence* was assessed at age 10 in school using assessed in school, using a modified version of the British Ability Scales (BAS) which can serve as a measure for childhood IQ. The assessment involved the administration of four sub-scales: word

definitions and word similarities which were used to measure verbal ability, and recall of digits and matrices which were used to measure non-verbal ability. The alpha for the four measures combined into a total scale was .92.

3. *Locus of Control* was measured at age 10. Cohort members completed a 16-item Locus of Control Scale (Yes/No) [32]. The alpha was .72.
4. *Self-esteem* was measured at age 10. Cohort members completed a 12-item Self-esteem Scale (Yes/No) [33,34]. The alpha was .74.
5. *Educational Qualifications* was assessed at age 34, participants were asked about their highest academic or vocational qualifications. Responses are coded to the six-point scale of National Vocational Qualifications levels (NVQ) which ranges from 'none' to 'university degree/higher'/equivalent NVQ 5 or 6.
6. *Malaise Inventory* is a 9-item self-completion instrument assessed at age 34, measuring depression, anxiety and psychosomatic illness [35] and it correlates significantly with previously diagnosed and currently treated depression. The alpha was .81.
7. *Frequency of physical exercise* was measured at age 42. Number of days in a typical week does 30 minutes or more of exercise ranged from 0-7.
8. *Current occupational Levels* was measured at age 42. Current or last occupation held by cohort members were coded according to the Registrar General's Classification of Occupations (RGSC), described above, using a 6-point classification mentioned above.
9. *BMI and obesity* BMI was computed following the Metric Imperial BMI Formula kg/m^2. Obesity at 34 and 42 years defined as body mass index ≥ 30 according to World Health Organisation recommendation [36].

Results

Descriptive Analysis

Table 1 shows the characteristics of the study population according to prevalence of obesity at 34 and 42 years. The prevalence of obesity increased from 15.5% at age 34 years to 22.2% at age 42 years. Sex differences were also shown in Table 1, males had greater prevalence of obesity than females (17.6 vs 13.4 at age 34 years and 23.3 vs 19.0 at age 42 years). On parental and own occupation and education, the patterns showed an inverse association. Participants who came from higher family social class and had higher educational qualifications and higher levels of occupation were less likely to have obesity in adulthood.

Insert Table 1 about here

Correlational analysis

Pearson product-moment correlation analysis was conducted among the variables used in the study. Results are shown in Appendix 1. Appendix 1 shows that obesity in adulthood was significantly associated with parental social class, childhood locus of control and self-esteem, education and occupation, psychological distress and exercise. This confirms all the hypotheses.

Regression analysis

To investigate whether parental social class, locus of control and self-esteem, education and occupation, psychological, and exercise were independently associated with adult obesity, a series of logistic regression analyses were conducted. Table 2 shows the results of the odds ratios (95% CI).

Model 1 shows the results of the associations between childhood factors and obesity at the age of 42 years and Model 2 shows factors in both childhood and adulthood in predicting

adult obesity, adjusted for birth weight and gestation, childhood BMI, maternal and paternal BMI, and childhood intelligence.

Results showed that in Model 1, gender, the highest parental social class, locus of control and self-esteem were significantly associated with the outcome variable (p<.05 to p<.001). In Model 2, after entering adulthood factors into the equation, parental social class ceased to be significantly associated with adult obesity while childhood locus of control and self-esteem as well as gender remained as the significant predictors of adult obesity (p<.05 to p<.001). Educational qualifications, psychological distress, and exercise were also significantly associated with the outcome variable. (p<.05 to p<.001).

Discussion

Main Findings of this study

The current study set out to investigate whether locus of control, self-esteem, psychological distress, physical exercise, as well as socio-demographic factors independently associated with obesity in 42 year old adults in a longitudinal birth cohort study. Results of the study confirm and extend the findings in the area. As found in previous studies, low psychological distress, high educational achievement, and frequency of physical exercise tend to reduce the prevalence of obesity in adulthood. Psychological distress, educational attainment, and exercise were significantly inter-correlated showing that those with malaise in early adulthood and those with lower educational attainment tended to exercise less [37].

The correlational results in the appendix show a number of interesting things. First, that obesity is consistent over time: the correlation of r=.66 between obesity measured at 34 and again eight years later. Second, that locus of control (measured 32 years previously) and educational qualifications (assessed at age 34 yrs), themselves modestly inter-correlated (r=.33) were the significant predictors of adult (at age 42 yrs) obesity. Those with internal locus

of control and better education had a lower BMI. Third, and in accordance with the previous literature, social class (of parents) and current physical exercise regime were also related to obesity. Those from higher social class backgrounds and those who exercised more were less likely to be obese. Fourth, self-esteem (measured 32 years earlier) as predicted, was related to adult obesity. Those with higher, overall self-esteem as pre-adolescents were less likely as middle-aged adults to be obese.

The strength of this study lay not only in the longitudinal nature of the data but the analysis which could show the comparative power of the eight variables examined to predict adult obesity. The analysis (shown in table 2) indicated that gender, education and exercise were significantly associated with obesity. Less well educated males who took little exercise were more likely to be obese. However the results did indicate three other psychological factors which were related to obesity. Childhood locus of control predicted adult obesity. Those with external beliefs tend to fatalistic and may attribute their size to genetic and environmental factors over which they have little control. There is evidence that these beliefs are self-fullfilling which accounts for the association over time [38].

It demonstrates that exercise self-control is effective in controlling weight gain and in maintaining good health possibly through food intake monitoring and exercise. It was interesting that the correlation almost halved between exercise and obesity measured over this 8 year period which may be due to the fact that as people age most do less exercise.

In accordance with both our hypotheses and previous studies there was a significant association between self-esteem and obesity. From this longitudinal data we may be able to infer causality which suggests that those pre-adolescents with lower self-esteem pay less attention to their looks and health and hence are more likely to become obese. However the literature does suggest that it is possible to distinguish different facets of self-esteem (i.e. intellectual, physical appearance) which although highly inter-correlated are differentially

related to specific outcome variables [39]. Further work about the specific facets of self-esteem is thus merited.

Finally malaise, or psychological distress is a significant predictor of obesity. Interestingly the correlation between malaise and obesity when both were measured at 34years was almost identical when the measure of obesity was taken eight years later which is testament to the stability of malaise [27]. Those with malaise tend to lead much less structured and healthy life-styles which, no doubt impacts on their eating, exercising and health overall.

This is perhaps the first study that looked at the effects of locus of control and self-esteem in pre-adolescents on adult obesity. Results showed that after controlling for a set of biomedical, socio-demographic and psychological factors in childhood and adulthood, locus of control and self-esteem were significant and independent predictors of obesity 32 years later. The results certainly indicate that psychological vulnerability to adult obesity can be identified even before adolescence. Locus of control and self-esteem were highly inter-correlated (r=.44) suggesting that those with external, fatalistic locus of control beliefs had lower self-esteem. This suggests the possibility of targeting pre-adolescents with an aim to changing these beliefs. There is a great deal of work in health psychology about the efficacy of locus of control interventions which aims to increase the perception of self-efficacy so changing health-related behaviours [40]. Given the literature in the field it would seem sensible to aim to modify locus of control rather than self-esteem beliefs which may be less amenable to specific interventions.

What is known about this topic

Socio-economic status, education, physical exercise are correlated with obesity. Personality factors are related to obesity. Obesity remains for many stable over time.

What this study adds

Personality variables measured at aged 10yrs predicts obesity at age 42yeas. Locus of Control beliefs are more powerful predictors than social class (both parental and own). Locus of control beliefs, self-esteem, psychological distress and education are all independent predictors of obesity 8-32 years later.

Limitations of this study

Although our study is based on a birth cohort with representative sample, the attrition of respondents over time was greater among the socioeconomically disadvantaged groups. Our results may thus be a conservative estimate of the long term influence of social inequalities experienced during childhood. This study is based on a British cohort, and may not be representative internationally. Future studies are required to confirm the findings.

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Table 1. Characteristics of the study population according to prevalence of obesity at 34 and 42 years.

			Obesity at age 34	Obesity at age 42
	n	%	%	%
Sex				
Male	2927	51.0	17.6	23.3
Female	2768	49.0	13.4	19.0
Parental social class at birth				
Unskilled (V)	260	4.6	18.1	25.8
Partly skilled (IV)	786	13.9	18.9	25.3
Skilled manual (III)	2567	45.5	17.1	23.1
Skilled non-manual (III)	881	15.6	12.7	18.6
Managerial\tech (II)	807	14.3	11.6	16.9
Professional (I)	344	6.1	8.7	10.5
Educational qualifications at age 33				
No qualifications	335	5.9	24.3	31.0
CSE 2-5/equivalent NVQ1	833	14.8	18.4	25.8
O Level/equivalent NVQ2	1898	33.6	17.0	23.1
A level/equivalent NVQ 3	535	9.5	14.7	20.6
Higher qualification/equivalent NVQ4	1645	29.1	12.2	17.8
University degree/equivalent NVQ 5, 6	399	7.1	7.0	8.5
Own current social class				
Unskilled (V)	106	1.9	25.5	28.3
Partly skilled (IV)	637	11.3	16.6	23.2
Skilled manual (III)	950	16.8	21.4	26.4
Skilled non-manual (III)	999	17.7	14.3	19.5
Managerial\tech (II)	2586	45.8	13.8	20.3
Professional (I)	367	6.5	8.8	12.3

Table 2. Odds ratios (95% CI) for obesity at age 42, according to parental social class, educational qualifications, psychological distress, physical exercise, and current occupational levels.

	Model 1	**Model 2**	
Measures	Odds ratio (95% CI)	Odds ratio (95% CI)	*p*-value#
Sex	0.73 (0.62, 0.86)***	0.71 (0.59, 0.85)***	<0.001
Parental social class at birth (*unskilled as reference group*)			
Partly skilled	1.03 (0.69, 1.54)	1.06 (0.71, 1.60)	0.767
Skilled manual	0.90 (0.63, 1.29)	0.93 (0.64, 1.35)	0.690
Skilled non-manual	0.85 (0.56, 1.27)	0.86 (0.56, 1.30)	0.474
Managerial/tech	0.68 (0.45, 1.03)	0.73 (0.47, 1.13)	0.156
Professional	0.54 (0.30, 0.93)*	0.64 (0.35, 1.15)	0.135
Locus of control at age 10	0.85 (0.77, 0.93)***	0.87 (0.79, 0.96)**	0.006
Self-esteem at age 10	0.91 (0.83, 0.99)*	0.91 (0.83, 0.98)*	0.045
Educational qualifications at age 34 (*no qualification as reference group*)			
CSE 2-5/equivalent NVQ1		0.75 (0.52, 1.06)	0.104
O Level/equivalent NVQ2		0.66 (0.48, 0.92)*	0.015
A level/equivalent NVQ 3		0.66 (0.43, 0.98)*	0.045
Higher qualification/ equivalent NVQ4		0.60 (0.42, 0.86)**	0.006
University Degree/ equivalent NVQ 5, 6		0.26 (0.14, 0.47)***	<0.001
Psychological distress at age 34		1.34 (1.06, 1.68)*	0.014
Physical exercise at age 42		0.90 (0.86, 0.93)***	<0.001
Current social class at age 42 (*unskilled as reference group*)			
Partly skilled		0.96 (0.54, 1.71)	0.897
Skilled manual		0.95 (0.55, 1.67)	0.871
Skilled non-manual		0.84 (0.48, 1.48)	0.548
Managerial/tech		1.10 (0.64, 1.90)	0.738
Professional		0.56 (0.28, 1.13)	0.104

Note. *p<.05; **p<.01;***p<.001. Adjusted for birth weight and gestation, childhood BMI, maternal and paternal BMI, and childhood intelligence. #p values of model 2.