

ASSOCIATIONS BETWEEN BODY MASS INDEX (BMI), BREAKFAST, JUNK FOOD,
WELL-BEING AND ACADEMIC ATTAINMENT

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ABSTRACT

Background: It is well established that a high Body Mass Index (BMI) is a risk factor for ill health, reduced well-being and decreased performance efficiency. This was examined here by investigating the associations between BMI, well-being and academic attainment of university students. The associations between breakfast, junk food consumption, well-being and academic attainment were also investigated. **Methods:** In the first study, one thousand two hundred and thirty-eight students completed an online survey that provided information on their BMI and well-being (measured by the Well-being Process Questionnaire). Examination and coursework marks were also available. The second study, with a sample size of three hundred and fifty-six students, included measures of the frequency of consuming breakfast and junk food. **Results:** High BMI scores (>24) were significantly associated with reduced positive well-being, increased negative well-being and lower academic attainment. These effects remained significant when established predictors of well-being and attainment were covaried. In the second study, skipping breakfast was associated with reduced well-being and lower academic attainment scores. Frequent consumption of junk food was also associated with lower academic attainment. **Conclusion:** High BMI scores were associated with reduced well-being and lower academic attainment scores. This result was also observed when skipping breakfast was examined. Frequent junk food consumption was associated with lower academic attainment scores. We now have a methodology that can investigate associations between diet, well-being and academic attainment. This methodology can now be extended using longitudinal and intervention studies.

KEYWORDS: Body Mass Index (BMI); Skipping breakfast; Junk Food; Well-being; Academic attainment; University students.

INTRODUCTION

Well-being can reflect a wide range of things. The American Psychological Association^[1] define well-being "as a state of happiness and contentment, with low levels of distress, overall good physical health, mental health and outlook, or good quality of life". The Oxford Dictionary defines well-being as "The state of being or doing well in life; happy, healthy, or prosperous condition; moral or physical welfare."^[2] Well-being involves not just the person's mood but their overall functioning. The WHO^[3] defines positive mental health as "a state of well-being in which the individual realises his or her abilities, can cope with the everyday stresses of life, can work productively and fruitfully, and can contribute to his or her community."

Well-being has been subdivided into different dimensions: subjective, objective, psychological, and emotional well-being. Subjective well-being includes judgements of overall life satisfaction, contentment in particular areas of life, and people's positive and negative emotional responses.^[4] Well-being has also been defined

as the absence of ill health, stress, anxiety and depression. These mental health issues account for a vast number of lost working days, absence from education, and a cost to health services.^[5,6] Despite the early focus on mental health problems, well-being is not just the absence of illness.^[7] Positive well-being is now considered an essential element of well-being.^[6] Over the last few decades, there has been an increased interest in subjective well-being, which partly reflects the importance of subjective views in evaluating life.^[4] Objective social indicators, such as socioeconomic status, education, and crime rates, can influence quality of life, but happiness and life satisfaction are often considered more important than money.^[8]

The Well-being Process model included more concepts than the subjective well-being outcomes of happiness, positive affect, and life satisfaction.^[9] Negative outcomes such as stress, anxiety and depression were also included. Different types of brain activation lead to positive and negative emotions, and they are not the endpoints of a single process. The Well-being Process

Questionnaire^[10, 11] was based on the DRIVE (Demands-Resources-Individual Effects) model.^[12, 13] This model was initially used to investigate stress in occupational samples but was then used in education settings. Initially, the DRIVE model focused on predictors of mental health, such as demands, control and support, and coping styles. Additional well-being predictors (e.g. psychological capital) and outcomes (e.g. happiness, positive affect and life satisfaction) were added in the development of the Well-being Process Questionnaire (WPQ). There is now a large body of research using the Well-being Process Questionnaires with students^[14-25], and these studies have generally replicated the effects of the established predictor variables and added new predictor variables (e.g. work-life balance, workload, daytime sleepiness and flow) and outcome variables (e.g. physical health and flourishing).

One factor that influences health and well-being is the body mass index (BMI). There is extensive literature on associations between BMI and students' well-being and academic attainment, with the general pattern of results showing that very high BMI scores are associated with reduced well-being and academic attainment. However, there have been no studies on the impact of BMI on well-being using the WPQ, and this was the present study's first aim. Dietary factors such as skipping breakfast and consuming junk food are risk factors for a high BMI, and the present research also examined the impact of these factors on the well-being and academic attainment of university students.

Our previous research has involved extensive studies of the effects of breakfast on cognition, mood and mental health.^[26-30] Our research has recently examined associations between breakfast, junk food and well-being using the WPQ. In the first study,^[31] a sample of university students completed the WPQ and also provided information on the frequency of breakfast consumption (the Diet and Behaviour Survey).^[33] The univariate correlations showed that skipping breakfast was positively correlated with negative outcomes and negatively associated with positive outcomes. Skipping breakfast was associated with established predictors of positive and negative outcomes (negative coping, social support, and psychological capital). Regressions including skipping breakfast and the established predictors of positive and negative outcomes showed no significant effects of skipping breakfast when personality, coping, exposure to stressors and social support were statistically controlled.

The following study^[32] attempted to replicate the initial findings using a larger sample. The established predictors of well-being showed their usual significant associations with the outcomes. Health-related behaviours were also associated with well-being and health. Regression analyses, including established predictors and health-related behaviours as predictors, showed that only smoking, alcohol consumption and sleep were associated

with the outcomes. These results confirmed that initial associations between diet and well-being observed in univariate analyses are no longer significant when established psychosocial predictors of well-being and other health-related behaviours are covaried.

The next study^[34] involved a survey of students in their first week at university and asked about the six months before coming to university. The univariate analyses showed that a healthy diet, including breakfast consumption, was associated with more positive well-being. Again, these associations between eating, drinking and well-being were no longer significant when psychosocial predictors of well-being and other health-related behaviours were included in the analyses. The next study involved secondary school students.^[35] Positive well-being was associated with more frequent breakfast consumption and fruit and vegetables. The significant effect of fruit and vegetable consumption remained when established predictors and other health-related behaviours were covaried.

In conclusion, recent research has shown that aspects of diet are associated with well-being. Many of these associations were no longer significant when psychosocial predictors of well-being and other health-related behaviours were covaried. However, some associations remained significant and require further investigation. This was one of the objectives of the present study.

STUDY 1: BODY MASS INDEX, WELL-BEING, AND ACADEMIC ATTAINMENT

METHOD

The study was carried out with the approval of the ethics committee, School of Psychology, Cardiff University, and with the informed consent of the participants.

Design

Participants carried out an online survey where their weight and height were recorded. The remaining survey questions were taken from the WPQ. Examination results and coursework were also available for the participants.

Participants

One thousand two hundred and thirty-eight psychology students (89.4% females; 10.6% males; median age: 19 years, age range: 18-48 years) participated in the study. They were given course credits for completing the survey.

Measures

BMI was measured by recording height and weight. The WPQ measured positive and negative well-being outcomes and established predictors of well-being (student stressors, negative coping, psychological capital and social support).

Analysis strategy

Three outcome measures were used in the analysis. The first was positive well-being (the sum of positive affect, life satisfaction and happiness). The second was negative well-being (the sum of negative affect, stress, anxiety and depression). The final measure was academic attainment (the sum of coursework and examination marks). Each variable was split at the median to give high and low-scoring groups.

BMI scores were sub-divided into those below 25 and those 25 and above (N=29.6%). Initial analyses involved

cross-tabulations of BMI, breakfast, and junk food, with the outcomes.

In multivariate logistic regressions, established predictor variables (student stressors, negative coping, social support, psychological capital and conscientiousness) were used as covariates.

RESULTS**Cross-tabulations**

Those with lower BMI scores were significantly more likely to have higher attainment scores, high positive well-being and lower negative well-being. These effects are shown in Table 1.

Table 1: BMI, attainment and well-being.

	BMI < 25	BMI > 24	
High attainment	52.3%	40.0%	p<0.001
High positive well-being	58.7%	26.5%	p<0.001
High negative well-being	43.5%	73.7%	p<0.001

Multivariate logistic regressions

These analyses controlled for established predictors of the outcomes. A lower BMI was associated with higher academic attainment (OR=1.16 CI 1.04-1.30 p <0.01) and more positive well-being (OR=1.12 CI = 1.02-1.29 p <0.05). A higher BMI was associated with greater negative well-being (OR =3.33 CI = 2.49-4.45 p <0.001).

STUDY 2: BREAKFAST, JUNK FOOD, WELL-BEING AND ACADEMIC ATTAINMENT METHOD

This study was similar to the previous one, except that the independent variables were breakfast and junk food consumption. It was carried with the approval of the ethics committee, School of Psychology, Cardiff University, and with the informed consent of the participants,

Design and measures

Participants carried out an online survey where breakfast and junk food consumption was recorded. The frequency of consuming breakfast and junk food was measured using single questions with a scale of 1= Never to 5 = every day. Academic attainment scores (examination and coursework marks) were also obtained. The remaining

survey questions were taken from the WPQ. Examination results and coursework were also available for the participants.

Participants

Three hundred and fifty-six psychology students (89% females, 11% males; median age: 19 years, age range: 18-30 years) participated in the study. They were given course credits for completing the survey.

Analysis strategy

The outcome variables and established predictors were derived similarly to the previous study. The breakfast frequency scores compared those who skipped breakfast with regular consumers. Regular junk food consumers were compared with those who consumed little junk food.

RESULTS

Those who skipped breakfast were less likely to attain high attainment and positive well-being. In contrast, those who skipped breakfast were more likely to have high negative well-being. These results are shown in Table 2.

Table 2: Breakfast skipping, attainment and well-being.

	Breakfast consumers	Skippers	
High attainment	57.1%	41.9%	p<0.001
High positive well-being	58.8%	36.2%	p<0.001
High negative well-being	47.8%	55.3%	p<0.05

High consumption of junk food was significantly associated with lower academic attainment but not with well-being outcomes (High attainment: Regular junk food: 45.3%; Little junk food: 61.1% p < 0.01).

Multivariate logistic regressions

When established predictors were covaried, regular consumption of breakfast was significantly associated

with higher academic attainment (OR = 1.30 CI = 1.03-1.65 p <0.01) and higher positive well-being (OR= 1.42 CI = 1.05-1.91 p < 0.05). Rarely consuming junk food was associated with higher academic attainment (OR = 1.92 CI = 1.15-3.2 p <0.01).

DISCUSSION

The results from these two studies confirm that a high BMI, skipping breakfast, and regular consumption of junk food are risk factors for lower positive well-being, increased negative well-being and lower academic attainment scores. Indeed, these aspects of a poor diet must be considered when investigating other dietary factors. For example, a longitudinal study of secondary students at Cornish Academies^[36] showed that energy drink consumption was associated with poorer academic attainment. Energy drink consumption was part of a junk food diet, and when other aspects of the junk food diet were covaried, the effects of energy drink consumption were no longer significant.

The results from the present studies demonstrate the efficacy of the methodology. The key feature is the multivariate approach, and future studies must apply this to diet as well as to the established predictors of well-being and attainment. A significant limitation of the present research is that a cross-sectional design was used. The methodology should now be extended using longitudinal and intervention studies. The present approach provides a good compromise between large-scale epidemiological studies, with a restricted range of variables, and small-scale psychology surveys, with a broader range of variables. The approach can address various topics by adding other variables to the WPQ. A study like the one used here does not tell us about the underlying biological mechanisms. However, it can address some mechanisms; for example, well-being and attainment are not strongly related, and associations with attainment do not generally reflect well-being. It is also possible to use statistical models (e.g. mediation, moderation and combined effects) to obtain a clearer profile of the pathways linking the different variables.

CONCLUSION

A high Body Mass Index (BMI) can be a risk factor for reduced well-being, ill health, and decreased performance efficiency. This was examined in the present study using a sample of university students, and the associations between BMI, well-being, and academic attainment were investigated. The associations between skipping breakfast, junk food consumption, well-being and academic attainment were also investigated. In the first study, one thousand two hundred and thirty-eight students provided information on their BMI and well-being (measured by the Well-being Process Questionnaire). Examination and coursework marks were also available for the students. In the second study, three hundred and fifty-six students provided information about their well-being and frequency of consuming breakfast and junk food. High BMI scores (>24) were significantly associated with lower positive well-being (higher negative well-being) and lower academic attainment. These effects remained significant when established predictors of well-being and attainment were statistically adjusted. In the second study, skipping breakfast was associated with lower well-being and

academic attainment scores. Frequent consumption of junk food was also significantly associated with lower academic attainment. These results show we have a methodology to investigate associations between diet, well-being and academic attainment, and this research can now be extended using longitudinal and intervention studies.

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