

**ASSOCIATIONS BETWEEN DIET, OTHER HEALTH-RELATED BEHAVIOURS,  
WELL-BEING AND GENERAL HEALTH: A SURVEY OF UNIVERSITY STUDENTS**

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**ABSTRACT**

**Background:** Research has investigated associations between health-related behaviours and health outcomes. This study examined general health and well-being, measured using the student well-being process questionnaire (WPQ). Health-related behaviours (smoking, alcohol consumption and sleep) were also measured, as was diet using the Diet and Behaviour Scale (DABS). **Methods:** An online survey of 552 university students was carried out using the Qualtrics platform. **Results:** Univariate analyses showed that established predictors of well-being and health were associated with the outcomes. Health-related behaviours were also correlated with well-being and health. When regressions, including established predictors and health-related behaviours in the model, were carried out, most of the associations between health-related behaviours and outcomes were not significant. Some associations remained significant. Smoking was associated with greater negative well-being, whereas good sleep and more frequent alcohol consumption were associated with lower negative well-being. Good sleep was also associated with better general health. **Conclusion:** The established predictors of well-being showed their usual associations with the outcomes. Health-related behaviours were also associated with well-being and health. Regressions including both established predictors and health-related behaviours, showed that only smoking, alcohol consumption and sleep were associated with the outcomes. Further research is required to determine the mechanisms underlying such effects and to evaluate the practical significance of them.

**KEYWORDS:** Well-being; General Health; Diet; Smoking; Alcohol; Sleep; Healthy diet; Junk Food; Caffeine; Energy Drinks; Coffee; Tea.

**INTRODUCTION**

The aim of the present research was to examine associations between health-related behaviours (HRBs: diet, sleep, smoking and alcohol consumption) and the well-being and health of university students. Our previous research examined this topic in a sample of secondary school students<sup>[1]</sup> and students just starting university.<sup>[2]</sup> The present study continued this line of research using a sample of university students. Diet was measured using the Diet and Behaviour Scale (DABS),<sup>[3]</sup> which was developed in order to conduct research on diet, academic attainment and conduct in secondary school students in Cornish academies.<sup>[4-9]</sup> Well-being was measured using the Student Well-being Process Questionnaire (WPQ).<sup>[10,11]</sup> which has been used in studies of both secondary school and university students.<sup>[12-25]</sup> The WPQ was developed from the Demands, Resources and Individual Effects (DRIVE) model<sup>[26, 27]</sup> and had predictor variables associated with negative outcomes (e.g. exposure to stressors; negative coping style) and predictors of positive outcomes (e.g.

psychological capital and social support). Both positive well-being (happiness, life satisfaction and positive affect) and negative well-being (e.g. stress, fatigue, anxiety and depression) were measured.

Our previous studies<sup>[2,3]</sup> found significant associations between diet, sleep, exercise and well-being. However, the DABS scores were also correlated with the established WPQ predictor variables. When the established predictors of well-being were in the regression model, many of the associations seen in univariate analyses were not significant. However, some associations were still significant. Positive well-being was associated with lower consumption of fast food/takeaways and with more frequent fruit and vegetable consumption. The present study used a methodology that was like our previous studies, the main difference being that the sample consisted of university students. Other differences were the inclusion of smoking and frequency and amount of alcohol consumption in the questionnaire. Both sleep duration and quality of sleep were also recorded. Also, the

original Student WPQ and the diet part of the DABS were used here, whereas the study with secondary school students used shortened versions. It was predicted that the established psychosocial predictors of well-being would be associated with the outcomes. It was also predicted that associations between the health-related behaviour scores and the well-being outcomes would be found in the univariate analyses. It was also predicted that many of these associations would not be significant when the established predictors of well-being and health were included in the analyses.

## MATERIALS AND METHODS

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.

### Participants

The participants selected for this study were undergraduate students at Cardiff University. The total sample consisted of five hundred and fifty-two students,

23% male, who were between 18 and 45 years old ( $M=20$ ,  $SD=3.16$ ). The majority of these students (79%) had previously attended state schools (see Table 1). The students were given course credits or paid for their participation.

### Materials

Data for the study were collected using an online survey presented on the Qualtrics platform. Questions about diet came from DABS. The Student Well-being Process Questionnaire was used to measure the predictors of positive and negative well-being and general health. Other questions provided demographic information (e.g. gender, age, type of high school attended, the status of current degree, whether it was a first or second degree and BMI). In terms of lifestyle, two questions were asked about sleep (sleep duration and sleep quality). In order to measure alcohol consumption, two questions were asked (how many days per week and how many units of alcohol per week were consumed). There was also a question about smoking.

**Table 1: The descriptive analysis of demographic variables.**

| First or second degree   | N (%) | First degree | Second degree | Total      |      |
|--------------------------|-------|--------------|---------------|------------|------|
|                          |       | 497 (90%)    | 55 (10%)      | 552 (100%) |      |
| Type of secondary school | N (%) | Private/paid | state         | Total      |      |
|                          |       | 116 (21%)    | 436 (79%)     | 552 (100%) |      |
| Smoking                  | N (%) | yes          | No            | Total      |      |
|                          |       | 73 (13.2%)   | 479 (86.8%)   | 552 (100%) |      |
| Age                      | N     | Max.         | Min.          | Mean       | SD   |
|                          | 552   | 45           | 18            | 20         | 3.16 |
| BMI                      | 552   | 52.44        | 13.19         | 22.92      | 3.91 |

### Statistical analyses

Factor scores were used for the diet, sleep and alcohol measures. Correlations were calculated to examine associations between the established well-being predictors and well-being and health outcomes. Similarly, correlations were computed to examine associations between health-related behaviours and the outcomes and established predictors. Then, three separate regression models were tested for each dependent variable, the model's goodness of fit was examined, and the significant associations were determined. Since the number of independent variables was large, the presence of multicollinearity among the dependent variables of the model could have been a severe problem. Therefore, the variance inflation factor (VIF) technique was used to detect the presence of multicollinearity. The significance of each test was based on the respective p-values being below the significance level ( $p < 0.05$ ).

## RESULTS

### Correlations between health-related behaviours predictors and the outcomes

The results of the correlation matrix between the Student Well-being Process predictors and the outcomes revealed

significant correlations, which are shown in Table 2. Table 3 shows the correlations between health-related behaviours and the outcomes. There was a positive correlation between good sleep and positive well-being and general health. There was a negative correlation between good sleep and negative well-being. In addition, there was a positive association between negative well-being and higher consumption of energy drinks, cola, tea, and coffee. Good general health was associated with more frequent consumption of healthy food and better sleep. A negative relationship was found between general health and higher junk food and cola. The correlations between the Student Well-being Process predictors and health-related behaviours are shown in Table 4. Sleep has a significant correlation with all the WPQ predictors. It was found that there was a negative correlation between social support and junk food and energy drink consumption. There were positive associations between negative well-being and energy drink, cola, tea, and coffee consumption.

Table 2: Correlation matrix between WPQ predictors and the outcomes.

|                      | Positive well-being |       | Negative well-being |       | General Health |       |
|----------------------|---------------------|-------|---------------------|-------|----------------|-------|
|                      | r                   | p     | r                   | p     | r              | p     |
| Student stressors    | -.367**             | <.001 | .452**              | <.001 | -.210**        | <.001 |
| Social support       | .338**              | <.001 | -.232**             | <.001 | .114**         | .009  |
| Positive personality | .820**              | <.001 | -.666**             | <.001 | .279**         | <.001 |
| Negative coping      | -.430**             | <.001 | .514**              | <.001 | -.213**        | <.001 |

Table 3: Correlation matrix of Health-related behaviours and outcomes.

| Variables    | Positive well-being |       | Negative well-being |       | General Health |       |
|--------------|---------------------|-------|---------------------|-------|----------------|-------|
|              | r                   | p     | r                   | P     | r              | p     |
| Healthy food | .058                | .173  | -.026               | .546  | .132**         | .002  |
| Junk food    | -.001               | .985  | .069                | .105  | -.125          | .003  |
| Cola         | -.070               | .101  | .096*               | .023  | -.084*         | .049  |
| Energy drink | -.102*              | .016  | .114**              | .007  | .036           | .404  |
| Coffee       | -.033               | .434  | .083                | .050  | .008           | .860  |
| Tea          | -.028               | .515  | .102**              | .016  | -.056          | .190  |
| Sleep        | .321**              | <.001 | -.372**             | <.001 | .314**         | <.001 |
| Alcohol      | .001                | .974  | -.048               | .263  | -.059          | .168  |

Table 4: Correlation matrix of WPQ predictors and health-related behaviours.

| Variables    | Student stressor |       | Social support |       | Positive personality |       | Negative coping |       |
|--------------|------------------|-------|----------------|-------|----------------------|-------|-----------------|-------|
|              | r                | p     | r              | P     | r                    | p     | r               | p     |
| Healthy food | -.061            | .161  | .020           | .642  | .042                 | .336  | -.019           | .668  |
| Junk food    | .061             | .165  | -.133          | .002  | .016                 | .709  | .032            | .470  |
| Cola         | .011             | .809  | -.054          | .216  | -.069                | .115  | -.017           | .705  |
| Energy drink | .048             | .269  | -.176          | <.001 | -.051                | .242  | .059            | .177  |
| Coffee       | -.020            | .653  | -.023          | .595  | .014                 | .750  | -.032           | .470  |
| tea          | .030             | .486  | -.029          | .507  | -.032                | .464  | .112            | .011  |
| Sleep        | -.207            | <.001 | .093           | .032  | .310                 | <.001 | -.203           | <.001 |
| Alcohol      | .022             | .613  | .003           | .937  | -.060                | .174  | .045            | .305  |

**Multivariate analysis of predictors and positive well-being**

A hierarchical regression was performed to investigate associations between the HRB predictors of positive well-being after controlling for the influence of demographic data and well-being predictors. Demographic data were entered in Step 1 and accounted for 4% of the variance in positive well-being. However, WPQ predictors were entered in Step 2 and accounted

for 47% of the variance in positive well-being. In step 3, the HRB predictors increased the total variance explained by the model to 48%,  $F[16, 459] = 26.219, p < .001, R^2 = .480$ . Social support, positive personality, negative coping, and student stressors were good predictors of positive well-being. In contrast, there were no significant relationships between the HRB predictors and positive well-being (see Table 5).

Table 5: Multivariate Analysis of predictors of positive well-being.

| Model |                       | B     | Std. Error | Beta  | t      | Sig. |
|-------|-----------------------|-------|------------|-------|--------|------|
| 1     | Age                   | -.035 | .046       | -.036 | -.764  | .445 |
|       | BMI                   | .019  | .046       | .019  | .412   | .680 |
|       | Smoking               | .071  | .067       | .049  | 1.058  | .291 |
|       | Secondary school type | -.021 | .056       | -.017 | -.378  | .705 |
| 2     | Age                   | -.029 | .034       | -.029 | -.843  | .400 |
|       | BMI                   | .025  | .034       | .025  | .730   | .466 |
|       | Smoking               | .001  | .050       | .001  | .028   | .977 |
|       | Secondary school type | .068  | .041       | .056  | 1.642  | .101 |
|       | Student stressors     | -.111 | .036       | -.111 | -3.047 | .002 |
|       | Social support        | .105  | .035       | .106  | 2.991  | .003 |
|       | Positive personality  | .571  | .037       | .573  | 15.471 | .000 |

|   |   |       |      |       |        |             |
|---|---|-------|------|-------|--------|-------------|
|   | <b>Negative coping</b>                  | -.098 | .037 | -.098 | -2.677 | <b>.008</b> |
| 3 | <b>Age</b>                              | -.031 | .036 | -.031 | -.871  | .384        |
|   | <b>BMI</b>                              | .025  | .034 | .025  | .740   | .460        |
|   | <b>Smoke (1=smoker, 2 = non-smoker)</b> | .002  | .050 | .001  | .037   | .970        |
|   | <b>State secondary school</b>           | .066  | .041 | .055  | 1.606  | .109        |
|   | <b>Student stressors</b>                | -.105 | .037 | -.105 | -2.856 | <b>.004</b> |
|   | <b>Social support</b>                   | .105  | .036 | .106  | 2.963  | <b>.003</b> |
|   | <b>Positive personality</b>             | .567  | .038 | .569  | 15.021 | <b>.000</b> |
|   | <b>Negative coping</b>                  | -.094 | .037 | -.094 | -2.538 | <b>.011</b> |
|   | <b>High Junk food</b>                   | -.025 | .034 | -.025 | -.734  | .463        |
|   | <b>High Healthy</b>                     | .061  | .034 | .061  | 1.792  | .074        |
|   | <b>High Energy drinks</b>               | .012  | .037 | .012  | .321   | .749        |
|   | <b>High Coffee</b>                      | -.008 | .036 | -.008 | -.223  | .824        |
|   | <b>High Tea</b>                         | .047  | .035 | .047  | 1.345  | .179        |
|   | <b>High Cola</b>                        | .008  | .035 | .008  | .216   | .829        |
|   | <b>Good sleep</b>                       | .041  | .036 | .041  | 1.122  | .262        |
|   | <b>High alcohol</b>                     | .040  | .035 | .040  | 1.125  | .261        |

**Multivariate analysis of predictors and negative well-being**

A hierarchical regression was performed to examine HRB predictors of negative well-being after controlling for the influence of demographic data and well-being predictors. In step 1, demographic data were entered, accounting for 2.4% of the variance in negative well-being. In comparison, well-being predictors were entered in Step 2 and accounted for 41.4% of the variance in

negative well-being. In step 3, the HRB predictors increased the total variance explained by the model to 44.2%,  $F[16, 454] = 22.439, p < .001, R^2 = .442$ . All of the established well-being predictors were significant, apart from social support. Smoking was also associated with greater negative well-being. Poor sleep was associated with negative well-being, as was less frequent consumption of alcohol.

**Table 6: Multivariate Analysis of predictors of negative well-being.**

| Model            |   | <b>B</b> | <b>Std. Error</b> | <b>Beta</b> | <b>t</b> | <b>Sig.</b> |
|------------------|---|----------|-------------------|-------------|----------|-------------|
| 1                | <b>Age</b>                              | .022     | .046              | .022        | .470     | .638        |
|                  | <b>BMI</b>                              | .017     | .046              | .017        | .368     | .713        |
|                  | <b>Smoking</b>                          | -.169    | .067              | -.116       | -2.520   | <b>.012</b> |
|                  | <b>Secondary school type</b>            | .120     | .055              | .099        | 2.164    | <b>.031</b> |
| 2                | <b>Age</b>                              | .022     | .036              | .022        | .603     | .547        |
|                  | <b>BMI</b>                              | .010     | .036              | .010        | .277     | .782        |
|                  | <b>Smoking</b>                          | -.098    | .052              | -.067       | -1.861   | .063        |
|                  | <b>Secondary school type</b>            | .047     | .043              | .039        | 1.089    | .277        |
|                  | <b>Student stressors</b>                | .176     | .038              | .176        | 4.604    | <b>.000</b> |
|                  | <b>Social support</b>                   | -.038    | .037              | -.038       | -1.018   | .309        |
|                  | <b>Positive personality</b>             | -.464    | .039              | -.464       | -11.928  | <b>.000</b> |
| 3                | <b>Negative coping</b>                  | .166     | .039              | .165        | 4.291    | <b>.000</b> |
|                  | <b>Age</b>                              | .012     | .037              | .012        | .337     | .737        |
|                  | <b>BMI</b>                              | .028     | .035              | .028        | .783     | .434        |
|                  | <b>Smoke (1=smoker, 2 = non-smoker)</b> | -.114    | .052              | -.078       | -2.172   | <b>.030</b> |
|                  | <b>State secondary school</b>           | .046     | .043              | .038        | 1.069    | .285        |
|                  | <b>Student stressors</b>                | .157     | .038              | .157        | 4.116    | <b>.000</b> |
|                  | <b>Social support</b>                   | -.035    | .037              | -.035       | -.951    | .342        |
|                  | <b>Positive personality</b>             | -.459    | .039              | -.459       | -11.696  | <b>.000</b> |
|                  | <b>Negative coping</b>                  | .146     | .038              | .145        | 3.797    | <b>.000</b> |
|                  | <b>High Junk food</b>                   | .015     | .036              | .015        | .426     | .671        |
|                  | <b>High Healthy Diet</b>                | .051     | .035              | .051        | 1.453    | .147        |
|                  | <b>High Energy drinks</b>               | .010     | .039              | .010        | .250     | .803        |
|                  | <b>High Coffee</b>                      | .046     | .037              | .046        | 1.243    | .214        |
| <b>High Tea</b>  | .005                                    | .036     | .005              | .141        | .888     |             |
| <b>High Cola</b> | -.018                                   | .037     | -.018             | -.501       | .616     |             |

|  |                     |       |      |       |        |             |
|--|---------------------|-------|------|-------|--------|-------------|
|  | <b>Good Sleep</b>   | -.115 | .038 | -.114 | -3.030 | <b>.003</b> |
|  | <b>High Alcohol</b> | -.112 | .037 | -.112 | -3.042 | <b>.002</b> |

### Multivariate analysis of predictors and general health

Hierarchical regression was performed to investigate the HRB predictors of general health after controlling for the influence of demographic and well-being factors. Demographics were entered in step 1 and accounted for 0.02% of the variance in general health, whereas predictors of well-being were entered in step 2 and

accounted for approximately 8% of the variance in general health. In step 3, the HRB predictors increased the total variance explained by the model to 10%,  $F[12, 467] = 4.320$ ,  $p < .001$ ,  $R^2 = .100$ . Positive personality and good sleep significantly predicted general health (see Table 7).

**Table 7: Multivariate Analysis of predictors General Health.**

| Model           |                                  | B     | Std. Error | Beta  | t      | Sig.        |
|-----------------|----------------------------------|-------|------------|-------|--------|-------------|
| 1               | Age                              | .094  | .044       | .097  | 2.116  | <b>.035</b> |
|                 | BMI                              | -.059 | .044       | -.061 | -1.337 | .182        |
|                 | Low Smoking                      | .135  | .065       | .095  | 2.079  | <b>.038</b> |
|                 | Secondary school type            | -.051 | .053       | -.044 | -.959  | .338        |
| 2               | Age                              | .095  | .043       | .098  | 2.185  | <b>.029</b> |
|                 | BMI                              | -.061 | .043       | -.062 | -1.407 | .160        |
|                 | Low Smoking                      | .108  | .064       | .076  | 1.693  | .091        |
|                 | Secondary school type            | -.026 | .053       | -.022 | -.486  | .627        |
|                 | Student stressors                | -.093 | .046       | -.096 | -2.009 | .045        |
|                 | Social support                   | .013  | .045       | .013  | .288   | .774        |
|                 | Positive personality             | .174  | .047       | .179  | 3.704  | <b>.000</b> |
| Negative coping | -.027                            | .047  | -.028      | -.581 | .561   |             |
| 3               | Age                              | .075  | .045       | .077  | 1.663  | .097        |
|                 | BMI                              | -.066 | .043       | -.068 | -1.525 | .128        |
|                 | Smoking (1=smoker, 2=non-smoker) | .096  | .064       | .067  | 1.496  | .135        |
|                 | Secondary school                 | -.024 | .052       | -.020 | -.454  | .650        |
|                 | Student stressors                | -.074 | .046       | -.076 | -1.595 | .111        |
|                 | Social support                   | .008  | .045       | .008  | .183   | .855        |
|                 | Positive personality             | .156  | .048       | .160  | 3.250  | <b>.001</b> |
|                 | Negative coping                  | -.018 | .047       | -.018 | -.383  | .702        |
|                 | High Junk food                   | -.064 | .043       | -.066 | -1.469 | .143        |
|                 | High healthy diet                | .045  | .043       | .046  | 1.042  | .298        |
|                 | High Energy drinks               | .001  | .047       | .001  | .028   | .978        |
|                 | High Coffee                      | .008  | .045       | .008  | .174   | .862        |
|                 | High Tea                         | -.014 | .044       | -.015 | -.324  | .746        |
|                 | High Cola                        | -.002 | .045       | -.002 | -.035  | .972        |
|                 | Good Sleep                       | .120  | .046       | .123  | 2.616  | <b>.009</b> |
| High Alcohol    | .019                             | .045  | .019       | .414  | .679   |             |

## DISCUSSION

The first feature of the present results was the replication of established psychosocial predictors of well-being. Four predictors were examined. Two (positive personality and social support) were predicted to have positive associations with positive well-being and negative associations with negative well-being. These predictions were confirmed, and the predictors were also positively associated with general health. Two predictors (student stressors and negative coping) were predicted to show the opposite pattern of results, and the results confirmed these predictions. The replication of these established effects gives one greater confidence in the more novel aspects of the results.

A previous study<sup>[1]</sup> with secondary students examined the associations between health-related behaviours and well-being. Significant correlations between HRBs and well-being were found, with positive well-being showing correlations with good sleep, healthy diet and regular exercise. In contrast, negative well-being was associated with negative HRBs. Established predictors of well-being were associated with both well-being outcomes and HRBs. Regressions that included established psychosocial predictors showed that few of the HRBs remained significant predictors of outcomes. Very similar results were obtained in a study where students provided information about the six months prior to starting university. In addition, established associations between smoking, exercise and health were significant,

which also gives confidence in the HRB results observed in the study.

The present study extended the research to university students who have more control over their HRBs. The results showed a similar pattern to the previous studies. The correlations identified associations between HRBs and well-being and health outcomes. However, regressions that included the established predictors showed that many of the effects of the HRBs were no longer significant. The more robust effects were those of a good sleeping pattern, alcohol consumption, and smoking.

The present study had some limitations. The sample was mainly female, and more research on possible gender differences is required. This has been identified as a potential problem in previous studies on this topic.<sup>[28]</sup> The study was also cross-sectional and longitudinal studies are required to provide a better indication of causality. Intervention studies are also required to identify underlying mechanisms and assess the practical importance of these associations.

## CONCLUSION

An online survey examined the association between HRBs, well-being and general health. HRBs were correlated with well-being and health outcomes, but these associations were often not significant when established predictors of well-being were included in the regressions. The established predictors of well-being showed their usual significant effects, and good sleep, alcohol consumption and smoking were associated with well-being and general health. The replication of established effects gives one confidence in the more novel HRB/well-being results. Further research is now required to determine whether these results are observed with other samples. The underlying mechanisms and practical importance of these effects also require further investigation.

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