

DIET AND OTHER HEALTH-RELATED BEHAVIOURS: ASSOCIATIONS WITH THE WELL-BEING OF SECONDARY SCHOOL STUDENTS***Andrew P. Smith and Arwel James**

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ABSTRACT

Background: It is widely acknowledged that diet and other health-related behaviours (e.g. sleep and exercise) are very important for the development of school children. Research has examined the associations of health-related behaviours with many different outcomes (e.g. academic attainment, cognitive function and health). The present study focused on well-being, measured using the well-being process questionnaire (WPQ) and the Strength and Difficulties Questionnaire (SDQ). Diet and other health-related behaviours were measured by the Diet and Behaviour Scale (DABS). **Methods:** An online Qualtrics survey of 155 secondary school students, covering both sexes and most year groups, was carried out. The survey included the WPQ, SDQ and DABS. **Results:** Univariate analyses showed that health-related behaviours were associated with many well-being outcomes. When established predictors of well-being were covaried, many of the associations were no longer significant. However, some remained significant. For example, positive well-being was associated with higher fruit and vegetable consumption and lower consumption of fast food/takeaways. **Conclusion:** Diet and other health-related behaviours were associated with well-being outcomes. Many of these associations reflect the shared variance of health-related behaviours with established predictors of well-being. However, some associations were independent of the established predictors, and further research is required to identify the underlying mechanisms and practical implications of these results.

KEYWORDS: Well-being; Strengths and Difficulties; Diet; Exercise; Sleep; Breakfast; Fruit and Vegetables; Junk Food; Caffeine; Energy Drinks; Coffee; Tea.

INTRODUCTION

Health-related behaviours (HRBs) have become one of the most important public health issues. Diet is a major health-related behaviour, and it should be investigated along with factors such as exercise and sleep. Research shows that health-related behaviours are highly likely to influence health and academic achievement. It is important to examine how different health behaviours contribute to healthy lifestyles of adolescents and how these lifestyles relate to health outcomes later in life.^[1] The aim of this study was to examine the relationship between health-related behaviours and the well-being of secondary students. The next section summarises the literature on the effects of diet in educational settings.

HRBs can be subdivided into positive health-promoting behavioural patterns and negative behavioural patterns harmful to health. Positive and health-promoting behaviours include good sleep, physical activity, and healthy nutrition.^[2] Such behaviours protect the individual from disease and promote good health. The understanding of health behaviours has become important because of the increase in chronic diseases

among young people. In addition, adolescents often engage in behaviours that reduce their well-being, such as having a poor diet and a lack of exercise. Research has shown that the practice of appropriate HRBs can improve physical health and increase an individual's well-being.^[3] For example, a study of high school students in Turkey aged between 15 and 18 years old confirmed the strong direct relationship between their diet and their quality of life. Aspects of their diet predicted their level of well-being.^[4] Results from another study showed that a diet high in processed meats, fast foods, soft and sweetened drinks, fried foods, and high-fat foods was associated with a reduced sense of well-being.^[5]

The present study focused on four aspects of diet. The first, breakfast consumption, has been widely studied for many years.^[6-8] However, there has been a lack of research examining associations between breakfast and subjective well-being. A search of PubMed showed that there were over 3,000 articles on breakfast and adolescents. However, when subjective well-being was added as a search term, only eight articles were

identified. This suggests that further research on the topic is required.

The second aspect of diet that was investigated was consumption of fruit and vegetables. Again, a PubMed search revealed nearly 6,000 papers on fruit/vegetables and adolescents. Again, when subjective well-being was added as a search term, only eight articles were identified. Other research has examined related topics such as fruit/vegetables and mental health, and these have been reviewed.^[9] One negative aspect of the diet that has been reviewed is the consumption of junk food, and that was the third aspect of the diet investigated here. This may relate to meals (e.g. fast food/takeaways) or to snacks (e.g. crisps, chocolate and sweets). Again, there has been a great deal of research on these aspects of diet and adolescents. A Pubmed search on junk food and adolescents revealed 304 papers and several reviews.^[10] The general profile of results suggests that frequent consumption of fruit and vegetables will increase positive well-being, whereas consumption of junk food will be associated with lower levels of well-being.

The final aspect of the diet examined here was the consumption of caffeinated drinks. Again, the effects of caffeine have been widely studied and reviewed.^[11,12] Early research used adult populations because the main sources of caffeine were coffee and tea, which were rarely consumed by children. However, children frequently consume caffeinated colas, and more recently, drinks with high levels of caffeine (energy drinks) have been marketed. A PubMed search shows over 2,000 articles on caffeine and adolescents. These have been reviewed several times,^[13] although the amount of research on subjective well-being is small.

The measure of diet used in the present study was the DABS.^[14] This was developed as part of research on dietary influences on the academic performance, conduct and health of secondary students at Cornish academies.^[15-21] As well as diet, the questionnaire measured sleep and exercise. Both of these HRBs have been related to well-being. There have been over 100 articles on the sleep and well-being of adolescents, as well as several reviews.^[22] The results usually show that short sleep, poor quality sleep and daytime sleepiness are associated with reduced well-being. There are also over one hundred papers on exercise, adolescents and subjective well-being. The most frequent result is that lack of exercise is associated with reduced well-being. Whether the exercise has to be mild, moderate or vigorous is less clear. Associations between sleep, exercise and well-being were examined in the present study.

The next section covers the conceptualisation and measurement of well-being.^[23] The term well-being covers a wide range of things. 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." It involves not just the person's mood but their overall functioning. The American Psychological Association^[24] have defined 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 WHO^[25] has defined positive mental health as "a state of well-being in which the individual realises his or her own 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 different dimensions, and various types have been identified - subjective, objective, psychological, and emotional well-being.

The Well-being Process model covered more concepts than the subjective well-being outcomes of positive affect, happiness, and life satisfaction.^[26] It also included negative outcomes such as anxiety, depression and stress. Research has shown that positive and negative emotions reflect different types of brain activation and are not the endpoints of a single process.

The Well-being Process Questionnaire^[27,28] was developed from the DRIVE (Demands Resources Individual Effects) model.^[29,30] This model was developed for use with occupational samples but could also be used in education settings. Additional predictor and outcome variables could easily be added to the survey. Initially, the DRIVE model focused on predictors of mental health, namely demands, resources (support and control), and individual factors such as coping styles. The Well-being Process Questionnaire (WPQ) included more predictor variables (e.g. psychological capital) and positive outcomes (happiness, positive affect and positive affect).

There is now extensive literature using the Well-being Process Questionnaires with students^[31-42] and studies have generally replicated the effects of the established predictors, and added new predictor variables (e.g. work-life balance; workload; flow; and daytime sleepiness) and outcome variables (e.g. physical health and flourishing;). For research with secondary school students, it was apparent that other outcome measures should be added, and these came from the Strengths and Difficulties Questionnaire.^[43] The Strengths and Difficulties Questionnaire (SDQ) covers five domains, namely emotional problems, hyperactivity/inattention, conduct problems, peer relationship problems and prosocial behaviour.

In summary, the present study examined associations between well-being predictors and outcomes (from the WPQ), SDQ measures and the HRBs (from the DABS). This online survey was given to a sample from a secondary school in South Wales.

MATERIALS AND METHODS

The study took place between 1-10 July 2022. An online survey was carried out using the Qualtrics platform. The

research was approved by the Ethics Committee, School of Psychology, Cardiff University. (EC20.03.10.5987R2A3) and carried out with the informed consent of the participants. The survey included an information sheet describing the study and informing participants that it was entirely up to them to participate. Consent was obtained before starting the survey.

Participants

The participants were students at a secondary school in South Wales. One hundred and fifty-five students (91 male; 65 female; 21 years 7 and 8; 49 years 9 and 10; 59 years 11; 27 years 12 and 13) participated in the study.

The Survey

The survey consisted of the short-form student WPQ questionnaire (see Table 1), the short-form Diet and Behaviour Scale (DABS- see Table 2), and the Strengths and Difficulties Questionnaire (SDQ). The predictor variables were consumption of breakfast, fruit and

vegetables, junk food, energy drinks, coffee and tea, amount of exercise, work-life balance, social support, student stressors, sleepiness, positive coping, flow, rumination, negative coping and psychological capital. The dependent variables were positive well-being, negative well-being, physical health, flourishing, emotional problems, hyperactivity, conduct, peer relationships and prosocial behaviour.

Analysis strategy

Descriptive statistics of the variables were computed. The correlation between the predictor variables and outcomes was then analysed. Regression analyses were then conducted. These included the DABS predictors and the established predictors from the WPQ. A separate analysis was carried out for each outcome. The aim of the regressions was to determine whether any associations between the DABS scores and well-being outcomes remained significant when the established well-being predictors were covaried.

Table 1: The short form Student Well-being Questionnaire.

1. Year of study:
2. Gender: Male [1] Female [2]
Please answer the following questions about how you have felt and behaved in the last six weeks:
3. I have been experiencing positive feelings (e.g. feeling happy, satisfied with life, in good spirits; feeling good about relationships; being able to relax; and feeling energetic and interested).
<i>Rated on a scale from 1=Strongly Disagree to 10=Strongly agree</i>
4. I have been experiencing negative feelings (e.g. feeling stressed; feeling anxious or depressed; feeling physically or mentally tired, and feeling emotionally drained).
<i>Rated on a scale from 1=Strongly Disagree to 10=Strongly agree</i>
5. I have had stressful experiences (e.g. time pressure; academic dissatisfaction; loneliness; and friendship problems).
<i>Rated on a scale from 1=Strongly Disagree to 10=Strongly agree</i>
6. I feel that I have the social support I need (e.g. people to talk to, support for financial needs, friendship, and someone to discuss problems with).
<i>Rated on a scale from 1=Strongly Disagree to 10=Strongly agree</i>
7. When I'm in a stressful situation, I try and solve the problem or look for support from others.
<i>Rated on a scale from 1=Strongly Disagree to 10=Strongly agree</i>
8. When I am in a stressful situation, I blame myself or wish for things to improve or avoid the problem.
<i>Rated on a scale from 1=Strongly Disagree to 10=Strongly agree</i>
9. I am optimistic, confident in my ability to solve problems, and I am generally satisfied with myself.
<i>Rated on a scale from 1=Strongly Disagree to 10=Strongly agree</i>
10. Does life outside of school interfere with your school work, and school interferes with other aspects of your life?
<i>Rated on a scale from 1=Not at all to 10=Definitely Yes</i>
11. Do you have a high workload that makes you feel stressed and could affect how efficiently you do your work?
<i>Rated on a scale from 1=Not at all to 10=Definitely Yes</i>
12. How often do you feel sleepy during the day?
<i>Rated on a scale from 1=Never to 10=All the time</i>
13. In general, how would you rate your physical health?
<i>Rated on a scale from 1=Extremely poor to 10=Extremely good</i>
14. To what extent do you feel immersed in your academic work and have full involvement and engagement in your studies?
<i>Rated on a scale from 1=Not at all to 10=Very much so</i>
15. To what extent do you feel you are thriving or flourishing (e.g. being successful, feeling that life is going well, and having a sense of belonging)?
<i>Rated on a scale from 1=Not at all to 10=Very much so</i>
16. If you think about school work in your free time does it have a negative effect (e.g. makes you tense and troubled), or does it help to solve problems?
<i>Rated on a scale from 1=Negative effect to 10=Positive effect</i>

Table 2: The short-form DABS questionnaire

In the last six weeks

1. How often did you eat breakfast?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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2. How often did you eat snacks like chocolate, crisps and sweets?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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3. How often did you eat takeaways or fast food?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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4. How often did you eat five pieces of fruit or vegetables?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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5. How often did you drink coffee?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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6. How often did you drink tea?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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7. How often did you drink cola (coca cola, Pepsi, other colas)?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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8. How often did you drink energy drinks like Red Bull, Monster etc?

Every day	Most days (3-6)	Once or twice a week	Once a month	Never
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The next set of questions asks about how much you consume of different drinks (Put 0 if you don't drink that product)

9. Energy drinks _____ cans a week.
10. Colas _____ cans a week.
11. Coffee _____ cups a week.
12. Tea _____ cups a week.

13. How often do you take part in sports or other types of physical exercise: (Please tick ONE box per category)

	Three times a week or more	once or twice a week	about once to three times a month	never/ hardly ever
a) Mildly energetic (e.g. walking)	~ 1	~ 2	~ 3	~ 4
b) Moderately energetic (e.g. dancing, cycling, leisurely swimming)	~ 1	~ 2	~ 3	~ 4
c) Vigorous (e.g. running, hard swimming, tennis, squash, aerobics)	~ 1	~ 2	~ 3	~ 4

Descriptive Statistics

The descriptive statistics for the WPQ and SDQ variables are shown in Table 3. The results show that there was variation in the responses, with the full range of response categories being used. There was also very little missing data.

The descriptive statistics for the DABS scores are shown in Table 4. Again, the full range of response categories was used, and there was little missing data.

RESULTS

Table 3: Descriptive Statistics for WPQ and SDQ variables.

	N	Range	Minimum	Maximum	Mean		Std.Deviation
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Positive well-being	154	9	1	10	5.98	.202	2.501
Negative well-being	152	9	1	10	5.07	.233	2.879
Stressful experiences	154	9	1	10	5.21	.229	2.837
Social Support	154	9	1	10	6.35	.232	2.885
Positive coping	153	9	1	10	5.82	.211	2.614
Negative Coping	152	9	1	10	5.77	.220	2.712
Psychological Capital	153	9	1	10	5.95	.200	2.472
Work-Life Balance	151	9	1	10	5.10	.234	2.877
Workload	152	9	1	10	5.55	.217	2.681
Sleepy during the day	152	9	1	10	6.46	.218	2.686
Physical Health	150	10	1	11	5.91	.177	2.167
Flow	149	9	1	10	5.50	.177	2.158
Flourishing	151	9	1	10	5.65	.195	2.395
Rumination	149	9	1	10	4.52	.214	2.606
Conduct	146	7.0	.0	7.0	2.6027	.12159	1.46913
Hyperactivity	145	10.0	.0	10.0	5.2138	.20370	2.45285
Emotional problems	147	10.0	.0	10.0	4.6463	.23003	2.78893
Peer problems	147	10.0	.0	10.0	2.9524	.16505	2.00114
Prosocial behaviour	148	10.0	.0	10.0	7.1757	.16150	1.96471

Table 4: Descriptive statistics for the DABs variables.

	N	Minimum	Maximum	Mean	Std.Deviation
How often did you eat breakfast? (Please tick one circle.)	152	1	5	2.49	1.487
How often did you eat five pieces of fruit or vegetables?	151	1	5	2.64	1.092
How often did you eat snacks like chocolate, crisps and sweets?	150	1	5	1.98	.764
How often did you eat takeaways or fast food?	151	1	5	3.30	.693
Energy Drinks _____ cans a week	152	0	13	1.32	2.329
Colas _____ cans a week.	152	0	70	2.83	6.404
Coffee _____ cups a week.	151	0	15	1.77	3.333
Tea _____ cups a week.	152	0	45	4.07	6.630
How often do you feel sleepy during the day?	152	1	10	6.46	2.686
Mildly energetic exercise (e.g. walking)	145	1	4	1.43	.806
Moderately energetic (e.g. dancing, cycling, leisurely swimming)	146	1	4	2.38	1.090
Vigorous (e.g. running, hard swimming, tennis, squash, aerobics)	142	1	4	2.29	1.164

Correlations

The significant correlations between health-related behaviours and outcomes are shown in Table 5. The expected associations between breakfast consumption

and well-being were obtained, as were the associations between fruit/vegetable consumption and well-being. Daytime sleepiness was negatively associated with well-being, as was low moderate/vigorous exercise.

Table 5: Correlations between health-related behaviours and well-being outcomes.

	Sleepy	Low Breakfast	Low Fruit/Veg	Amount of coffee	Low moderate exercise	Low vigorous exercise
Positive well-being	-0.36		-0.36		-0.26	-0.17*
Negative well-being	0.31	0.18*	0.25		0.25	
Flourishing	-0.27	-0.21*	-0.33		-0.28	-0.24
Physical Health			-0.29			
Conduct problems						
Hyperactivity	-0.40			0.20*		
Emotional problems	0.35	0.30	0.23		0.26	0.19*
Peer problems		0.26	0.21*			

* $p < 0.05$ All other correlations, $p < 0.01$

The significant correlations between the health-related behaviours and well-being predictors are shown in Table 6. Daytime sleepiness was positively associated with the negative predictors (e.g. stressful experiences) and negatively associated with the positive predictors (e.g. psychological capital). A similar profile was observed

for low breakfast, low fruit/vegetable consumption and low vigorous exercise. These results show that the established predictors of well-being need to be covaried when examining associations between health-related behaviours and outcomes.

Table 6: Correlations between health-related behaviours and well-being predictors.

	Sleepy	Low Breakfast	Low Fruit/Veg	Amount of coffee	Low moderate exercise	Low vigorous exercise
Stressful experiences	0.29		0.23			0.25
Social Support						0.17*
Positive coping	-0.31			-0.16*		
Negative Coping	0.29		0.24			0.25
Psychological Capital	-0.33	-0.24	-0.23		-0.19	-0.21*
Poor Work-life balance	0.24			0.16*		0.20*
Workload	0.32	0.22				0.22
Flow	-0.31		-0.16*			

* $p < 0.05$ All other correlations, $p < 0.01$

Regressions

Separate regressions were carried out for each outcome variable. The predictor variables were the health-related behaviours and the established predictors of well-being. Significant effects of the established predictors represent replication of previous findings and give more confidence in the significant effects of health-related behaviours.

Positive well-being was predicted by psychological capital (+association) and stressful experiences (-). Low fruit/vegetables were negatively associated ($\beta = -0.35$ $p < 0.05$) and low consumption of fast food/takeaways was positively associated ($\beta = 0.63$ $p < 0.05$).

Negative well-being was predicted by stressful experiences (+) and psychological capital (-). None of the health-related behaviour variables was significant.

Flourishing was predicted by stressful experiences (-), psychological capital (+) and flow (+). It was also predicted by low consumption of fast food/takeaways ($\beta = 0.58$ $p < 0.05$).

Conduct problems were predicted by positive coping (-). None of the health-related behaviour variables was significant.

Hyperactivity was predicted by positive coping (-) and low daytime sleepiness ($\beta = -0.16$ $p < 0.05$).

Emotional problems were predicted by low social support, negative coping and low psychological capital. None of the health-related behaviour variables was significant.

Prosocial behaviour was predicted by low negative coping. None of the health-related behaviour variables was significant.

Peer problems were predicted by negative coping (+). None of the health-related behaviour variables was significant.

DISCUSSION

The present study is the first to use a holistic approach to the study of HRBs and the well-being of secondary school students. Most of the previous research has used univariate analyses to examine associations between well-being and HRBs. In the present study, these analyses confirmed many previous findings, with healthy diet options (breakfast and fruit/vegetables) and exercise being associated with more positive well-being and daytime sleepiness being associated with more negative well-being. In these analyses, there was little evidence of junk food and energy drinks being associated with well-being. Results from the Cornish Academies project showed that a high junk food diet, which included energy drink consumption, was associated with lower academic attainment and conduct problems. Well-being was not measured in that project, so the different results may reflect the different outcome measures. However, a different explanation is supported by the results from the regression analyses. The univariate analyses showed that the HRBs were correlated with many of the established predictors of well-being. Regressions were carried out, including both the HRBs and the established predictors as independent variables and the well-being measures as outcomes. Many of the effects of HRBs found in the univariate analyses were no longer significant when established predictors were included in the regression model. The best example of this was daytime sleepiness which was associated with many outcomes in the correlational analyses but had few significant effects in

the regressions. This leads to the conclusion that many associations between HRBs and well-being outcomes reflect their associations with established psychosocial predictors. Even where the effects of HRBs remained significant, the size of the associations with the outcomes was smaller than the established predictors of well-being.

Another type of effect was also observed in the regressions, namely significant effects of fast-food/takeaways that were not observed in the univariate analyses. This shows that multivariate analyses, including established predictors, are essential to obtain a better representation of the effects of HRBs once the shared variance with other variables is removed. The present study also included the SDQ variables because they are very relevant to secondary school students. Indeed, a recent study^[44] has shown these are more strongly associated with autistic and ADHD traits than WPQ outcomes. However, the present study showed that most of the SDQ variables were not associated with HRBs, which confirms that the WPQ is a more useful measuring instrument in this type of research. Future research can use the present methodology in longitudinal or intervention studies, and this will lead to a better understanding of underlying mechanisms and practical implications.

CONCLUSION

Previous research suggests that HRBs are associated with well-being. This was examined here using the DABS, WPQ and SDQ measuring instruments. An online survey was carried out with a sample of secondary students in South Wales. Initial univariate analyses confirmed many of the associations reported in the literature. Multivariate regressions showed that many of the significant correlations between HRBs and well-being outcomes were no longer significant when established predictors of well-being were included in the model. However, some associations remained significant (e.g. consumption of fruit/vegetables and positive well-being), and some new effects became significant (e.g. consumption of fast-food/takeaways and reduced positive well-being). This methodology can now be used to identify the mechanisms underlying these associations and their practical implications.

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