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The Diet and Behaviour Scale (DABS): Testing a New Measure of Food and Drink Consumption in a Cohort of Secondary School Children From the South West of England

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Abstract

A multitude of instruments exist to assess dietary intake. Many, however, are time-consuming to administer, focus primarily on macronutrient composition or the effects of specific micronutrients, and do not consider the effects of foods and drinks that fail to add significant nutritional contributions (e.g. energy drinks, chewing gum). In order to address these issues the current paper introduces the Diet and Behaviour Scale (DABS). This 29-item questionnaire is used to measure both the frequency and amount of consumption of common foods and drinks, with a particular onus on functional foods and dietary variables of current concern. The DABS was administered to a large cohort of secondary school children from the South West of England at two time-points. At Time 1 (December 2012) the cohort consisted of 3071 pupils, 2030 of whom responded to the questionnaire; at Time 2 (June 2013) 3323 pupils made up the cohort, and 2307 completed the questionnaire. Factor analysis yielded a four-factor solution labelled Junk Food, Caffeinated Soft Drinks/Gum, Healthy Foods, and Hot Caffeinated Beverages. When investigating how these factors were related to demographic and lifestyle variables, Chi-square analyses uncovered the following relationships: being male was associated with high Junk Food intake; sleeping for fewer hours than average, achieving low school attendance, and having poor general health were associated with high intake of Caffeinated Soft Drinks/Gum; lower school year, more sleep, more frequent exercise, and good general health were associated with high intake of Healthy Foods; and being male, having a special educational needs status, reporting fewer hours of sleep, and being in an older school year were associated with a high intake of Hot Caffeinated Beverages. Whilst controlling for demographic and lifestyle variables, logistic regression analyses determined that poor general health was predicted by high consumption of Caffeinated Soft Drinks/Gum and low consumption of Healthy Foods. Though additional studies are required to further test the questionnaire and its associated factor structure, the DABS is considered to be a useful self-report measure of certain aspects of dietary intake, and is proposed as a useful tool for future research investigating dietary influences on psychological variables such as mental wellbeing.

Keywords: caffeine, diet, diet and behaviour scale, energy drinks, nutrition, wellbeing

1. Introduction

Though it is widely understood that poor quality nutrition is associated with physical health complications such as obesity, diabetes, and the metabolic syndrome (Bonow & Eckel, 2003), it is a lesser-known fact that diet also exerts both short-term and long-term effects on cognition, mood, and behaviour. For instance, carbohydrate-rich afternoon snacks can provide acute benefits in cognitive performance (Kanarek, 1997; Kanarek & Swinney, 1990), and high vegetable consumption has been shown to protect against age related cognitive decline and Alzheimer's disease (Loef & Walach, 2012). It is likely that many such diet-induced improvements in cognitive functioning may simply reflect the reversal of a poor nutritional status (Bellisle, 2004). However, we also consume things that have little nutritional effect but also influence behaviour (e.g. caffeine). The initial aim of the present research was to develop a questionnaire that could be used to assess consumption of types of food and drink that are not always represented in food frequency questionnaires (FFQs). Other research often uses single measures of the food/drink under consideration and there is frequently little attempt to co-vary additional aspects of diet. The need for such a measure can be shown by considering some of the recent research in this area. Consumption of certain foods may have positive effects (e.g. consumption of breakfast, fruit and vegetables) whereas other eating and drinking patterns (e.g. consumption of junk food and energy drinks) are thought to lead to more negative outcomes. Both types of effect are described here. The review is then followed by research on the initial development of the questionnaire, which can then be use in analyses examining the association between diet, academic attainment, attendance and behaviour at school.

A well-documented example of how diet can affect behaviour and cognition is the intake or omission of breakfast. Eating breakfast has been associated with acute benefits such as promoting positive mood and calmness, improving short-term recognition and spatial memory, free recall and auditory attention (Mahoney, Taylor, Kanarek, & Samuel, 2005; Smith, Clark, & Gallagher, 1999; Smith, Kendrick, & Maben, 1992; Smith, Kendrick, Maben, & Salmon, 1994). Furthermore, the benefits appear to extend beyond the short-term, with those who consume breakfast on a daily basis being found to be less depressed, less emotionally distressed, and to have lower levels of perceived stress than those who do not eat breakfast each day (Smith, 1998; for a review of the behavioural effects of breakfast, see Smith, 2011). Breakfast consumption is often measured using a single item that asks about the frequency of having breakfast (Smith, 2011). This means that most of the research has failed to remove the influence of other dietary variables. Most of the research has also been cross-sectional, which means that it is often difficult to determine causality (e.g. not eating breakfast could increase depression, or, alternatively, depression could influence consumption of breakfast). Breakfast intervention programmes have been shown to improve school attendance (Powell, Walker, Chang, & Grantham-McGregor, 1998), academic performance (Rampersaud, Pereira, Girard, Adams, & Metzl, 2005) and behaviour (Murphy et al., 1998). In addition, diet has also been found to be a significant predictor of academic performance, even after socioeconomic status and gender differences have been controlled for (Florence, Asbridge, & Veugelers, 2008). Due to such observations, a more thorough understanding of the cognitive and behavioural effects of different dietary profiles in the school environment is desirable.

Another aspect of diet that has gained considerable interest regarding its effects on behaviour is snacking (defined as consuming food or drink between meals; Chaplin & Smith, 2011a). The acute effects of snacking appear to be similar to those observed after meals; for example, cereal bars have been shown to produce similar effects to those of breakfast (Smith & Stamatakis, 2010; Smith & Wilds, 2009). However, it also appears that certain forms of snacking may be associated with negative effects. For example, a study of over 800 nurses, (Chaplin & Smith, 2011b) found snacking on crisps, chocolate and biscuits to be associated with higher stress, more cognitive failures and more injuries outside of work. Furthermore, a recent 10-day intervention study (Smith & Rogers, 2014) demonstrated snacking on chocolate once per day to lead to decreases in self-reported wellbeing. However, this study also found that snacking on fruit led to an increase in wellbeing, therefore suggesting that snacking itself may be of less importance than the foods that are chosen to snack upon, and that supplementing the right food items as snacks may be an effective way to increase subjective wellbeing.

One aspect of diet that is generally considered to be beneficial is the high intake of fruit and vegetables. Though campaigns such as ‘five-a-day’ are likely to have been motivated by research showing fruit and vegetable intake to have protective effects against stroke and coronary heart disease (Ness & Powles, 1997) as well as a number of cancers (Riboli & Norat, 2003), their consumption is also known to exert effects on mood and cognitive functioning. For instance, high cruciferous and green leafy vegetable intake has been associated with slower age-related cognitive decline (Kang, Ascherio, & Grodstein, 2005; Morris, Evans, Tangney, Bienias, & Wilson, 2006). Furthermore, a recent longitudinal study of elderly Taiwanese adults demonstrated high vegetable intake to be associated with significantly fewer depressive symptoms (Tsai, Chang, & Chi, 2012).

A number of dietary products of current concern do not provide significant nutritional contributions. As FFQs often focus on macronutrient composition (Rockett et al., 1997), micronutrient profiles (Watson, Collins, Sibbritt, Dibley, & Garg, 2009), or food categories (Hu et al., 1999), rather than specifically identifying factors known to influence behaviour, the effects of certain ‘functional foods’ may be wrongly ascribed or missed altogether. Chewing gum, for example, has been associated with positive mood, faster reaction times, and increased alertness (Allen & Smith, 2011; Smith, 2009, 2010). Another important example is caffeine. Though caffeine contributes no nutritional value in itself, it has become one of the most commonly consumed dietary ingredients (Heckman, Weil, & Gonzalez de Mejia, 2010) with around 80% of the world’s population consuming it on a daily basis (Ogawa & Ueki, 2007). Due to the far-reaching effects of caffeine on mood, behaviour and cognitive function (Smith, 2002) and considering that roasted coffee beans (*Coffea Arabica* and *Coffea robusta*) and tea leaves (*Camelia siniensis*) are the world’s primary sources of the substance (Barone & Roberts, 1996), it may be important to record tea and coffee consumption when assessing diet. In addition to tea and coffee, ‘energy drinks’ are known to provide little of nutritional value, yet deliver high levels of caffeine. These products are associated with short-term improvements in aerobic endurance, anaerobic performance, reaction time, concentration and memory (Alford, Cox, & Westcott, 2001; Scholey & Kennedy, 2004). Though others (e.g. McLellan & Lieberman, 2012) consider there to be little evidence to ascribe these effects to ingredients other than caffeine, the fact that such products have also been associated with serious health complaints, such as arrhythmias, tachycardia, stroke, psychotic symptoms/mania, seizures, and even death (Seifert, Schaechter, Hershorin, & Lipschultz, 2011) suggests that their inclusion in dietary questionnaires is both relevant and necessary.

The above section shows that it is desirable to have a measure of consumption of food and drink that may lead to changes in cognition and behaviour. This topic has often been studied using single frequency or quantity questions and such an approach does not allow one to control for other aspects of diet. There have been comprehensive reviews that have examined the dietary assessment methods in school age children. One review (McPherson, Hoelscher, Alexander, Scanlon, & Serdula, 2002) concluded that the heterogeneity of the designs of the studies, study populations, and instruments makes comparisons between methods, and often within methods, difficult. Another review (Livingston & Robson, 2000) examined the issue of misreporting and the identification of misreporters. Correlations between reference methods and dietary assessment tools were almost always higher for food records and recall than for FFQs. Despite the superiority of techniques based on food records or recall these methods of measuring dietary intake can be problematic for several reasons. If, for example, one is using weighed food records, data collection and analysis are often extremely time consuming, expensive, and dropout rates for studies could be relatively high. Some of these problems can be removed by using estimated food records but, again, this is not an ideal method for large sample sizes. Food recall also has problems in that the observations may be a poor measure of general intake and may show biases towards recall of certain types of dietary product. Multi-pass recall removes some of these problems but, again, is memory dependent and data entry can be labour intensive. Due to these reasons, FFQs are often used as a more economical alternative.

There are studies that have shown self-administered FFQs to be able to produce similar results as food diaries (Rimm et al., 1992). However, these correlations are often present for the group as a whole but not for individuals (Rockett et al., 1997). Other studies (e.g. Willett et al., 1985) have shown poor agreement between the FFQ and recall, although the FFQ could correctly classify low, medium and high intake consumers. This suggests that studies using FFQs with children should compare these categories rather than analyzing the scores as continuous variables. Many FFQs are still relatively long and time consuming to implement. Even scales such as The Youth/Adolescent Food Frequency Questionnaire (Rockett et al., 1997), which contains 131 items, could be problematic when administered to participants who struggle to sustain concentration for long periods of time (e.g. schoolchildren). The main focus of most FFQs is the estimation of nutrient values (Willett et al., 1985; Willett, Reynolds, Cottrell-Hoehner, Sampson, & Brown, 1987), caloric consumption, and macronutrient composition (Martin-Moreno et al., 1993). However, people do not eat isolated nutrients, but meals consisting of a variety of foods with complex combinations of nutrients (Hu et al., 1999). In addition to this, certain foods and drinks (e.g. chewing gum and energy drinks) contain very little of nutritional value, yet are known to have far reaching effects on behaviour, cognition and mood.

Factor analysis is a common method used to reduce a large number of foods and drinks to take into account the fact that consumption of different items is often highly correlated. Not all studies use factor analysis; some classify the items on the basis of nutritional properties (Bertoli et al., 2005; Brunner, Stallone, Juneja, Bingham, & Marmot, 2001; Emmett, 2009; Rockett et al., 1997; Watson et al., 2009). The results of factor analyses have also been very variable. For example, some studies report a two-factor solution (Ambrosini et al., 2011; Hu et al., 1999). However, this often leads to inclusion of items with a low weighting on the factor and/or exclusion of certain factors. These methods of factor analysis also often explain very little of the variance (e.g. 20% - Hu et al., 1999). Other studies (Speck, Bradley, Harrell, & Belyea, 2001) have identified 10 factors with several only containing a small number of items. There have been a number of studies that use factor analysis to examine the dietary patterns of adolescents (Ambrosini et al., 2011; Bertoli et al., 2005; Malik et al., 2012; McNaughton, Ball, Mishra, & Crawford, 2008; Speck et al., 2001). These studies also show variable results but often identify a “Western” pattern (e.g. high intake of take-away foods, soft drinks, confectionery, French fries, refined grains, full-fat dairy products and processed meats) and a “healthy” or “prudent” pattern (e.g. whole grains, fruit, vegetables, legumes and fish). These dietary patterns are associated with lifestyle, demographic and psychosocial factors. Indeed, it is clear that dietary patterns are present in adolescents and that these may be risk factors for future disease (Malik et al., 2012; McNaughton et al., 2008).

The objective of the current paper is to describe a new, easy to administer questionnaire, which can be used in studies of the psychological effects of diet, in order to provide a solution to some of the problems associated with other commonly used measures. The questionnaire’s main function is to record both the frequency and amount of consumption of common foods and drinks, with the further purpose of investigating their effects on behaviour and cognition. It is not intended as a replacement for FFQs used to study other domains and does not provide information on all important food groups (e.g. dairy products are not covered). The current paper further aims to investigate the structure underpinning the questionnaire by using exploratory factor analysis. The paper will also then discuss relationships observed between the factors extracted and a number of demographic and lifestyle variables. This initial study was conducted with schoolchildren, as it was part of a larger programme examining associations between diet, academic attainment and behaviour. Other parallel research is also using the scale with university students and working adults.

2. Method

The Cornish Academies Project is a large-scale longitudinal programme of research designed to investigate dietary effects on school performance and wellbeing in secondary school children. Two cross-sections of data were collected from three academies in the South West of England. The first cross-section (Time 1; T1) was collected six months prior to the second cross-section (Time 2; T2), in order to allow for longitudinal analyses of dietary change over time (though such analyses will be presented in future reports).

2.1 Participants

Three thousand and seventy one secondary school pupils from three academies in the South West of England (Academy 1 $N = 954$, Academy 2 $N = 1363$, Academy 3 $N = 754$) were asked to take part in the current study. Two thousand six hundred and ten (85%) agreed to participate. Approximately 20% of the sample came from each of the five year-groups present in UK secondary education, giving an age range of 11-16 years ($M = 13.83$, $SD = 1.46$) and a relatively balanced sex ratio (51.1% males, 48.9% females). Almost all participants were White (97.3%), the majority of which spoke English as their first language (98.3%). Thirteen per cent of pupils met the eligibility requirements to receive free school meals (a proxy indication of socioeconomic status; Shuttleworth, 1995), and the prevalence of special educational needs was relatively high (21.8%).

2.2 Materials & Apparatus

The Diet and Behaviour Scale (DABS) is a 29-item questionnaire developed for the purpose of assessing intake of common dietary variables with an onus on functional foods, and foods and drinks of current concern (for individual questions included, see Tables 1 and 2). The questions were selected to cover areas of eating and drinking where there has been interest in possible effects on behaviour. Many of the questions had been used individually by the researchers or other research teams to assess the behavioural effects of coffee, tea, caffeinated soft drinks, breakfast, chewing gum, fruit and vegetables, and junk food. Individual items were also present in other FFQs and have been compared with food recall or records. The advantage of the present approach over the use of single items was that consumption of other foods and drinks could be statistically controlled for. The advantage over other FFQs was the length, and, as described in the literature, the relevance to food and drink with little nutritional value.

The first section of the DABS focuses on how frequently the respondent typically consumes common foods and drinks. Frequency of consumption of 18 dietary variables is measured on a five-point scale (1 = never, 2 = once a month, 3 = once or twice a week, 4 = most days [3-6], 5 = every day). The second section investigates the typical amounts consumed for 11 common foods and drinks. Eight of these items (energy drinks, cola, coffee, tea, crisps, chocolate, burgers/hot dogs, and chewing gum) require participants to state how much they typically consume per week, whereas three items (pieces of fruit, portions of vegetables, and water) require participants to state how much they typically consume per day.

Alongside the DABS, five questions were administered in order to assess additional aspects of lifestyle. It is considered important to address such variables as it has been suggested by some (e.g. Akbaraly, 2009) that diet simply reflects general lifestyle. Three items were used to gauge the frequency by which subjects participated in mildly energetic, moderately energetic, and vigorous physical exercise, with answers being given on a four-point scale (1 = never/hardly ever, 2 = about once to three times a month, 3 = once or twice a week, 4 = 3 times a week or more). Finally, participants were asked to state how many hours per night they typically spent sleeping, and to give an indication of their general health (1 = very good, 2 = good, 3 = fair, 4 = bad, 5 = very bad).

2.3 Design & Procedure

Schoolteachers administered the DABS, along with the aforementioned additional lifestyle questions, in the classroom to pupils from their respective academies. Demographic information relating to the participants was later acquired through the School Information Management System (SIMS) and stored within a confidential database in Cardiff. This information included age, sex, academy attended, school year, ethnicity, special educational needs status, eligibility to received free school meals, whether or not English was spoken as an additional language, and whether the child was looked after by a non-parental guardian.

All questionnaire and demographic data were fully anonymised before being merged into a single dataset. Cardiff University's School of Psychology Ethics Committee granted ethical clearance for the study, and informed consent was acquired from all participants (as well as from their parents) prior to data collection.

2.4 Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics Version 20. Initial cross-tabulations were examined to determine how representative the sample was. This was followed by factor analysis using varimax rotation. Based on the items that loaded strongly onto each factor extracted, subscales were then created, and internal consistency was tested using Cronbach's alpha. Finally, relationships between dietary factors and lifestyle and demographic variables were examined using cross-tabulations and logistic regression.

3. Results

3.1 Representativeness of the Sample at T1

A relatively high response rate of 77.8% was observed for completion of the DABS at T1. In order to investigate whether this sample was representative of the academies from which it came, Chi-square tests were used to determine if SIMS data for those who completed the DABS differed from SIMS data of those who did not. Though it was noted that there were trends for females, $\chi2$ (1, N = 3040) = 2.935, p = .087, and those not entitled to free school meals, $\chi2$ (1, N = 3040) = 3.218, p = .073, to be more likely to answer the questionnaire, neither achieved statistical significance. However, the school year that a participant came from was significantly related to their likelihood to complete the DABS, $\chi2$ (4, N = 3040) = 13.076, p = .011, with fewer respondents than expected coming from Year 7, and more respondents than expected coming from Year 9. It was also found that children with a special educational needs status were less likely to answer the questionnaire, $\chi2$ (1, N = 3068) = 21.056, $p < .001$. In addition to this, more respondents than expected came from Academy 1 and Academy 2, and fewer than expected came from Academy 3, $\chi2$ (2, N = 3071) = 164.003, $p < .001$. Though such findings may cast doubts on the sample's representativeness, it must be noted that the variables in question were statistically controlled for in subsequent analyses.

Of those who completed the DABS at T1, 683 (33.6%) came from Academy 1, 993 (48.9%) came from Academy 2, and 354 (17.4%) came from Academy 3. Exactly 50% were male and 50% were female, and similar numbers came from each of the school years present in secondary education: Year 7 = 356 (17.8%), Year 8 = 393 (19.6%), Year 9 = 438 (21.9%), Year 10 = 398 (19.9%), Year 11 = 417 (20.8%). Two hundred and forty-five (12.2%) pupils were eligible for free school meals and 393 (19.4%) had a special educational needs status. Almost all pupils were White (1937; 97.5%), spoke English as their first language (1994; 98.2%), and were not looked after by a non-parental guardian (2018; 99.4%).

3.2 Dietary Questionnaire Data and Factor Analysis

Considerable variance in responding to the DABS was observed (for frequency of consumption data, see Table 1; for amount of consumption data, see Table 2). Table 2 shows a number of outliers that probably reflect confusion over the time period assessed. Such outliers need to be removed if the scores are treated as continuous variables. The amount of missing data was generally low (the greatest amount for frequency items being 1.2% at T1 and 1.8% at T2; the highest for amount items being 2.4% at T1 and 2.8% at T2) and probably reflects slight difficulties in understanding the questions (e.g. some children may not know what processed meat refers to, or may use metric units rather than pints).

In order to reduce data, and because the frequency and amount of consumption of many foods and drinks are known to be heavily inter-correlated (Wiles, Northstone, Emmett, & Lewis, 2009), food frequency data are often entered into a factor analysis. All 29 items of the DABS were entered into an exploratory factor analysis with the number of factors extracted being determined by examining the scree plot. The factor analysis used varimax rotation and a four-factor solution with eigenvalues greater than 1.5 was extracted. This solution accounted for 38.02% of variance within the dataset at T1 and 37.74% at T2. Due to high loadings from crisps, chocolate, chips, and sweets, factor 1 was labelled 'Junk Food'. This factor explained 11.87% of variance at T1 and 12.07% at T2 (initial eigenvalues: T1 = 4.584, T2 = 4.479). Due to high loadings from energy drinks, chewing gum, and cola, factor 2 was labelled 'Caffeinated Soft Drinks/Gum'. This factor explained 10.44% of variance at T1 and 10.26% at T2 (initial eigenvalues: T1 = 2.539, T2 = 2.547). Factor 3 explained 8.52% of variance at T1 and 8.34% at T2 (initial eigenvalues: T1 = 2.21, T2 = 2.204), and was labelled 'Healthy Foods' due to high loadings from variables measuring fruit and vegetable consumption. Factor 4 was labelled 'Hot Caffeinated Beverages' due to high loadings from tea and coffee. This last factor explained 7.19% of variance within the dataset at T1 and 7.07% at T2 (initial eigenvalues: T1 = 1.694, T2 = 1.715). For factor loading scores at T1 and T2, see Table 3.

To verify the factor structure described in the above paragraph, separate exploratory factor analyses were conducted for each of the three academies at both T1 and T2. Very similar four-factor structures emerged in each of these analyses (for the percentage of variance explained by each factor and the initial eigenvalues, see Table 4; for all factor loading scores at T1 and T2, see Tables 5 and 6, respectively). In order to assess whether the factors discussed above measure the same underlying variables, reliability analyses were conducted for the items that loaded strongly onto each factor to test for internal consistency. It was found that the internal consistency for each of these dietary subscales was acceptable. Standardised Cronbach's α values were as follows: Junk Food (items 2, 3, 10, 17, 23, and 24) T1, 0.735, T2, 0.74; Caffeinated Soft Drinks/Gum (items 7, 8, 9, 19, and 26) T1, 0.741, T2, 0.724; Healthy Foods (items 4, 27, and 28) T1, 0.691, T2, 0.693; Hot Caffeinated Beverages (items 5, 6, 21, and 22) T1, 0.675, T2, 0.661.

Table 1. Frequency of consumption of common dietary variables as assessed by the DABS at T1 and T2

	N		Never		Once a month		Once/twice a week		Most days (3-6)		Every day	
Frequency	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**	**T1**	**T2**
Q1. How often did you eat breakfast?	2022	2306	8.60%	8.20%	4.70%	5.10%	15.70%	15.60%	20.60%	23.10%	**50.40%**	**48%**
Q2. How often did you eat chocolate?	2019	2294	1.70%	1.70%	11.40%	12%	**43.50%**	**45.40%**	29.80%	30%	13.50%	10.90%
Q3. How often did you eat crisps?	2019	2298	4.30%	5.60%	10%	11.10%	30%	30.70%	**36.50%**	**36.60%**	18.60%	15.90%
Q4. How often did you eat 5 fruit or vegetables?	2011	2295	6.20%	6.40%	9.30%	7.90%	27.50%	29.60%	**42.70%**	**42.70%**	14.30%	13.30%
Q5. How often did you drink coffee?	2025	2301	**63.80%**	**65.30%**	10.30%	9.70%	10.70%	11.40%	7.80%	6.70%	7.50%	6.90%
Q6. How often did you drink tea?	2024	2303	**35.60%**	**35.80%**	11.80%	11%	17.20%	18.50%	16.40%	14.80%	19.10%	20%
Q7. How often did you drink cola?	2025	2298	11.40%	10.40%	25.90%	26.60%	**37.80%**	**41.40%**	18.30%	16.80%	6.70%	4.80%
Q8. How often did you drink energy drinks?	2004	2291	**44.10%**	**44.90%**	28.90%	30.60%	16.30%	16%	7.80%	6.10%	2.80%	2.50%
Q9. How often did you chew gum?	2006	2291	15.80%	16.10%	25.90%	25.30%	**29.30%**	**30.60%**	19.90%	20.40%	9.10%	7.60%
Q10. How often did you eat sweets?	2003	2283	3.70%	4.20%	19.90%	23.30%	**50%**	**53.10%**	21.80%	16.50%	4.60%	2.80%
Q11. How often did you eat fast-food?	2001	2285	8.30%	8.30%	**61.60%**	**61.80%**	24.80%	26.70%	4.50%	2.60%	0.80%	0.60%
Q12. How often did you eat an Indian or Chinese take-away?	2007	2293	23.40%	25.10%	**62.90%**	**64.20%**	11.90%	10%	1.30%	0.30%	0.50%	0.30%
Q13. How often did you eat pies or pasties?	2005	2292	13.90%	14.40%	**50.60%**	**53.20%**	28.80%	27.70%	5.90%	3.80%	0.70%	1%
Q14. How often did you eat processed meat?	1999	2281	**44.90%**	**46.60%**	22.50%	25.70%	20.10%	17.80%	10%	7.90%	0.60%	2%
Q15. How often did you eat fried fish?	2012	2289	29.50%	29.40%	**41.50%**	**43.30%**	24.50%	23.40%	4.20%	3.50%	0.30%	0.30%
Q16. How often did you eat oily fish?	2012	2286	**46.60%**	**47%**	33.80%	32.10%	15.90%	17.40%	3.30%	3.10%	0.40%	0.40%
Q17. How often did you eat chips?	2007	2283	3.40%	3.40%	24.70%	25.10%	**53.30%**	**56.20%**	16.10%	13.90%	0.40%	1.40%
Q18. How often did you eat beans of peas?	2006	2277	10.30%	9.90%	10.90%	12.20%	**46.90%**	**48.40%**	28.50%	27.10%	3.40%	2.50%

Note. Modal values are displayed in bold.

Table 2. Amount of consumption of common dietary variables as assessed by the DABS at T1 and T2

	N		Min		Max		Mean		SD	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Q19. Cans of energy drinks per week	2008	2254	0	0	25	20	0.99	0.93	1.96	1.86
Q20. Cans of cola per week	1996	2253	0	0	36	32	1.49	1.47	2.14	2.22
Q21. Cups of coffee per week	2014	2265	0	0	40	50	1.41	1.42	3.66	4.03
Q22. Cups of tea per week	2010	2267	0	0	50	50	3.48	3.81	5.88	6.54
Q23. Packets of crisps per week	2006	2262	0	0	30	30	3.62	3.55	2.88	2.75
Q24. Bars of chocolate per week	2009	2269	0	0	70	50	3.15	3.12	3.56	3.39
Q25. Burgers/hot dogs per week	1995	2245	0	0	10	11	0.73	0.69	1.09	1.02
Q26. Packs of chewing gum per week	2005	2263	0	0	15	16	1.33	1.29	1.9	1.78
Q27. Pieces of fruit per day	2008	2263	0	0	17	18	2.82	2.74	1.91	1.82
Q28. Portions of vegetables per day	1981	2250	0	0	15	16	2.77	2.57	1.91	1.68
Q29. Pints of water per day	1964	2203	0	0	17	18	2.43	2.47	2.01	1.97

Table 3. Exploratory factor analysis of DABS items at T1 and T2

	Junk Food		Caffeinated Soft Drinks/Gum		Healthy Foods		Hot Caffeinated Beverages	
	T1	T2	T1	T2	T1	T2	T1	T2
Q1. Breakfast (F)	.124	.146	-.456	-.409	.321	.32	.031	-.016
Q2. Chocolate (F)	**.66**	**.611**	.016	-.032	-.065	-.084	.032	-.062
Q3. Crisps (F)	**.669**	**.682**	-.046	-.093	-.057	-.074	-.007	-.014
Q4. Five pieces of fruit or veg (F)	-.262	-.250	-.137	-.084	**.622**	**.623**	-.032	-.076
Q5. Coffee (F)	.013	-.052	.144	.187	.02	.019	**.734**	**.72**
Q6. Tea (F)	.001	.061	.091	.054	.103	.129	**.676**	**.656**
Q7. Cola (F)	.377	.366	**.544**	**.538**	-.039	-.123	.061	.033
Q8. Energy drinks (F)	.178	.171	**.742**	**.693**	-.02	-.077	.115	.196
Q9. Chewing gum (F)	.068	.036	**.61**	**.634**	.021	.079	.175	.044
Q10. Sweets (F)	**.525**	**.512**	.264	.305	.031	.072	-.011	-.053
Q11. Fast-food (F)	.452	.453	.342	.377	-.007	-.06	-.057	-.034
Q12. Takeaway (F)	.375	.356	.259	.214	.185	.129	.069	.062
Q13. Pies or pasties (F)	.312	.350	.229	.198	.395	.318	.048	.108
Q14. Processed meat (F)	.266	.265	.091	.118	.206	.177	-.051	.082
Q15. Fried fish (F)	.227	.239	.038	.029	.485	.457	.082	.073
Q16. Oily fish (F)	.091	.063	-.107	-.062	.497	.454	.081	.188
Q17. Chips (F)	**.531**	**.541**	.196	.138	.021	-.01	-.005	-.016
Q18. Beans or peas (F)	.09	.103	-.069	-.146	.483	.452	.064	.071
Q19. Energy drinks per week	.093	.121	**.699**	**.644**	-.011	-.084	.048	.197
Q20. Cola per week	.250	.276	.456	.472	-.087	-.097	-.034	-.003
Q21. Coffee per week	.029	-.055	.081	.139	-.037	-.052	**.714**	**.684**
Q22. Tea per week	-.005	.065	.034	-.052	.024	.068	**.683**	**.671**
Q23. Crisps per week	**.67**	**.697**	-.019	-.037	-.103	-.104	.066	.105
Q24. Chocolate per week	**.62**	**.626**	.02	.018	-.109	-.098	.03	.009
Q25. Burgers/hot dogs per week	.397	.447	.314	.323	.166	.042	-.023	.012
Q26. Chewing gum per week	-.001	-.046	**.61**	**.658**	.04	.158	.138	-.005
Q27. Fruit per day	-.237	-.231	.054	.044	**.639**	**.66**	-.045	-.1
Q28. Vegetables per day	-.195	-.151	-.02	-.006	**.616**	**.652**	-.026	-.021
Q29. Water per day	-.034	-.036	.02	.044	.401	.405	-.02	.012

Note. Factor scores are the product of varimax (orthogonal) rotation. Factor scores > .5 are displayed in bold. 'F' refers to 'frequency'.

Table 4. Initial eigenvalues and variance explained by each factor across academies at T1 and T2

		Total	**Junk Food**		**Caffeinated Soft Drinks/Gum**		**Healthy Foods**		**Hot Caffeinated Beverages**	
		Total variance explained	Initial eigenvalue	% variance explained	Initial eigenvalue	% variance explained	Initial eigenvalue	% variance explained	Initial eigenvalue	% variance explained
Academy 1	T1	39.45%	5.05	13.55%	2.62	9.32%	2.17	8.85%	1.61	7.72%
	T2	40.37%	5.11	13.12%	2.63	10.36%	2.11	8.89%	1.86	7.99%
Academy 2	T1	38.02%	2.72	10.69%	4.36	11.38%	2.29	8.7%	1.66	7.25%
	T2	36.08%	4.01	11.91%	2.64	9.43%	2.16	7.89%	1.66	6.85%
Academy 3	T1	38.9%	4.69	12.4%	2.44	10.57%	2.09	8.03%	2.06	7.9%
	T2	40.56%	2.79	11.18%	4.87	12.59%	2.29	9.02%	1.81	7.77%

Table 5. Exploratory factor analysis of DABS items at T1 for individual academies

	Junk Food			**Caffeinated Soft Drinks/Gum**			**Healthy Foods**			**Hot Caffeinated Beverages**		
	School 1	**School 2**	**School 3**	**School 1**	**School 2**	**School 3**	**School 1**	**School 2**	**School 3**	**School 1**	**School 2**	**School 3**
Q1. Breakfast (F)	.116	.117	.2	-.462	-.488	-.353	.349	.261	.417	-.029	.103	-.068
Q2. Chocolate (F)	**.688**	**.683**	**.636**	.089	-.041	.01	-.092	-.069	.063	.033	.05	.053
Q3. Crisps (F)	**.703**	**.639**	**.676**	-.156	.014	-.012	-.064	-.021	-.058	.149	-.108	-.117
Q4. Five pieces of fruit or veg (F)	-.251	-.248	-.28	-.165	-.137	-.163	**.64**	**.605**	**.633**	-.028	.034	-.092
Q5. Coffee (F)	.005	-.02	.051	.246	.14	.104	.051	.027	-.014	**.607**	**.72**	**.722**
Q6. Tea (F)	.024	.021	-.037	.029	.079	.053	.079	.09	.145	**.763**	**.66**	**.684**
Q7. Cola (F)	.435	.307	.388	.47	**.61**	**.563**	.001	-.04	-.11	.062	.047	.061
Q8. Energy drinks (F)	.219	.103	.245	**.748**	**.764**	**.689**	-.109	.023	.019	.122	.113	.158
Q9. Chewing gum (F)	.168	.075	-.031	**.469**	**.588**	**.638**	-.021	.022	.091	.323	.254	.024
Q10. Sweets (F)	**.561**	**.545**	.452	.233	.216	.349	.043	-.014	.17	.118	.015	-.077
Q11. Fast-food (F)	**.552**	.401	.398	.333	.349	.34	-.007	-.028	.067	-.127	.018	-.089
Q12. Takeaway (F)	.394	.312	.411	.257	.308	.296	.188	.173	.273	-.046	.052	.184
Q13. Pies or pasties (F)	.383	.302	.155	.208	.217	.318	.353	.44	.356	.019	.062	.141
Q14. Processed meat (F)	.232	.212	.357	.065	.11	.117	.295	.189	.103	.16	-.201	.021
Q15. Fried fish (F)	.209	.161	.285	.096	.041	.086	.45	.499	**.517**	.124	-.037	.18
Q16. Oily fish (F)	.112	.065	.046	-.013	-.132	-.06	.444	**.538**	.481	.029	.046	.131
Q17. Chips (F)	.479	**.581**	.489	.205	.213	.178	.05	.034	-.002	.035	-.023	.017
Q18. Beans or peas (F)	.161	.015	.126	-.086	-.054	-.089	.459	**.527**	.367	.087	-.025	.211
Q19. Energy drinks per week	.153	.016	.151	**.709**	**.724**	**.659**	-.051	.002	-.016	.075	.032	.071
Q20. Cola per week	.316	.168	.276	.329	**.552**	**.534**	-.066	-.098	-.131	-.018	-.058	-.095
Q21. Coffee per week	.009	-.028	.127	.2	.078	.009	.018	-.017	-.136	**.572**	**.686**	**.726**
Q22. Tea per week	.089	-.01	-.074	-.087	.06	-.025	.03	-.026	.073	**.739**	**.685**	**.688**
Q23. Crisps per week	**.688**	**.614**	**.734**	-.097	.04	-.01	-.061	-.094	-.168	.197	-.059	-.02
Q24. Chocolate per week	**.666**	**.612**	**.627**	.104	-.006	.0	-.05	-.135	-.104	-.029	.034	.08
Q25. Burgers/hot dogs per week	.442	.316	.462	.323	.371	.218	.233	.185	-.006	-.163	.016	.154
Q26. Chewing gum per week	.068	.005	-.065	.48	**.582**	**.66**	.041	.059	-.053	.33	.205	-.043
Q27. Fruit per day	-.213	-.24	-.251	.061	.034	.039	**.686**	**.658**	.468	-.068	.025	-.145
Q28. Vegetables per day	-.185	-.198	-.214	-.058	-.04	.052	**.673**	**.578**	**.571**	-.008	.024	-.11
Q29. Water per day	-.07	-.043	.04	-.093	.063	.056	.382	.392	.443	-.002	-.01	-.021

Note. Factor scores are the product of varimax (orthogonal) rotation. Factor scores > .5 are displayed in bold. 'F' refers to 'frequency'.

Table 6. Exploratory factor analysis of DABS items at T2 for individual academies

	Junk Food			**Caffeinated Soft Drinks/Gum**			**Healthy Foods**			**Hot Caffeinated Beverages**		
	School 1	**School 2**	**School 3**	**School 1**	**School 2**	**School 3**	**School 1**	**School 2**	**School 3**	**School 1**	**School 2**	**School 3**
Q1. Breakfast (F)	.097	.113	.182	-.497	-.371	-.262	.298	.346	.342	.014	-.007	-.173
Q2. Chocolate (F)	**.602**	**.587**	**.629**	.053	-.154	.104	-.151	-.024	-.025	.016	-.102	-.044
Q3. Crisps (F)	**.702**	**.642**	**.73**	-.133	-.054	-.033	-.097	-.058	.04	.067	-.061	-.153
Q4. Five pieces of fruit or veg (F)	-.234	-.271	-.261	-.104	-.017	-.112	**.612**	**.632**	**.654**	-.132	-.059	-.12
Q5. Coffee (F)	.02	-.094	-.019	.101	.3	.109	.043	.0	.002	**.655**	**.627**	**.795**
Q6. Tea (F)	.058	.083	-.059	.096	.003	.078	.107	.083	.268	**.714**	**.723**	**.523**
Q7. Cola (F)	.4	.442	.237	**.539**	.469	**.597**	-.091	-.164	-.079	-.05	.099	.04
Q8. Energy drinks (F)	.195	.227	.094	**.639**	**.721**	**.687**	-.096	-.049	-.113	.254	.142	.212
Q9. Chewing gum (F)	.079	.042	-.031	**.672**	**.583**	**.673**	.023	.04	.168	.147	.084	-.134
Q10. Sweets (F)	**.55**	**.54**	.324	.346	.141	**.524**	.139	.067	.017	.048	-.051	-.088
Q11. Fast-food (F)	**.508**	.43	.439	.414	.217	.497	-.03	-.094	-.041	-.098	.065	-.021
Q12. Takeaway (F)	.427	.319	.374	.185	.123	.295	.142	.144	.058	-.093	.221	.093
Q13. Pies or pasties (F)	.383	.373	.241	.209	.131	.256	.419	.286	.231	.058	.134	.217
Q14. Processed meat (F)	.261	.211	.272	.098	.086	.251	.281	-.008	.35	.086	.086	.037
Q15. Fried fish (F)	.233	.211	.184	.073	-.092	.132	**.509**	.389	.49	.196	.024	.149
Q16. Oily fish (F)	.06	.042	.011	-.117	-.15	.108	.42	.422	**.531**	.195	.18	.23
Q17. Chips (F)	**.528**	**.558**	.492	.163	.048	.268	.014	-.037	.03	.062	-.016	-.081
Q18. Beans or peas (F)	.123	.051	.128	-.099	-.184	-.098	.439	.444	.485	.032	.086	.096
Q19. Energy drinks per week	.171	.145	.069	**.601**	**.682**	**.633**	-.137	-.032	-.115	.234	.123	.275
Q20. Cola per week	.216	.362	.262	.433	.413	**.583**	-.069	-.11	-.101	-.157	.003	.21
Q21. Coffee per week	.052	-.138	-.02	.122	.228	.069	-.026	-.023	-.148	**.652**	**.539**	**.803**
Q22. Tea per week	.064	.065	-.015	.029	-.116	-.038	.066	.024	.202	**.718**	**.758**	.492
Q23. Crisps per week	**.722**	**.652**	**.737**	-.071	.008	-.004	-.089	-.077	-.049	.239	-.004	.0
Q24. Chocolate per week	**.667**	**.581**	**.623**	.085	-.103	.095	-.083	-.06	-.103	.109	-.065	.07
Q25. Burgers/hot dogs per week	.467	.471	.39	.273	.257	.417	.106	-.009	.042	-.025	.017	.149
Q26. Chewing gum per week	.019	-.037	-.186	**.682**	**.618**	**.687**	.107	.138	.18	.157	-.01	-.117
Q27. Fruit per day	-.228	-.219	-.241	-.031	.193	-.05	**.664**	**.657**	**.645**	-.153	-.093	-.079
Q28. Vegetables per day	-.213	-.103	-.174	-.003	.048	-.063	**.644**	**.685**	**.571**	-.09	.019	.043
Q29. Water per day	-.051	-.065	.018	-.072	.16	.045	.455	.373	.368	.095	-.04	.026

Note. Factor scores are the product of varimax (orthogonal) rotation. Factor scores > .5 are displayed in bold. 'F' refers to 'frequency'.

3.3 Lifestyle Variables

Mildly energetic exercise was common, with the majority of pupils (73% at T1, 76.7% at T2) reporting to take part three times a week or more. Likewise, 66.8% at T1 and 65.8% at T2 took part in moderately energetic exercise at least once per week. Vigorous exercise was also relative common, with 56.5% at T1 and 57.1% at T2 taking part at least once per week. The majority of pupils reportedly slept between seven and 10 hours per night, with mean scores of 8.64 (SD = 1.55) at T1 and 8.41 (SD = 1.54) at T2 being observed. General health was also deemed to be relatively high, with 95.5% at T1, and 94.9% at T2, claiming their health to have been ‘fair’ or better (72.3% at T1 and 70.6% at T2 responding with either ‘good’ or ‘very good’).

The three items relating to exercise frequency (mildly energetic, moderately energetic, and vigorous exercise) were factor analysed to provide a single factor solution. At T1 the (un-rotated) factor loadings were as follows: moderate exercise, .796, vigorous exercise, .765, mild exercise, .534. The initial eigenvalue was 1.503, and the factor extracted explained 50.12% of variance. At T2, the following (un-rotated) factor loadings were observed: vigorous exercise, .778, moderate exercise, .765, mild exercise, .56. The initial eigenvalue was 1.504, and the factor was found to explain 50.13% of the variance.

3.4 Relationships Between Dietary Factors and Lifestyle and Demographic Variables at T1

Factor scores were recoded into new dependent variables based on median splits. This provided a high consumption group and a low consumption group for each factor extracted. Relationships between these groups and demographic and lifestyle variables were subsequently investigated at T1 using Chi-square analyses. To partial out variance from confounders (e.g. socioeconomic status), any observed associations were then further investigated using forwards logistic regression. The covariates entered into the regression models were academy attended, school year, sex, eligibility to receive free school meals, special educational needs status, exercise frequency (median split of the previously discussed exercise frequency factor score), school attendance, and sleep. Ethnicity, speaking English as an additional language, and being looked after by a non-parental guardian were not controlled for in these analyses due to the numbers present in the relevant minority groups being particularly small. General health was also dichotomised, with those claiming their health to have been 'good' or 'very good' making up the good health group, and those claiming their health to have been 'fair', 'bad', or 'very bad' comprising the poor health group. It was found that poor health was associated with being in the high consumption group for Caffeinated Soft Drinks/Gum, OR = 1.388, 95% CI [1.11, 1.735], $p = .004$, and being in the low consumption group for Healthy Foods, OR = .477, 95% CI [.38, .598], $p < .001$. Once the demographic and lifestyle covariates described earlier in this paragraph were controlled for, both of these effects remained significant: Caffeinated Soft Drinks/Gum, OR = 1.326, 95% CI [1.034, 1.699], $p = .026$, Healthy Foods, OR = .537, 95% CI [.418, .689], $p < .001$.

3.4.1 Factor 1 (Junk Food)

The only demographic or lifestyle variable that was significantly related to Junk Food consumption was sex. Males were more likely than females to be high consumers, $\chi 2$ (1, $N = 1674$) = 10.413, $p = .001$**.**

3.4.2 Factor 2 (Caffeinated Soft Drinks/Gum)

High consumption of Caffeinated Soft Drinks/Gum was related to poor general health, $\chi 2$ (1, $N = 1627$) = 8.736, $p = .003$, fewer hours of sleep per night, $\chi 2$ (1, $N = 1643$) = 48.678, $p < .001$, and below average school attendance, $\chi 2$ (1, $N = 1674$) = 5.284, $p = .022$.

3.4.3 Factor 3 (Healthy Foods)

Consumption of Healthy Foods was related to school year, $\chi 2$ (4, $N = 1674$) = 10.504, $p = .033$. This finding reflected a significant linear-by-linear trend, by which its consumption decreased with age, $\chi 2$ (1, $N = 1674$) = 9.083, $p = .003$. High consumers of Healthy Foods were also found to sleep for more hours per night, $\chi 2$ (1, $N = 1643$) = 17.885, $p < .001$, to exercise more frequently, $\chi 2$ (1, $N = 1585$) = 28.621, $p < .001$, and to report better general health, $\chi 2$ (1, $N = 1627$) = 42.252, $p < .001$.

3.4.4 Factor 4 (Hot Caffeinated Beverages)

Those in the high consumption group for Hot Caffeinated Beverages were more likely to be male, $\chi 2$ (1, $N = 1674$) = 6.703, $p = .01$, to have a special educational needs status, $\chi 2$ (1, $N = 1699$) = 4.282, $p = .039$, and to report fewer hours of sleep per night, $\chi 2$ (1, $N = 1643$) = 6.248, $p = .012$. Consumption of Hot Caffeinated Beverages was also related to school year, $\chi 2$ (4, $N = 1674$) = 10.522, $p = .033$, with a significant linear-by-linear trend showing that its consumption increased with age, $\chi 2$ (1, $N = 1674$) = 9.772, $p = .002$.

3.5 Possible Methods for Scoring the DABS in Future Research

One method of scoring the DABS is to use four subscales based on the previously discussed factors extracted through exploratory factor analysis. For example, the items loading strongly onto the Junk Food factor were Q2, Q3, Q10, Q17, Q23, and Q24. Therefore these items can be used to make up a subscale for Junk Food. In order to test whether these subscales provide similar measures of diet to the factors extracted through factor analysis, relationships between the relevant variables were investigated using Pearson's correlations. Before being able to do this however, the questionnaire data needed to be converted so that the scoring systems were universal for the items that measured frequency of consumption as well as for those that measured amount. As FFQs are able to distinguish between high, medium and low consumers (Willett et al., 1985), scores from all items were recoded into tertiles (except in cases where a bimodal distribution was observed: for these variables, the smaller of the two groups was counted as one tertile, and a median split was performed on the remaining data to create the required three groups). Strong positive correlations were observed between each subscale and its respective factor score at both time-points: Junk Food: T1, $r(1697) = .744$, $p < .001$, T2, $r(1898) = .729$, $p < .001$; Caffeinated Soft Drinks/Gum: T1 $r(1697) = .747$, $p < .001$, T2 $r(1898) = .743$, $p < .001$; Healthy Foods: T1, $r(1697) = .646$, $p < .001$, T2, $r(1898) = .601$, $p < .001$; Hot Caffeinated Beverages: T1, $r(1697) = .816$, $p < .001$, T2 $r(1898) = .8$, $p < .001$.

Though the subscale scores have been shown to be reliable, and to correlate strongly with their respective factor scores, it is suggested that the factor scores should be used wherever possible during analysis as they take into account variance from items that do not load strongly onto any particular factor. However, as the factor scores cannot be considered to be exactly the same across time-points, it is necessary to use the subscale scores when undertaking change score analyses. It was therefore deemed useful to examine whether the subscales can produce consistent responses over time. To do this, Pearson's correlations (two-tailed) were conducted to determine how strongly the subscale scores from T1 correlated with those from T2. All correlations were positive and ranged from weak to moderate: Junk Food, $r(1514) = .413$, $p < .001$, Caffeinated Soft Drinks/Gum, $r(1542) = .398$, $p < .001$, Healthy Foods, $r(1535) = .295$, $p < .001$, Hot Caffeinated Beverages, $r(1594) = .475$, $p < .001$.

4. Discussion

The current study has shown that the DABS can be associated with an underlying four-factor model of diet consisting of Junk Food, Caffeinated Soft Drinks/Gum, Healthy Foods, and Hot Caffeinated Beverages. In addition to this, it was found that all four factors were significantly related to demographic variables and/or certain aspects of lifestyle. The four-factor model produced provides a useful system for exploration of dietary effects upon other areas of life. Though factor analysis of other FFQs has provided two-factor solutions, such as 'prudent dietary pattern' vs. 'Western pattern' (Ambrosini et al., 2011; Hu et al., 1999), and 'wholefoods' vs. 'processed foods' (Akbaraly, 2009), such a models are considered likely to obscure the effects of dietary items that do not contribute much of significant nutritional value. As these very items (i.e. energy drinks, cola, and chewing gum) were found to make up a unique factor in the four-factor model presented here, this model is deemed to be very relevant when regarding potential for subsequent investigation of their effects upon behaviour, cognition and mood.

It must be acknowledge that several limitations are incurred by the current study. Firstly, as the DABS has previously been untested, the results presented are somewhat preliminary, and so, need validation from future research. In addition to this, the study sample used was somewhat homogeneous (being made up almost entirely of White children from a specific age range, as well as including a high proportion of pupils with special educational needs), and came from an area of relatively low socioeconomic status. Generalisability of the results may therefore be limited.

The issue of reverse-causation is another potential limitation of the current findings. It is highly probable that, though diet is likely to affect health, health may also affect choices made regarding diet and lifestyle. For example, eating healthy foods may promote good health, but having good health may also lead towards the selection of healthy foods. It is possible therefore, that certain dietary variables, particularly those associated with the Caffeinated Soft Drinks/Gum factor, may be viewed as outcomes rather than just causes of behaviour. A healthy diet may also simply reflect an overall healthy lifestyle (Akbaraly, 2009), and so, any effects observed may not be entirely attributable to diet. Though the current study attempted to avoid such issues by controlling for lifestyle covariates such as exercise frequency and number of hours of sleep, it is likely that other variables, mental wellbeing for example, should also be taken into account.

The current paper provides evidence that the DABS can be used to measure the frequency and amount of consumption of common foods and drinks, and it is suggested that the four-factor model (as well as the relevant subscales) associated with it should be further investigated using other populations. As it has previously been demonstrated that diet can exert effects upon behaviour, cognition, and mood, it is also suggested that studies should investigate dietary effects upon psychological wellbeing in order to help identify products that are potentially beneficial or harmful. Further use of the scale may also provide information on levels of consumption that produce effects of clinical significance. In addition, comparison with other methods of assessing diet will allow further development of the measure.

5. Conclusions

The current paper has described a new measure of commonly consumed dietary variables, with an onus upon functional foods and foods and drinks of current concern, that addresses both frequency of consumption as well as amount of consumption, and may save time regarding data collection and analysis compared to other FFQs. A four-factor structure of diet was associated with the questionnaire, consisting of Junk Food, Caffeinated Soft Drinks/Gum, Healthy Foods, and Hot Caffeinated Beverages. The main finding was that Caffeinated Soft Drinks/Gum was associated with negative effects such as fewer than average sleep hours and poor general health, whereas Healthy Foods was associated with good health, frequent exercise and more than average sleep hours. Though the DABS requires further rigorous testing, it is currently considered to be a convenient tool for providing an assessment of recent dietary consumption, and may be of additional use when investigating the effects of diet on mental wellbeing, school performance and behaviour.

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