The purpose of this study was to investigate the relationship between nutrition knowledge and body mass index (BMI). The General Nutrition Questionnaire was distributed to 500 individuals on the database of a large general practice. Results demonstrated that there was no significant correlation between levels of nutrition knowledge and BMI; however, a high level of nutrition knowledge was found among the sample. This suggests that a knowledge deficit may not be the most significant factor preventing overweight individuals from adopting a healthier diet and questions the utility of purely educational approaches to dietary behaviour change. Evidence-based health behaviour change techniques are discussed.

Introduction

Advice-giving approaches aimed at stimulating dietary behaviour change are typically based on variations of the Knowledge–Attitudes–Behaviour model [1]. This model is based on the assumption that exposing an individual to new information leads to a gain in knowledge, prompting changes in attitude, which, in turn, will result in improved dietary behaviour. Both individual and public health initiatives targeting obesity have relied on this logic despite the fact that it is lacking in sound empirical foundations. This failure to convert increased knowledge into dietary behaviour change is well reported in the literature [2, 3]. Although the measures of nutrition knowledge used in some of these studies have been criticized [4], a systematic review of well-controlled studies concluded that behavioural programs are more effective at facilitating dietary change than their knowledge-based counterparts [5].

Underlying the information-giving models, which typically characterize individual nutrition education programs, is the assumption that a knowledge deficit exists in those who are overweight. However, research has demonstrated that people are aware of what they should be eating, particularly in relation to avoiding fat in their diet [6, 7], although knowledge of the links between diet and disease is less robust [8]. Despite a good level of awareness of the major guidelines on healthy eating [8] and the existence of many public health campaigns aimed at encouraging healthier diets (e.g. Five-a-Day campaign), obesity rates continue to rise in the United Kingdom [9]. This suggests that an increase in knowledge alone does not lead to behaviour change and that a knowledge deficit explanation of unhealthy dietary behaviour may be oversimplified.

The aim of this study was to investigate whether there was a significant correlation between levels of nutrition knowledge and body mass index (BMI) in this sample. Previous research has explored the relationship between nutrition knowledge and food intake. Mixed results have been reported [2, 4]. Even fewer studies, if any, have investigated whether...
nutrition knowledge is associated with BMI in adults. One study reported no association between nutrition knowledge, as measured by an unstandardized questionnaire, and obesity rates among adolescents [10]. In the current study, the association between nutrition knowledge and BMI was investigated as it is a longer term index of dietary behaviour, as opposed to the time-limited measures of food intake utilized in other studies [4]. Evidence-based guidelines suggest that the initial goal of weight loss interventions is to reduce body weight by ~10% from baseline [11], hence highlighting the importance of BMI as a primary outcome measure in obesity research. Contrary to assumptions underlying educational and information-giving models of dietary behaviour change, it was hypothesized that there would be no significant correlation between levels of nutrition knowledge and BMI in the sample.

**Method**

**Participants**

The sample comprised the first 500 patients listed in alphabetical order and aged between 18 and 65 years on the database of a large general practice in Belfast, Northern Ireland. The general practice is situated in an urban area with a mixed socio-economic profile. The sample comprised 261 (52%) females and 239 (48%) males, and the mean age was 41.39 years (SD = 12.89).

**Materials**

Levels of nutrition knowledge were assessed using the General Nutrition Questionnaire [12] which is a self-report measure divided into four subscales. Two subscales, ‘awareness of dietary recommendations’ (10 items) and ‘choosing everyday foods’ (11 items), were utilized as these were most relevant to the aims of the study. Research has demonstrated that each of these subscales has good internal and test–retest reliability, e.g. dietary recommendations = 0.70 and 0.80 and choosing everyday foods = 0.76 and 0.87 respectively [12]. Subscale scores can be calculated as well as a total nutrition knowledge score. Demographic questions concerned age and gender. Participants were asked to report their weight and height in order to calculate their BMI. Two additional questions were included to control for those who had nutrition-related qualifications and for individuals who had consulted a nutritionist/dietician in the past year.

**Procedure**

A questionnaire comprising the two subscales of the General Nutrition Questionnaire [12] was distributed to each of the potential participants by post. Accompanying the questionnaire were two letters: one from the general practitioner introducing the study and one from the researchers explaining the purpose of the study. A postage-paid envelope was also enclosed for returning completed anonymous questionnaires within 1 month. Entry into a prize draw for £200 was offered to all potential participants in an attempt to increase response rates. This study received ethical approval from the School of Psychology Ethics Committee, Queen’s University Belfast.

**Results**

**Sample characteristics**

In total, 145 people returned completed questionnaires (29% response rate). The sample comprised 91 females (63%) and 54 males (37%). The mean age of responders was 43.8 years (SD = 12.5). The World Health Organisation [13] obesity classification system was used to categorize participants according to their BMI: underweight (2.8%), normal (43.4%), overweight (31%), obese class I (22.1%) and obese class II (0.7%). The percentage of overweight and obese participants in this study is in keeping with previous research which found that 37% of the population of Northern Ireland is overweight and a further 19% obese [14]. Responders and non-responders were compared according to age and gender. A chi square was used to determine whether there was a significant association between gender and responding status. A significant association was found between these two
variables ($\chi^2 = 8.87, P < 0.05$), indicating a greater proportion of female responders. The mean age of non-responders was 40.4 years (SD = 12.9) and a $t$-test revealed that responders were significantly older than non-responders ($t = 2.69; df = 498; P < 0.05$).

**Nutrition knowledge**

The mean scores obtained by participants on the ‘dietary recommendations’ and ‘choosing foods’ subscales are presented in Table I. The maximum score on each subscale is 10. These scores are slightly higher than those obtained in previous research in the United Kingdom with adult samples, i.e. Scottish men and computer science students [15, 12]. These scores represent a high level of nutrition knowledge as measured by this questionnaire.

**Correlation between nutrition knowledge and BMI**

Non-parametric Spearman’s Rho correlations were performed as nutrition knowledge scores were not normally distributed. As is evident from Table II, there were no significant correlations between nutrition knowledge as indexed by scores on the questionnaire and either specific BMI scores or BMI categories.

Spearman’s Rho correlations were performed following exclusion of the 18 participants who had nutrition related qualifications and/or consulted with a dietician/nutritionist in the past year. No significant correlations were found between the BMI of the remaining participants and total nutrition score ($r = -0.05, P = 0.56$); choosing foods subscale ($r = -0.06, P = 0.52$) or dietary recommendations subscale ($r = 0.01, P = 0.94$). In order to examine the association between gender and nutrition knowledge Spearman’s Rho correlations were performed for males and females separately. No significant correlations were found between total nutrition score and BMI of male respondents ($r = -0.01, P = 0.92$) or between total nutrition score and BMI of female respondents ($r = -0.02, P = 0.86$). In addition, no significant correlations were found between the age of responders and BMI ($r = -0.07, P = 0.39$) or between the age of responders and total nutrition knowledge scores ($r = -0.01, P = 0.87$).

**Discussion**

There was no significant correlation between nutrition knowledge and BMI in this sample. This finding supports the research hypothesis and suggests that a knowledge deficit model does not fully explain the individual variation in BMI found in this sample. The results demonstrate that obese individuals and those of healthy weight had comparable levels of nutrition knowledge, suggesting that there may be reasons other than poor nutrition knowledge that account for the higher BMIs of the overweight and obese respondents. This contention is supported by researchers in the field who note that there are few people remaining for whom lack of knowledge is the principal obstacle to eating a low-fat diet [4]. It would be more reasonable to suppose that knowledge is an important but not a sufficient factor for dietary behaviour change.

It has been suggested that nutrition education alone, albeit necessary, is typically insufficient to

<table>
<thead>
<tr>
<th>Table I. Nutrition knowledge scores ($n = 145$)</th>
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<tbody>
<tr>
<td>Subscale</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Dietary recommendations</td>
</tr>
<tr>
<td>Choosing foods</td>
</tr>
<tr>
<td>Total score</td>
</tr>
</tbody>
</table>

*a*Maximum score on each subscale = 10.
facilitate behaviour change because of its failure to specifically address the personal, behavioural and environmental barriers to dietary behaviour change [16]. In a randomized parallel group trial comparing behavioural counselling with health promotion advice giving in a general practice setting, Steptoe et al. [17] reported significantly greater increases in fruit and vegetable intake in the behavioural condition. Furthermore, the behavioural intervention led to greater increases in self-efficacy, smaller increases in perceived barriers and greater increases in knowledge of recommended intake than nutrition education alone. While at first this greater increase in knowledge in the behavioural condition may appear unexpected it suggests that perhaps knowledge is more salient when it is transmitted in the context of behaviourally oriented advice. This provides support for the integration of nutrition education into behavioural programs targeting dietary behaviour change.

The application of established psychological principles to health promotion behaviours can affect behaviour change, e.g. social cognitive theory, trans-theoretical model [17, 18]. Lessons can be learnt from other health behaviour research, e.g. smoking, in which techniques such as motivational interviewing offer promise [19]. The Expert Panel on the Identification, Evaluation and Treatment of Overweight and Obesity in Adults [11] concluded that a combined intervention of behaviour therapy, a controlled energy diet and increased physical activity provides the most successful therapy for weight loss and weight maintenance. Importantly, information giving and education are not explicitly stated as core components of this recommended treatment approach, although undoubtedly they are included as part of the overall approach. Meanwhile, the components of behaviour therapy endorsed in these guidelines include goal setting and self-monitoring, stimulus control, reinforcement techniques, behavioural contracting and social support programs [20, 21].

There are several limitations that restrict the generalizability of the results. These include the sampling technique, the low response rate, the limited information about characteristics of non-responders and the failure to collect information about variables which influence nutrition knowledge, e.g. socio-economic status. The finding that the level of nutrition knowledge was consistently high across the sample suggests that overweight individuals who are concerned about their weight may have sought out information and advice and therefore become more educated in terms of nutrition knowledge. Equally, underweight or normal weight individuals may have an interest in their diet and have sought out information about healthy eating which affected their nutrition knowledge scores. Furthermore, there is conflicting evidence about the reliability of self-reported height and weight, which may have affected the reliability of the results [22, 23]. Given the low response rate one cannot rule out the possibility that a Type II error has occurred, although the sample size obtained was sufficiently powered to detect a correlation of 0.2 or greater between BMI and nutrition knowledge [24]. A response rate of ~20–30% is average for a postal survey and the sampling method was taken into account when doing the power calculation [25].

In order to determine how representative the responders were of the overall sample, responders and non-responders were compared in terms of age and gender. Responders and non-responders differed significantly in terms of gender; however, analysis demonstrated that the correlation coefficients were very similar for males and females. Responders were also statistically significantly older than non-responders, however, this difference is unlikely to have any clinical significance as the difference between the mean ages of the two groups

Table II. Correlations

<table>
<thead>
<tr>
<th>Subscale</th>
<th>BMI (specific)</th>
<th>BMI (category)</th>
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<tbody>
<tr>
<td></td>
<td>Spearman’s Rho</td>
<td>P value</td>
</tr>
<tr>
<td>Dietary recommendations</td>
<td>0.01</td>
<td>0.94</td>
</tr>
<tr>
<td>Choosing foods</td>
<td>−0.04</td>
<td>0.61</td>
</tr>
<tr>
<td>Total score</td>
<td>−0.04</td>
<td>0.59</td>
</tr>
</tbody>
</table>
was so small (3.4 years). Furthermore, age was not correlated with BMI or nutrition knowledge so this small difference is unlikely to exert a significant effect on the results. Future research should incorporate longitudinal designs and use reliable, well-validated measures of nutrition knowledge and dietary behaviour, supported by biomarkers of health status.

Acknowledgements

We thank Dr. A. E. Gilliland and Dr. Martin Dempster, Queen’s University Belfast.

Conflict of interest statement

None declared.

References


Received on September 2, 2005; accepted on August 24, 2006