

Abstract

Background

International study is becoming more prevalent, yet aspects such as food neophobia often militate against the consumption of a nutritionally balanced diet of visiting students. The purpose of this paper, therefore, was to evaluate the extent to which international postgraduate students experience food neophobia, how this might vary by nationality and other demographic characteristics, and how acculturation might manifest itself in students' dietary behaviour.

Methods

International postgraduate students were invited to complete a validated questionnaire during their first week at university. The questionnaire was subsequently re-administered to the same students approximately four and eight months later.

Results

In total, 226 usable responses were analysed, 124, 58 and 44, respectively, for the first, second and final data collection. Perhaps surprisingly, the overall food neophobia scores increased from an initial value of 27.95 (SD \pm 16.95) to 33.67 (SD \pm 33.67) after 3 months although when comparing European and Asian students, only the former were significantly different ($p < 0.05$). Both Asian and European students reported small but not significant changes in their eating habits, although after 3 months significantly ($p = < 0.05$) less changes were reported. No significant changes were reported in students' perceived healthiness of their diets either by nationality or over time.

Conclusions

Understanding the complexities of food neophobia, other aspects of dietary change and at what point these changes might take place in the acculturation process when students arrive in the UK needs to be fully understood if a climate for positive learning is to be established.

Introduction

The consumption of a healthy, nutritionally balanced diet is not only essential for life, it is also associated with a low incidence of various adverse medical conditions (Department of Health, 1991; US Department of Health, 2005). In addition to recommendations for specific nutrients, many countries also recommend that, people should eat '*a healthy balanced diet which contains a variety of types of food, including lots of fruit, vegetables and starchy foods such as wholemeal bread and wholegrain cereals; some protein-rich foods such as meat, fish, eggs and lentils; and some milk and dairy foods*' (Food Standards Agency, 2008) and *Consume a variety of nutrient dense foods and beverages within and among the basic food groups...*' (US Department of Health, 2005). However, one aspect that often militates against individuals consuming a varied diet is 'Food Neophobia'.

Food neophobia

Food neophobia is generally defined as the rejection of foods that are novel or unknown (Dovey et al 2008), a term that can be traced back to 1886 where Popular Science Monthly reported: '*In the student, curiosity takes the place of neophobia*' (OED, 2008). On the other hand, picky or fussy eating is the rejection of a large proportion of familiar (as well as novel) foods, resulting in a habitual diet characterised by the consumption of a particularly low variety of foods (Dovey, et al. 2008). Other authors (Nicholls et al., 2001) refer to 'selective eating', 'few foods', 'restricted eating' or 'faddy eating', which they describe as a highly selective pattern of food intake in terms of the range of foods eaten.

Neophobia is a phenomenon which has received a considerable amount of attention and studies have been conducted on both genders and various age groups (7 year old girls, Galloway et al, 2003; 7-17 years olds, Koivisto-Hursti and Sjöden, 1997; 9-10 year olds, Falciglia et al, 2000; 12-18 year olds, Flight et al. 2003; 18-50 year olds, Schickenberg et al 2008; females 21-62 years old, Arvola, et al. 1999; mixed ages <25 to >55 year olds, Verbeke and López, 2005) and particularly among younger children (2-5 years, Addessi et al 2005; 4-5 year olds, Cooke, et al. 2006; 2-6 year olds, Cooke et al, 2003). The work on children is important, for not only has it been shown that food habits are formed in the early years of life (Birch, 1998) but also because in many cases, an unwillingness to try a variety of foods can continue into adult life (Nicholls, et al. 2001).

Studies have been conducted on different nationalities including: Australians (Flight et al. 2003); both Belgians and Hispanics living in Belgium (Verbeke and López, 2005); Dutch, (Schickenberg et al 2008); Finns (Tuorila et al. 2001); French (Rubio et al, 2008); Swedes, (Koivisto-Hursti and Sjöden, 1997); Canadians (McFarlane and Pliner, 1997); Americans (Frank and Kalisewicz, 2000) and most recently Lebanese college students (Olabi, et al 2009).

Research has shown that the diets of individuals displaying neophobia traits have a poor dietary variety with a number of potential negative consequences. For example, children with neophobia have a lower overall diet quality than children with an average or neophilic (willingness to try) diet, characterised in part by the high consumption of saturated fat (Falciglia et al, 2000); consume less fruit, vegetables and protein foods (Cooke, et al, 2006); and girls (7 years old) with both neophobia and pickiness consume less vegetables (Galloway et al 2003). Food rejection and aversions are more common in women (69% and 38% respectively) than men (47% and 18%

respectively); women were more disgust sensitive than men (Nordin, et al., 2004); and high protein items are commonly targeted for aversion (Nordin et al., 2004).

International study and acculturation

International study is becoming increasingly prevalent, and worldwide it is estimated that in 2006 there were over 2.9 million students in tertiary education enrolled outside their country of citizenship: France, Germany, the United Kingdom and the United States receive 49% of all foreign students (OECD, 2008). Many institutions and countries see and rely on overseas students, not only as a valuable source of income, but also as an opportunity to recruit highly qualified graduates where skills shortages exist (Blair, 2006). However, in doing so, it is important to improve the student experience and develop a reputation of Britain as an appealing country for international students if it is to remain competitive (Smith 2006).

As students move from one country to another, often to live within the local community, they may well need to adopt and assimilate (acculturation) the customs and culture of their hosts. In many cases, transition to a new culture may well have negative effects on diet and health, such as high alcohol intake, altered dietary practices and an increased Body Mass Index (Gordon-Larsen et al, 2003; Lara et al 2005; McDonald & Kennedy, 2005; Abraído-Lanza, et al., 2005). Hispanics who are highly acculturated have been shown to eat fewer fruits and vegetables than those who were less acculturated although they still ate more than their non-Hispanic white counterparts. Fat consumption can also be slightly, but not significantly higher; however one of the noticeable early dietary changes made on acculturation included adding butter and margarine at the table on foods such a bread and potatoes. Surprisingly, the less acculturated used smaller amounts of fat and oil when cooking products such as tortillas, than highly acculturated and non-Hispanic residents (Neuhausser, et al. 2004). The length of time spent in the host country can also have an affect. Jamal (1998) investigated perceptions of English and Pakistani foods of British born Pakistani and revealed that the length of time spent in the host country can affect how foods and meals are perceived.

In addition to food intake, changes have also been reported in dietary and meal patterns. Pakistani and Sri-Lanka immigrants, for example, to Norway changed their meal patterns substantially, from 3 hot meals per day to 1.5, to conform to the host country's norms, primarily because of changes in work patterns and climate considerations (Wandel, et al 2008). In the UK, those originally from South Asia ate significantly fewer meals than those from Europe; the former also eating their evening meal 2-3 hours later (Simmons and Williams, 1997).

Asian students in the United States, who had been there at least 3 months before the start of their studies, reported that the number of meals consumed per day decreased with nearly half of them missing breakfast more often than the other two meals, primarily because of their class timetables. Significant increases were observed in the consumption of fats, salty and sweet snack items, and dairy products; significant decreases in the consumption of meat and meat alternatives, and vegetables. They also ate out less often but when they did, chose American fast foods (Pan et al, 1999).

Aim

Notwithstanding, despite the UK's and other country's reliance on overseas students in the higher

education sector, no research has been undertaken to assess what effects Food Neophobia might have on students and their diets over time. The purpose of this paper, therefore, was to evaluate the extent to which international postgraduate students experience and demonstrate food neophobia over time, how this might vary by nationality and other demographic characteristics, and how acculturation might manifest itself in students' dietary behaviour.

Methodology

Subjects

Subjects were recruited from two cohorts (October and January intakes) of international students attending a Masters course at a University in Southern England. The courses involved centred on 'Services Management' including tourism, hospitality, retail, sports and events, and typically attract in the order of 150 students a year from most parts of the world. Subjects were recruited in the induction (first) week at University. During one of their introductory lectures, they were introduced to the research component of the course and as part of their learning, invited to take part in the research, and experience, at first hand, what their subjects might in turn experience when they undertook research for their dissertation. It was explained that participation was completely voluntary and non-participation would have no effect on the course whatsoever.

Instruments

The first part of the study was a pencil and paper instrument based on the Food Neophobia scale as developed by Pliner & Hobden (1992), which is now well-validated, although a number of minor changes were made so as to ensure that the meanings of each statement were perfectly clear. The word 'ethnic', for example, also identified by Flight et al (2003), is not commonly understood, nor are words such as 'weird'. These were, therefore, expanded upon so that students fully understood the questions. The final version is given in Figure 1.

Insert Figure 1 about here

Additional questions, informed by the literature and based in part on the work by Lake et al, (2004) were used to establish what basic dietary changes might have taken place over time. These included a question, using a 5-point scale where 1 = 'no change at all', to 5 = 'some very major changes', asking if dietary habits had changed: and a further question asking if food groups were being consumed 'more often', 'less often', or 'no change'. Finally, personal and demographic details were requested in order to facilitate the analysis and relate the results to variables identified by other researchers as being important.

This instrument was initially pretested on 'international' members of staff and minor modifications and amendments made. It was then piloted on eight students, including Chinese and Indians, partly to see how long it might take to complete, but primarily to ensure that each statement was unambiguous and clear.

Procedures

Immediately after the initial briefing, the instrument was distributed to all students who were 'talked through it' and the purpose, but not the precise aim, of the questionnaire was explained. Clarification was also provided as to how it should be completed including examples of healthy foods/diet. They were then invited to complete the questionnaire, which took approximately 10

minutes.

Follow-up questionnaires, modified slightly to reflect the passage of time, were administered in a similar manner approximately four and eight months after students had been at the University. Administering questionnaires any later in the course was not a practical proposition as students may have returned to their own countries to collect data for their studies or were undertaking an industrial placement.

Data Analysis

All data were entered into the computer program, Statistical Package for the Social Sciences (SPSS v 17). The coding protocol of reversing the scores negative criteria (see Figure 1) on the Food Neophobia Scale was adopted in the analysis. Where appropriate means and standard deviations were calculated and data compared using Chi square, independent t-tests and one-way analysis of variance (ANOVA). A significance level of $p < 0.05$ was used to interpret the results, above which it was assumed that differences could not have occurred through chance.

Results

Demographics

In total, 226 postgraduate students attended classes and completed the questionnaire; 124, 58 and 44, respectively, for the first, second and third data collections. Of those, 31% were male and 69% female; their mean age was 25.3 (SD \pm 4.0) years, range 20-60 years, with the most prevalent ages (71.3%) being 22-26 years. Thirty six nationalities were represented, the most common being Thailand, 21% and China, 11%; 20% lived in a rural setting in their own country, 80% in a city; and the mean length of time they had been in the UK was 9.7 (SD \pm 13.7) months, range 1 week to 84 months (excludes UK students). The higher proportion of females to males; ages; and Asian to European students reflect and are representative of the courses offered.

During the process of data analysis and evaluation, it soon became apparent that although some students may have only just started the course, they had actually been in the country for some time, perhaps attending a language school. On the other hand, some students had arrived the night before. To address these differences, the data were recoded so as to reflect the length of time students had been in the country, rather than when they had started at the University. The internal consistency of the results for the Food Neophobia scale was considered to be appropriate with a Cronbach's Alpha value of 0.81, a value typically in the range reported by Ritchey et al, (2003) in other studies.

At the same time, and in view of the sample size, the data were also truncated into smaller group sizes, suitable for analysis: length of time in the UK, <3 months, 4-12 months, and >12 months. Similarly, other variables were also truncated: age; <24 years and 25 years and older; Asian and European.

Food Neophobia

Results from the food neophobia scale are given in Table 1.

Insert Table 1 about here

As can be seen, the only significant differences in the food neophobia scores are between the Asian and European students and in the length of time they have been in the UK. In order to assess if there were any differences between Asian and European students and the length of time they had been in the UK, these two groups were analysed separately for the three time periods. Results indicate that there were no significant differences in the scores for the Asian students although the scores for the European students were significantly different between 'less than three months' (25.84 ± 16.95) and 'four to 12 months' (33.76 ± 19.90) and also between 'four to 12 months' and 'over 12 months' (28.76 ± 18.32).

What is clear from these results is the increase in food neophobia scores between the first three months and the subsequent two periods although when considering the groups separately, only the European group is significantly different.

When looking at changes in eating habits since arriving at University, both the Asian and European students reported small changes, but these were not significantly different between the groups. On the other hand, significant changes were reported between the first three months and four to 12 months and also between the first three months and after 12 months. The extent of these changes decreased the longer students had been in the UK (Table 2).

Insert Table 2 about here

When considering if their diets were perceived as being more or less healthy since they arrived in the UK, there were no significant differences between Asian and European students and no significant changes over time, with students perceiving their diet as either being between less healthy and about the same (Table 2).

When asked what changes had taken place over time, a number of significant differences can be seen between both Asian and European students (Table 3) and over time (Table 4). These data have been have also been grouped in accordance with the 'Eatwell Plate' (Food Standards Agency, 2009) plus alcohol. These details are given in Figures 2 and 3.

Insert Tables 3 and 4 about here

Insert Figures 2 and 3 about here

The mean number of meals, both breakfasts per week and main meals per day consumed prior to arriving at University and three months later are given in Table 5.

Insert Table 5 about here

Discussion

Food neophobia

Food neophobia is an important research topic in the understanding of food habits and a lot of the previous research, whilst involving students, has often considered neophobia in relation to food stimuli (Tuorila, 2001; Schickenberg, et al 2008; Olabi, et al, 2009). The only other research looking at changes in food neophobia over time (Meiselman, et al. 1999) investigated undergraduate students at a University in the United Kingdom. The current study, to the best of

our knowledge, is the first to investigate international students over time and the results add to our understanding of the subject and also the process of acculturation. It is appreciated that this sample is relatively smaller than those of earlier studies, but the nature of the subjects involved was a clear limitation in seeking a larger sample. Notwithstanding, it is considered that the sample size enables some basic inferences to be drawn.

Using a seven point scale, the total of the variables is in the range 10-70; the higher the score, the more neophobic the individual. Some authors have assigned categories to these values hence scores: ≤ 25 could be classified as food neophilic; >25 and < 45 neutral; and ≥ 45 , or neophobic (Olabi et al 2009). Using these criteria, all students in this study could be classified as being neutral; similar values of 29.51 (range 26.67 to 30.30) were found by Meiselman et al, (1999) in UK undergraduate students.

Previous studies have reported significant differences between rural and city living, with city dwellers being less neophobic (Flight et al. 2003; Verbeke and López, 2005) and whilst this was the case here, these differences were not significant. Similarly, women have been reported as being less neophobic than men (Koivisto Hursti & Sjödén 1997; Tuorila et al. 2001); no differences (Nordin, et al., 2004) and although in the present study men were very slightly more neophobic than women, again the differences were not significant.

Children, perhaps not surprisingly, show a relative aversion to trying new foods (Wardle and Cooke, 2008) and younger subjects have been reported as being more neophobic than older ones (McFarlane and Pliner, 1997; Rigal et al., 2006). There were practically no age related differences in this study, possibly because of the nature and size of the sample. Education was not measured for obvious reasons.

Significant differences were noted between Asian and European students with Asians being less willing to try new foods, which perhaps is to be expected. As observed by Ward et al (2001), cultural distances determine the nature of acculturative stress experienced by migrants. It has been shown, for example, that people from Canada, United States and Finland are more neophobic than Swedes, and whilst it might be tempting to offer an international comparison of previous studies and our results, Ritchey et al (2007) counsel against this, citing the lack of inappropriate psychometric analysis required to validate the scale. Similarly, with 36 nationalities, the sample size precludes more than a comparison between the major groupings of Asia and Europe. In addition, neophobia is highly heritable, (Cooke et al., 2007), and approximately two-thirds of food neophobia could be inherited, indicating a genetic component. However, the family component could perhaps be due more to the environment in which individuals grew up (Knaapila, et al 2007) which might go some way towards explaining the phenomenon seen here.

What is interesting in the current study is that significant differences can be seen between the amounts of time spent in the UK. Food neophobia scores rose significantly after students had been here for three months and, although these differences fell back after 12 months, they still did not drop to the initial values. These differences were significant for Europeans but not so for Asian students. This is perhaps counter-intuitive with an expectation that food neophobia might be high on arrival in the UK, falling once students had overcome their initial euphoria and excitement experienced on arrival, and had been here for some time: however, this was not the

case. Students may arrive with an open attitude but direct experience of the food available and confrontation with additional stressors in the new environment can lower such openness (Zwingmann and Gunn, 1983; Brown 2009).

The consumption of a healthy, balanced diet containing a variety of foods is well accepted (Food Standards Agency, 2008; US Department of Health, 2005) and it has been shown that variety in a meal can enhance food intake (Rolls, et al., 1981). Whilst variety is important in, for example, a healthcare setting, it is equally important in a younger population so as to ensure, on the one hand, an adequate intake of nutrients and on the other hand, that heavy reliance on one source or type of food, does not lead to a nutrient deficiency or malnutrition.

Dietary changes and acculturation

The importance of meals and food has not always received prominence when considering the overall acculturation process, which students might go through, yet it is food which can have the greatest impact on adjustment (Furukawa, 1997). A number of models have been proposed to describe the adjustment process. Lysgaard (1955) suggests that adjustment follows a 'U' shaped curve; the first stage being characterised by positive feelings, followed by a stage of maladjustment until final adjustment is reached. This model was further developed and consolidated by Gullahorn and Gullahorn (1960), Adler (1975); Brown (1980), Mohamed (1997). The work of Brown and Holloway (2008) on international students did not support the assertion that a state of euphoria exists on arrival, rather, they supported the work of Biddle (1979) and Ward et al (2001) who found that stress was at its most intense at the very beginning of the course, characterised by more negative mood states of anxiety, depression, loneliness and stress. Rejecting the linearity and prescriptiveness of the U Curve models, Brown and Holloway (2008) suggest that adjustment is a multifaceted process fluctuating throughout the stay as a result of individual, cultural and external factors. In Brown's (2009) research on the changes in food habits, only a minority of students embraced diversity in food choice, not just because of taste differences, but also because food became a symbol of home and a means of bringing fellow nationals together. Consuming home-country food alleviated homesickness during a time when students were beset by the stress of operating in a foreign language and adapting to a new culture (Locher, et al 2005). Hence their concern with diet and reluctance to try new foods was less important, supporting Warde's (1997) claim that eating habits are the slowest to change among migrants. Pliner et al, (1995) found that people were least neophobic in low fear and low hunger situations. Only once that initial phase was over, they had settled in, made new friends, and located local suppliers for familiar foods, did food neophobia start to become an issue.

Changes in eating habits

As seen in Table 2, there were small changes in eating habits but no significant differences between the Asian and European groups and, as might be expected, most of the changes took place in the first three months. Similar results were found with UK undergraduate students during their first year at University where most of the dietary changes took place within the first term (Edwards & Meiselman, 2003). In another study of dietary changes of international students in Belgium (Perez-Cueto, et al., (2009), the majority (85%) reported making changes to their dietary habits since arrival, whereas the corresponding figures in this study were 8% reporting no change, 59% very small and small changes, and 33% major and very major changes.

Healthy vs less healthy diets

In most nations, the importance and association of diet varies. In general, the group associating food most with health and least with pleasure are the Americans; the group most food-pleasure orientated and least food-health orientated are the French and Belgians with the Japanese somewhere in the middle (Rozin, 1999). How students perceived the healthiness of their diets in this study (Table 2) did not change significantly with all students considering that their diets were between 'less healthy' and 'about the same'. The perception that on arrival in a Western country diets become less healthy has been reported in a number of studies (Burns, 2004; Kedia, 2004; Saleh, et al. 2002).

Changes in the consumption of foods and food groups

Studies have reported changes in dietary habits, often undesirable, when students commence their studies at University (Papadaki, et al. (2007) and in one study during the first three-month period, the intake of protein fat and carbohydrate declined significantly, whilst alcohol intake increased, although this was not significant (Edwards & Meiselman, 2003). In another study (Papadaki & Scott, 2002) the diet of Greek students who moved to Glasgow showed significant decreases in the frequency of consumption of foods such as fresh fruit, raw vegetables, fish, legumes, meat and poultry with an increase in the consumption of foods such as savoury snacks, soft and fizzy drinks and alcohol.

In a systematic review of the literature on the changing dietary habits of ethnic groups in Europe, Gilbert and Khokhar (2008) concluded that ethnic groups, the Chinese in particular, alter their eating habits, combining parts of their traditional diet with some of the less healthy elements of the indigenous population. However, in all groups, staples including rice, starchy vegetables, ethnic breads and noodles remained, by and large, in the diet with more Western foods being consumed by the younger generations.

Details of the consumption of individual food groups, Tables 3 and 4 and summarised in Figures 2 and 3, show a number of interesting changes. Fruit and vegetables, inversely and significantly correlated with stress and depression in Chinese students (Liu et al., 2007), seem not to have changed among Asian students in this study, being consumed both more and less often in similar proportions; whereas European students consumed these primarily 'less often' and 'no change' (Figure 2). Over time, however, they were consumed 'more often' and 'no change' (63%) in the second period (Figure 3).

For Asian students, bread and cereal consumption rose, and in particular, milk and dairy products also rose which is surprising as it has been recognised that high exposure by Chinese immigrants to animal and dairy products, not traditional Chinese foods, might create a taste aversion that is not counterbalanced by the perceived health outcomes of food (Cervellon and Dubé 2005). There were noticeably fewer changes in European students with four groups showing mainly that no changes had taken place.

An increased consumption of alcohol, often in the form of binge drinking, has been reported in students in a number of studies (Edwards & Meiselman, 2003; Keller et al., 2008); and an overall increase in alcohol intake can be seen in this study. This is not commonly noted in studies of

international student behaviour, possibly because they are not yet immersed in the British drinking culture (UKCOSA 2004).

Changes in the number of meals

Missing meals is not unusual in students (Coli?, et al., 2003) and in this study, Asian students significantly reduced the number of breakfasts and main meals consumed and whilst European students did similarly, only breakfasts were significantly different. It is appreciated that the definition of 'main meals' is problematic, but the premise here is that students' own definition remained constant throughout. Other studies (Papadaki, et al., (2007) have also reported a reduction in the number of cooked meals before and after enrolment, reducing from 10.40 to 6.52 per week for those students living at home and 12.7 to 4.17 for those living away from home. Croatian University students consumed, on average, 2.4 meals and 1.3 snacks per day (Coli?, et al., 2003).

Meals and eating patterns have been the subject of considerable study where it has been shown, for example, that in adolescents, a larger number of eating occasions are associated with higher energy, sugar and carbohydrate intakes and lower sodium intakes (Dwyer, et al., 2001). In addition, breakfast, particularly a 'good quality' breakfast (O'Sullivan, 2009) has been shown to affect 'mental stress' and academic performance (Smith, 1998) and immigrants have been shown to be more likely to miss meals than the indigenous population (Lien 2007). Clearly, therefore, where there is high-level academic study, regular meals assume an even greater importance.

Summary and conclusions

Perhaps not surprisingly, Asian students were significantly more neophobic than European students and although, counter-intuitively both groups became more neophobic overtime; only the European students were significantly different. The precise reason for this is not clear, although one suggestion is that students are initially presented with a number of 'challenges' on arrival in the UK and only once these have been addressed does neophobia become an issue.

Moving to another country invariably involves, *inter alia*, a change in dietary habits. In this study, there were no significant changes in eating habits between European and Asian students although there were small changes over time; most taking place in the first three months. There were, however, changes in the consumption of some food groups. Similarly, perceptions of the healthiness of their diets did not change significantly. What did change was the number of meals consumed, which overall showed a decline.

International students are an important market for the Higher Education sector, offering considerable potential for income generation. This study has, for the first time, looked at changes in food neophobia and aspects of dietary changes, which occur when students arrive in the UK for a course of study. Understanding the complexity of the issues involved, the timing of the changes in the acculturation process, and of their effects on dietary issues is necessary if a climate for positive learning is to be achieved.

Limitations and further research

It is appreciated that these results are limited by the sample size, governed in turn by the number of students attending the course, although it is suggested that they do provide usable data to

illustrate and add to our understanding of dietary-related issues including food neophobia and the acculturation of international students. It is our intention now to develop this research in an attempt to ascertain *inter alia* the point at which significant changes take place in the transition from Food Neophobia to Food Neophilia, changes in dietary habits and how these might vary between cultural/national groups. This will allow us to better understand how these might affect the climate for positive learning at university.

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