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Eating behaviour of university students in Germany: Dietary intake, barriers to healthy eating and changes in eating behaviour since the time of matriculation

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ABSTRACT

A healthy diet plays a key role in preventing obesity and non-communicable diseases such as type 2 diabetes. This is true for all age groups, including young adults. While unhealthy eating habits among young adults, in particular university students, have been identified in former studies, this group has been neglected in existing health promotion strategies. Our aim was to explore baseline dietary intake, common barriers to healthy eating, and changes in eating behaviour among university students since the time of matriculation. We used data from the quantitative part of the Nutrition and Physical Activity Study (NuPhA), a cross-sectional online survey (data collection: 2014/10/31–2015/01/15). Students were recruited from all over Germany. Overall, 689 university students (30.5% male; mean age: 22.69) from more than 40 universities across Germany participated. We found that there is room for improvement with regard to the consumption of specific food groups, for example, fruits and vegetables. The main barriers to healthy eating were lack of time due to studies, lack of healthy meals at the university canteen, and high prices of healthy foods. Cluster analysis revealed that barriers to healthy eating might affect only specific subgroups, for instance freshmen. Changes in eating behaviour since matriculation were found in the consumption of meat, fish, and regular meals. Future qualitative studies may help to explore why university students change their eating behaviour since the time of matriculation. Such knowledge is necessary to inform health promotion strategies in the university setting.

1. Introduction

A healthy diet is widely recognized as a main factor in preventing obesity and non-communicable diseases such as type 2 diabetes and cardiovascular disease (World Health Organisation, 2016). Therefore, following a healthy diet should be promoted across all age groups. According to the WHO (2016) a healthy diet should include, for instance, high consumption of fruits, vegetables, and whole grains, in addition to low consumption of saturated fats, salt, and refined carbohydrates. The transition from adolescence to young adulthood may be a particularly important time for health promotion strategies, including the promotion of healthy eating, because many health behaviours are developed and established during this period (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008; Poobalan, Aucott, Clarke, & Smith, 2014). However, current studies indicate that poor dietary habits seem to be common among this age group. Former studies report, for example, high levels of fast food consumption, low intake of fruits and vegetables, and breakfast skipping (N. Larson, Laska, Story, & Neumark-Sztainer, 2012; Niemeier, Raynor, Lloyd-Richardson, Rogers, & Wing, 2006). Furthermore, excessive weight gain has been observed among young adults (Gordon-Larsen, Adair, Nelson, & Popkin, 2004; Mensink, Schienkiewitz, Haftenberger, Lampert, Ziese, & Scheidt-Nave, 2013; Nelson Laska, Larson, Neumark-Sztainer, & Story, 2010), particularly university students (Mihalopoulos, Auinger, & Klein, 2008; Racette, Deusinger, Strube, Highstein, & Deusinger, 2005).

The transition from school to university coincides changing living arrangements, which might also result in a reorientation of eating behaviours (El Ansari, Stock, & Mikolajczyk, 2012). However, only a few studies have focused on potential changes in eating

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behaviour since matriculation (Lupi, Bagordo, Stefanati, Grassi, Piccinni, Bergamini, et al., 2015; Nelson Laska et al., 2010; Wengreen & Moncur, 2009). In addition, little is known about the reasons which may prevent university students from following a healthy diet. Thus, we aimed to a) describe the baseline dietary intake of university students, b) identify potential barriers to healthy eating and c) explore potential changes in their eating behaviour since the time of matriculation.

2. Material and methods

2.1. Study design and sample

The analyses are based on data from the quantitative part of the Nutrition and Physical Activity Study (NuPhA), a cross-sectional online survey among university students conducted across Germany from October 2014 to January 2015. University students were recruited via fliers, mailing lists, social networks, and advertising the study during classes and lectures. Students received information on the study aims and data security regulations; they were informed that participation was voluntary and withdrawal from the study possible at any point in time. Participants provided informed consent by selecting the "agreement button" during the online survey, which then directed them to the first question of the survey. As an incentive we randomly awarded gift certificates to 40 students who completed the online survey. The study was approved by the Medical Ethics Committee of the Medical Faculty Mannheim, Heidelberg University (2013-634N-MA).

2.2. Measures

2.2.1. Dietary assessment

Dietary intake was assessed using a brief food frequency questionnaire (FFQ). The original FFQ consisted of 17 food items and was developed by the Max Rubner Institute (2016), the German Federal Research Institute of Nutrition and Food. The FFQ was originally designed as a parental questionnaire to evaluate the dietary intake of children. We slightly adapted this FFQ to fit the population of young adults. Our final FFQ consisted of 22 food items, and the frequency of consumption was assessed by the following response categories: *never, less than once a week, once a week, two to three times a week, four to five times a week, six to seven times a week, or several times a day.* For further analyses we grouped the categories *once a week* and *two to three times a week*, as well as the categories *four to five times a week* and *six to seven times a week*. Based on a food pyramid developed by the German state-funded Agency for Consumer Information (Koelsch & Brueggemann, 2012; von Ruesten, Illner, Buijsse, Heidemann, & Boeing, 2010), the 22 food items were grouped into six food groups: 1. Vegetables, salad; 2. Fruits; 3. Bread, grains, side dishes; 4. Dairy products; 5. Meat, sausages, fish, eggs; 6. Sweets and snacks.

2.2.2. Assessment of barriers to healthy eating

We used a questionnaire applied and validated in previous research among adolescents and young adults (Andajani-Sutjahjo, Ball, Warren, Inglis, & Crawford, 2004; Musaiger, Al-Mannai, Tayyem, Al-Lalla, Ali, Kalam, et al., 2014; Musaiger, Al-Kandari, Al-Mannai, Al-Faraj, Bouriki, Shehab, et al., 2013) to identify potential barriers to healthy eating. The questionnaire was translated into German and slightly modified by adapting and adding items to fit the population of university students. Participants could choose one of the following response options for each of the 22 barrier items: "Not a barrier, a somewhat important barrier, a very important barrier". For further analysis, we combined the two categories "important barrier" and "very important barrier" into one barrier category based on sensitivity analysis.

2.2.3. Assessment of changes in eating behaviour

Changes in eating behaviour since matriculation were examined by asking, "Has your eating behaviour changed since matriculation?" (response categories: yes/no/unknown). A second question enquired after changes in the frequency of food consumption: "Since matriculation, do you consume: more, less, or as many as before of the following foods". We assessed changes in the consumption of ten food items, eight of which were also included in the FFQ and two additional ones (total calories; regular meals). These questions were adapted from the Campbell Survey on Well-Being in Canada (Canadian Fitness and Lifestyle Research Institute, 1988).

2.3. Data analysis

Descriptive analyses like frequency distributions and cross classifications were performed to characterise the sample's baseline dietary intake, barriers to a healthy eating, and changes in eating behaviour since matriculation. In addition, we conducted Chi^2 tests to explore if eating behaviour differs between male and female university students. To combine similar barriers to healthy eating into one dimension, we conducted an explorative factor analysis using SPSS FACTOR with Varimax rotation. After excluding eight of the primarily 22 barrier items with factor loadings <0.6, we obtained a five-factor solution (Kaiser-Meyer-Olkin-Measure: 0.685; Bartlett-Test: <0.001; supplement 1): factor 1: Personal motivation/attitudes; factor 2: Lack of knowledge/information; factor 3: Environmental barriers; factor 4: Lack of social support; factor 5: Lack of time. The five factors identified were subsequently incorporated in a hierarchical cluster analysis (Ward's method, squared Euclidian distance). The cluster analysis was conducted to group university students affected by the same barriers to healthy eating. To detect differences between the clusters identified, Chi^2 tests were applied to discrete variables and Kruskal-Wallis H test to continuous variables.

All statistical analyses were performed using IBM SPSS Statistics 22 (IBM Corporation, Armonk, USA). The pre-defined level of significance for all tests was $p < 0.05$.

3. Results

The sample included 689 university students (30.5% male; Table 1) aged 16–29 years from more than 40 universities across Germany. Approximately 35% of them were undergraduate students in the first to third semesters. The majority of the students (74.2%) had left their hometown to enrol at university.

3.1. Baseline dietary intake

A minority of the students reported eating cooked vegetables (3.2%) as well as raw vegetables and salad (3.6%) several times a day. Fresh fruits were consumed by 26.9% of students several times a day (Fig. 1). Brown bread was eaten by 10.3% less than once a week. While 18.0% of the students reported that they never ate red meat, 12.6% stated that they consumed it 4–7 times per week. More than half of the students (55.4%) ate poultry 1–3 times a week, and 43.1% consumed fish 1–3 times a week. Chocolate was eaten by 4.5% several times per day. More than half (52.5%) of the university students reported consuming fast food less than once a week, and a minority (1.9%) reported eating fast food frequently (4–7 times a week).

Gender differences in the frequency of food consumption were also identified: While females were more likely to consume cooked