



What is a nutritious snack? Level of processing and macronutrient content influences young adults' perceptions



Nienke M De Vlieger, MS, Clare Collins, PhD, Tamara Bucher, PhD *

Nutrition and Dietetics, School of Health Sciences, Faculty of Health and Medicine, Priority Research Centre for Physical Activity and Nutrition, The University of Newcastle, University Drive, Newcastle, Callaghan NSW 2300, Australia

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ABSTRACT

Snacking has become more prevalent in developed countries. While poor food choices pose health risks, nutritious choices contribute important nutrients to overall dietary intakes. Young adults consumer snacks frequently and nutritious choices should be promoted among this group.

However, how young adults define the term 'nutritious' currently and how they evaluate the nutritiousness of various snack foods required further investigation. The current study used a mixed methods design with 115 young adults invited to sort 32 commonly available snack foods into a line ranging from 'not nutritious' to 'very nutritious'. The sorting data was analysed by hierarchical cluster analysis and multi-dimensional scaling (MDS) analysis. Participants were also asked to define the word 'nutritious', with definitions then categorized and number of counts per category analysed. Predictors of perceived snack nutritiousness were sugar ($\beta = -0.45, P < 0.005$), fat ($\beta = -0.43, P < 0.05$), nut ($\beta = 0.45, P < 0.05$) and fruit/vegetable ($\beta = 0.33, P < 0.05$) content. Level of food processing was significantly related to perceived nutritiousness ($\beta = 0.79, P < 0.05$). The terms given within the definitions most frequently were: 'vitamins' (40%), 'good for body/body needs' (40%), 'minerals' (39%), 'low in sugars' (36%), 'protein' (32%), 'healthy' (28%) and 'long lasting source of energy' (27%). Results of the current study provide first insight into how young adults interpret the term 'nutritious'. This could help in the design of more effective nutrition education materials and food product labels to guide healthy choices in this age group.

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1. Introduction

In recent decades, eating patterns have changed (Hill, Wyatt, Reed, & Peters, 2003) and snacking has become more common (Piernas & Popkin, 2010). Among young adults in the US there was a 25% increase in the prevalence of snacking from 1977 to 2006 (Piernas & Popkin, 2010). This is of concern given that snack foods tend to be more energy-dense and nutrient-poor (Piernas & Popkin, 2010). People who snack more often have been shown to have higher energy intakes (Hampfl, Heaton, & Taylor, 2003; Nicklas, O'Neil, & Fulgoni, 2014), which may be related to both the energy density and large portion size of many commonly consumed snack foods (Kerr et al., 2009; Piernas & Popkin, 2010). Snacking might also impact on weight status, with the consumption frequency of commercial snack foods found to be higher in obese compared to lean individuals (Forsslund, Torgerson, Sjöström,

& Lindroos, 2005).

However, the evidence regarding the relationship between snacking and BMI or weight status is contradictory (Drummond, Crombie, & Kirk, 1996). Some studies found that frequent snacking was not associated with a higher BMI (Larson, Miller, Watts, Story, & Neumark-Sztainer, 2016) and that frequent snacking can be part of a healthy dietary pattern (Hartmann, Siegrist, & van der Horst, 2013; Zizza & Xu, 2012). Discrepant findings may be confounded by underreporting of snack intake (Schoeller, 1995) or higher physical activity levels being associated with snacking (Kerver, Yang, Obayashi, Bianchi, & Song, 2006) (Larson et al., 2016). Snacking habits, including snacking on whole fruit, vegetables and crackers, were found to contribute to better overall diet quality, while consuming snacks such as cakes/cookies/pastries, sweets, milk desserts and soft drinks was associated with poorer diet quality (Hartmann et al., 2013). The nutritional quality of the snack therefore matters and choosing nutritious foods as snacks can be beneficial and help individuals meet national dietary recommendations (Schoeller, 1995; Zizza & Xu, 2012).

Frequent out of home eating and high snack consumption is

* Corresponding author.

E-mail address: tamara.bucher@newcastle.edu.au (T. Bucher).

particularly common in young adults (Hankinson et al., 2010; Niemeier, Raynor, Lloyd-Richardson, Rogers, & Wing, 2006). The 19–30 year old age group experienced the largest increase in energy consumed per snack and total number of snacks per day, and had the most unhealthy snacking behaviour trend (Hampfl et al., 2003). Young adults do not consume the recommended target for daily servings of fruits and vegetables, with energy-dense, nutrient-poor foods and snacks consumed frequently (Butler, Black, Blue, & Gretebeck, 2004; Debate, Topping, & Sargent, 2001).

Weight gain during the transition from adolescence to adulthood has been reported commonly (Greaney et al., 2009), with breakfast skipping and increased out of home eating thought to be important reasons for this (Hankinson et al., 2010; Niemeier et al., 2006; Pereira et al., 2005). A healthy snacking pattern that includes nutritious choices is likely to contribute to young adult's health (Hampfl et al., 2003; Kerver et al., 2006). Unhealthy eating behaviours adopted at this life stage can persist through to adulthood (Deliens, Clarys, De Bourdeaudhuij, & Deforche, 2014) and adversely impact on health. Interventions targeting young adults are therefore a priority (Deliens et al., 2014). In order to promote healthy eating, further insights are needed into the reasons for poor food choices amongst young adults (Hampfl et al., 2003).

Kerver et al. (2006) reported that high intakes of energy-dense snacks in young adults could be exacerbated by social norms, with a study among Belgian university students finding that media and advertising, appeal of foods, home education on healthy eating, and nutrition knowledge were most influential in terms of snack product choice (Deliens et al., 2014). Nutrient and/or health claims influence perceptions about product and may influence food choice (Deliens et al., 2014). While nutrient claims related to foods, such as a product being 'a good source of calcium' or 'low in fat', is governed by regulations and can only be used when certain criteria are met, the use of the term 'healthy' or 'nutritious', or a derivative such as 'nutri-', is not regulated (Food Standards Australia New Zealand, 2016). In the USA, the Food and Drug Administration (FDA) does regulate the use of the term 'healthy' (FDA, 2013), which prompted many manufacturers to work around using the word 'healthy' and instead advertise using non-legislated terms such as 'wholesome' or 'nutritious' (Williams, 2005). Although 'nutritious' is frequently used in advertisements, currently no clear definition of the term exists (Food Standards Australia New Zealand, 2016) and it is therefore unclear how consumers interpret it. A 'nutritious' claim may persuade consumers that foods are good for their health, even if they contain unfavourable types or amounts of added sugar, fat and sodium. Adverse impacts have been observed previously related to claims such as 'low fat' or 'high in vitamin C' (CNN, 2015; FDA, 2013; Federal Register of Legislation, 2016).

To evaluate the 'nutritiousness' of food and meals, a range of food-based approaches to quantify or score the nutrient density of food products have been suggested (Drewnowski, 2010; Nicklas, Drewnowski, & O'Neil, 2014; Rayner & Scarborough, 2009). Nutrient profile scores, such as the Ofcom nutrient profile score (Rayner & Scarborough, 2009) and the Australian Health Star Rating Score (Health Star Ratings, 2014), which informs the Health Star Rating that appears on some food labels, use a quantitative formula to weight 'healthy' and 'unhealthy' nutrient components within foods. The term 'nutritious' could therefore be defined as containing a higher proportion of preferable or 'healthful' nutrients. A nutritious food should therefore provide a higher proportion of essential nutrients relative to the energy content or portion size, and be low in unfavourable components such as trans-fat or added sugars.

In order to promote healthy eating and to design nutrition information panels that are relevant to consumer needs and food habits it is important for nutrition experts and policy makers to

understand how lay people interpret the concept of 'nutritiousness'. However, there commonly are discrepancies between what experts and lay people consider relevant within nutrition information presented on food labels (Worsley, 2002). To date, it is unclear how consumers interpret the term 'nutritious' and which criteria they use to determine whether a food is nutritious or not. Therefore, the aim of the current study was to examine how young adults define and evaluate how nutritious a range of snack foods are.

2. Materials and methods

2.1. Snack selection

The snacks were selected to represent the choice commonly consumed by and available to the target population. Therefore, a range of snack products were pre-selected using several sources. Firstly, two researchers documented all types of snack sold in cafeterias, snack outlets and vending machines on the University of Newcastle campus in January 2015 and interviewed cafeteria and shop cashiers about which snacks they sold the most often to determine which snacks were the most popular among the students. Secondly, an analysis of the NNPAS 2011/2013 data identified the 30 snacks consumed most often by Australians aged 18 to 30 (ABS, 2012). In addition, the Nielsen shopper study of Australia's top 50 grocery items purchased was consulted to identify popular snack items (McCabe, 2014). Finally, popular grocery shops were searched to identify common portion sizes of the common snack foods identified. Thirty-five snacks were selected and evaluated in a pre-test.

2.2. Pre-test

In order to standardize the experimental procedure and test the snack selection, eight participants were recruited from the target population (4 male, 4 female). The procedure of the pre-test was identical to the study procedure, but the pre-test participants were also interviewed about their familiarity with the snacks and if they recognized the foods as a snack food (and not as a meal). Based on the results of the pre-test, three items were removed from the selection as most participants did not consider them to be a snack, but rather a meal (beef & mushroom pie, ham and egg sandwich, chicken wrap). The final selection therefore included 27 popular snacks and five products of the same type, but with differing unit portion sizes (total $N = 32$). A list of all snacks and their characteristics is provided in [supplementary table 1](#).

The nutrient profile score of all snacks was calculated using the Ofcom system (Rayner & Scarborough, 2009): 21 snacks were evaluated as 'less healthy' choices and 11 were classified as more 'healthy'. The nutrient profile scores of all snacks are reported in [Table 1](#).

2.3. Recruitment and participant characteristics

In total, 118 young adults (31 male and 87 female) were presented with a display of 32 different snacks. People were eligible to participate if they were aged between 18 and 36 years old, did not follow a medically prescribed diet (vegetarian and self-reported lactose/gluten intolerance were allowed) and were not nutrition and dietetics students or experts. Participants were recruited by distributing flyers on campus and (social) media advertisement. Nursing and midwifery students could earn credits towards specific courses. As a small appreciation, a coffee voucher and a small snack were offered. All participants signed an informed consent statement.

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