



The associations of vegetable consumption with food mavenism, personal values, food knowledge and demographic factors



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ABSTRACT

Background: Poor dietary choices, in particular low consumption of fruits and vegetables are associated with the prevalence of diet related diseases. Ways to increase consumption are urgently required. This paper examines the associations of demographic, psychographic and food knowledge variables with reported vegetable consumption.

Methods: An online questionnaire was administered in late 2012 to a national sample 2146 Australians who were selected to represent the Australian population in terms of age, sex, education and location of residence. It was divided into sections which assessed food knowledge, food involvement, food mavenism, personal values and personality factors, demographic characteristics and reported consumption of 13 vegetables and the total number of servings of vegetables per day. Principal components analyses of the individual vegetable consumption ratings derived three forms of vegetable consumption scores. These and total serving per day were used as dependent variables in a structural equation model to identify pathways between them and their likely antecedents.

Major findings: Three types of vegetable consumption were formed: *Salad vegetables* (onion, tomato and lettuce); *Dinner vegetables* (carrot, peas and beans); and *'Green' vegetables* (cabbage, spinach broccoli and cauliflower). Food mavenism, food knowledge, food involvement and equality-universalist values mediated the relationships between demographics and conscientiousness and the vegetable consumption variables.

Conclusions: The three types of vegetable consumption and total servings per day were associated with different antecedent pathways. The mediating roles of food mavenism, food knowledge, food involvement and equality-universalist values may present opportunities for health promotion and the horticultural industry to increase population vegetable intake. Further research is required to test these associations via experimental and longitudinal studies and qualitative investigation of the meaning and place of the three forms of vegetable consumption in people's daily lives is recommended.

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1. Introduction

The high prevalence of certain diet related diseases and conditions (e.g. type 2 diabetes, obesity) represents a major health challenge for most countries in the 21st century (Australian Institute of Health and Welfare, 2013; Ogden, Carroll, Kit, & Flegal, 2013). In part the prevalence of these diseases is related to

poor dietary choices characterised by low fruit and vegetable consumption (Boeing et al., 2012). Recent research suggests there is an inverse dose response relationship between fruit and vegetables consumption and all cause mortality (Wang et al., 2014).

Increases in the consumption of fruit and vegetables are important public health goals (NHMRC, 2013; WHO, 2009). Around four out of five people in low and middle income countries do not consume the recommended five servings of fruit and vegetables each day (Hall, Moore, Harper, & Lynch, 2009). In affluent societies like the USA, the European Union, Australia and New Zealand, and Coastal China, fruit and vegetables consumption is

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also low. In the USA, for example, only about one quarter of the population eats five serves of fruit and vegetables each day (Guenther et al., 2013; USDA, 2010). Generally, consumption of the recommended amounts of vegetables appears to be much more difficult for consumers to achieve than the consumption of fruit perhaps because of the greater preparation and cooking that is required (Goody, 1982). Despite the disappointing results of many campaigns, it is important that new approaches are found to increase the population's vegetable consumption (Rekhy & McConchie, 2014).

Several consumer attributes may be associated with vegetable consumption (and overall dietary quality), including demographic characteristics, food and nutrition knowledge, personal values and other personal factors. For example, women tend to consume healthier diets (and fruit and vegetables) than men (Dickson-Spillman & Siergrist, 2010; Kresic, Jovanovic, Zezelj, Crijanovic, & Ivezic, 2009; Sarmugam, Worsley, & Wang, 2013; Wardle, Parmenter, & Waller, 2000). Associations with age are less clear, though several studies have found that dietary quality increases with age (Berg, Jonsson, Conner, & Lissner, 2002; Kresic et al., 2009; C. T. Lin & Yen, 2010) though others have found opposite findings or had no associations (Bakhotmah, 2012; Charlton, Yeatman, Houweling, & Guenon, 2010; W. Lin, Hang, Yang, & Hung, 2011). Other demographic factors such as education, marital status or number of children in the household may also influence vegetable consumption (e.g. education, Barker, Lawrence, Woadden, Crozier, & Skinner, 2008, cohabitation, Elstgeest, Mishra, & Dobson, 2012). We proposed that demographic variables will be related to vegetable consumption, specifically that women, older people, tertiary educated, and people in cohabiting relationships will exhibit higher levels of vegetable consumption.

The influence of intrapersonal, psychographic variables on vegetable consumption has been less extensively studied though the relationship of nutrition knowledge with healthy food consumption has been relatively well studied. A positive relationship has been seen in several studies (Dickson-Spillman & Siergrist, 2010; Kolodinsky, Harvey-Berino, Berlin, Johnson, & Reynolds, 2007; Kresic et al., 2009; Oosthuizen, Oldewage-Theron, & Napier, 2011; Sarmugam et al., 2013; Wardle et al., 2000). Of these studies, Wardle et al.'s (2000) study has been one of the most influential as it used a new questionnaire that was developed specifically to assess general nutrition knowledge. This questionnaire was well validated (Parmenter & Wardle, 1999) and has since been used in a number of different studies including that of Hendrie, Coveney, and Cox (2008). Wardle et al. (2000) found that nutrition knowledge had strong positive associations with fruit and vegetable intakes. Therefore we hypothesized that food and nutrition knowledge will be positively related to vegetable consumption.

It might be expected that higher levels of knowledge about food and nutrition might follow from involvement with food, for example, in the preparation of meals. Bell and Marshall (2003) built on the involvement construct (Zaichkowsky, 1985) and defined food involvement as the priority people give to food, i.e. how much time and effort they are prepared to spend on food-related activities such as cooking. Food involved individuals are more likely to derive pleasure from activities associated with food and to consume a better quality diet (Barker et al., 2008; Jarman et al., 2012; Marshall & Bell, 2004; Ohly et al., 2013). We expected that people with high levels of food involvement would be likely to consume vegetables more often than those with lower food involvement.

A conceptually related construct to involvement is that of mavenism. "Market mavens" have been defined as "individuals

with a general interest in an area (like clothes or food shopping), who are influential within their social group and willing to share their general knowledge and experience of the area" (Feick & Price, 1987). Kontos, Emmons, Puleo, and Viswanath (2011) extended the concept to health mavenism and showed that health mavens are both knowledgeable and influential in the health domain. More recently, Somers, Worsley, and McNaughton (2014) have extended the concept to 'food mavenism'. Therefore we hypothesized that 'food mavenism' would be positively related to the consumption of vegetables.

Several behavioural models propose that personal values have distal relationships with behaviours e.g. the Theory of Planned Behaviour (Fishbein & Ajzen, 2010) and the Food Related Lifestyle Model (Grunert, Brunsø, & Bisp, 1997) underpinning attitude formation and thence influencing behaviour. Personal values can be defined as the guiding principles in a person's life (Schwartz et al., 2001). A number of different personal values may be related to food consumption choices. Among them, universalism values (self-transcendence values about the importance of social harmony, equality, nature and the environment) have been linked to healthier food choices (Nijmeijer, Worsley, & Astill, 2004; Worsley, 2003). Therefore, we hypothesized that vegetable intakes will be positively related to universalism values.

Conceptually related to the construct of personal values is that of personality (Roccas, Sagiv, Schwartz, & Knafo, 2002) especially the Big Five personality taxonomy: neuroticism (sometimes referred as its obverse, emotional stability, Gosling, Rentfrow, & Swann, 2003, extraversion, openness to experience, conscientiousness, and agreeableness). Recently Lunn, Nowson, Worsley, and Torres (2014) have found that two of the 'Big Five' personality factors may be related to the consumption of vegetables. Openness to experience and conscientiousness were consistently associated with fruit and vegetable consumption and healthier eating habits. Gosling et al. (2003), have developed a ten item inventory which indexes each of the Big Five personality factors suitable for surveys. Accordingly, we hypothesized that Openness to experience and Conscientiousness would be positively related to reported intakes of individual vegetables and total number of servings per day.

Most studies of vegetable intake use 'global' questions such as: "how many servings of vegetables do you eat each day". These short questions have been shown to yield valid population estimates (Marks, Webb, Rutishauser, & Riley, 2001). However, there have been relatively few studies of the consumption of individual vegetables such as potatoes, lettuce, cauliflower, etc. Mainvil, Horwath, McKenzie, and Lawson (2011), however, have derived a series of validated indices for the consumption of both vegetables in general and individual vegetables that we employed in this study.

In summary, the overall aim of the study was to examine some of the psychographic and demographic factors which may influence the consumption of different individual vegetables as well as the number of serves of vegetables consumed per day.

2. Methods

2.1. Study design and sample selection

A cross-sectional internet based survey was conducted in 2012 to assess Australian adults' knowledge of a range of food related issues. A total of 2146 respondents aged 18 years and over participated in the survey. Participants were selected from the Global Market Insite (GMI) research database and invited to participate via email. The GMI database is made up of individuals who volunteer to take part in surveys in return for reward points. Those who volunteered to participate were emailed a link to the survey. Quota

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