



Personality and Fruit and Vegetable Consumption in Young Men: Mixed Methods Assessment

Stephanie Howard Wilsher^{1*}, Julie Houghton² and Alexia Papageorgiou³

¹Kent Business School, University of Kent, UK

²School of Health Sciences, University of East Anglia, UK

³St. Georges School of Medicine, University of Nicosia, Cyprus

Abstract

Background: To assess whether personality of young men (18–24) may impact on their fruit and vegetable consumption using mixed methods.

Methods: Interviews, food diaries and Ten-Item Personality Inventory (TIPI). Eight Caucasian young men (18-24), four with low (up to 2 portions daily) and four with high (>4 portions) fruit and vegetable consumption. Ethical approval was provided by the University Ethics Committee.

Results: Of the five personality dimensions (extraversion, agreeableness, openness, conscientiousness, and emotional stability), conscientiousness and emotional stability presented a near perfect result on TIPI: high scores for high consumers and low scores for low consumers. These scores were generally supported by the thematic analysis of the interviews. One low consumer overturned the trend on the personality dimensions; however, the findings of his interview did not support his TIPI scores. Several reasons may explain this discrepancy, such as the social context of the target behaviour or potential incongruities in survey data.

Conclusions: Larger surveys using validated personality tests and qualitative interviews are needed to provide much needed definitive insights into this research area. The findings suggest behavioural interventions might be improved by using cognitive behaviour therapy rather than dietary interventions.

Abbreviations

FFQ – Food Frequency Questionnaire; TIPI – Ten Item Personality Inventory

Introduction

A diet rich in fruit and vegetables significantly reduces the risk of many chronic diseases including mental health [1-5]. These health benefits are also effective across the life course from pregnancy to older age [6,7]. However, average fruit and vegetable consumption around the world is only three portions per day [8-11]. In the UK, men in all age groups consume less fruit and vegetables than women, with young men (18-24 years) eating the least (2.9 portions daily) [12]. Promotion and interventions to increase fruit and vegetable consumption to at least 5 a day are essential to improve health, especially in young men, who are at greater risk of suffering chronic diseases later in life.

To date, psychosocial theories of the determinants of dietary behaviour have looked at individual factors, such as the theory of planned behaviour and at environmental influences [13,14]. However, the explained variance in health behaviour is often low. For example, a meta-analysis of 185 independent studies found that the theory of planned behaviour (consisting of three constructs (attitude, subjective norm and perceived behavioural control) accounted for just 27% of behavior and 39% of the intention to do the behavior [15]. These findings suggest that other factors not covered by the theories are important to explain behavior. This has led to exploration of the potential effects of personality. Person-specific traits of personality could account for differences in dietary intake, thus influencing health outcomes in later life [16].

Common models of personality have five recognised factors - extraversion, agreeableness, conscientiousness, emotional stability and openness to experience - that each includes particular personality traits [17] as documented in Table 1.

OPEN ACCESS

*Correspondence:

Stephanie Howard Wilsher, Norwich School of Medicine, University of East Anglia, NR4 7TJ, UK,

E-mail: stephanie.howard@uea.ac.uk

Received Date: 13 Jan 2018

Accepted Date: 29 Mar 2018

Published Date: 05 Apr 2018

Citation:

Howard Wilsher S, Houghton J, Papageorgiou A. Personality and Fruit and Vegetable Consumption in Young Men: Mixed Methods Assessment. *Ann Nutr Food Sci.* 2018; 2(1): 1012.

Copyright © 2018 Stephanie Howard Wilsher. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Table 1: Personality factors and their associated traits.

Personality factors	Personality traits
Extraversion (E)	Gregariousness, assertiveness, warmth, excitement seeking, activity and positive emotions
Agreeableness (A)	Modesty, compliance, straightforwardness, trust, altruism and tender-mindedness
Conscientiousness (C)	Achievement, striving, self-discipline, deliberation, order and dutifulness
Emotional stability (ES)	Depression, hostility, impulsiveness, vulnerability, self-consciousness and anxiety
Openness to experience (O)	Aesthetics, feelings, fantasy, ideas, actions and values

Source: Costa and McCrae [17].

Table 2: Interview guide.

Topic	Prompts
Health	How healthy would you describe yourself? Could you describe what being healthy means to you? Who would you say looks after your health?
Fruit and vegetable consumption	If you were given a choice between a chocolate bar and an apple, which would you choose and why? Who influences your fruit and vegetable consumption? How do you feel about eating fruit and vegetables for health?

Personality traits have been associated with numerous health outcomes and health-related behaviors. For example, boys (6–12) scoring high on conscientiousness and emotional stability consumed more fruit and vegetables, while those scoring low on these factors were more likely to be obese [18]. Likewise, conscientious students were more likely to adhere to healthy behaviours, whereas highly extraverted students tended to adopt unhealthy behaviours [19]. Conscientiousness was positively associated with preventive health behaviours and negatively associated with unhealthy behaviours across populations, [20,16] suggesting it might also be linked to risk aversion [19]. Agreeableness was associated with vegetable consumption and openness to experience with fruit consumption in adolescents (12-18 years), which is thought to indicate parental influence [21]. Openness to experience was associated with fruit and vegetable consumption and healthy eating, however, unlike conscientiousness; it was not associated with compliance to dietary recommendations [16]. Conscientiousness is reported to be a health protector that positively and significantly predicts longevity of life with fewer incidences of mental and physical disorders while low emotional stability is associated with more disorders [22,23].

Much of the quantitative research on personality and dietary behaviour has been conducted on adolescents and students, but few studies have measured diet other than with the Food Frequency Questionnaire (FFQ). The aim of this research was to assess whether personality of young men (18–24 years old) living in the community may impact on their fruit and vegetable consumption. In-depth interviews with young men were conducted to explore how personality might influence diet and health. The interviews were thematically analysed and compared with the results of a personality survey. Fruit and vegetable consumption was measured with food diaries.

Method

Recruitment and sampling

Young men (n=34) who had taken part in focus groups for previous research [24] and had agreed to be contacted about further research were sent an information sheet and letter inviting them to take part. Affirmative replies were received from nine participants who were sent two consent forms, (one to return to SHW and one to keep), a four-day food diary and the Ten-Item Personality Inventory (TIPI). Pre-paid envelopes were included for the participants to return their consent form, food diary and personality questionnaire. Two

brothers who had not taken part in the previous study, but who had previously expressed an interest in research and were known to have different eating habits were also invited to take part. On affirmation, they were sent, completed and returned the same documents as the other young men.

Young men (n=8) were selected for interview based on their fruit and vegetable consumption to provide extreme case sampling of high (4 or more a day, n=4) and low (up to 2 portions, n=4). These differences reflect theoretical replication advocated to assess motivational differences, rather than the pursuit of data saturation. The three young men whose fruit and vegetable consumption was not extreme were sent a letter explaining why they were not chosen for the research and thanking them for their interest. The final group of selected participants included the two brothers whose average fruit and vegetable consumption matched the target case sampling. For the purposes of calculating fruit and vegetable consumption, four days is considered the optimal period for assessment [26,27]. Six of the young men had completed four food diaries or 24-hour recalls a year earlier, allowing triangulation of behavioural measures and longitudinal data that is considered superior to cross-sectional measures [28]. The Ethics Committee at the University of Kent, UK, approved the methods and procedures for this study.

Data collection

Semi-structured interviews were conducted by the first author (SHW), either face-to-face at the home of the participant or via Skype. Interviews allow in-depth and flexible exploration of research questions [29]. The interview guide was developed to explore the potential influence of personality factors on health and fruit and vegetable consumption (Table 2).

Each interview took about one hour, was audio recorded and transcribed verbatim. Upon completion of the interview participants received £20 to compensate for their time. Prior to commencement of the interview participants were reminded about the nature of the research, that the information they provided would be anonymised (using a pseudonym only known by the first author) to protect their confidentiality and that they could withdraw from the study at any time. The young men had previously completed research documentation (see above), including the Ten-Item Personality Inventory (TIPI) questionnaire.

TIPI was developed to measure the bipolar elements of each factor with two questions per dimension [30]. Personality measures

Table 3: Personality traits and rating scale questionnaire.

	I see myself as.....	1 Disagree strongly	2 Disagree moderately	3 Disagree a little	4 Neither agree or disagree	5 Agree a little	6 Agree moderately	7 Agree strongly
1 (E)	Extraverted, enthusiastic							
2 (A)	Critical, quarrelsome							
3 (C)	Dependable, Self-disciplined							
4 (ES)	Anxious, easily upset							
5 (O)	Open to new experiences, complex							
6 (E)	Reserved, quiet							
7 (A)	Sympathetic, warm							
8 (C)	Disorganised, careless							
9 (ES)	Calm, emotionally stable							
10 (O)	Conventional, uncreative							

Source: Gosling [30]

Table 4: Demographic details of the interview participants.

Pseudonym	Age	Education	Employment	Residence	Average FVC
Terry	21	Further	Full time	Family	1
Mel	18	Further	Unemployed	Family	1
Ben	20	High School	Unemployed	Family	1
Phil*	23	High school	Self employed	Family	2
Lee	24	Graduate	Full time	Family	4
Tony	19	Sixth form	Part time	Family	5
Jess	18	Further	Full time	Partner	5
Bob*	24	Further	Full time	Family	5

Note: * Denotes brothers living in the family home; FVC-fruit and vegetable consumption.

often have many items, ranging from 44-item BFI to 240-item NEO-PI-R [31,17], measuring the multi-faceted constructs of each factor. These are time consuming to administer and complete. When compared with the longer measures, TIPI was found to have good factor structure and convergent validity and was therefore selected for use in this study [32,33]. The personality traits and rating scale of the questionnaire are show in Table 3.

Data analysis

The average portions of fruit and vegetables recorded each day was calculated over the four food measurements using the NHS 5 A Day as a guide [34]. For example, an apple, an orange, a portion of baked beans or vegetables counted as one serving. A salad counted as three portions, but only half a portion if it constituted part of a filling for a sandwich.

Analysis of the TIPI personality questionnaire was as described by [30]. The bi-polar elements were scored from 1-7 for five questions (1,3,5,7,9) and reverse-scored for the other five questions (2,4,6,8,10). The paired scores were averaged. For example, using the Extraversion scale: A participant has scores of 5 on item 1 (Extraverted, enthusiastic) and 2 on item 6 (Reserved, quiet). The reverse-scored item (i.e., item 6) is recoded, replacing the 2 with a 6, and the average of the score for item 1 and the (recoded) score for item 6 is calculated. In this instance the TIPI Extraversion scale score would be: (5 + 6)/2 = 5.5. A spreadsheet, developed by Daniel DeNeui, was used to calculate the average score and compare it with the norms of scores collected from

around the world [35].

Interview transcripts were coded using QRS Nvivo 9, and thematically analysed using a coding framework of positive or negative statements to reflect the lexical descriptors of the five personality dimensions (extraversion, agreeableness, conscientiousness, emotional stability, openness to experience), as shown above. Analysis of the eight interviews was completed by the first author (SHW) and the team members (AP, JH) verified the findings on four analyses each. Any disagreements were resolved through discussion.

Results

All participants were British Caucasians and aged between 18-24 years. The mean age for high consumers was 22 years and for low consumers was 21.5 years. Most participants were in work and two were unemployed. Seven young men lived in their childhood family home and one lived with a partner. Two of the participants were brothers living in the family home, one a high consumer and one a low consumer. See Table 4 for demographic details of the participants.

The results of the TIPI questionnaire are presented in Table 5. Of the five dimensions, extraversion, agreeableness and openness to experience failed to show any real difference between high and low fruit and vegetable consumption. Conscientiousness and emotional stability presented an almost perfect result: above average scores for high consumers and below average scores for low consumers. The personalities of the two brothers conformed to that norm.

Table 5: Ten Item Personality Inventory scores for the young men interviewed about fruit and vegetable consumption.

FVC Low	Extraversion	Agreeableness	Conscientiousness	Emotional stability	Openness to experience
Terry	3.5	5.5	4.5	4	6
Mel	6.5	4.5	4.5	3.5	6.5
Ben	6.5	4.5	6.5	7	6.5
Phil*	6.5	6	4	4.5	6.5
Norms	4.4	5.2	5.4	4.8	5.4
High					
Lee	6	5.5	6	6.5	6.5
Tony	7	3	7	5.5	6.5
Jess	6	5	6.5	6	6.3
Bob*	3.5	5	6	5	4

Note: * denotes brothers living in the family home; FVC – fruit and vegetable consumption.

Table 6: Interview statements for Bob, a young man with high fruit and vegetable consumption.

TUPI dimensions	Positive statements	Negative statements
Extraversion	"...my main friends are people I work with." "...like to cook my own things."	"...quiet silent..."
Agreeableness		"...if it (message) was backed up..(with research)"
Conscientiousness	"I'm in control of my own health." "I rarely snack..." "...will think about it (food).."	
Emotional stability	"...fairly happy." "I like my lifestyle.."	
Openness to experience	"...range of things to eat." "...try out new recipes and new foods.."	

Table 7: Interview statements for Phil, a young man with low fruit and vegetable consumption.

TUPI dimensions	Positive statements	Negative statements
Extraversion	"..I will see someone socially..3-4 days"	
Agreeableness	"...I'll just do it with her..." "I will eat them (vegetables) if they are put in front of me..."	
Conscientiousness		"...its (health) not on top priority list." "...haven't got time...prepare a meal.."
Emotional stability	"...happy at the moment." "...easy going person.."	"...if I feel stressed... I will get a take away." "...Cola...I enjoy the taste." "I am always quite fidgeting.."
Openness to experience	"..we will try anything (food).."	

One participant did not conform to the trend on the personality dimensions.

Generally, the interview analyses supported the TIPI for all the young men. The findings of the interview analyses with the two brothers are presented as these represent the norm for young men with high or low fruit and vegetable consumption. In addition, the findings of Ben’s interview highlights how he digressed from the norm.

The high conscientiousness score (Table 6) of one of the brothers, Bob, was supported by his commitment to health. His score for emotional stability was supported by positive statements of calmness with no negative statements. Bob’s low score for extraversion was supported by statements that he is quiet and has a limited circle of friends. Low agreeableness was supported by Bob’s critical consideration of health messages. The low score on openness to experience is interesting as Bob said he liked to try new recipes and foods.

Phil, Bob’s brother, presented the antithesis on the personality dimensions (Table 7). For him, socialising was preferable to a healthy lifestyle and he rarely cooked. Agreeableness was supported, as Phil

wanted to fit in with others and would eat vegetables only if they were served to him. His low conscientiousness was reflected by putting little priority on health and not finding time for meal preparation. Although Phil thought he was emotionally stable, he was observed fidgeting during the interview and, stated that when stressed, he would opt for unhealthy foods chosen for hedonistic reasons. Openness to experience was supported by his willingness to try most foods.

In contrast to the other young men, the interview analysis for Ben did not support the high scores for conscientiousness and emotional stability of TIPI (Table 8). Ben was conscientious toward exercise but was lazy and would only try to eat healthier. Ben said he was easy-going, supporting the high emotional stability score, however, the negative statements of impatience and getting bored with healthy foods suggests the TIPI score should be lower. Extraversion was supported by statements around sociability and enthusiasm for fitness. Openness to experience suggested Ben might try to cook but the choice of foods would be conservative. The low score for agreeableness was supported by eating fruit and vegetables because his mother cooked them and wanted him to eat them, however, Ben stated he was very selective in what he would eat.

Table 8: Interview statements for Ben, a young man with low fruit and vegetable consumption that did not support his TIPI score.

TIPI dimensions	Positive statements	Negative statements
Extraversion	"I'm not quite as sociable as I used to be..."	
Agreeableness	"I never really eat vegetables, except when Mum cooks them." "I'm like `Ok` (will eat fruit and vegetables)."	"I am quite fussy (fruit and vegetables)."
Conscientiousness	"I'm quite active..." "..very disciplined in my exercise."	"I wouldn't ever cut down on meat..." "try to get healthier...try to lose weight" "lazy" "I do try and eat as much (fruit and vegetables) as I can.."
Emotional stability	"I'm pretty laid back..."	"...get bored with it (healthy diet)." "...irritable if I get hungry..." "I'm quite impatient.."
Openness to experience	"I'm not scared to have a go (cooking)..."	"I've got quite a selective taste."

Discussion

We believe this is the first study on personality and fruit and vegetable consumption to focus on young men (18-24 years). Using a mixed methods approach, our study showed that conscientiousness and emotional stability were the personality dimensions that were most likely to predict fruit and vegetable consumption. Generally, the interview analysis supported the TIPI scores for all the young men.

We presented evidence from the two brothers as this was a unique opportunity to compare dietary behaviour within a single household. Being raised in the same environment by a mother who was an experienced chef appeared to have little effect on actual behaviour. The young men had different personalities that reflected their approach to diet and health. Many studies have shown that parents influence childhood and adolescent diet [36], however, little is known about the potential interaction between parental personality and childhood personality.

We presented evidence for one young man whose TIPI scores and interview analysis were different. The TIPI scores suggested conscientiousness and emotional stability, however, the positive and negative lexical descriptors of the five factors of the interview analysis suggested otherwise. The TIPI results may reflect the drive for fitness, which supports the view that personality, is built on self-perceptions to present a social persona and some people show more variability in personality presentation [37]. Half of personality traits are considered heritable, but the biological system is flexible and external events can bring about changes [38]. Personality theory posits that the basic tendencies (5 dimensions) interact with external factors to produce an expressed personality [39]. This might explain why personality traits vary according to context [40,19] and demographic and lifestyle factors [41]. A short measure of personality is very useful, but relying only on survey results may not provide an accurate profile of all individuals. Comparing the results of TIPI with the findings of the interviews, we highlighted the potential for variations of personality that might reflect expressed personality rather than basic tendencies.

Our findings support other research showing that high and low levels of conscientiousness and emotional stability are associated generally with health and health behaviors [20,16,18,42]. These personality dimensions might also be linked to risk aversion as participants avoid risky behaviours, such as not wearing seat belts or smoking cigarettes [19]. Young men with high conscientiousness and emotional stability adopt lifestyle behaviours to maintain health, hence reducing physical and mental disorders and increasing life expectancy [22,23]. Other research has suggested agreeableness in adolescents (12-18 years) is indicative parental influence [21], however, our findings suggest that "agreeableness" is presented

differently and might indicate negotiations on food choice between family members. Family socialisation does effect food choice [43,44]. The young men in our research were mostly living at home and their TIPI scores did not reveal any clear differences for agreeableness. The interviews suggested those with low fruit and vegetable consumption would eat them if they were provided or were very pedantic around foods they would eat. Those with high consumption would critically assess evidence on diet and health and were not easily swayed by the views of others.

Linking personality back to psychosocial theories such as the theory of planned behaviour, conscientiousness and emotional stability may have direct influence on fruit and vegetable consumption, rather than moderate behaviour through intention [45]. Personality factors contribute to development of habits, attitudes and skills [46]. Therefore, individuals with high conscientious and emotionally stability are more likely to develop self-efficacy, such as cooking skills, to pursue their goal of high fruit and vegetable consumption. In addition, they are more likely to plan ahead to self-regulate their diet [47]. By contrast, those with low conscientiousness and low emotional stability do not plan ahead and are likely to resort to unhealthy emotionally-driven eating patterns [48]. This potential for self-regulated behaviour versus emotionally-driven behaviour is redolent with dual processing theories. Dual processing theories, suggest there are two pathways that determine the actions or behaviours taken by an individual. Behaviours are either automatic or impulsive or self-regulated and planned. For example, overweight and obese individuals acted impulsively, whereas those of normal weight planned behaviour that might influence dietary intake [42]. Dual processing has been found in all areas of psychology, for example in risk theory and in trust [49-51]. Research suggests the two pathways of dual processing are associated with the capacity of working memory [52,53]. Working memory is thought to have capacity to hold seven items + or - 2 at any one time [54]. Those who have capacity to hold more items tend to think about and plan their behaviour, whereas people who can hold fewer items generally act impulsively or automatically [52,53].

Limitations

The small study sample limits generalisability to the whole population, nevertheless, the extreme sampling strategy showed motivational differences between the two groups, which are transferable and could be applicable to many more young men [25,55]. Just one participant provides further understanding of the social context in which we live as demonstrated by our findings where one participant deviates from the norm [56]. Further research is needed to assess the prevalence of such deviations and further explore why they occur. TIPI does not measure the full range of individual traits, which

limits its usefulness, but taking only one minute to complete is of real benefit for participants and provides researchers with indicators for future research. Comparison of quantitative and qualitative research methods assessed how personality might vary across social contexts or might highlight expressed personality rather than the basic tendencies [37,39]. Larger studies using validated personality tests and qualitative research are needed in order to provide more definitive insights into this research area [19]. However, we believe this is the first study to triangulate TIPI scores with qualitative interview analyses in diet-related research and similar research is needed to ensure trustworthiness of the findings. The study is novel as it focuses on young men, segmented by level of fruit and vegetable consumption. While social bias could influence self-report of fruit and vegetable consumption, six of the young men completed repeat intake measures (separated by 12-month period). Comparison of the two measures indicated that the fruit and vegetable intake was stable, suggesting responses to questions were genuine and not influenced by an older female researcher [57]. Future research should assess the role of personality in young women and how personality of family members might interact and influence food choice within families. Longitudinal research is essential to understand how and when the personality of children begins to impact on their food choice and whether there are any changes during adolescence and early adulthood. The role of working memory on lifestyle behaviours may open new avenues of research and interventions.

Conclusions and Future Study

Our findings add to the body of evidence that suggests personality has an important role in dietary and health behaviour. Conscientiousness and emotional stability were the dimensions that were most powerful for fruit and vegetable consumption. TIPI is a valuable short measure of personality but might not capture the factors that reflect the research context. Inclusion of interviews allowed exploration of the young men's perceptions and personality and highlighted potential incongruities if reliance is on surveys only. Larger surveys using validated personality tests and qualitative interviews are needed to provide definitive insights into this research area. Moreover, if personality underlies health behaviours such as fruit and vegetable consumption, then behavioural interventions using cognitive behaviour therapy may be more effective than dietary interventions. Were capacity of working memory the reason for impulsive versus self-regulated behaviour a brain training programme might, in future, improve behavioural change, such as consuming enough fruit and vegetables for a healthy life.

Acknowledgements

Kinds thanks to the Agriculture and Horticulture Development Board, UK for funding the research, Professor Andrew Fearn for accepting me as a PhD candidate and the young men who took part in the research.

References

- Dauchet L, Amouyel P, Dallongeville J. Fruit and vegetable consumption and risk of stroke - A meta-analysis of cohort studies. *Neurology*. 2005;65(8):1193-7.
- Esposito K, Kastorini CM, Panagiotakos DB, Giugliano D. Prevention of Type 2 Diabetes by Dietary Patterns: A Systematic Review of Prospective Studies and Meta-Analysis. *Metab Syndr Relat Disord*. 2010;8(6):471-6.
- Wang X, Ouyang Y, Liu J, Zhu M, Zhao G, Bao W. Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies. *BMJ*. 2014;349.
- Ryrie I, Cornah D, Van de Weyer C. Food, mood and mental health. *Mental Health*. 2009;1-4.
- O'Neil A, Quirk SE, Housden S, Brennan SL, Williams LJ, Pasco JA, et al. Relationship Between Diet and Mental Health in Children and Adolescents: A Systematic Review. *Am J Public Health*. 2014;104(10):e31-e42.
- McCowan L, Horgan R. Risk factors for small for gestational age infants. *Best Pract Res Clin Obstet Gynaecol*. 2009;23(6):779-93.
- Gao X, Chen H, Fung TT, Logroscino G, Schwarzschild MA, Hu FB, et al. Prospective study of dietary pattern and risk of Parkinson disease. *Am J Clin Nutr*. 2007;86(5):1486-94.
- Pomerleau J, Lock K, Knai C, McKee M. Interventions designed to increase adult fruit and vegetable intake can be effective: A systematic review of the literature. *J Nutr*. 2005;135(10):2486-95.
- ABS. Australian Health Survey. 2011.
- EHN. Diet, Physical Activity and Cardiovascular Disease Prevention. In: Network EH (ed). Brussels. 2011.
- Defra. Report of the fruit and vegetable task force. In: Food F (ed). London: The Stationary Office. 2010.
- NHS. Statistics on obesity, physical activity and diet: England, February 2009. London: The NHS Information Centre, Lifestyle Statistics. 2009.
- Ajzen I. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Process*. 1991;50(2):179-211.
- Kamphuis CB, Giskes K, de Bruijn GJ, Wendel-Vos W, Brug J, van Lenthe FJ. Environmental determinants of fruit and vegetable consumption among adults: a systematic review. *Br J Nutr*. 2006;96(4):620-35.
- Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: A meta-analytic review. *Br J Soc Psychol*. 2001;40:471-99.
- Lunn TE, Nowson CA, Worsley A, Torres SJ. Does personality affect dietary intake? *Nutrition*. 2014;30(4):403-9.
- Costa PT and McCrae RR. NEO PI-R professional manual, Florida: Odessa. 1992.
- Vollrath ME, Hampson SE, Juliusson PB. Children and eating. Personality and gender are associated with obesogenic food consumption and overweight in 6-to 12-year-olds. *Appetite*. 2012;58(3):1113-7.
- Raynor D, Levine H. Associations Between the Five-Factor Model of Personality and Health Behaviors Among College Students. *J Am Coll Health*. 2009;58(1):73-81.
- Bogg T, Roberts BW. Conscientiousness and health-related behaviors: A meta-analysis of the leading behavioral contributors to mortality. *Psychol Bull*. 2004;130(6):887-919.
- de Bruijn GJ, Kremers SP, van Mechelen W, Brug J. Is personality related to fruit and vegetable intake and physical activity in adolescents? *Health Educ Res*. 2005;20(6):635-44.
- Kern ML, Friedman HS. Do conscientious individuals live longer? A quantitative review. *Health Psychol*. 2008;27(5):505-12.
- Goodwin RD, Friedman HS. Health status and the five-factor personality traits in a nationally representative sample. *J Health Psychol*. 2006;11(5):643-54.
- Howard Wilsher S, Duffy R, Fearn A, Panagiotaki G. (in preparation) Young men (18-24) and 5 a day: "That is an awful lot of fruit and veg to be eating", a qualitative study.
- Yin RK. Case Study Research Design and Methods, Thousand Island, London: Sage Publications. 2009.
- Warm DL. The impact of increased physical access through the opening

- of a superstore on fruit and vegetable consumption. Southampton: Southampton. 2002.
27. Hearty AP, McCarthy SN, Kearney JM, Gibney MJ. Relationship between attitudes towards healthy eating and dietary behaviour, lifestyle and demographic factors in a representative sample of Irish adults. *Appetite*. 2007;48(1):1-11.
28. Shaikh AR, Yaroch AL, Nebeling L, Yeh MC, Resnicow K. Psychosocial predictors of fruit and vegetable consumption in adults a review of the literature. *Am J Prev Med*. 2008;34(6):535-43.
29. Mason J. Mixing methods in a qualitatively driven way. *Qualitative Research*. 2006;6(1):9-25.
30. Gosling S, Rentfrow PJ, Swann WB. A Very Brief Measure of the Big Five Personality Domains. *Journal of Research in Personality*. 2003;37(6):504-28.
31. John OP and Srivastava S. The Big Five Trait taxonomy: History, measurement, and theoretical perspectives. In: John LAPOP (ed) *Handbook of personality: Theory and research*. 2nd ed. New York: Guildford Press. 1999;102-139.
32. Goldberg LR, Johnson JA, Eber HW, Hogan R, Ashton MC, Clonin RC, et al. The international personality item pool and the future of public domain personality measures. *Journal of Research in Personality*. 2006; 40(1):84-96.
33. Ehrhart MG, Ehrhart KH, Roesch SC, Chung-Herrera BG, Nadler K, Bradshaw K. Testing the latent factor structure and construct validity of the Ten-Item Personality Inventory. *Personality and Individual Differences*. 2009;47(8):900-5.
34. NHS. *Healthy eating*. 2013.
35. Gosling SD, Rentfrow PJ, Potter J. Norms for the Ten Item Personality Inventory. Unpublished Data. 2014.
36. Pearson N, Biddle S, Gorely T. Family correlates of fruit and vegetable consumption in children and adolescents: A systematic review. *Public Health Nutr*. 2009;12(2):267-83.
37. Querstret D, Robinson OC. Person, Persona, and Personality Modification: An In-Depth Qualitative Exploration of Quantitative Findings. *Qualitative Research in Psychology*. 2013;10(2):140-59.
38. Spector T. *Identically different: Why you can change your genes*, Phoenix: Phoenix. 2013.
39. McCrae RaC PT. The five-factor theory of personality. In: John O, Robins, RW., Pervin, LA. (ed) *Handbook of Personality: Theory and Research*. 3rd ed. New York: Guildford Press. 2008;159-181.
40. Smollen R, Matheny JA, Sayers J. Personality, affect, and organisational change: A qualitative study. *Research on Emotion in Organisations*. 2010;6:85-112.
41. van den Bree MBM, Przybeck TR, Robert Cloninger C. Diet and personality: Associations in a population-based sample. *Appetite*. 2006;46(2):177-88.
42. Terracciano A, Sutin AR, McCrae RR, Deiana B, Ferrucci L, Schlessinger D, et al. Facets of personality linked to underweight and overweight. *Psychosom med*. 2009;71(6):682-9.
43. Cullen KW, Baranowski T, Rittenberry L, Cosart C, Hebert D, de Moor C. Child-reported family and peer influences on fruit juice and vegetable consumption: reliability and validity of measures. *Health Educ Res*. 2001;16(2):187-200.
44. Chadwick P, Crawford C, Ly L. Human food choice and nutritional interventions. *Nutrition Bulletin*. 2013;38(1):36-42.
45. de Bruijn G, Brug J, Van Lenthe F. Neuroticism, conscientiousness and fruit consumption: Exploring mediator and moderator effects in the theory of planned behaviour. *Psychol Health*. 2009;24(9): 1051-69.
46. McCrae R, Costa P. Trait explanations in personality psychology. *European Journal of Personality*. 1995;9(4):231-52.
47. de Bruijn G. Understanding college students' fruit consumption. Integrating habit strength in the theory planned behaviour. *Appetite*. 2010;54(1):16-22.
48. Keller C, Siegrist M. Does personality influence eating styles and food choices? Direct and indirect effects. *Appetite*. 2015;84:128-38.
49. Barrett LF, Tugade MM, Engle RW. Individual differences in working memory capacity and dual-process theories of the mind. *Psychol Bull*. 2004;130(4):553-73.
50. Leikas S, Lindeman M, Roininen K, Lähteenmäki L. Food risk perceptions, gender, and individual differences in avoidance and approach motivation, intuitive and analytic thinking styles, and anxiety. *Appetite*. 2007;48(2):232-40.
51. Gilson L. Trust and the development of health care as a social institution. *Soc Sci Med*. 2003;56(7):1453-68.
52. Hofmann W, Schmeichel BJ, Baddeley AD. Executive functions and self-regulation. *Trends Cogn Sci*. 2012;16(3):174-80.
53. Studer-Luethi B, Jaeggi SM, Buschkuhl M, Perrig WJ. Influence of neuroticism and conscientiousness on working memory training outcome. *Personality and Individual Differences*. 2012;53(1):44-9.
54. Baddeley A. *Human Memory: Theory and Practice*, Hove: Psychology Press. 1997.
55. Baxter P, Jack S. Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*. 2008;13(4):544-59.
56. Crouch M, McKenzie H. The logic of small samples in interview-based qualitative research. *Social Science Information*. 2006;45(4):483-99.
57. Silverman D. *Doing Qualitative Research*, London: Sage. 2005.