

DOI: 10.21767/2572-5394.100002

Relationship between Personality Type and Fruit and Vegetable Preference in Third and Fourth Grade Students

Megan Myrdal¹, Abby Gold^{2*}, Jim Deal³, Mary Larson⁴ and Michelle Strang⁵

¹Department of Health, Nutrition and Exercise Science, North Dakota State University, NDSU– Department 7270, Fargo

²College of Pharmacy, Nursing, and Allied Sciences, North Dakota State University, NDSU Department 2662, Fargo

³Department of Human Development and Family Science, North Dakota State University

⁴Department of Health, Nutrition and Exercise Science, North Dakota State University

⁵Department of Health, Nutrition and Exercise Science, North Dakota State University

*Corresponding Author: Abby Gold, College of Pharmacy, Nursing, and Allied Sciences

North Dakota State University NDSU Department 2662, PO Box 6050, Fargo, ND 58108-6050, Tel: 701.231.7478, Fax: 701.231.5586, Email: Abby.gold@ndsu.edu

Rec date: Dec 19, 2015, Acc date: Jan 20, 2016, Pub date: Jan 26, 2016

Copyright: © 2016 Myrdal M, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Abstract

Objective: The purpose of this study was to investigate the relationship between personality type and fruit and vegetable preferences of third and fourth grade children.

Methods: A cross-sectional, quantitative survey study was used to gather information from parents or caregivers (N=345). Survey packets were distributed and included a demographic questionnaire, the Inventory of Children's Individual Differences (short version), the Fruit and Vegetable Preference Questionnaire, and the Healthy Eating Index (HEI). Demographic variables were controlled and multiple regression analyses were conducted for fruit preference, vegetable preference, fruit and vegetable preference, and the HEI score to determine relationships to openness to experience, agreeableness, and neuroticism.

Results: The combined effect of openness to experience, agreeableness and neuroticism was significant for the fruit preference score ($p < 0.05$), vegetable preference score ($p < 0.001$), combined fruit/vegetable preference score ($p < 0.01$), and the HEI score ($p < 0.01$).

Conclusion: These results indicate that children who are more agreeable and open in nature may have stronger preferences for fruits, vegetables, and fruits and vegetables in general, and they may score higher on the HEI, and children who are more neurotic may have lower preferences for fruits and vegetables, and they may score lower on the HEI. These results support the consideration of personality as a factor that influences food preference.

Key words:

Preference; Personality; Children; Child nutrition; Fruit; Vegetables

Introduction

Childhood obesity is a major concern in the United States, with most children falling short of dietary recommendations, eating too many energy-dense, nutrient-poor foods and too few nutrient-dense foods like fruits and vegetables [1-3]. Research suggests positive health outcomes for a diet rich in fruits and vegetables, including improved nutrient intake, weight control, and a reduced risk of chronic diseases [4-6]. Despite the considerable health benefits found with fruit and vegetable intake, consumption remains low, with less than a quarter of Americans consuming the United States Department of Agriculture (USDA) recommendation for daily fruits and vegetables [7]. Numerous intervention attempts have been made to change and improve eating practices of children; however, the overweight and obesity epidemic persists as a serious national health concern.

Determining the factors that influence a child's eating behavior and ways to increase consumption of nutrient-dense foods and decrease consumption of nutrient-poor foods have been identified as public health priorities [8]. Dietary intervention strategies may prove more successful if they are tailored to the individual, accounting for variables including sex, age, cultural health beliefs, genetics, and personality attributes. Furthermore, understanding the determinants of health (social, psychological, and physical and economic environment; and the person's individual characteristics and behaviors) has been recognized as vital in the development of policy and intervention strategies to improve the health and wellbeing of a population [9].

The topic of food preference has been researched widely in relation to children's health and food consumption patterns based on the presumption that children "eat what they like" [10]. Food likes and dislikes have been determined to be significant predictors of food acceptance and consumption [11,12]. A substantial amount of research has focused on the factors that influence the development of food preference, including what children observe other people eating (especially their parents), the type and frequency of food offered, and how parents or caregivers promote and control food intake [13-15]. These factors are undoubtedly important; however, considerably less attention has been paid to the characteristics of children, such as personality and its impact on food preference.

Personality refers to a person's tendency to behave, think, and feel in a certain consistent manner [16]. Personality traits have been shown to predict behaviors due to biological and behavioral underpinnings [16]. In recent years, the research evaluating the relationship between personality and dietary behaviors has grown, with some research showing positive associations between personality dimensions and dietary intake [17-20] and others producing null results [21]. Since the research connecting food preference to consumption is significant, the purpose of this study was to investigate the association between personality type and preference for fruits, vegetables, or both in young children. The study sought to identify if personality explains part of the pathway leading to preference or liking of fruits and vegetables. It also seeks to determine if preference may support the previous research associating personality dimensions with certain dietary behaviors. We hypothesized that the personality dimensions of openness to experience and agreeableness would have a positive relationship with the sum score of preferred fruits, preferred vegetables, combined preferred fruits and vegetables, and the Healthy Eating Index (HEI) score, and that neuroticism would have a negative relationship to these sum scores.

Methods

Survey instruments were selected, modified, and underwent cognitive pretesting and piloted with appropriate parent audiences based upon criteria established by Fink [22]. These materials included a demographic questionnaire, Inventory of Children's Individual Differences - Short Version, Fruit and Vegetable Preference Questionnaire, and Caregiver Food Behavior Checklist.

The demographic questionnaire was used to ensure that the person completing the surveys was the decision maker regarding food purchases and preparation in the household. The questionnaire obtained the following information about the child: grade level and gender; about the parent or caregiver: relationship to the child, gender, age, ethnicity, education level, home ownership status; and household's proximity to a grocery store. The education and homeownership status variables were used to account for socioeconomic status, and the proximity to a full-service

grocery store was used to account for access to fruits and vegetables.

The Inventory of Children's Individual Differences (ICID) is an age and cultural neutral instrument designed to assess the Five Factor Model (FFM or Big Five) of personality in children and adolescents ages 2 to 15 using parental, non-parental or self-reports [23]. The FFM is a way to describe the main dimensions of personality based on a hierarchical model of trait structure. In this model narrow and specific traits are organized into five broad factors – extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience [24-26]. The short version of the ICID (ICID-S) has been shown to maintain the same levels of validity and reliability as the original ICID, successfully measuring the five broad personality dimensions while minimizing the time required for completion [27].

The Fruit and Vegetable Preference Questionnaire (FVPQ) is an adaptation of the SLU4Kids Food Frequency Questionnaire (SLU4KidsFFQ) [28]. Reliability and validity of the original tool is based on a study assessing the accuracy of parents as reporters of their own and their child's (age 2-5) fruit and vegetable intake. The FVPQ is designed to be easily and independently completed by parents or caregivers. The FVPQ eliminated original questions related to consumption of fruits and vegetables and focuses solely on preference. Another modification of the FVPQ is it includes a more robust listing of fruits and vegetables (23 fruits and 23 vegetables) to further capture the relationship between personality dimensions and fruit and vegetable preference. The scale measures preference of fruits and vegetables and summary scores were computed based on a Likert scale: Favorite, Likes It, Doesn't Like It, Hates It, Has Never Had It, Not Sure. A sum score was calculated for each child's preference for fruits, vegetables, and fruits and vegetables combined ($\alpha = 0.95$).

The Caregiver Food Behavior Checklist (CFBC) is an adaptation of the Food Behavior Checklist (FBC); a 22 item tool measuring eating behaviors of adults participating in the USDA Expanded Food and Nutrition Education Program (EFNEP) [29]. The instrument measures consumption of fruits, vegetables, milk, and sugar-sweetened beverages. The tool was adapted for children by Branscum et al. and evaluated for construct validity and internal consistency reliability with low-income, EFNEP eligible children (Food Behavior Checklist modified for children – FBC-MC) [30]. The CFBC utilizes 12 of the 16 original questions on the FBC-MC, and is adapted for parents to complete on behalf of their children. An example of this adaption: the first question on the FBC-MC asks "Do you eat more than 1 kind of fruit daily?" The CFBC asks "Does your child eat more than 1 kind of fruit daily?" The first ten questions on the CFBC were used to produce an HEI score by summing responses (questions 1-7, yes = 1 and no = 0, questions 8-10, yes = 0, no = 1) for a potential range of scores from 0 to 10. HEI scores were used as dependent variables in multiple regression analyses. The final two measures on the CFBC report the number of times per day a child eats fruits and vegetables (0, 1, 2, 3, 4, 5, more than 5, or don't know).

Following Institutional Review Board approval, volunteer Extension Service agents distributed 1,593 survey packets to third and fourth grade students in 22 participating elementary schools in the spring of 2014. Packets were given to students to take home to their parent or guardian. Inclusion criteria for study participants required the parent or guardian to live in the same home as the third or fourth grade child and be fluent in English. A parent or guardian completed the surveys at home and returned them to the researcher via a self-addressed stamped envelope. Participants had the option to complete and return a contact information form for a chance to win one of three \$50 gift cards.

A total of 347 survey packets were returned to the researcher and of those, 345 (n = 345) were included in the data analysis (two surveys did not complete a sufficient number of questions on the ICID to produce valid personality dimensions). This resulted in a completion rate of 21.66%. All data were entered and analyzed using the Statistical Package for the Social Sciences SPSS 15.0.1.1 [31]. Hierarchical multiple regressions were conducted to determine if personality contributed to the prediction of preference for fruits, vegetables, or both, and the HEI scores in children above and beyond what was accounted for by demographic factors.

Results

Personality dimensions were generated based on responses to the 50-item ICID, which asked parents to choose the degree

to which each statement describes their child in comparison to other children his/her age. Responses ranged from “much less than the average child” or “not at all” to “much more than the average child” on a 7-point Likert scale. Response scores were combined to create 15 intermediate personality dimensions, including items such as “considerate” and “intelligent.”

Finally, these variables were combined to compute the five personality dimensions: neuroticism ($\alpha = 0.85$), extraversion ($\alpha = 0.66$), openness to experiences ($\alpha = 0.71$), agreeableness ($\alpha = 0.87$), and conscientiousness ($\alpha = 0.76$).

Correlational matrices were examined for the five personality dimensions measured on the ICID. Multicollinearity was found for extraversion and conscientiousness. It was not hypothesized that these dimensions would be related to fruit and vegetable preference and HEI scores, and due to multicollinearity, extraversion and conscientiousness were omitted from data analysis.

Descriptive statistics were run for all demographic variables and are displayed in Table 1. In the majority of cases, persons completing the survey were responsible for making the purchasing and preparation decisions related to food (n = 343; 99.1%), were mothers (n = 305; 87.9%), between 30-49 years of age (n = 294; 85%), female (n = 323, 93.4%), attended at least some college (n = 282, 81.7%), and white (n = 310; 89.3%). The majority of households were within 5 miles of a grocery store (n = 263, 75.8%) and owned their home (n = 268; 77.2%).

Table 1: Characteristics of the Sample.

	n = 345
Food person	99.10%
Child grade - 3	51.90%
Child grade - 4	48.10%
Relationship to child	
Mother	87.90%
Father	6.60%
Grandmother	3.20%
Grandfather	0.30%
Other	2.00%
Child gender - boy	51.70%
Child gender - girl	48.00%
Parent/caregiver's age	
Less than 20	0.60%
20-29	8.10%
30-39	48.60%
40-49	36.40%
50-59	5.20%

60-69	0.60%
70 or over	0.60%
Parent/caregiver's gender - female	93.40%
Parent/caregiver's gender - male	6.60%
Ethnicity	
White	89.30%
Hispanic/Latino	2.30%
Native American	8.40%
Education of parent/caregiver	
High school or less	18.30%
Some college	36.80%
Bachelor's degree	33.00%
Graduate degree	11.90%
Grocery store proximity	
Less than 1 mile	41.80%
1-5 miles	34.00%
6-10 miles	8.60%
11-15 miles	5.20%
16-20 miles	5.90%
More than 20 miles	4.30%
Household home ownership status	
Own	77.20%
Rent	19.30%
Other	3.50%

Descriptive statistics were also run for the fruit and vegetable preference questionnaire and are presented in Table 2. Participants had the option to select that their child "Has Never Had It" or "Not Sure" for each fruit and vegetable. These responses were omitted from data analysis. The most preferred fruits among third and fourth grade students, according to their parents or caregivers, were watermelon

(3.71; SD = 0.546), strawberries (3.70; SD = 0.552) and juice (3.67; SD = 0.518), and the least preferred was papaya (2.45, SD = 0.829).

The most preferred vegetables were corn (3.60; SD = 0.547), carrots (3.41; SD = 0.627), and potatoes (3.38; SD = 0.721), and the least preferred was mushrooms (2.11; SD = 0.879).

Table 2: Hierarchical Order of Fruit & Vegetable Preference Descriptive Statistics.

Fruit	N	M	SD	Vegetable	N	M	SD
Watermelon	345	3.71	0.546	Corn	345	3.6	0.547
Strawberry	344	3.7	0.552	Carrot	344	3.41	0.627
Juice	345	3.67	0.518	Potato	345	3.38	0.721
Grapes	345	3.62	0.558	Lettuce	334	3.13	0.734
Apple	345	3.61	0.559	Green Beans	340	3.1	0.76
Orange	345	3.55	0.65	Cucumber	329	3.09	0.884
Banana	345	3.51	0.605	Broccoli	337	3	0.818

Pineapple	338	3.36	0.738	Celery	333	2.83	0.784
Pear	339	3.34	0.634	Cauliflower	317	2.75	0.822
Peach	343	3.34	0.702	Dark Greens	294	2.7	0.782
Raspberry	324	3.34	0.744	Green Peas	337	2.7	0.891
Cantaloupe	334	3.31	0.749	Bean	319	2.69	0.809
Blueberry	329	3.28	0.737	Asparagus	248	2.52	0.909
Cherry	332	3.27	0.783	Sweet Potato	268	2.5	0.786
Kiwi	325	3.25	0.756	Cabbage	273	2.44	0.736
Nectarines	279	3.24	0.681	Tomato	342	2.39	1.009
Tangerine	282	3.2	0.712	Green Pepper	300	2.38	0.824
Honeydew	318	3.14	0.751	Red Pepper	284	2.36	0.764
Plum	279	3.06	0.756	Squash	345	2.36	0.79
Mango	218	2.9	0.761	Kale	81	2.32	0.629
Apricot	211	2.79	0.765	Onion	328	2.21	0.832
Grapefruit	259	2.55	0.84	Beets	203	2.12	0.812
Papaya	97	2.45	0.829	Mushrooms	304	2.11	0.879

Demographic dummy variables were created for three categorical items: child's gender (boy or girl), ethnic origin (white/other or Native American), and home ownership (own or rent/other). Continuous variables were created for age and

education level of the parent/guardian, and distance to a full-service grocery store. These demographic variables were utilized in the regression analysis, and descriptive statistics for the items are shown in Tables 3 and 4.

Table 3: Frequency Statistics for Categorical Demographic Variables.

Variable		N	Valid Percent
Child's Gender	Male	179	51.9
	Female	166	48.1
Ethnicity	White/Other	317	91.6
	Native American	28	8.4
Home Ownership	Own Home	267	77.2
	Rent/Other	78	22.8

Table 4: Descriptive Statistics for Continuous Demographic Variables.

Variable	Mean	SD
Age	3.4	0.78
Education Level	2.39	0.92
Distance from Store	2.12	1.4

Age: 1 = less than 20; 2 = 20-29; 3 = 30-39; 4 = 40-49; 5 = 50-59; 6 = 60-69; 7 = 70 or over
 Education Level: 1 = high school or less; 2 = some college; 3 = bachelor's degree; 4 = graduate degree
 Distance from Store: 1 = less than 1 mile, 2 = 1-5 miles, 3 = 6-10 miles, 4 = 11-15 miles, 5 = 16-20 miles, 6 = more than 20 miles

Continuous variables were created from the CFBC and FVPQ for the HEI Score (0 to 10), Vegetable Preference Score (23 vegetables with a potential score ranging from 0 to 92), Fruit Preference Score (23 fruits with a potential score range of 0 to

92), and combined Fruit and Vegetable Preference Score (46 fruits and vegetables with a potential score range of 0 to 184).

It was hypothesized that openness to experience, agreeableness, and neuroticism would be correlated to fruit/vegetable preference and HEI scores. Due to strong correlations among these variables, personality facets were regressed in one equation. Diagnostic tests for linearity and homoscedasticity indicated that assumptions of regression were not substantively violated, and all variables used in the regression analyses were normally distributed.

To conduct the analysis, four separate regressions were run for each of the dependent variables (preference for fruit, vegetables, combined fruit and vegetables, and HEI score). Demographic variables (child's gender, parent's age, ethnicity, parent's education, and household distance from a grocery store) were entered into the first block followed by the three personality types (openness to experience, agreeableness, and neuroticism) in the second block. The combined personality dimensions of openness to experience, agreeableness, and neuroticism accounted for a significant proportion of the fruit preference score (R^2 change = .024, $F = 2.765$, $p = .04$), the vegetable preference score (R^2 change = .062, $F = 7.426$, $p < .001$), the combined fruit/vegetable preference score (R^2 change = .051, $F = 5.964$, $p = .001$), and the HEI score (R^2 change = .049, $F = 5.720$, $p = .001$). The addition of the personality dimension accounted for 2.4% of the variance in fruit preference, 6.2% of the vegetable preference, 5.1% of the combined fruit and vegetable preference. Additionally, 4.9% of the variance in HEI score is explained by the addition of personality, whereas the personality dimensions of openness to experience and agreeableness had positive regression weight for the dependent variables. These results indicate that children who are more agreeable and open in nature may have stronger preferences for fruits and vegetables, and they may score higher on the HEI. The personality facet of neuroticism had negative regression weights for all of the dependent variables. These results support the hypothesis that children who are more neurotic may have lower preferences for fruits and vegetables and may score lower on the HEI.

Discussion

The purpose of this study was to investigate the relationship between personality dimensions and fruit and vegetable preference in third and fourth grade children. Statistically significant increase in predictability of variance in preference for fruit, vegetables, or both and HEI score occurs when personality dimensions are included in the regression model. Hypotheses 1 and 3 address the personality facets of openness to experience and agreeableness and their relationship to fruit and vegetable preference and the HEI score. Hypotheses 2 and 4 address the personality facet neuroticism and its relationship to fruit and vegetable preference and the HEI score. This discussion examines the results from each hypothesis, evaluates them against the current literature, and provides recommendations for future research. The discussion will conclude with an examination of current food and nutrition behavioral models, including consideration of factoring personality dimensions as a food behavior determinant.

Hypotheses 1 and 3

The results of this study suggest that children who measured high in agreeableness and openness to experience have a significantly higher preference for fruits, vegetables, and/or combined fruits and vegetables and scored higher on the HEI. These results are in line with previous research that has shown agreeableness and openness to experience to be predictive of fruit and vegetable consumption and healthful eating [18,19].

Openness to experience is characterized by seeking novel and new experiences, curiosity, intellect, and creativity components [32], and previous research has shown this personality facet plays a role in consuming a healthful, balanced diet including fruits and vegetables [18, 33,34]. Researchers have hypothesized that the openness to experience personality dimension in relation to food preference and behavior may create willingness to seek out and try new fruits and vegetables, and subsequent increased exposure increases preference and consumption [13,35]. Many studies supporting a relationship between openness to experience and positive eating behaviors have been found in adults, as adults differ from children in their levels of independence, ability, and free will to make their own food choices.

The findings of this study are unique, as children in the third and fourth grade have limited ability to seek their own food choices, and previous research has suggested that parental influence and foods made available in the household may overrule the influence of personality on food consumption and preference in children [20]. Parents or caregivers typically determine the kind, quality, and content of food brought into the home and consumed outside of the home in early childhood. As openness to experience is characterized by novelty seeking, parents of these children may indulge this desire for new and unique experiences with new food choices. Research by De Bruijn et al. found openness to experience has a strong, significant effect on fruit and vegetable consumption in adolescents [19]. Our study demonstrated openness to experience has a significant effect on fruit and vegetable preference in young children. It is of interest to consider how these individuals with limited ability to seek their own food choices may gain preferences, and how personality plays a role in the pathway to food preference and choice. Parenting based on personality type is not a new concept. Considerable information exists on the topic in the research-based and consumer literature. However, no studies were found examining if the personality of a child might influence the foods available in the home. If children express a desire to try new foods (fulfilling the novelty seeking aspect of their personality type), if the desired new foods fits the family's description of a healthful, suitable food, and if the family has the means to purchase those foods, might the child's personality influence the foods made available inside the home and consumed outside the home? This question remains unanswered and is a potential direction for future research.

Agreeableness is characterized by individuals who are cooperative, considerate, and kind, and this personality type

has been linked to a willingness to accommodate others' wishes [32]. This study demonstrated that children with a high degree of agreeableness were associated with an increased preference for fruits, vegetables, fruits and vegetables, and scored higher on the HEI. De Bruijn et al. found agreeableness in adolescents to be associated with vegetable consumption [32]. The researchers hypothesized this because vegetables are usually a food group encouraged by parents or caregivers, and it follows those agreeable children or adolescents may be more easily encouraged to follow a healthful diet, especially when they are motivated, encouraged, and placed in an environment where they are able to do so.

The present food environment in the U.S. is considered "obesogenic," making less healthful foods easily accessible. At the same time it is more difficult for individuals to choose healthy foods like fruits and vegetables [36]. A significant improvement to increase healthy food offerings to children was the overhaul of the National School Lunch and School Breakfast Programs. One major objective of the revisions in the program was to increase the amount and diversity of fruits and vegetables served to students each week [37]. These guidelines require students to take a fruit serving at breakfast and lunch. Furthermore, the guidelines established subgroups and weekly requirements for vegetable categories, including dark green, dark orange/red, legumes, starchy, and other vegetables.

These healthful food choices may be novel to many children (in our present environment), which may motivate children high in openness to experience to try them. Additionally, many school nutrition programs provide staff training to teach personnel how to prompt or encourage young people to try new fruits and vegetables. Similarly, children high in agreeableness have a desire to cooperate and obey requests, making them more likely to accept and try the suggested foods. Young people who are high in openness to experience and agreeableness may be more willing to immediately try novel foods that are now being offered in the National School Meal programs, whereas young people who are high in neuroticism may require repeated exposures to gain a preference for novel foods. This pathway is currently unknown, but personality in acceptance of fruits and vegetables in school nutrition programs may be of interest for future research.

Finally, as parents and caregivers play a significant role in the development of food preference and consumption, exploring the mediating effect of openness to experience and agreeableness amongst parents who provide and encourage consumption of fruits and vegetables at home would improve our understanding.

Hypotheses 2 and 4

In the study, neuroticism had an inverse relationship with all the measures. Therefore, children who are more neurotic have a lower preference for fruits, vegetables, combined fruits and vegetables, and scored lower on the HEI. These results are consistent with previous research findings where neurotic personality types are correlated with eating a less healthful diet.

Mottus et al. examined the relationship between personality type and a Mediterranean-style diet, rich in fruits and vegetables and lower in meat products, in older adults [33]. The authors found that neuroticism was negatively associated with the Mediterranean-style diet, but positively associated with convenience foods and foods higher in sugar, salt and fat. Keller and Siegrist examined the direct and indirect effects of the Big Five personality traits on eating styles and food choices in a large, community-based sample [38]. Neuroticism was related to the consumption of sweet and savory foods via counter-regulatory emotional and external eating pathways.

Neuroticism is associated with emotional instability and experiencing negative emotions. It is hypothesized that individuals who are neurotic may use convenience foods, which are higher in sugar and fat, to cope with the negative emotions [39]. Highly palatable foods that are rich in sugar trigger the production of dopamine in the nucleus accumbens of the brain. Dopamine produces a pleasure response in the body that can surpass cocaine rewards in rats [40]. Schaefer et al. correlated neuroticism with increased activity in the brain's reward circuits [41]. Neurotic individuals may utilize pleasure-producing foods (rich in sugar and fat) to combat negative emotions. Moreover, these individuals may be more sensitive to the neurochemical response produced from such foods.

A recent study of college students ($n = 670$) asked participants and their parents to recall the frequency of consumption of foods in childhood, and looked at the relationship with current liking [42]. Frequent consumption of specific foods in childhood was significantly related to the current liking of that food. These findings highlight the importance of establishing healthful feeding practices in childhood to instill lifelong habits. Understanding how to best introduce healthy foods to children seems an important direction for future research.

Neuroticism is associated with a variety of physical and mental health problems [43]. Consideration should be given to parents of neurotic children in order to determine early dietary interventions and best feed practices for this personality type to promote consumption of nutrient-dense foods and decrease consumption of nutrient-poor foods. How parents feed their children clearly matters regarding short and long-term nutrient intake and food behavior practices. Numerous approaches are taken by parents and caregivers to influence their child's food consumption. Birch and Marlin demonstrated that preference for foods increases with familiarity [44]. In fact, new foods may take between 5 to 10 exposures before they become familiar and accepted. In a retrospective analysis of forced feeding episodes with college students, respondents reported experiencing at least one forced food consumption experience during childhood. The most common type of forced consumption involved an authority figure (parent or teacher) forcing the child to eat a food [45]. The most negative aspect of forced feeding was the lack of control and feeling of helplessness, creating distaste for the forced food.

As demonstrated in this study, children high in neuroticism may have lower preferences for fruits and vegetables related

to their personality. Parents may struggle to encourage consumption of fruits and vegetables, possibly leading to negative feeding scenarios and distaste for certain healthful foods. Future research should examine the neurotic child to determine best feeding practices and strategies to encourage preference and consumption of healthful foods like fruits and vegetables.

Personality and Food Intake Behavior Models

Various models exist to understand the highly complex determinants of food and diet related behaviors. Until recently, little consideration has been given to personality in these models, and Falconer et al. provide context as to why personality is a difficult factor to consider [46].

Personality is a highly complex concept, and there are numerous scales to assess the various proposed aspects. In practice, the nutrition educator will not be able to undertake a full personality assessment of all potential participants in a

nutrition program before designing the appropriate intervention (p. 317).

This sentiment was widely accepted by the nutrition community due to the limited understanding of the complexities of personality dimensions and lack of individuals cross-trained to understand both personality and nutrition research. Lunn et al. evaluated the associations between the Big Five personality dimensions and dietary intake, along with compliance to dietary recommendations [47]. This review provided considerable discussion to the known determinants of food behaviors and the previous challenges of incorporating personality dimensions into food and diet models. The review highlights how the core components of personality (basic tendencies, characteristic adaptations, and expressed personality) can be explained and incorporated into well-established dietary behavior models. It also provides a proposed model (Figure 1) to explain how the personality theory may fit.

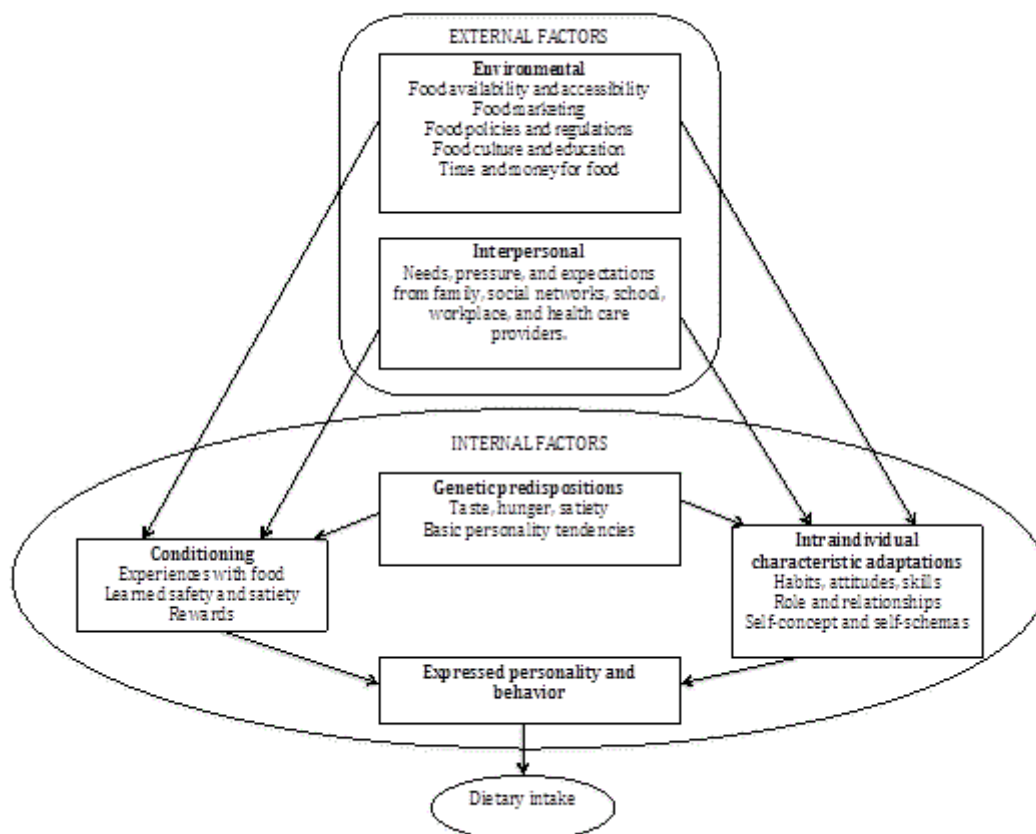


Figure 1: Model explaining how genetically inherited basic personality traits interact with environmental and interpersonal factors to develop intraindividual characteristic adaptations and conditioned responses, and how this might result in expressed personality and behavior, and ultimately dietary intake.

It is important to consider personality in models of dietary intake, because knowledge of this relationship can be used to generate tailored interventions that may produce dramatically better results. Personality-based nutrition education for groups or establishing personality in the selection criteria for

nutrition interventions is currently of little use. However, the ability to tailor a food plan based on personality facets would be quite useful for professionals working with parents of children struggling to introduce new foods and to establish healthful eating practices. The results of the current study

demonstrate that children who are more neurotic may have a lower preference for fruits and vegetables. Therefore, parents of children who are more neurotic may benefit from additional education and support to determine strategies to best encourage and promote children's acceptance of healthful food. Additionally, as neuroticism is characterized by being tense, anxious and moody [48], support should be given to parents or caregivers of neurotic children to recognize the struggles they are experiencing to feed their child, and work to develop best practices to develop lifelong preference and consumption of healthful foods.

Limitations of the Study

This was a correlational study, so causation cannot be inferred. Further, parents served as personality and food preference reporters for their children. While parents have been found to be accurate reporters in certain situations for their child's dietary intake and food preferences (Linneman et al. 2004), this method was not as accurate as direct observation of eating patterns. Further, this study examined and controlled for the potential confounding variables of age, education level, and distance to a full service grocery store in relation to the HEI, vegetable preference, fruit preference, and total fruit and vegetable preference. However, the study did not examine other known influences on children's food consumption and preference, including parental feeding styles, the home food environment, and school's participation in the USDA's Fresh Fruit and Vegetable Program (to name a few). Finally, the sample demographics are not representative of the U. S. population. Future research would benefit from an increased sample size pulled from a wider geographic region.

Conclusion

In summary, these results indicate that children who are more agreeable and open in nature may have stronger preference for fruits, vegetables, and fruits and vegetables in general, and they may score higher on the HEI. Children who are more neurotic may have lower preferences for fruits and vegetables, and they may score lower on the HEI. These results support the consideration of personality as a factor that influences food preference. Future research should look to better understand the feeding preferences and behaviors of neurotic children, and how best to influence and encourage healthful dietary practice.

Acknowledgements

In addition to the invaluable contributions of the co-authors, I wish to thank the North Dakota State University Extension Agents who assisted with school recruitment and survey distribution. I would also like to acknowledge Rebecca West and Kierstin Hurtt for their valuable editing contributions.

Contributor Statement

Megan Myrdal made contributions to conception and design, acquisition of data, and analysis and interpretation of data. Myrdal also drafted and revised the article. Abby Gold served as the principal investigator and made contributions to conception and design, acquisition of data, and analysis and interpretation of data. Gold also critically revised the article. Jim Deal made contributions to the conception and design, and analysis and interpretation of data. Deal also critically revised the article. Mary Larson made contributions to the conception and design, and analysis and interpretation of data. Larson also critically revised the article. And Michelle Strange made contributions to the analysis and interpretation of data.

References

1. Ogden C, Carroll M, Curtin L, Lamb M, Flegal K, et al. (2010) Prevalence of high body mass index in US children and adolescents, 2007-2008. *Journal of the American Medical Association* 303: 242-249.
2. Reedy J, Krebs-Smith S (2010) Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. *Journal of the American Dietetic Association* 110: 1477-1484.
3. Lorson B, Melgar-Quinonez H, Taylor C (2009) Correlates of fruit and vegetable intake in U.S. children. *Journal of the American Dietetic Association* 109: 474-478.
4. Hyson D (2011) Fruits, vegetables, and health: A scientific overview. Produce for Better Health Foundation.
5. Harding A, Wareham N, Bingham S, Khaw K, Luben R, et al. (2008) Plasma vitamin C level, fruit and vegetable consumption, and the risk of new-onset type 2 diabetes mellitus: the European Prospective Investigation of Cancer-Norfolk Prospective Study. *Archives of Internal Medicine* 168: 1493-1499.
6. Crowe F, Roddam A, Key T, Appleby P, Overvad K, et al. (2011) Fruit and vegetable intake and mortality from ischaemic heart disease: Results from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Heart study. *European Heart Journal* 32: 1235-1243.
7. Lutfiyya M, Chang L, Lipsky M (2012) A cross-sectional study of US rural adults' consumption of fruits and vegetables: Do they consume at least five servings daily? *BMC Public Health* 12: 280-295.
8. Lobstein T, Baur L, Uauy R (2004) Obesity in children and young people: a crisis in public health. *Obesity Reviews* 5: 4-85.
9. World Health Organization. [Internet] (2013) Health impact assessment (HIA): the determinants of health .
10. Cooke L, Wardle J (2005) Age and gender differences in children's food preferences. *British Journal of Nutrition* 93: 741-746.
11. Gibson E, Wardle J, Watts C (1998) Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite* 31: 205-228.

12. Raynor D, Polley B, Wing R, Jeffery R (2004) Is dietary fat intake related to liking or household availability of high- and low-fat foods? *Obesity Research* 12: 816-823.
13. Birch L (1999) Development of food preferences. *Annual Review of Nutrition* 19: 41.
14. Cooke L, Wardle J, Gibson E, Sapochnik M, Sheiham A, et al. (2004) Demographic, familial and trait predictors of fruit and vegetable consumption by pre-school children. *Public Health Nutrition* 7: 295-302.
15. Vereecken C, Keukelier E, Maes L (2004) Influence of mother's educational level on food parenting practices and food habits of young children. *Appetite* 43: 93-103.
16. Caspi A, Shiner R (2006) Personality development. *Handbook of Child Psychology, Volume (3rd. 4th edn)*. Hobokan: Wiley.
17. Goldberg L, Strycker L (2002) Personality traits and eating habits: the assessment of food preferences in a large community sample. *Personality and Individual Differences* 32: 49-65.
18. Tiainen A, Männistö S, Lahti M, Blomstedt P, Lahti J, et al. (2013) Personality and dietary intake – findings in the Helsinki Birth Cohort Study. *PLoS ONE* 8: 1-8.
19. De Bruijn G, Kremers S, Van Mechelen W, Brug J (2005) Is personality related to fruit and vegetable intake and physical activity in adolescents? *Health Education Research* 20: 635-644.
20. Vollrath M, Hampson S, Júlíusson P (2012) Children and eating: Personality and gender are associated with obesogenic food consumption and overweight in 6- to 12-year-olds. *Appetite* 58: 1113-1117.
21. Yeo M, Treloar S, Marks G, Heath A, Martin N, et al. (1997) What are the causes of individual differences in food consumption and are they modified by personality? *Personality and Individual Differences* 23: 535-542.
22. Fink A (2003) *The survey handbook*. (2nd edn). Sage, Thousand Oaks, California.
23. Halverson C, Havill V, Deal J, Baker S, Victor J, et al. (2003) Personality structure as derived from parental ratings of free descriptions of children: the inventory of child individual differences. *Journal of Personality* 71: 995.
24. Digman J (1990) Personality structure: Emergence of the five-factor model. *Annual Review of Psychology* 41: 417-440.
25. McCrae R, John O (1992) An introduction to the five-factor model and its applications. *Journal of Personality* 60: 175-215.
26. Saucier G (2008) Measures of the personality factors found recurrently in human lexicons. *The SAGE handbook of personality theory and assessment, Volume 2*. Boyle, G, Matthews, G, Saklofske, D, editors. Thousand Oaks, (CA): Sage.
27. Deal J, Halverson C, Martin R, Victor J, Baker S, et al. (2007) The inventory of children's individual differences: Development and validation of a short version. *Journal of Personality Assessment* 89: 162-166.
28. Linneman C, Hessler K, Nanney S, Steger-May K, Huynh A, et al. (2004) Parents are accurate reporters of their preschoolers' fruit and vegetable consumption under limited conditions. *Journal of Nutrition Education & Behavior* 36: 305-308.
29. Townsend M, Kaiser L, Allen L, Joy A, Murphy S, et al. (2003) Selecting items for a food behavior checklist for a limited-resource audience. *Journal of Nutrition Education & Behavior* 35: 69-77.
30. Branscum P, Sharma M, Kaye G, Succop P (2010) An evaluation of the validity and reliability of a food behavior checklist modified for children. *Journal of Nutrition Education and Behavior* 42: 349-352.
31. SPSS Inc. Released (2007) *SPSS for Windows, Version 16.0*. Chicago, IL.
32. Caspi A, Roberts B, Shiner R (2005) Personality development: Stability and change. *Annual Review of Psychology* 56: 453-484.
33. Mottus R, McNeill G, Craig L, Starr J, Deary I, et al. (2013) The association between personality, diet, and body mass index in older people. *Health Psychology* 32: 353-360.
34. Raynor D, Levine H (2009) Associations between the five-factor model of personality and health behaviors among college students. *Journal of American College Health* 58: 73-81.
35. Birch L, Fisher J (1998) Development of eating behaviors among children and adolescents. *Pediatrics* 101: 539-549.
36. Larson N, Story M, Nelson M (2009) Neighborhood food environments: disparities in access to healthy foods in the U.S. *American Journal of Preventive Medicine* 36: 74-81.
37. National Standards in the National School Lunch and School Breakfast Programs (2012) Food and Nutrition Service, United States Department of Agriculture. *Federal Register* 77: 4088-4167.
38. Keller C, Siegrist M (2015) Does personality influence eating styles and food choices? Direct and indirect effects. *Appetite* 84: 128-138.
39. Groesz L, McCoy S, Carl J, Saslow L, Stewart J, et al. (2012) What is eating you? Stress and the drive to eat. *Appetite* 58: 717-721.
40. Lenoir M, Serre F, Cantin L, Ahmed S (2007) Intense sweetness surpasses cocaine reward. *PLoS One* 2: e698.
41. Schaefer M, Knuth M, Rumpel F (2011) Striatal response to favorite brands as a function of neuroticism and extraversion. *Brain Research* 1425: 83-89.
42. Wadhera D, Capaldi Phillip E, Wilkie L, Boggess M (2015) Perceived recollection of frequent exposure to foods in childhood is associated with adulthood liking. *Appetite* 89: 22-32.
43. Lahey B (2009) Public health significance of neuroticism. *American Psychologist* 64: 241-256.
44. Birch L, Marlin D (1982) I don't like it; I never tried it: effects of exposure on two-year-old children's food preferences. *Appetite* 3: 353-360.
45. Batsell W, Jr Brown A, Ansfield M, Paschall G (2002) "You WILL eat all of that!" A retrospective analysis of forced consumption episodes. *Appetite* 38: 211-219.
46. Falconer H, Baghurts K, Rump E (1993) Nutrient intakes in relation to health-related aspects of personality. *Journal of Nutrition Education* 25: 307-319.
47. Lunn T, Nowson C, Worsley A, Torres S (2014) Does personality affect dietary intake? *Nutrition* 30: 403-409.
48. Shiner R (2006) Temperament and Personality in Childhood. *Handbook of personality development*. Mroczek, Little, T, editors. Mahwah (NJ): Lawrence Erlbaum.