Diet Choices: Psychological Impacts and Influences

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A research thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Clinical Psychology (DClinPsych)

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Table of Contents

List of Abbreviations

ACT	Acceptance and Commitment Therapy
AqoL	Assessment of Quality of Life
BL-VAS	Bond-Lader Visual Analogue Scale
BMI	Body Mass Index
BPS	British Psychological Society
CESD-R	Center for Epidemiologic Studies Depression Scale
CGI-I	Clinical Global Impression Improvement Scale
CI	Confidence interval
CVD	Cardiovascular disease
DASS-21	The Depression, Anxiety and Stress Scale - 21 Items
GP	General Practitioner
GSES	General Self-Efficacy Scale
HADS	Hospital Anxiety and Depression Scale
HR	Hazard ratio
IAT	Implicit Association Test
IPAQ	The International Physical Activity Questionnaire
KIDMED	Mediterranean Diet Quality Index for Children and Teenagers
Kg	Kilogram
MADRS	Montgomery-Asberg Depression Rating Scale
MD	Mediterranean diet
MDE	Major depressive episode
M^2	Meters squared
MEDAS	Mediterranean Diet Adherence Screener
NHS	National Health Service
NS	Not stated

OCTD	Obsessive-Compulsive Tic Disorder
PANAS	The Positive and Negative Affect Schedule
POMS	Profile of Mood States
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSQI	Pittsburgh Sleep Quality Index
PWB	Psychological Wellbeing
QoL	Quality of Life
QoL-VAS	Quality of Life Visual Analogue Scale
RCT	Randomised controlled trial
SC-IAT	Single-Category Implicit Association Test
SD	Standard deviation
SDQ	Strengths and Difficulties Questionnaire
SF-36	36 Item Short Form Survey
SMI	Serious mental illness
SRHI	Self-report Habit Index
WHO-5	World Health Organisation Five Well-Being Index
WHOQoL-BREF	World Health Organisation Quality of Life – 26 Items
Y-BOCS	Yale-Brown Obsessive Compulsive Scale
YGTSS	Yale Global Tic Severity Scale

List of Tables

List of Figures

Acknowledgments

Firstly, I would like to thank my research supervisors, Dr Anthony Colombo and Dr Carolyn Gordon, for all the guidance and expertise they have provided me throughout this process. I also want to thank Dr Rob Lowe for sparking my interest and enthusiasm in health behaviour and clinical health psychology research.

To all my friends that have helped me through this process in various ways, thank you. To my fellow psychologists and friends, Muj and Ryan, your constant support and humour has made the long days working easier and is appreciated.

Thank you to my Father, and Brothers, for always being there when needed and for helping me along every step of this journey. Lastly, to my partner, Bee, thank you for your support, encouragement, and patience throughout. You have really helped to keep me grounded and to see this project through.

This thesis is dedicated to the memory of my Mother, Deborah Larcombe. While you are not here to see the ending of this journey, the values you taught me served as my compass throughout and always.

- Thank you.

Declaration

I declare that this research thesis is the result of my own work and investigation. All chapters within this research thesis have been prepared under my own authorship. However, the guidance of my supervision team, Dr Anthony Colombo and Dr Carolyn Gordon, has been sought and used throughout this research process. This research thesis has not been submitted for another degree at another university.

It is intended that chapter one and two of this research thesis will subsequently be submitted for publication (Appendix A). It is intended that chapter one will be submitted to the British Journal of Nutrition, chapter two will be submitted to the British Journal of Health Psychology.

Summary

This research thesis further contributes to the understanding of both psychological influences on dietary choices and bodyweight status, and the impacts of diet interventions on psychological wellbeing. This thesis is split across three chapters, each outlined below:

Chapter One

A systematic review of the impacts of Mediterranean diet interventions on psychological wellbeing. Narrative synthesis within indicated that Mediterranean diet interventions may lead to a range of improvements in psychological wellbeing across clinical and non-clinical populations. Particular benefits on hedonic and eudaimonic psychological wellbeing are discussed. Clinical implications and future research directions are outlined.

Chapter Two

A research study examining the influence of implicit (relative to explicit) attitudes toward 'junk food', on habitual consumption of junk food and subsequent risk of overweight/obesity. Results suggested that implicit attitudes are significant and more powerful predictors of habitual consumption of junk food than explicit attitudes, and might influence risk of overweight/obesity. It is concluded that related interventions to improve public health may benefit from targeting implicit attitudes potentially influencing eating behaviours and habits.

Chapter Three

A personal reflective account of the process of conducting the research outlined in chapter one and two. A 'pragmatist reflective position' is broadly taken in order to aid learning from the research experiences. Following reflection across a range of topics within, numerous benefits to the role of clinical psychologist are highlighted and discussed.

Total word count:

19, 995 *(all chapters – excluding abstracts, tables/figures, references and appendices)*

Chapter One

Mediterranean Diet Interventions and Psychological Wellbeing Outcomes in Clinical and Non-Clinical Populations: A Systematic Narrative Synthesis

Abstract

Background: Research has shown associations between diet quality and psychological wellbeing (PWB) although the true nature of these links remains unclear. Gut-brain axis theorising suggests that diet can influence PWB. Therefore, diet interventions such as the Mediterranean diet, may hold promise as a novel intervention strategy for improving PWB. **Aim:** To examine if Mediterranean diet interventions can improve PWB in clinical and non-clinical populations. **Method:** A systematic review of published literature reporting on the impact of Mediterranean diet interventions on PWB was conducted. Searches were carried out within Embase, PsychINFO, Medline, Web of Science, and CINAHL databases. Twelve papers met the inclusion criteria and were retained for narrative synthesis. **Findings:** Mediterranean diet interventions seemingly led to a range of improvements in PWB across both clinical and non-clinical populations. Improvements in three key areas of PWB were noted, including: mental health, psychological functioning, and social functioning. **Conclusion:** While limitations of the research were acknowledged, it was concluded that Mediterranean diet interventions may benefit both hedonic and eudaimonic aspects of PWB across populations groups. Future research is warranted to determine the feasibility, efficacy and cost-effectiveness of using Mediterranean diet interventions across healthcare systems to promote and improve PWB.

Introduction

Links between common modern day unhealthy diet patterns and physical health difficulties are widely known and accepted (GBD Diet Collaborators, 2019; World Health Organisation, 2018). Connections between diet and psychological wellbeing (PWB) however, are less clear. The following review addresses this area by seeking to examine the literature relating to Mediterranean diet interventions and PWB in clinical and non-clinical populations.

PWB is an umbrella term with no universally agreed definition. PWB is often used interchangeably with the term wellbeing (Dodge, Daly, Huton, & Sanders, 2012). Wellbeing has been argued to be comprised of two broad domains: hedonic and eudaimonic. Hedonic wellbeing relates more to emotional/mental affective states, whereas eudaimonic wellbeing relates to lived experiences and quality of life ([QoL] Hernandez et al., 2018; Dodge et al., 2012). Within this review 'PWB' is used to refer to both hedonic (e.g. mental health, cognitive functioning, psychological distress etc.), and eudaimonic (e.g. psychosocial distress and quality of life) aspects of PWB. The Mediterranean diet definition varies across country but is typically regarded as a diet high in: vegetables, fruits, legumes, nuts, beans, cereals, grains, fish and unsaturated fats such as olive oil. The Mediterranean diet involves controlled intakes of dairy and other lean meat (such as poultry). Low intakes of foods high in fat, salt, and sugar is also a feature (NHS, 2017; Davis, Bryan, Hodgson, & Murphy, 2015).

Psychological Wellbeing and Diet

Emerging research has begun to demonstrate links between diet quality, mental health (a key component of PWB) and broader measures of PWB. Associations between 'healthier' diet quality, and improved PWB, have been consistently reported in reviews of studies involving children and young people (Khalid, Williams, & Reynolds, 2017; O'Neil et al., 2014) and adult (Teasdale et al., 2019; Quirk et al., 2013) populations. The potential influence of diet on PWB remains an important issue to consider given the large numbers of people consuming unhealthy diets globally (GBD Diet Collaborators, 2019). Despite emerging evidence that a healthy diet and positive PWB are linked, the true nature of these associations remains unclear.

This idea that diet can influence PWB is supported by recent emergence of theory and research on the gut-brain axis. The gut-brain axis is a bidirectional pathway connecting the brain and gut. Research has highlighted that the microbiome within the gut (influenced by diet) can impact brain function, mood and behaviour (Galland, 2014; Mohajeri, La Fata, Steinert, & Weber, 2018). This had led for calls to 'rethink' and augment traditional psychological intervention approaches by targeting microbiota through diet intervention (Liang, Wu, & Jin, 2018). However, despite diet interventions holding promise, such intervention strategies are not routinely used at any healthcare level to improve/promote PWB. Further research in this area therefore, may help to identify the specific 'active' ingredients or dietary pattern necessary for maintaining and/or developing good PWB.

If dietary interventions can potentially influence PWB through the gut-brain axis, it becomes important to consider which dietary pattern is most likely to be influential. Research on the Mediterranean diet specifically, has shown that increased adherence to this dietary pattern is associated with improved wellbeing (Moreno-Agostino et al., 2018). Furthermore, research that has compared different forms of dietary patterns has indicated that the Mediterranean diet is most strongly associated with mood (Lassale et al., 2019), and in turn therefore, implicated in PWB. As such, when considering types of diet interventions for improving PWB, the Mediterranean diet may hold particular promise.

When considering diet interventions for PWB 'parity of esteem' between physical and mental health services is an important issue to consider. Parity of esteem is both a current topic and necessity in delivery of optimal health care (NHS, 2014). Physical healthcare settings often take holistic approaches to intervention (The Health Foundation, 2016). Dietary intervention strategies are employed to tackle noncommunicable diseases, with a Mediterranean diet being among the most widely recommended (Bruins, Van Dael, & Eggersdorfer, 2019; Sofi et al., 2008). If dietary interventions such as the Mediterranean diet are also found to benefit PWB, they may hold additional promise as a tool for improving public health. Such strategies could potentially be used across healthcare settings and mental health services to promote and improve PWB. In order for these strategies to be trialled, the efficacy of Mediterranean diet interventions for improving PWB needs to be reviewed. If diet interventions (such as the Mediterranean diet) lead to improvements in PWB, it may be more confidently asserted that diet quality influences PWB.

Previous Literature

To date, there appears to be a lack of systematic reviews of studies examining the potential impact of Mediterranean diet interventions on PWB. A related review however, highlighted that the Mediterranean diet was associated with decreased risk of dementia and cognitive impairment (Petersson & Philippou, 2016). While not specific to Mediterranean diets, two recent reviews demonstrated that dietary interventions more generally can be used as interventions for depression. Opie, O'Neil, Itsiopoulos, and Jacka (2014) and Firth et al. (2019) both conducted systematic reviews of randomised controlled trials (RCTs) of whole diet interventions for adults with depression and/or anxiety. Opie et al.'s (2014) review included 17 studies from 2000 to 2012, whereas Firth et al.'s meta-analysis (2019) included 16 studies from 2000 to 2017. Both reviews found that whole diet interventions produced significant reductions in measures of depression but not anxiety. Both reviews concluded that dietary interventions hold promise as intervention strategies for depression. Firth et al. (2019) highlighted that more research was necessary to explore underlying mechanisms and delivery strategies for dietary interventions in clinical and public health settings.

Rationale and Review Aim

While the above reviews produced interesting findings there are some notable limitations. Firstly, both included only RCT studies involving adults, therefore it is possible that many robustly conducted studies not conforming to these criteria were excluded. Secondly, these reviews included only papers reporting outcomes of 'symptoms of depression/anxiety'. This approach may have therefore missed relevant literature on PWB more generally. Furthermore, both reviews only included one study involving participants with clinical levels of mood difficulties, thus impacting upon the generalisability of the findings. Lastly, these reviews both focused on whole diet interventions generally rather than a specific diet. While the revealed findings are promising, these reviews do not conclusively highlight a specific dietary pattern that could potentially be used to improve PWB outcomes across healthcare levels.

This systematic review aims to add to current understanding in the area of diet interventions and PWB. This review will address the current gaps in the literature by: taking a specific focus on recent research that has investigated Mediterranean diet interventions only, has used measures of PWB as the outcome (rather than being restricted to 'depression/anxiety' only), and unlike previous reviews will not be restricted to RCT study

designs. Specifically, this review aims to answer the question: can Mediterranean diet interventions improve PWB in clinical and non-clinical populations?

Method

Search Process

A systematic search was conducted between November 2019 and January 2020. The search looked for relevant quantitative and/or qualitative research studies that had investigated whether Mediterranean diet interventions improve PWB. Embase, PsychINFO, Medline, Web of Science, and CINAHL databases were searched. These databases were deemed most likely to capture papers of relevance to psychology, nursing, and nutrition and thus most relevant to the research question/field. To ensure reproducibility and transparency of the searches an audit trail was kept (Appendix B). Searches of grey literature were also conducted using OpenGrey and OpenDoar. These were deemed important given the prevalence of 'publication bias' within journals wherein studies with 'positive findings' are more commonly published (Song, Hooper, & Loke, 2013). Following the database search, an internet search using Google Scholar was performed to find any articles missed by the main search. Lastly, reference lists of relevant articles were examined to indentify further literature of relevance.

Search Terms

Key search terms used within the systematic search process are outlined in Table 1.1 below. Included are the: main concepts, synonyms of the main concepts, and location within the database in which the key word was searched for.

Table 1.1. *Key Search Terms*

Main Concepts	**Synonyms**	**Location**
Mediterranean diet	N.A.	Title/Abstract
Wellbeing or well-being or well being	Mental health Mental disorder* Mental problem* Mental illness	Title/Abstract

Cognitive functioning
Psychological distress
Psychosocial distress
Quality of life

As can be seen within Table 1.1 the main concepts within the search are 'Mediterranean diet' and 'wellbeing'. The main concept of 'Mediterranean diet' was not further broken-down into synonyms (i.e. nuts, olive oil, lean meat etc.) as this would have shifted focus away from a holistic Mediterranean dietary pattern. The main search concept 'wellbeing' has three possible spellings, each of which was included to not miss any relevant literature. The term 'psychological' was not added to 'wellbeing' to avoid missing relevant literature. As can be seen in Table 1.1 'wellbeing' was broken-down further in a second wave synonym search. As previously discussed, PWB is argued to have two specific domains: hedonic and eudaimonic (Hernandez et al., 2018). Therefore, PWB was operationalised by including synonyms that captured both hedonic (e.g. mental health, cognitive functioning, psychological distress) and eudaimonic (e.g. psychosocial distress/quality of life) aspects of PWB. Titles and abstracts were searched using the key search terms to find papers.

Search Strategy

Boolean Logic was used to focus the systematic search (Ridley, 2012). 'AND' and 'OR' Boolean operators were used to combine the key search terms and refine the search. The Boolean 'catch all' function ('*') was employed to facilitate truncation of key search terms and ensure relevant words/phrases were identified. The below Boolean search string was replicated across all databases (CINAHL required a slightly modified search process given the configuration of this database, see Appendix B):

Mediterranean diet
AND
Wellbeing OR well-being OR well being
OR
Mental health OR mental disorder OR mental problem* OR mental illness OR*

cognitive functioning OR psychological distress OR psychosocial distress OR quality of life

The search process was conducted in three waves. The first wave included main concepts only whereas the second phase additionally included the synonyms. A third wave search (using Google Scholar) was conducted in January 2020 to find additional new studies.

Inclusion and Exclusion Criteria

The articles returned from the searches were screened in two stages. An initial brief screening determined whether a second, more in-depth screening against specific inclusion and exclusion criteria was appropriate.

Initial screening.

Articles were retained if they were:

1. Broadly related to the research question: can Mediterranean diet interventions improve PWB?
2. Not a meta analysis/review, study protocol, single case report, or commentary paper.
3. Available in English language.
4. Available in 'full text' version.
5. Peer reviewed.
6. Less than 10 years old.

Full inclusion and exclusion criteria.

Articles satisfying initial screening checks were retained for screening against specific inclusion and exclusion criteria. Table 1.2 below illustrates the criteria used to select studies to be included within this systematic review.

Table 1.2. *Inclusion and Exclusion Criteria*

Category	Inclusion Criteria	Exclusion Criteria
Participants	Males and/or females Child and/or adult studies Studies that included individuals with chronic health conditions Clinical and/or non-clinical populations	Participants with eating disorders Studies focusing on pregnant women or breast feeding women
Study Location	Any country	
Methodology	Quantitative, qualitative or mixed methods designs	Meta-analyses/reviews, editorials, critical discussions, single case reports
Variables	Mediterranean diet intervention described in sufficient detail Studies including dietary supplementation (if supplementation aligned with principles of Mediterranean diet and/or restricted to one food item only) Diet intervention delivered in any format Intervention period of at least one week Study reports on at least one qualitative/quantitative PWB aspect/change as primary or secondary outcome	Studies evaluating single nutrients, single food items or drinks only Mediterranean diet studies that used combined interventions Diet interventions other than Mediterranean Hypocaloric Mediterranean diet interventions

As can be seen in Table 1.2 selected studies were not restricted by age, gender or study location. This was to enable a good breadth and depth of research to be reviewed. Research studies involving clinical and non-clinical populations were included, including research on individuals with chronic health conditions (e.g. cancer, cystic fibrosis, HIV) where outcomes on PWB were reported as a primary or secondary focus. Research involving participants with eating disorders however, was excluded as this may have created a confounding variable around self-reported adherence to prospective diet intervention. Similarly, studies focusing upon pregnant or breast feeding women were also excluded due

to possible nutrient exchange and hormone changes confounding effects of dietary intervention.

This review was inclusive of all research designs: quantitative, qualitative and mixed methods. Studies were included where the intervention was described in sufficient detail to ensure it was consistent with key principles of a holistic Mediterranean diet (NHS, 2017; Davis et al., 2015). Thus, studies focusing on singular food/drink items, or singular nutrients only were excluded. Diet interventions other than Mediterranean (e.g. Nordic, Vegan, DASH) were excluded. No restriction was placed upon diet intervention delivery method, for example: diet counselling, cooking classes, information provision, prescribing meals/ingredients were included. However, studies with an active intervention period of less than one week were excluded to ensure the diet intervention had time to take effect. Studies using active calorie restriction or hypocaloric Mediterranean diets were excluded to potentially prevent fatigue confounding results. Research involving a Mediterranean diet intervention with dietary supplementation was permitted if supplementation was consistent with key features of Mediterranean diet (e.g. extra: olive oil, lean meat etc.) or limited to one food item only (e.g. supplemental nuts, or, dairy etc.). This was to ensure that a holistic Mediterranean diet was the heart of all study interventions while allowing a small amount of supplementation flexibility to aid inclusivity. Lastly, studies were retained if they reported on at least one PWB aspect/change regardless of whether this was a primary or a secondary outcome. Studies that used combined interventions (e.g. diet plus exercise) were excluded to ensure changes in PWB were more likely attributable to diet intervention alone.

Classification of Studies

The study selection processes described above was guided by and recorded using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram (PRISMA; Moher, Liberati, Tetzlaff, Altman, & The PRISMA Group, 2009). This was to facilitate best practice transparent reporting of the systematic review process (Liberati et al., 2009).

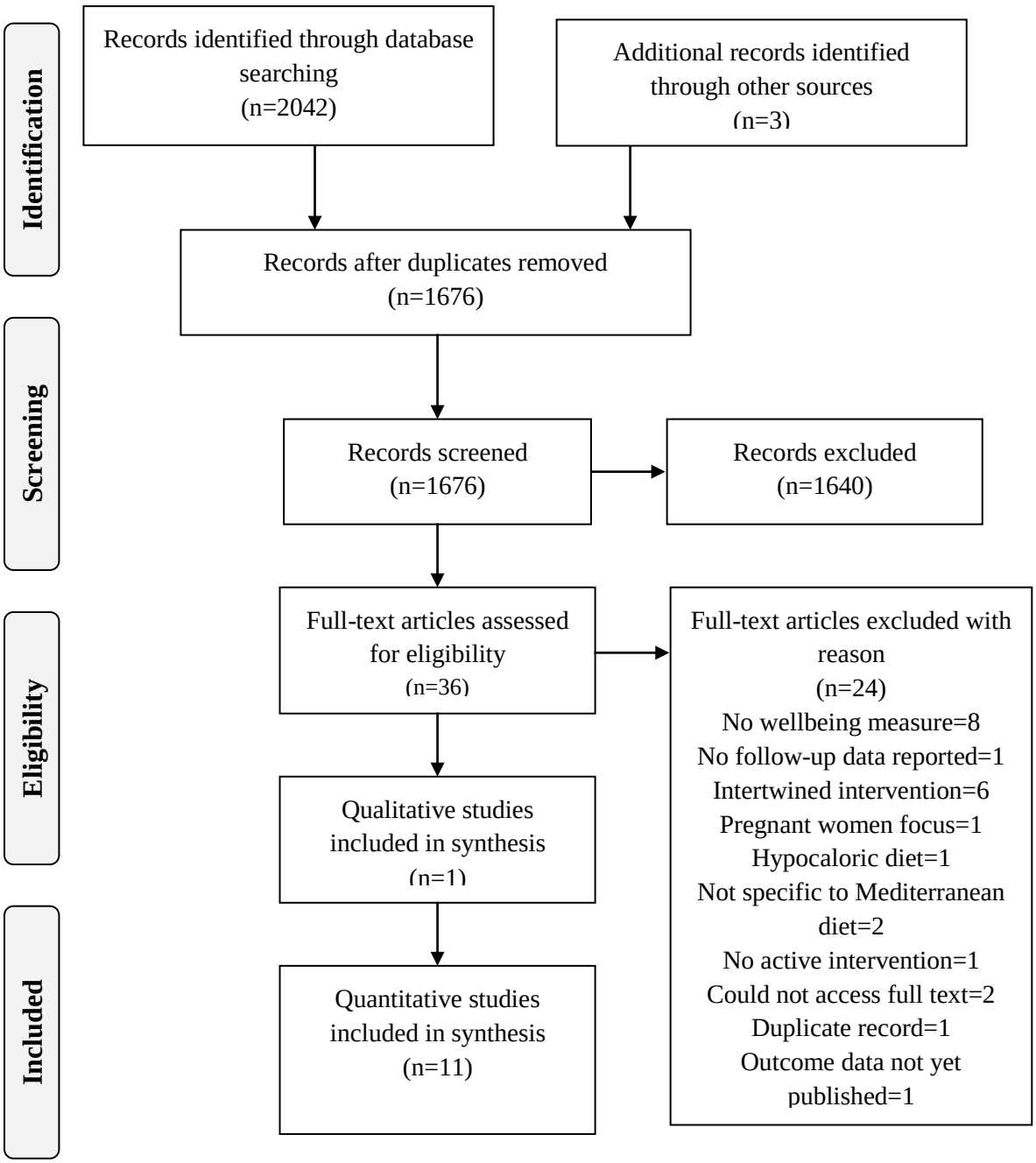

Figure 1.1. PRISMA flow diagram reporting of the systematic search process.

Figure 1.1 above outlines the systematic search as guided by the PRISMA process. As can be seen, electronic database searches returned 2042 articles. Three records were identified via searching other sources. Thirty-six of these articles met initial screening checks and were retained for screening against the inclusion/exclusion criteria. Twenty-four of these articles were excluded, the reasons for these exclusions are shown in Figure 1.1

above. In total, 12 articles including 11 quantitative and one qualitative were retained for inclusion in this systematic review.

Quality Assessment Analysis

Quality assessment checks.

The methodological rigour of the included studies was determined to establish the suitability of these papers. This was necessary as a study meeting inclusion/exclusion criteria does not guarantee the study is 'well conducted' and methodologically robust. In order to ensure this systematic review produced valid, reliable, and generalisable knowledge it is necessary that included studies are of a good standard. Caldwell, Henshaw, and Taylors' (2011) quality assessment framework was employed to aid this process (Appendix C). This framework was chosen as it can be used to assess quantitative and qualitative methodologies. Furthermore, this assessment framework was developed specifically to facilitate critical assessment of health related research (Caldwell et al., 2011).

Caldwell et al.'s (2011) framework provides 17 assessment criteria, each with corresponding guidance to facilitate critical appraisal scoring. For example, criteria 2 is *'are the authors credible'* and the associated guidance for this criterion is '*researchers should hold appropriate academic qualifications and be linked to a professional field relevant to the research'.* This framework was augmented by the primary reviewer adding a three point scoring system to aid systematic quality scoring of the articles. The reviewer awarded 2 points if a criterion was '*fully met'*, 1 point if a criterion was '*partially met*', and 0 points where a criterion was '*not met'*. This enabled an overall quality score to be generated for each article by combing the awarded criterion scores together. Scores ultimately ranged from 0 to 34, with larger numbers representing more robust/'higher quality' research. While no universally agreed method for assessing quality exists, for the purpose of this review, articles that scored 17 (i.e. the framework mid-point) and above, were deemed of an acceptable standard. The quality assessment score awarded to each of the included studies can be seen below in Table 1.3. All articles scored above the cut off value (17) for acceptable quality. The mean score was 31, the lowest score was 22, and all other papers scored between 29 and 33. As such, 11 of the 12 articles were deemed of high quality and the remaining other article was deemed of acceptable quality.

Inter-rater reliability checks.

To ensure reliability of the aforementioned quality assessment checks, inter-rater reliability tests were conducted. A second independent researcher rated each of the studies using the same method. Two main scoring areas of disagreement emerged (ethical issues and author credibility within the papers), these were discussed and a consensus scoring method agreed. Reliability scores were then generated using Kappa statistic. Scores of .6 or higher were indicative of acceptable agreement (McHugh, 2012). The Kappa statistic scores awarded to each article within this review are displayed in Table 1.3 below. Kappa coefficients for all articles ranged between .60 and 1.00, thus representing reliable quality assessment (Appendix D).

Characteristics of the Literature

The key characteristics of the included studies are displayed below in Table 1.3.

Table 1.3. *Summary of the Key Characteristics of the Research Studies*

Author, Date and Quality Assessment / Kappa Score	Country	Research Aim	Research Design, Intervention Delivery Method, and Control	Sample	Methods of Data Collection	Key Findings
McMillan, Owen, Kras & Scholey (2011) 29 / .72	Australia	Examine effects of 10 day nutrient rich MD on mood	**RCT:** single blind, parallel groups Intervention group: MD plan Control group: diet as usual	**N:** 25 **Gender:** Female **Age**: 19-30 **Ethnicity:** NS **Population:** General **Recruitment:** Snowball sampling through public recruitment	**Questionnaire:** POMS, & BL-VAS **Diet adherence measure:** daily food diary	MD group showed sig improvement on aspects of mood: vigour ($F(1,21)=11.25$, $p=.00$) alertness ($F(1,23)=22.23$, $p=.00$) and contentment ($F(1,23)=16.63$, $p=.00$)
Sanchez-Villegas et al. (2013) 33 / 1.00	Spain	To compare effects of two MDs (MD + extra nuts, or olive oil) versus a low-fat diet on depression risk after at least 3 years of intervention	**RCT**: parallel groups Intervention group 1: Ongoing MD education plus extra virgin olive oil supplements Intervention group 2: Ongoing MD education plus supplements of mixed nuts Control group: low fat diet	**N**: 3923 **Gender**: 1920 M & 2003 F **Age**: 55-80 **Ethnicity**: NS **Population**: General (although individuals at high risk of CVD) **Recruitment:** Community sample recruited through primary care centres	Incident cases of depression: defined as diagnosis of depression (by physician) reported by participants in any follow-up interviews, or report of habitual use of antidepressant drugs **Diet adherence measure:** baseline and yearly food frequency questionnaire	Non-sig inverse association with depression for participants assigned to MD supplemented with nuts compared with participants assigned to the control group (multivariate *HR*=.78, 95% *CI* .55 to 1.10). When analysis restricted to participants with type 2 diabetes, magnitude of the effect did reach sig (multivariate *HR*=.59, 95% *CI* .36 to .98). Result suggests MD supplemented with nuts could exert beneficial effect on depression risk in DM2 patients

Lee et al. (2015) 32 / .61	Australia	Assess effects of switching to 10-day MD on mood	**Crossover**: randomised balanced design Intervention phase: MD plan and daily food diary Control phase: diet as usual	**N**: 24 **Gender**: F **Age**: 20-38 **Ethnicity**: NS **Population**: General **Recruitment**: Snowball sampling through social media	**Questionnaires**: POMS, & BL-VAS **Diet adherence measure:** daily food dairy	MD associated with sig elevated: contentment (F(1,21)=6.49, p=.02), and alertness (F(1,21)=14.11, p=.00), and significantly reduced confusion (F(1,19)=6.87, p=.02)
Bogomolova et al. (2016) 30 / .67	Australia	To improve diets of people with SMI using MD and to evaluate the impact	Mixed method – quantitative and thematic analysis Intervention: ongoing diet education (adapted to individuals with SMI), cooking workshops twice weekly with supplied recipes, weekly food hampers and shopping vouchers for guided shopping trips	**N**: 13 **Gender**: 8 M 5 F **Age**: 18-40 **Ethnicity**: 92.3% Caucasian, 7.7% Aboriginal or Torres Strait **Population**: Clinical (Individuals with SMI, predominately psychosis) **Recruitment**: Residents from 20 bed CRC unit	Qualitative - Semi-structured interview about experiences. Interviews were conducted with participants (mean duration 13 minutes) and separate interviews with key workers of the participants (mean duration 25 minutes). Key worker and researcher field notes were also examined Quantitative – range of cardiovascular measures **Diet adherence measure:** Through interview with participant and their key worker	Thematic analysis suggested intervention led to development of independent living and social interaction skills, and reduced social anxiety
Jacka et al. (2017)	Australia	Investigate efficacy of 12 week MD improvement program for	**RCT**: parallel-group, single blind Intervention group:	**N**: 67 **Gender**: 48 F, 19 M **Age**: 18 and over (40.3, Mean)	**Questionnaires**: MADRS, HADS, POMS, CGI-I, WHO-5, & GSES	MD group demonstrated sig greater improvement between baseline and 12 weeks on the MADRS than the social support

33 / .64		treatment of major depressive episodes	personalised dietary advice and seven nutritional counselling support sessions. Also provided with food hamper, recipes and meal plans Control group: social support group	**Ethnicity**: NS **Population**: Clinical (Moderate to severe depression; met DSM-IV criteria for MDE and scored 18 or above on MADRS) **Recruitment**: Community-based strategies: flyers, social media, Google, newspaper, radio, contact with local referral sources (e.g. GPs)	**Diet adherence measure:** 7-day food diaries completed at baseline and end point	control group (t(60.7)=4.38, p=.00, Cohen's d=-1.16) Similar findings also found on HADS depression (t(55.1)=2.20, p=.03, Cohen's d=-0.63) and anxiety (t(59.0)=2.19, p=.03, Cohen's d=-0.60) scales, and on the CGI-I (t(50)=-2.58, p=.01) Sig differences not found between groups on POMS or GSES
O'Connor, Biberstine, Paddon-Jones, Schwichtenberg & Campbell (2018) 31 / .60	USA	Assess effects of MD-eating pattern with different amounts of lean red meat on wellbeing	**RCT**: Crossover, investigator-blinded. 16 week Intervention group 1 (MD control): MD meals prepared and provided for participants. Included 500g of lean meat weekly Intervention group 2 (MD + extra red meat): MD meals prepared and provided for participants. Included 200g of lean meat	**N**: 41 **Gender**: 13 M 28 F **Age**: 30-69 **Ethnicity**: NS **Population**: General (adults who were overweight or obese) **Recruitment**: Community sample through paper advertisement and email lists	**Questionnaires**: POMS, SF-36v2, & PSQI **Diet adherence measure:** daily menu 'check offs'	Following a MD-Pattern did not significantly change domains of physical health, mental health, total mood disturbances, sleep perceptions, and sleep patterns. However, it did improve subdomains of physical health role limitations (p=.04), vitality (p=.02), and fatigue (p=.04) There were no differences between the two MD intervention MD + extra red meat and MD control

			weekly Control group: diet as usual			
Wade et al. (2018) 32 / .64	Australia	Determine the cognitive and psychological effects of a MD with adequate calcium	**RCT**: parallel crossover design. 24 weeks Intervention phase: MD advice and food supplements. Fortnightly visits from dietician and food diaries Control phase: low fat diet	**N**: 41 **Gender**: 13 M 28 F **Age**: 45 and over **Ethnicity**: NS **Population**: General (at high risk of CVD) **Recruitment**: Community sample through electronic and paper advertisements	**Questionnaires**: POMS, & SF-36 **Diet adherence measure:** 3-day food record completed at four time points throughout	Sig improvements on the POMS were observed for total mood disturbance (p=.01, d=1.8), tension (p=.03, d=1.8), depression (p=.03, d=1.8), anger (p=.02, d=1.8), and confusion (p=<.01, d=23) following MD+Dairy intervention No significant differences between the diets were observed on the SF-36
Briguglio, Dell'Osso, Galentino, Banfi & Porta (2019) 22 / .80	Italy	Examine impact of MD counselling on symptoms of obsessive compulsive tic disorder symptoms and related quality of life	Case series intervention Intervention: diet counselling and nutritional booklet. Follow-up visit by nutritionist	**N**: 9 **Gender**: M **Age**: 11-18 **Ethnicity**: NS **Population**: Clinical (Boys with OCTD) **Recruitment**: Young people admitted to Movement Disorders Centre in Milan	**Questionnaires**: Y-BOCS, YGTSS, & QoL-VAS **Diet adherence measure:** KIDMED at baseline and endpoint	After one month of diet intervention there was a sig reduction in OCTD symptoms on both the YGTSS (p=<.05) and Y-BOCS (p=<.01). QoL scores also non-significantly diminished (p=.34)
Francis et al. (2019)	Australia	Examine impact of three week MD intervention on depression	**RCT**: single blind, parallel groups Intervention group: MD nutritional advice	**N**: 76 **Gender**: 48 F, 28 M **Age**: 17-35 **Ethnicity**: NS **Population**: Students	**Questionnaires**: CESD-R, DASS-21, POMS, & GSES **Diet adherence measure:** Diet compliance	Diet group showed sig lower depression symptoms than control group on the CESD-R (p=.00, d=.65) and DASS-21 (p=.00, d=.75). Scores on DASS-21 were

33 / .64		symptoms	plus meal plans and food hamper Control group: diet as usual	(with moderate-high depression symptoms) **Recruitment**: University campus advertisement	questionnaire at baseline and endpoint	maintained at three month follow-up (p=.01) No sig differences in mood were found between the groups on the POMS
Klonizakis et al. (2019) 33 / .64	Greece and UK	Assess effects of long- vs. short-term MD adherence on QoL	Two centre parallel-arm open-label intervention trial MD intervention group (UK): food hamper, information booklet, recipes, social media support, email support and telephone support Control group (Greece): long term MD adherers	**N**: 74 **Gender**: 40 M 34 F **Age**: 18-75 **Ethnicity**: NS **Population**: General (healthy sedentary adults) **Recruitment**: Community - groups, social/mass media, word of mouth. Posters in hospitals and university campuses	**Questionnaires**: WHOQoL-BREF, & IPAQ **Diet adherence measure:** MEDAS questionnaire and 48 hour dietary recall at baseline and end	MD adherence brought about improvements in QoL in intervention group that matched control group by end of intervention Particular QoL improvements appeared in domain of physical role functioning (p=<.05)
Parletta et al. (2019) 33 / .64	Australia	Investigate if MD supplemented with fish oil can improve mental health	**RCT**: single blinded Intervention group: MD nutrition education, fortnightly cooking workshops, recipes, food hampers and fish oil capsules Control group: social support	**N**: 152 **Gender**: 47 M, 105 F**Age**: 18-65 **Ethnicity**: 91.5% Caucasian, Other NS **Population**: Clinical (GP diagnosed or self-reported depression) **Recruitment**: Community sample through newspaper	**Questionnaires**: DASS-21, AQoL, PANAS, & SDQ **Diet adherence measure:** Mediterranean diet questionnaire at baseline, 3 months and 6 months	Diet intervention group had greater reduction in depression (t=-2.24, p=.03) and improved mental health QoL (t=2.10, p=.04) scores at 3 months. Improved diet and mental health scores sustained at 6 months. Reduced depression correlated with increased MD score (r=-.30, p=.01)

				advertisements, flyers, television and radio interviews, social media, and a market research agency		
Wade et al. (2019) 33 / .64	Australia	Examined cognitive effects of MD supplemented with additional lean red meat	**RCT** – parallel crossover design. 24 weeks Intervention phase: dietary education and resources, food hampers and fortnightly dietician visits Control phase: low fat diet	**N**: 33 **Gender**: 10 M 23 F **Age**: 45-80 **Ethnicity**: NS **Population**: General (at risk of CVD) **Recruitment**: Community sample through electronic and paper advertisements	**Questionnaires**: POMS, & SF-36 **Diet adherence measure:** Surveys completed every two weeks	MD+lean meat intervention led to significantly higher emotional role functioning on the SF-36 (p=.03, d=.5). No other significant differences were found

Note. Only study information relevant to research question included. Abbreviations: AQoL=Assessment of Quality of Life, BL-VAS=Bond-Lader Visual Analogue Scale, CESD-R=Center for Epidemiologic Studies Depression Scale, CGI-I=Clinical Global Impression Improvement Scale, CI=confidence interval, DASS-21=The Depression, Anxiety and Stress Scale - 21 Items, F=female, GSES=General Self-Efficacy Scale, HADS=Hospital Anxiety and Depression Scale, HR=hazard ratio, IPAQ=The International Physical Activity Questionnaire, KIDMED= Mediterranean Diet Quality Index for Children and Teenagers, M=male, MADRS=Montgomery-Asberg Depression Rating Scale, MD=Mediterranean diet, MDE=major depressive episode, MEDAS=Mediterranean Diet Adherence Screener, NS= not stated, OCTD=Obsessive-Compulsive Tic Disorder, PANAS=The Positive and Negative Affect Schedule, POMS=Profile of Mood States, PSQI=Pittsburgh Sleep Quality Index, QoL-VAS=Quality of Life Visual Analogue Scale, RCT=randomised controlled trial, SDQ=Strengths and Difficulties Questionnaire, SF-36=36 Item Short Form Survey sig=significant, SMI=serious mental illness, WHO-5=World Health Organisation Five Well-Being Index, WHOQoL-BREF=World Health Organisation Quality of Life – 26 Items, Y-BOCS=Yale-Brown Obsessive Compulsive Scale, YGTSS=Yale Global Tic Severity Scale.

As can be seen in Table 1.3 over half of the studies were conducted in the last two years which perhaps demonstrates the emergent nature of this topic area. Predominately this research has been conducted in Australia (eight studies). Three studies were conducted in Western Europe and one study in North America. Only one study used a qualitative research element, with the majority of studies being RCT study designs. Only one study reported outcomes for children and young people with the rest of the research involving adult sample groups. Five studies reported on clinical populations (populations with elevated levels of mental health distress). The remaining studies involved general populations. Most of the studies employed community sampling strategies to obtain their sample. Ten out of 11 quantitative studies used self-report questionnaires in order to monitor PWB outcomes, with many different questionnaires being used across studies. The remaining quantitative study recorded diagnostic 'incidents of depression' as an indication of PWB. The one qualitative study used a semi-structured interview approach to gather information related to outcomes.

Analytic Review Strategy

The specific analytic review strategy employed was 'narrative synthesis' (Cochrane Consumers and Communication Review Group [CC&CRG], 2013; Popay, Arai, Rodgers, & Britten, 2006). Criticisms of narrative synthesis approaches are that they can lack transparency and be more susceptible to reviewer bias (Campbell et al., 2018). However, guidance documents (CC&CRG, 2013; Popay et al., 2006) have been developed to increase the methodological rigour of such approaches and have been used to guide this review. Several best practice techniques proposed by Popay et al. (2006) were employed; firstly, studies were grouped into methodologically similar clusters, before providing a descriptive overview of each study. A synthesis was then produced using 'vote counting' and 'ideas webbing' techniques. Lastly, a critical reflective summary of the studies/results was offered.

A narrative synthesis approach was deemed appropriate as the included studies had various research designs, intervention delivery methods, and outcomes that could not easily be pooled and analysed using a meta-analytic approach (CC&CRG, 2013). Furthermore, as mentioned previously the most recent related research review in this area (Firth et al., 2019) used a meta-analysis approach. In taking a different approach, this review may help to produce new/novel findings by using a narrative synthesis method that relies largely upon words and text to 'tell the story' of the data/literature. Furthermore, it has been argued that

narrative synthesis approaches are more likely to result in influencing policy and practice than more traditional number focused approaches (Popay et al., 2006).

Results

Studies included in this review were synthesised to answer the question 'can Mediterranean diet interventions improve PWB in clinical and non-clinical populations?' As highlighted, the first stage involved grouping the studies into methodologically similar clusters (Popay et al., 2006). Studies were grouped on the basis of sample group undertaking the Mediterranean diet intervention. Three population clusters emerged: clinical populations (sample groups with elevated levels of mental health distress or having a mental health related 'diagnosis'), non-clinical populations (sample groups recruited from the general population and considered 'healthy'), and non-clinical populations at risk of developing cardiovascular disease ([CVD] sample groups recruited from the general population but who were at risk of CVD). The studies within each cluster are next described in turn before being synthesised.

Clinical Population Studies

Five papers focused upon clinical populations. Three of these five papers (Francis et al., 2019; Jacka et al., 2017; Parletta et al., 2019) investigated the impact of a Mediterranean diet intervention on depression outcomes. All three studies were conducted in Australia and each used a single-blind randomised controlled trial study design involving adults. The Mediterranean diet intervention in all three studies consisted of diet advice, meal plans and the provision of ingredients through food hampers. Within Parletta et al.'s (2019) study individuals also attended fortnightly cooking workshops.

Francis et al. (2019) involved a sample of young adult students with moderate-high depression levels. They underwent a three week diet intervention group and compared results against a control group that received no diet advice. Parletta et al. (2019) and Jacka et al. (2017) involved community samples with self-reported moderate to severe depression or GP diagnosed depression. Parletta et al. (2019) compared results of a three month diet intervention against controls that attended a social support group for the same period. Similarly, Jacka et al. (2017) compared a 12 week diet intervention against a control group that received 12 weeks of 'befriending' social support.

Parletta et al. (2019) found both groups reported significant improvements in mental health outcomes across all measures at three and six months. The diet group showed significant improvements in depression and mental health related QoL. Higher adherence to Mediterranean diet was significantly correlated with improved mental health outcomes. Francis et al. (2019) found significant reductions in depression scores on the primary CESD-R measure for those in the diet group. Additionally, the diet group had significantly reduced scores on the secondary DASS-21 (depression, anxiety and stress subscales) compared to the control group. However, no significant differences between the groups were observed on self-efficacy or any POMS subscales. Scores on the DASS-21 were maintained at three month follow-up, although follow-up CESD data was not reported. Jacka et al. (2017) found the diet group showed significantly greater improvements in MADRS scores (lower depressive symptomology), and on the HADS (depression and anxiety scales) than the control group at 12 weeks. The diet group also had significantly lower average scores than the control group on the CGI-I at 12 weeks (demonstrating significant improvement in depression severity). No significant differences were reported between the groups on the POMS or self-efficacy scales.

The remaining two studies in this cluster took non-RCT designs and did not focus on depression outcomes. Briguglio et al. (2019) examined Mediterranean diet intervention on symptoms of OCTD and QoL. They used a case series study of nine boys (aged between 11 and 18) with OCTD who were referred to a hospital in Italy for intervention. The boys (and their parents) received a one hour nutritional counselling session and nutritional information booklet to alter current unhealthy eating habits. A follow-up visit one month later re-assessed OCTD symptoms and QoL. Significant reductions in OCTD measured by the Y-BOCS and YGTSS were observed. However, non-significant reductions in QoL were simultaneously noted. Authors attributed reduced QoL scores to restricted access to ‘junk food’ and increased exposure to more ‘unpleasant’ tasting foods. This study is limited by its case series status and small sample size. Nevertheless, this study achieved an acceptable quality assessment score (22 out of 34), therefore results here cannot be discounted.

Bogomolova et al. (2016) aimed to improve the diet of people with serious mental illness (SMI) using the Mediterranean diet and evaluate the impact of this. The study was conducted in Australia with 25 individuals (predominately diagnosed with psychotic disorders) taking part. Similarly to previous studies, participants were provided with nutritional advice, recipes, food hampers, and attended cooking workshops. Participants

were additionally taken on guided shopping trips and provided shopping vouchers. Semi-structured interviews following the three month intervention period, and subsequent thematic analysis, revealed that Mediterranean diet intervention led to improvements in independent living and social interaction skills, including increased confidence and reductions in social anxiety.

Non-clinical Population Studies

Three studies (Klonizakis et al., 2019; Lee et al., 2015; McMillan, Owen, Kras, & Scholey, 2011) included in this review involved 'healthy' adult samples recruited from the general population. A two-centre parallel arm trial in Greece and the UK assessed the effects of long vs. short term Mediterranean diet adherence on QoL (Klonizakis et al., 2019). The two population groups were made up of healthy adults aged between 18 and 75. The control group (diet as usual) consisted of long-term Mediterranean diet adheres from Greece. The intervention group consisted of Mediterranean diet non-adheres from the UK. The intervention group underwent a four week Mediterranean diet change programme in which they were given diet information and recipes, a food hamper, and ongoing diet support (via email, social media and telephone). Following intervention, the intervention group reported non-significant increases in QoL across all domains (physical, psychological, social and environmental), with improvements on the physical scale reaching significance. These QoL increases brought the intervention group in line with the control group, with no significant differences being observed between groups on domains of physical, psychological, and environmental QoL following intervention. However, numerous environmental factors perhaps also influenced outcomes given the two groups were situated across countries. Nevertheless, it was concluded that switching to a Mediterranean diet may bring about quick improvements in QoL.

McMillan et al. (2011) examined the effect of a 10 day Mediterranean diet intervention on mood and cognitive performance in a sample of 25 young women in Australia. A RCT design was used with those in the intervention group receiving meal plans and diet advice. The control group continued with their usual diets. Following intervention, the intervention group demonstrated significantly higher (increased) vigour, alertness, and contentment than controls. Individuals in the intervention group showed a reduction in total mood disturbance although this narrowly missed significance (p=.06).There were no other

significant differences between groups on other subscale measures (anxiety, depression, fatigue, etc).

Lee et al. (2015) partially replicated the aforementioned study but instead employed a randomised controlled crossover design. Twenty-four young female adults in Australia were assigned to either a 10 day Mediterranean diet condition or diet as usual. At the end of 10 days participants were switched into the alternate group for a further 10 days. Similarly to McMillan et al. (2011) they found significantly increased contentment and alertness, and significantly reduced confusion in the intervention group. Both Lee et al. (2015) and McMillan et al. (2011) however, used small all female samples thus potentially reducing the generalisability of these findings.

Non-clinical Population at Risk of Cardiovascular Disease Studies

Four studies involved samples from non-clinical populations at risk of developing CVD. Two separate Australian studies used randomised controlled crossover designs to investigate the cognitive effects of a Mediterranean diet intervention on adults aged over 45 (Wade et al. 2018; 2019). Both studies involved a Mediterranean diet intervention group and low-fat diet control. All participants underwent both conditions for eight weeks separated by an eight week 'wash-out' period. The intervention consisted of Mediterranean diet education, food supplements, and fortnightly visits from a dietician. Wade et al. (2018) supplemented the Mediterranean diet intervention with additional calcium. Wade et al. (2019) supplemented the Mediterranean diet intervention with additional lean meat.

Wade et al. (2018) reported that the supplemented Mediterranean diet intervention led to significant reductions in total mood disturbance, tension, depression, anger, and confusion as measured by the POMS. Wade et al. (2019) by contrast, found no differences between the two conditions on the POMS. However, the supplemented Mediterranean diet intervention led to significantly higher emotional role reported on the SF-36. A notable limitation of both studies however, was use of a low-fat diet control group. The authors acknowledged most Australians do not follow this diet, thus results perhaps underestimate the improvements made by switching to a healthier Mediterranean diet.

Sanchez-Villegas et al. (2013) compared the effects of two Mediterranean diets (one supplemented with olive oil and one supplemented with nuts) vs. a low-fat diet (control group) on depression risk three years after intervention. This was a RCT parallel groups

design made up of a large Spanish sample of 3923 adults aged between 55 and 80. Individuals in the intervention groups received education on the Mediterranean diet and were given food supplements. Every three months group and individual sessions were given to all groups to discuss meal plans, recipes, typical foods etc. Incidence of subsequent depression (GP diagnosed, or habitual use of antidepressants reported by participants) in each group after at least three years of intervention was the outcome measured. A non-significant inverse association was found between depression risk (25% reduction in risk) in the Mediterranean diet group supplemented with nuts compared to the control group. When the analysis was restricted to participants with diabetes only, this association reached significance (40% reduction in depression risk). No other significant associations were found between groups. However, the authors noted that the low-fat control diet was similar in principle to the Mediterranean diet and that greater benefit would perhaps be seen if compared against a typical 'unhealthy' western diet.

O'Connor et al. (2018) assessed the impacts of a Mediterranean diet pattern with differing amounts of lean red meat on wellbeing outcomes. The study was conducted in USA and involved a sample of 41 overweight/obese adults aged between 36 and 46 at risk of CVD. A randomised controlled crossover design was employed, participants were assigned to a Mediterranean diet condition with typical lean meat intake or a Mediterranean diet intervention supplemented with additional lean meat. Each intervention was followed for five weeks separated by a four week washout period. All Mediterranean diet meals were prepared for participants. It was found that following a Mediterranean diet pattern (independent of meat intake) significantly lessened fatigue. However, there were no post intervention differences between either group on any POMS subscales. Mediterranean diet patterns independent of meat intake significantly improved quality of life subscales (physical role limitations and vitality). However, no differences were found in relation to social functioning, role limitations due to emotional health, or mental health. Authors acknowledged that as participants had 'good mental health' at baseline there was perhaps 'little room' for improvement across outcomes (accounting for some 'null' results).

Summary Synthesis

The next phase of the synthesis consisted of combining the results together in order to draw out common themes. Vote counting was employed to provide an initial description of result patterns across the studies (Popay et al., 2006). Vote counting has been criticised

for giving studies of different methodological quality the same ‘weighting’ (Popay et al., 2006). However, quality assessment checks included in this review found all papers were of good quality, and 11 out of 12 papers being of high quality. The included studies therefore, were of robust methodological rigour meaning vote counting was unlikely to be disproportionately biased. The vote counting results are summarised in Table 1.4 below.

Table 1.4. *Vote Counting Summary of the Study Results*

Study Reference	**One or two significantly improved PWB outcomes reported**	**Three to four significantly improved PWB outcomes reported**	**Five or more significantly improved PWB outcomes reported**	**One or more decreased PWB outcome reported**	**PWB attribute significantly improved (measure/s attribute reported on and effect size)**	**Notable other non-significant PWB attributes improved**
Clinical Population Studies:						
Parletta (2019)	X				reduced depression (DASS-21, *d*=1.78) improved mental health QoL (AQoL, *d*=2.34)	
Francis (2019)		X			reduced depression (CESD-R, *d*=.65; DASS-21, *d*=.75) reduced anxiety (DASS-21, *d*=.54) reduced stress (DASS-21, *d*=.70)	
Jacka (2017)		X			reduced depression (MADRS, *d*=1.16; HADS, *d*=.63; CGI-I, *d*=.69) reduced anxiety (HADS, *d*=.59)	

Briguglio (2019)	X		X	reduced OCTD (Y-BOCS; YGTSS)	reduced QoL (non-significant *decrease;* QoL-VAS)
Bogomolova (2016)		X (*qualitative themes-significance n.a.*)			improved independent living skills improved social interaction improved confidence reduced social anxiety
Non-clinical Population Studies:					
Klonizakis (2019)	X			improved physical role functioning (WHOQoL-BREF)	improved QoL (psychological, social, and environmental domains; WHOQoL-BREF)
McMillan (2011)		X		improved vigour (POMS, *d*=1.23) improved alertness (BL-VAS, *d*=1.34) improved contentment (BL-VAS, *d*=1.53)	reduced total mood disturbance (POMS)
Lee (2015)		X		improved contentment (BL-VAS, *d*=.76) improved alertness (BL-	

				VAS, *d*=1.13) reduced confusion (POMS, *d*=.82)	
Non-clinical Population (CVD risk) Studies:					
Wade (2018)			X	reduced total mood disturbance (POMS, *d*=.28) reduced tension (POMS, *d*=.18) reduced depression (POMS, *d*=.39) reduced anger (POMS, *d*=.28) reduced confusion (POMS, *d*=.59)	
Wade (2019)	X			Improved emotional role functioning (SF-36, *d*=.41)	
Sanchez-Villegas (2013)	X			reduction in depression risk for those with diabetes (40% risk reduction)	general reduction in depression risk (25% risk reduction)
O'Connor (2018)		X		improved physical role functioning (SF-36)	

		reduced fatigue (POMS) improved vitality (SF-36)

Note. Effect sizes (*d*=Cohen's d) are reported for significant results only (on indicated measures) where sufficient data was obtainable to compute this effect; Briguglio (2019) and Klonizakis (2019) did not report correlation coefficients between (within-subjects) pre and post intervention scores. O'Connor (2018) did not report mean values/*T*-scores for outcome values of interest to this review. Abbreviations: AQoL=Assessment of Quality of Life, BL-VAS=Bond-Lader Visual Analogue Scale, CESD-R=Center for Epidemiologic Studies Depression Scale, CGI-I=Clinical Global Impression Improvement Scale, DASS-21=The Depression, Anxiety and Stress Scale - 21 Items, HADS=Hospital Anxiety and Depression Scale, MADRS=Montgomery-Asberg Depression Rating Scale, OCTD=Obsessive-Compulsive Tic Disorder, POMS=Profile of Mood States, QoL-VAS=Quality of Life Visual Analogue Scale, SF-36=36 Item Short Form Survey, WHOQoL-BREF=World Health Organisation Quality of Life – 26 Items, Y-BOCS=Yale-Brown Obsessive Compulsive Scale, YGTSS=Yale Global Tic Severity Scale.

As can be seen in Table 1.4, all 12 studies reported at least one beneficial improvement on PWB as a result of undertaking a Mediterranean diet intervention. Half of the studies reported three to four improvements in PWB, and one study reported five positive improvements in PWB. Across all study measures, only one study highlighted a negative impact on PWB, with this being a non-significant reduction in QoL (Briguglio et al., 2019). However, this study was also the lowest rated study during the quality assessment phase perhaps further limiting the significance of this finding. Results were not specific to population studied, with broad improvements in PWB being noted across all three population groups. Within the non-clinical population subgroup, two of the three studies reported notable improvements in PWB that narrowly missed significance. This is perhaps attributable to these participant groups already being 'mentally healthy' and thus having limited scope for further improvement. Overall, results from the vote counting process highlighted that Mediterranean diet interventions may improve PWB across population groups (as indicated by these studies involving samples taken from clinical and non-clinical populations).

As illustrated within Table 1.4 the range of improvements in PWB outcomes found across studies was varied. Ideas webbing (Popay et al. 2006) was employed to further explore these notable PWB outcomes, and to identify connections and themes across studies. Three themes emerged by pooling the key/significantly improved PWB outcomes across studies using ideas webbing techniques. Figure 1.2 below depicts this process including highlighting the range of improved PWB outcomes reported by the studies centred around the three identified key themes.

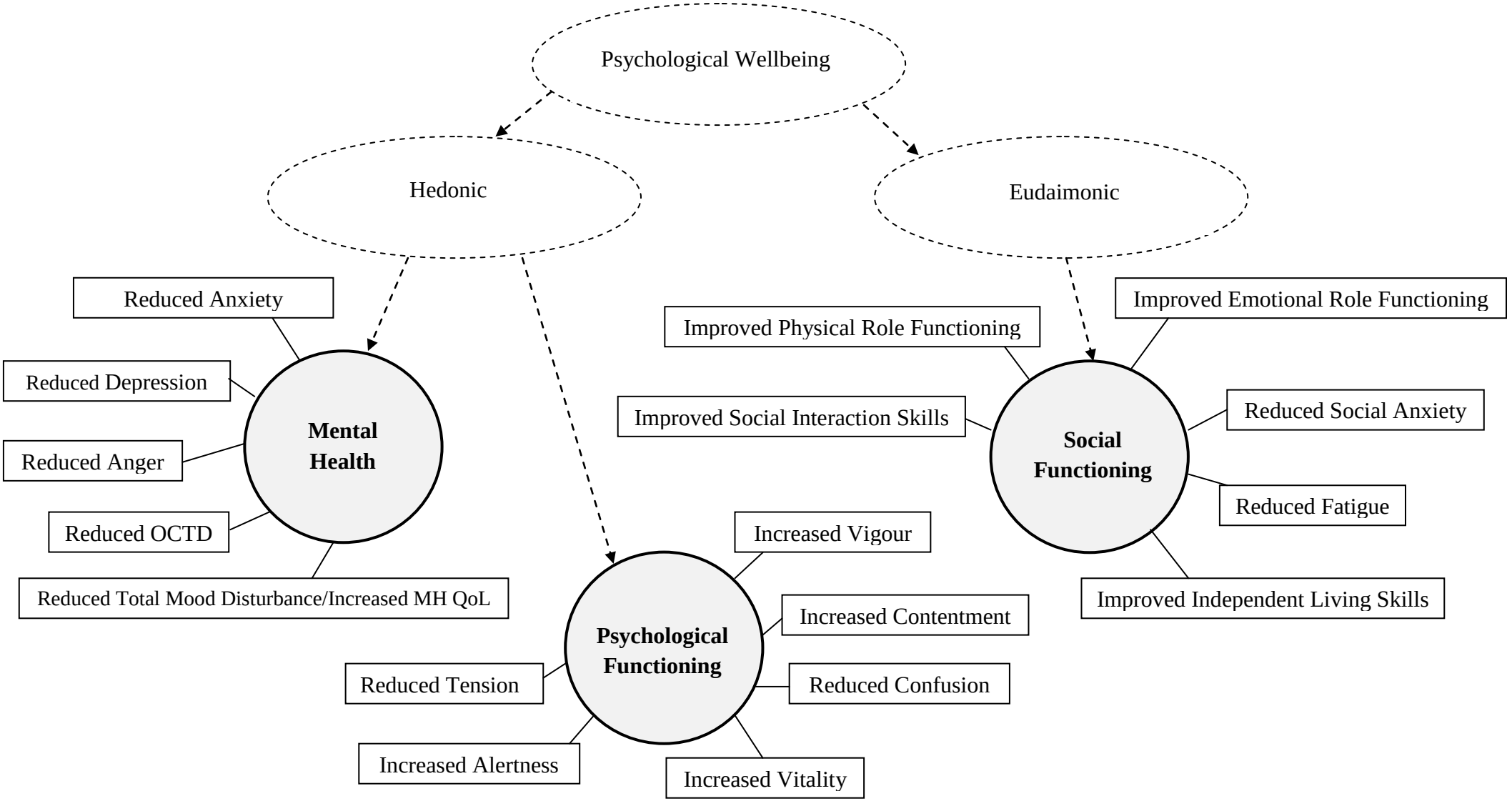

*Figure 1.2.*Key results and themes portrayed using ideas webbing.

As can be seen in Figure 1.2 Mediterranean diet interventions may have led to a range of improvements in PWB across participant groups in these studies. A number of the reported PWB improvements appeared to relate to a theme of 'mental health', including reduced: anxiety, depression, anger, OCTD, and total mood disturbance. Increased mental health quality of life was also reported. Taking in combination therefore, Mediterranean diet interventions appeared to benefit 'mental health'. Furthermore, numerous beneficial improvements appeared related to a theme of 'psychological functioning'. For instance, increased: vigour, contentment, vitality, and alertness were reported; as well as reduced confusion, and tension. Lastly, a third theme appeared related to 'social functioning'. Across studies improved: emotional role functioning, physical role functioning, independent living skills, and social interaction skills were reported. Additionally, reduced fatigue and social anxiety was noted. As such, Mediterranean diet interventions also appeared to benefit 'social functioning'.

As demonstrated in Figure 1.2 these three themes appear further aligned with definitions that outline PWB as consisting of both hedonic and eudaimonic branches (Hernandez et al., 2018). Hedonic PWB is represented by improvements in 'mental health', and 'psychological functioning'. Eudaimonic PWB is represented by improvements in 'social functioning'. Overall therefore, the synthesis processes of vote counting and subsequent ideas webbing highlighted that Mediterranean diet interventions appear to lead to improvements in mental health, psychological functioning, and social functioning. Therefore, potentially ultimately improving PWB (hedonic and eudaimonic) across clinical and non-clinical population groups.

As illustrated above the study results (Table 1.2 and Figure 1.2) broadly suggest that Mediterranean diet interventions may have a beneficial impact upon a large range of PWB outcomes. However, it is also important to note that these various improvements in dimensions of PWB were not reported in a uniform pattern across all studies. There was a wide degree of variation across outcomes/measures within the studies. As such, while these study results may provide a useful broad mapping of PWB areas associated with Mediterranean diet interventions, these areas will need more rigorous testing in future.

Critical Summary

As outlined by Popay et al.'s (2006) best practice guidance for conducting narrative synthesis a critical reflection is necessary. Despite the trend in significant improvements in

PWB produced across the studies, there are a number of limitations to note that may impact the validity of this synthesis. A theme across the studies was that in order for participants to be educated on the Mediterranean diet a level of 'social contact' was required (diet counselling, ongoing telephone support, cooking workshops etc.). It is possible that this increased social contact also influenced PWB outcomes given the well established links between PWB and 'connectedness' (Pritchard et al., 2019). Additionally, this may have also served indirectly as 'behavioural activation' (Mazzucchelli, Kane, & Rees, 2010) thus further influencing PWB. Furthermore, nine of the 12 studies provided Mediterranean diet ingredients to participants which again may have produced a felt-sense of being 'cared for', again possibly confounding PWB scores. Similarly, it is difficult to determine to what extent 'placebo' effects (vs. 'active' ingredients) were operating among individuals across studies who were switched to a perceived 'healthy' diet. While 10 of the 12 studies used control groups/crossover designs to help limit confounding variables, these interference effects cannot be ruled out.

All of the studies included relied on a level of self-reported adherence to the Mediterranean diet (e.g. food diaries). All studies also included self-reported measures (e.g. questionnaires, interviews) to record measures of PWB. A large assumption underpinning results of the studies (and in turn this synthesis) therefore, is that the use of self-report measures is both valid and reliable. However, a large limitation of self-report measures is that they are open to numerous biases (Coolican, 2013). As such, it is difficult to determine to what extent this weakness in methodology impacted upon findings in each study.

It should also be reiterated that broadly speaking, many different outcome measures were used to assess PWB. The majority of studies employed multiple questionnaires, with each questionnaire typically consisting of several subscales. While as highlighted numerous significant improvements were noted, there were also many occasions wherein different measures/subscales demonstrated no significant improvements. However, only one study on one singular measure highlighted a (non-significant) decrease in an aspect of PWB. Overall therefore, the trend from the pooled synthesis remains that adherence to Mediterranean diet interventions may improve various aspects of PWB.

Despite the aforementioned limitations highlighted, quality assessment checks included in this review demonstrated that all but one study in this review were of high methodological quality and the remaining study was of acceptable quality. However, only

one study used a sample of individuals under 18 years of age. This study was also the study rated lowest rated in terms of quality assessment and thus findings drawn from this study may not be generalisable to broader non-adult populations. Furthermore, the majority of studies in this area were conducted in Australia with only four studies being conducted elsewhere, and all of these four were also in western countries. This impacts the generalisability of these studies findings, particularly to non-western populations. PWB benefits in western populations may be magnified as switching from a 'typical western diet' to a Mediterranean diet may be a bigger change than in other countries that typically follow healthier dietary patterns. Nevertheless, in combination the included studies covered a range of clinical and non-clinical populations from young adulthood to older adulthood thus aiding the generalisability of the synthesis findings across western adult populations.

Discussion

This systematic review aimed to answer the question: can Mediterranean diet interventions improve PWB in clinical and non-clinical populations? All included studies reported at least one positive impact on PWB as a result of adhering to a Mediterranean diet. These positive outcomes reached statistical significance in all 11 quantitative studies, with the remaining study qualitatively reporting benefits. Only one study (on one measure) reported a negative impact of switching to Mediterranean diet on PWB, and this was a non-statistically significant reduction in QoL. Results from the narrative synthesis process demonstrated that following/adhering to Mediterranean diet interventions may improve PWB and this appears to hold across both clinical and non-clinical populations. Furthermore, the synthesis process highlighted in particular that Mediterranean diet interventions appear to benefit mental health, and psychological and social functioning - with these three areas representing hedonic and eudaimonic PWB respectively.

The findings of this review are consistent with, and build upon previous literature in this field. Pettersson and Philippou (2016) found that adhering to a Mediterranean diet may reduce risk of developing dementia and cognitive impairment. This review while looking at a different outcome (i.e. PWB), like Petterson and Philippou's (2016) review further demonstrated potential cognitive benefits of adhering to a Mediterranean diet. While previous reviews have not solely focused on the impact of Mediterranean diet interventions on PWB, the impact of diet interventions generally as interventions for depression has been investigated.

Opie et al. (2014) in a review of RCTs and Firth et al. (2019) in a meta-analysis of RCTs both found that whole diet interventions helped reduce depression but not anxiety in adults. The current review additionally found that a Mediterranean 'whole diet' intervention may help to reduce prevalence of depression and anxiety. The aforementioned reviews were largely limited to non-clinical populations whereas the current review offers evidence that these impacts extend beyond non-clinical populations. Furthermore, the current review offers evidence that the positive impact of a Mediterranean diet intervention is not limited to impacts on depression/anxiety only but extend to other areas of mental health, and psychological and social functioning (thus benefiting PWB overall).

This review in highlighting that Mediterranean diet interventions may be useful in improving PWB also builds on previous literature that has demonstrated associations between diet quality and broad measures of PWB (e.g. Khalid et al., 2017; O'Neil et al., 2014; Quirk et al., 2013; Teasdale et al., 2019). While it is not possible to fully answer the question as to the direction of this relationship, the results of the current review offer some support to suggest a possible causal relationship between adherence to a Mediterranean diet and PWB. However, as highlighted there are numerous confounding factors that could have influenced these outcomes. Including elements of 'behavioural activation' and social interaction that were inherent within the delivery of many of the diet interventions. Nevertheless, given the improvements in PWB seen, results also perhaps lend support to contemporary gut-brain axis theorising (Liang et al., 2018). While the precise mechanism of action cannot be deduced from this review alone, it may be that Mediterranean diet interventions influence PWB through altering gut microbiota and subsequent gut-brain axis signalling.

Firth et al. (2019) in their review suggested that further research was necessary to explore underlying mechanisms and delivery strategies for dietary interventions in clinical and public health settings. The current review highlighted that a general Mediterranean diet pattern seemingly holds promise as an approach for promoting PWB. However, it remains unclear precisely what the 'active ingredients' within this general Mediterranean diet (if any) that have the largest influence on PWB outcomes. Furthermore, some of the studies included in this review included a small amount of dietary supplementation (extra lean meat, fish oil etc.) alongside a core traditional Mediterranean diet (NHS, 2017). The included studies also delivered the Mediterranean diet intervention via numerous different mechanisms (e.g. food hampers, diet advice, cooking workshops). This perhaps makes it

increasingly challenging to determine exactly which ingredients should 'make up' Mediterranean diets and how the diet intervention should be delivered in order to exert maximum benefit on PWB.

Previous research in this area, such as Opie et al. (2014) and Firth et al. (2019), has been restricted to studies of adult populations. While this review was open to include studies of all age groups, 11 out of the 12 studies included in this review used adult populations. Therefore, it remains unclear whether Mediterranean diet interventions can be used to improve PWB in children and young people. Furthermore, while this review did include five studies of clinical populations, difficulties here were largely limited to clinical levels of depression and/or anxiety. While one study reported a reduction of OCTD symptoms it remains unclear to what extent do the benefits of a Mediterranean diet extend to other recognised mental health difficulties. Nevertheless, numerous benefits of PWB were reported, including many positive impacts on both psychological and social functioning (including in a study of individuals with SMI) aspects of PWB. As such, benefits are conceivably beneficial to individuals with a range of mental health difficulties regardless of 'diagnosis'.

Results from this review may help to inform current policy. While Mediterranean diet interventions are used within physical health settings to promote and improve physical health, such approaches to PWB have been overlooked. This review however, seemingly demonstrates that the Mediterranean diet may be usefully employed to improve PWB across adult populations. While health promotion campaigns at population levels often focus on the physical benefits of diet interventions, this review suggests that the PWB benefits could/should also be emphasised. Given that large numbers of individuals are consuming modern unhealthy western diets that are far removed from Mediterranean diet principles (GBD Diet Collaborators, 2019) the potential scope for improving PWB is perhaps large. It may be the case that promoting Mediterranean diets at population/primary care level could help to prevent some individuals from going on to develop more entrenched mental health difficulties.

Beneficial effects of the Mediterranean diet on PWB highlighted in this review appear to extend beyond non-clinical populations, thus perhaps holding implications for clinical practice. The need to take more holistic intervention approaches to improve PWB/mental health has been outlined (Department of Health and Social Care, 2010; Lake,

2017). This review highlights that the Mediterranean diet in particular may be of increased importance in improving multiple aspects of PWB, thus holding significance as an additional intervention strategy for many individuals with mental health difficulties. While the current review does not suggest that Mediterranean diet interventions should replace commonly used intervention strategies (such as psychotherapy and psychopharmacology), they may offer a useful alternative for some individuals. Mediterranean diet interventions could perhaps be combined with other traditional approaches to increase efficacy, as well as offering a more rounded holistic approach. It is plausible that routine use of diet interventions within primary and secondary mental health care settings may help to prevent some individuals from potential harmful side effects of psychopharmacology, as well as offering a less conceptually stigmatising approach.

Incorporating diet interventions such as the Mediterranean diet into mental health services would perhaps also help to increase parity of esteem between physical and mental health services. Offering such an alternate intervention approach would aid the holistic nature of service delivery thus bringing more alignment with multi-pronged approaches used within physical health settings (The Health Foundation, 2016). There would be some clear cost factors for services, in order to recreate some of the Mediterranean diet intervention approaches used by studies in this review at a clinical level (e.g. food hampers, cooking workshops etc). However, given that improving diet quality through following a Mediterranean diet has been linked to numerous physical health benefits there appears to be little risk in promoting Mediterranean diet interventions; Health services as a whole would likely see financial benefits in the long run as a result of increasing numbers of individuals improving their diet quality, regardless of whether these improvements are seen within PWB and/or physical health. It is also feasible that some Mediterranean diet interventions could perhaps be more easily implemented at numerous healthcare levels without need for large budgets or wholesale changes to existing service structures.

Conclusion

This review took a broad approach to examining the impact of Mediterranean diet interventions on PWB. This review was not tightly constrained by population type or age, study design, or intervention delivery method. This review in using the concept of ‘PWB’ rather than focusing on specific diagnostic categories such as depression/anxiety also aided inclusivity. Taking this inclusive approach seemingly allowed a true up-to-date picture of

the research on Mediterranean diet interventions to be gathered by limiting the exclusion of relevant studies. This review also benefited from use of narrative synthesis as this approach allowed synthesis of numerous study designs to produce novel findings not previously reported in other related reviews that utilised more rigid designs/inclusion criteria.

As noted however, this review is not without limitations. Firstly, as this review took an inclusive approach there was a degree of variation in Mediterranean diets (e.g. supplemented extra: lean meat, dairy, nuts, fish oil), and intervention delivery methods (e.g. diet counselling, cooking workshops, information provision, food hampers, pre-prepared meals, and meal plans) across included studies. Therefore, from this review alone it is difficult to disentangle the precise delivery mechanisms and active ingredients (or combination of both) that most effectively improved PWB.

Secondly, it is conceivable that this review, in using a strict definition of 'psychological wellbeing' which was perhaps further restricted by use of chosen key search terms/synonyms (and selected journal databases), may have filtered out some relevant papers. For instance, it is possible that some relevant research may have been missed during this process. Nevertheless, this process was a necessary trade-off to ensure the review was both systematic and manageable during the allotted timeframe.

Lastly, while every effort was made to ensure this review was conducted as 'systematically' as possible, the narrative synthesis process may have introduced some elements of researcher bias. For instance, there appears no universally agreed way in which to conduct narrative synthesis. Following guidance documents involves some element of method selection (e.g. vote counting and ideas webbing used within this review) from a range of possible techniques (Popay et al., 2006). It is possible that following different guidance/employing different techniques may have produced a slightly different synthesis. As such, narrative synthesis processes are arguably not as truly 'systematic' as more traditional meta-analytic processes.

Despite the limitations acknowledged, this review has produced novel findings. This review is seemingly the first review to demonstrate that Mediterranean diet interventions can be used to improve broad measures of PWB across both clinical and non-clinical populations. Additionally, this review has uniquely demonstrated that Mediterranean diet interventions in particular, may improve three key areas of PWB: mental health,

psychological functioning, and social functioning. Therefore, potentially benefiting both hedonic and eudaimonic PWB.

In closing, given the generalisability limitations of this review future research may usefully look at the use of Mediterranean diet interventions to improve PWB in studies of children and adolescents. It would also be beneficial for research trials to be conducted in more countries outside of the West and Australia. Future research may also wish to consider adding Mediterranean diet interventions into existing primary and secondary mental healthcare structures to determine the clinical efficacy (and ecological validity) of such approaches, and to compare alongside/against other commonly used interventions. Lastly, the cost-effectiveness of Mediterranean diet interventions should be evaluated to determine the feasibility of using these approaches to increase the holistic nature of service delivery.

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Chapter Two

Do Implicit Attitudes toward 'Junk Food' Influence Habitual Consumption in People who are Overweight?

Abstract

Background: Overconsumption of energy dense (‘junk food’) diets is implicated in the development of overweight/obesity. Public health initiatives to reduce rising overweight/obesity levels commonly target explicit cognitive processes underpinning maladaptive eating behaviours. Conversely, dual attitude theorising suggests automatic behaviours are more driven by implicit cognitive processes operating outside of awareness. Habits are defined as being automatic in nature. Therefore, habitual junk food consumption and subsequent risk of becoming overweight may be more influenced by processes under limited control. **Aim:** This study explored whether implicit rather than explicit attitudes have greater influence on habitual consumption of junk food leading to an increased risk of becoming overweight/obese. **Method:** Fifty-four adults completed measures of junk food consumption, including: explicit attitude and habit questionnaires, a single-category implicit association test, and food choice task. Participant’s body-mass index (BMI) was also calculated. **Results:** A series of regression and moderation analyses were performed. Implicit attitudes toward junk food significantly predicted both food choice and habitual consumption of junk food. Furthermore, implicit rather than explicit attitudes were shown to be more influential in these processes. Neither habit nor food choice significantly moderated a relationship between implicit attitudes and BMI. However, data trends indicated that implicit attitudes may influence BMI through their involvement in driving habitual consumption of junk food. **Conclusion:** Junk food consumption and habits (and potential risk of becoming overweight/obese) may be driven by attitudinal processes operating outside of awareness. Intervention strategies might benefit from addressing underlying implicit attitudes influencing maladaptive eating behaviours/habits implicated in overweight/obesity.

Introduction

This study aims to examine the theoretical assertion that excessive consumption of 'junk food' and the consequential risk of becoming overweight/obese, may be influenced by attitudinal processes and habits under limited control (Wilson, Lindsey, & Schooler, 2000). Junk food (synonyms with 'fast food') has been defined as highly processed food with minimal or poor nutritional value (Milani, Silano, Pietrobelli, & Agostoni, 2017). It is often high in calories, sugars and fats. Typical examples include: chocolate, chips, cakes, pizza, ice cream and 'soft' drinks. Along with other contributory factors (including lack of exercise and genetics), excessive consumption of energy dense (i.e. 'junk food') diets are strongly implicated in the development of overweight and obesity (Romieu et al., 2017). This is problematic, as overweight and obesity are associated with numerous health complications, including: type 2 diabetes, cardiovascular disease and cancer (World Health Organisation ([WHO] 2020). While obesity is a global problem, figures suggest there are approximately 30,000 obesity related deaths in the UK per year (Re:new Bariatrics, 2017). Determining if somebody falls into a category of being overweight/obese is measured using the Body Mass Index. BMI is calculated through a comparison of height-to-weight ratio (NHS, 2018a).

In an effort to improve the nation's diet, public health initiatives such as: 'Change4Life' (Department of Health, 2008; NHS, 2009), 'Five-a-Day' (NHS, 2018b), and 'Healthier You' (NHS, 2016) have been employed. These campaigns have largely attempted to improve public health through provision of health education information. Generally, health risks associated with unhealthy diets/'junk food' consumption are outlined in attempt to encourage people to take up healthier alternatives (e.g. increased fruit and vegetable intake; NHS, 2019). However, these and related initiatives appear to have limited efficacy as evidenced by increasing rates of overweight/obesity. Data from Health Survey England (2019) indicate that approximately 63.5% of adults are overweight, 27.5% are obese, and 3% morbidly obese; with these figures projected to continue increasing. The question is therefore, why does obesity continue to rise despite a plethora of health campaigns to tackle this issue?

One possible explanation may lie within dual attitude frameworks (Wilson et al., 2000). Such frameworks assert that people may simultaneously hold in memory two different forms of attitudinal evaluation of a single object (such as 'junk food'). One of

these attitudinal evaluations exists at a conscious level of awareness and represents 'explicit attitudes'. Explicit attitudes are argued to be highly accessible and influence behaviours described as deliberate and non-automatic (Muschalik et al., 2019; Stanley, Phelps, & Banaji, 2008). The principal goal of public health initiatives has seemingly been to change people's health behaviours by altering their 'explicit' attitudes surrounding these behaviours, for instance, through wide dissemination of information provision such as the 'Five-a-Day' mantra (NHS, 2018b). Such approaches are founded on the premise within traditional psychological literature that explicit cognition is the primary driver of subsequent behaviour (Theory of Planned Behaviour; Ajzen, 1985 & 1991). While explicit cognitive process (including attitudes) are valid predictors of many health behaviours, including dietary choices (Sheeran, 2002), research has conversely shown that explicit cognitive processes often fail to predict behaviour – widely known as the intention/attitude-behaviour gap (Sheeran & Webb, 2016).

Efficacy of health campaigns to improve the nation's dietary behaviour may have been limited in part by failure to account for the second form of attitudinal evaluation outlined within dual attitude frameworks (Wilson et al., 2000). This second attitudinal evaluation, known as 'implicit attitudes', is argued to exist at an unconscious level. Implicit attitudes are believed to be held largely outside of awareness and influence behaviours described as automatic, spontaneous, and uncontrolled (Muschalik et al., 2019; Stanley et al., 2008).

The multidimensional psychological construct of 'habit' (Verplanken & Orbell, 2003), may also play a role in accounting for the limited efficacy of health promotion campaigns. It has been argued that in addition to high frequency, only behaviours occurring with 'automaticity' are classifiable as habitual (Verplanken, 2006). Intuitively, many eating behaviours (including consuming junk food) might become habitual over time (Verplanken, 2006). As highlighted, dual attitude models suggest implicit (not explicit) attitudes more greatly influence 'automatic' behaviours (Wilson et al., 2000). Given that habitual behaviours are 'automatic' implicit attitudes may influence eating habits. Junk food consumption therefore, possibly becomes somewhat 'unconscious', with people having reduced awareness of/and control over this behaviour - resulting in (or maintaining) an unhealthy BMI.

Since the seminal work of Freud (1915), 'unconscious processes' have been acknowledged as drivers of behaviour. More recently, the development of measures such as

the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998) and the Self-Report Habit Index (SRHI; Verplanken & Orbell, 2003) have perhaps made it possible to quantify attitudes and behaviours operating at an 'unconscious'/automatic level. This has allowed research to empirically test models of dual attitudes that indciate that implicit attitudes (in addition to explicit attitudes) can also influence eating behaviours and habits, in turn potentially influincing BMI.

Previous Research

Sartor et al. (2011) investigated differences in implicit sweet taste perception in overweight/obese and healthy weight adults using an IAT. Overweight/obese people demonstrated a 2.1-fold implicit preference for sweet. It was concluded that individuals who are overweight/obese are more implicitly attracted to sweet (tastes often found in junk food diets). Roefs and Jansen (2002) compared implicit attitudes toward high and low-fat foods in obese people and healthy weight controls. They hypothesised that obese people would hold an implicit preference for high-fat stimuli on an IAT task. However, analysis revealed both groups displayed a negative implicit attitude toward high-fat stimuli, although this was more pronounced among the obese group. They suggested that obese people perhaps through failed dieting attempts learned that high-fat foods are 'forbidden', despite behaviours and explicit preferences often being contradictory to this.

Craeynest et al. (2005) found no difference between obese children and healthy weight controls in their implicit attitude toward unhealthy relative to healthy foods during a modified IAT task. However, they did find that obese children displayed a more positive implicit attitude toward both healthy and unhealthy food. They suggested that obesity therefore, may result from liking food in general rather than specifically liking unhealthy food. Currently therefore, there seems to be no conclusive evidence (or consensus) on associations between implicit attitudes and obesity (see McKenna et al., 2016 for a review).

While not directly related to implicit attitudes-obesity associations a greater body of research, largely within social-psychology, has demonstrated that implicit attitudes do influence food choice/dietary behaviour (e.g. Conner et al., 2007; Friese, Hofmann, & Wanke, 2008; Konig et al., 2016; Perugini, 2005/2010; Richetin, Perugini, Prestwich, & O'Gorman, 2007). Of note, Perugini (2005/2010) aimed to compare the predictive ability of explicit and implicit attitudes (toward fruits and snacks) on food choice behaviours. Young adults completed self-report questionnaires, an IAT, and food choice task. A double-

dissociative pattern was found in that implicit attitudes predicted actual (spontaneous) food choice whereas explicit attitudes predicted self-reported food choices. It appears only one study has investigated the role of habit in associations between attitudes and food choice. Conner et al. (2007) examined relations between implicit and explicit attitudes toward chocolate and fruit, habit, and food choice in a sample of young adults. Notably, they found habit moderated the relationship between implicit attitudes and food choice. The more habitual food choices were, the more strongly they were predicted by implicit attitudes.

Limitations of Previous Literature

Limitations with previous research may account for why implicit attitudes have shown to be poor predictors of BMI. Firstly, there are methodological issues with the traditional IAT (Greenwald et al., 1998) as a measure of attitudes toward foods. The IAT paradigm relies on comparing reaction time variance to categorise stimuli into one 'target' category (e.g. healthy) and one 'contrast' category (e.g. unhealthy) to create an aggregated score. Arguably however, there are no contrasts for food groups as both groups are still 'food'. For instance, individuals may implicitly 'like' both healthy and unhealthy foods which could falsely lead to an IAT score demonstrating no implicit 'liking' of either food.

Secondly, considering potential moderators of the relationship between implicit attitudes and obesity may increase their predictive power as highlighted by McKenna et al.'s (2016) review. Yet seemingly, no previous research has considered the role of habit in this relationship. As highlighted, consuming junk foods may become habitual ('automatic') in nature, thus influenced more by implicit attitudes. Habit therefore, may moderate the relationship between implicit attitudes and obesity such that the relationship becomes more evident as junk food consumption becomes increasingly habitual. Omission of a habit measure by previous research therefore, perhaps accounts for limited direct associations found between implicit attitudes and obesity.

Of further significance, previous research has failed to include measures of 'actual behaviour'. The IAT generally uses a narrow range of stimuli to form each category (e.g. Craeynest et al. 2005 used 'French Fries', 'Coke' and 'Crisps' to form an 'unhealthy' category). While a strong implicit preference for 'Crisps' may lead to habitual consumption of Crisps it may not always result in obesity given that obesity can be caused by numerous interacting factors. Prior research in omitting food choice tasks therefore, may have

overlooked an additional important variable influencing association between implicit attitudes and BMI.

Present Study Rationale and Research Questions

The present study aims to address the aforementioned limitations to further conceptualise the role that implicit attitudes potentially play in influencing junk food consumption and BMI. This study will use a Single-Category Implicit Association Test (SC-IAT; Karpinski & Steinman, 2006) instead of a traditional IAT. The SC-IAT removes need for a 'contrast' category in order to tap implicit attitudes thus overcoming methodological flaws in research that has used the traditional IAT. This study will also include measures of variables overlooked by previous research, namely habit and food choice. This will be to investigate if implicit attitudes influence these dietary processes and whether these processes then moderate a relationship between implicit attitudes toward junk food and BMI. Overall, this study aims to investigate if: implicit rather than explicit attitudes toward junk have greater influence on habitual consumption of junk food leading to an increased risk of becoming overweight/obese.

The present study aims to answer the following research questions:

1) Do implicit and explicit attitudes toward junk food predict food choice (i.e. if somebody spontaneously selects junk food when presented with an alternative)?

2) Do implicit and/or explicit attitudes toward junk food predict habitual consumption of junk food?

3) Are implicit rather than explicit attitudes toward junk food a stronger predictor of BMI?

4) Does level of habitual consumption of junk food moderate a relationship between implicit attitudes toward junk food and BMI?

5) Does food choice moderate a relationship between implicit attitudes toward junk food and BMI?

Method

Research Design

This research study was formed upon a positivist epistemological position. A realist ontology was adopted which assumes that there exists a singular objective reality. From this realist ontology it was assumed that through objective scientific study it becomes possible to discover the 'truth'. Positivism argues that only objects/stimuli/phenomenon that can be measured and/or observed are worthwhile of scientific enquiry. Through use of scientific enquiry involving observing and measuring, positivism argues that it becomes possible to ascertain cause-and-effect relationships (Coolican, 2013).

In taking this position, a quantitative research design was deemed the most applicable method of study. Quantitative research is built upon the premise of measuring variables of study objectively, hypothesising on and testing relationships between variables. Furthermore, quantitative research allows use of statistical analysis to explore associations and/or cause-and-effect relationships among variables (Yilmaz, 2013). Quantitative methods are more aligned with approaches used in the 'natural sciences' and thus positivism.

A cross-sectional research design was the specific quantitative method used. This design was used to explore relationships between the study variables: implicit attitudes, explicit attitudes, habit, food choice, and BMI. A cross-sectional design was appropriate as it allowed data on the variables of interest to be gathered, measured, and analysed simultaneously. A further benefit to the approach was that data could be collected for each participant at a singular time point, thus enabling the recruitment process to be inexpensive and efficient (Mann, 2003). While a longitudinal research design would have arguably produced richer data, the financial and time restrictions upon the current study dictated that a cross-sectional design was a more pragmatic methodology.

Sampling Design

Non-probability (convenience and snowball) sampling methods were used to recruit participants. Time and cost restriction on the current research, and not having an exhaustive list of the sample population meant that probability sampling was not possible. Therefore, despite this form of sampling potentially limiting the generalisability of the findings it allowed for these practicalities to be managed (Coolican, 2013). BMI was of specific interest in the current study and it was hypothesised that convenience/snowball sampling

would allow a range of participants to be recruited across the BMI spectrum as found in the population as a whole. This study aimed to recruit approximately 50 participants. This number was chosen as a balance between generating statistical power and managing the limited time available to complete data collection. Power analysis was performed to ensure the sample size was adequate for the planned statistical analysis procedures (see Methods of Data Analysis). A community sample was obtained with participants being primarily recruited from Coventry University and within the counties of Warwickshire, West Midlands, and Gloucestershire more broadly (using convenience and snowball sampling). See Table 2.1 below for the inclusion and exclusion criteria used during recruitment.

Table 2.1. *Sample Group Inclusion and Exclusion Criteria*

Category	Inclusion Criteria	Exclusion Criteria
Gender	Males and females	-
BMI	All BMI groups	-
Age	Individuals aged between 18-60yrs	Individuals aged 61yrs and older, or 17yrs and younger
Vision	Individuals with 'normal' or 'normal corrected' vision	Individuals with impaired vision
Neurological Disorders	Individuals with no known neurological disorder	Individuals with a known neurological disorder
English	Those fluent in spoken and written English	Individuals unable to read and speak English or those with a known learning disability
Consent	Those able to provide informed consent	Those unable to provide informed consent

Males and females with a full range of BMI's were included to allow greater generalisability to the general population. It has been highlighted that processing speed reduces with age (Ebaid et al., 2017). As such, those over 60 years of age were excluded to reduce reaction speed variance confounding SC-IAT results. Individuals with visual impairments and/or who were unable to read English were excluded. Individuals with a known neurological disorder, or learning disability that significantly impacted upon

reading/comprehension were also excluded. These criteria were again in place to control for confounding interference effects on SC-IAT response times. Lastly, individuals unable to provide written informed consent were excluded in-accordance with good ethical practice (British Psychological Society [BPS], 2014).

Participants

The final sample group recruited consisted of 54 participants, 23 of these were male (42.6%) and 31 were female (57.4%). Age was not recorded but the range was assumed between 18 and 60 as per the inclusion criteria. The BMI categorisation breakdown for the sample was: 0 ‘underweight’ (0%), 23 ‘healthy weight’ (42.6%), 20 ‘overweight’ (37%), 11 ‘obese’ (20.4%), and 0 ‘morbidly obese’ (0%).

Measuring Instruments

In order to operationalise the concept of ‘junk food’ the specific target behaviour measured was ‘chocolate consumption’. This was deemed appropriate and pragmatic given that chocolate snacks fit with definitions of junk food (Milani et al., 2017), are widely known and familiar, and are portable in nature. Several measuring instruments (Appendix F) were used to collect data on the variables of interest, discussed in turn below.

Body Mass Index (BMI).

Data for the BMI variable was calculated to determine which BMI category each participant belonged to. BMI was calculated as weight (Kgs) divided by the square of each participants height (meters), or $BMI=Kg/M^2$. This procedure is universally used within healthcare systems to determine BMI. The six BMI categories (NHS, 2018a) are: morbidly obese (>40), obese (30-39), overweight (25-29.9), healthy weight (18.5-24.9), or underweight (<18.5). Each participant was weighed using portable Omron BF510 scales and had their height measured using a portable Seca 213 stadiometer. Some have argued that body-fat percentage is a more valid/reliable measure of healthy weight status (Bhurosy & Jeewon, 2013). However, as BMI could be quickly and easily calculated, and remains the most frequently used measure of weight status within health settings, it was deemed the most appropriate measure for capturing this variable.

Single-Category Implicit Association Test (SC-IAT).

The SC-IAT (Karpinski & Steinman, 2006) was used to measure implicit attitudes toward chocolate. Karpinski and Steinman's (2006) computerised categorisation procedure was used as pre-programmed by Inquisit Millisecond 5.0 software. The software was loaded onto and displayed using a Toshiba Tecra A10-16E laptop with a Windows 10 operating system. The laptop had an Intel® Core™ Duo T6570 processor and 2.00GB RAM. The screen display was a 15.4 inch TFT high brightness display with a internal resolution of 1,280x800.

The procedure used involved a two block design with each block containing 24 practice trials and 72 critical trials. Block one comprised of the categories '*positive or chocolate*' and '*negative*'. Within block two the categories were '*positive*' and '*chocolate or negative*'. The order the blocks were presented in was counterbalanced between participants to limit practice effects. Words for categorisation were presented randomly and with equal frequency. Positive and negative words used within the SC-IAT were predetermined by the software. Chocolate words were chosen from commonly sold and popular UK chocolate bar snacks.

In practice, participants while sat in front of the laptop were presented with stimuli (positive, negative or chocolate words) on screen. For each trial, a word (e.g. *Twix*, *Painful*, *Happy*) that belonged to one of the two categories (mentioned above) appeared on the centre of the screen. Participants were asked to categorise each word into one of the two categories as quickly and accurately as possible. They did this by pressing one of two designated keys (E or I) on the laptop keyboard. Error feedback was provided for incorrect responses as recommended by Greenwald, Nosek, and Banaji (2003).

The premise of this SC-IAT procedure is that participants will be faster when categorising words congruent with their prospective attribute category implicitly associated within memory. For instance, if a person holds a strong positive implicit association between chocolate and positive they hypothetically will be faster to categorise chocolate words when *'chocolate'* and *'positive'* are aligned. It is believed that stronger implicit associations will result in faster categorisation. In order to index the strength of an implicit association a singular '*D'* score was produced. *D* scores were calculated automatically by the software in accordance with Greenwald et al.'s (2003) improved scoring algorithm. To summarise, the average response times for critical block one was subtracted from critical

block two. This score was then divided by the standard deviation of the response times for all correct critical trials. Positive *D* scores indicated positive implicit attitudes toward chocolate, whereas negative scores indicated negative implicit attitudes toward chocolate with the relative size indexing attitude strength. Scores between (minus or plus): 0 and .14 indicate little to no preference, .15 to .35 indicate a slight (implicit) attitude, .36 to .65 indicate a moderate attitude and scores .66 and over indicate a strong attitude.

The SC-IAT has demonstrated adequate reliability and validity as a measure of implicit social cognition across fields, including as a measure of soft drink preferences (Karpinski & Steinman, 2006; Bluemke & Friese, 2008). As the present study was constrained to the 'free-version' of the SC-IAT software, only final *D* scores were produced. Thus, it was not possible to calculate a Chronbach's alpha (α) equivalent for internal consistency using the Spearman-Brown correction (Karpinski & Steinman, 2006). Nevertheless, previous SC-IAT research (Rebar, Ram, & Conroy, 2015) has listed internal consistency ranging from adequate (α=.69) to high (α=.84).

Explicit Attitudes Scale.

To capture the variable of explicit attitudes toward chocolate an explicit attitude scale was used. The scale used was based upon the method outlined by Conner and Sparks (2005) and used in other studies (e.g. Lowe, Eves, & Carroll, 2002). The scale was a 16 item paper-based questionnaire. Each scale captured instrumental and affective beliefs that make up overall explicit attitude. Instrumental beliefs are said to concern a consideration of pro's and con's of target concept (i.e. chocolate), whereas affective beliefs relate more to emotion based evaluations of that concept. Examples of instrumental based questions included: *'I believe chocolate is harmful'*. Examples of affective based questions included: 'I believe chocolate is enjoyable'. A seven point semantic differential scale assessed participant responses, with each scale ranging from '*strongly disagree*' (1) to '*strongly agree*' (7). An overall explicit attitude score was calculated by taking the mean of the scores across all 16 questions. Thus, scores ranged between 1 (less favourable/'negative' attitudes toward chocolate) and 7 (more favourable/'positive' attitudes toward chocolate). Reliability analysis demonstrated the scale had good internal-consistency (α=.77).

Self-Report Habit Index (SRHI).

The SRHI (Verplanken & Orbell, 2003) was used to capture data on the variable 'habit'. Specifically, the SRHI was used to determine the extent to which eating chocolate was 'habitual' for the participants. The SRHI is a paper-based questionnaire comprised of 12 questions that combine to produce a singular index score capturing the degree to which performing a target behaviour can be classified as 'habitual'. The SRHI was designed following assertions that 'habit' is more than a mere frequency count (Verplanken, 2006). The 12 questions along the index are designed to measure in addition to frequency, the automaticity and relation to self-identity of performing the target behaviour. Each question was scored using a seven point semantic differential scale ranging from *'strongly agree'* (7) to *'strongly disagree'* (1). Examples of questions included: *'Eating chocolate is something I do without thinking'* and *'eating chocolate is something I would find hard not to do'*. The overall habit score was calculated by taking the mean of the scores across the 12 questions. This score represented an index strength in which eating chocolate is habitual for the participant. Scores ranged between 1 (weak habit) and 7 (strong habit). The SRHI has shown good reliability and validity as a measure of habitual eating behaviours (Verplanken & Orbell, 2003; Verplanken, 2006). Reliability analysis also demonstrated high internal-consistency (α=.90).

Food Choice.

A food selection task similar to procedures used in previous research (e.g. Karpinski & Hilton, 2001; Perugini, 2005/2010) was employed to capture data on the variable food choice. Participants were presented with an opaque and covered large bowl so that they could not see the three chocolate items (*Twix, Mars Bar, Twirl*) and three fruit items (*Banana, Orange, Apple*) within. Participants were instructed to select one item as quickly as possible once the cover was removed and were informed they could take the item away with them if wished. The three chocolate items represented a 'junk food' selection (consistent with the other variables), whereas the three fruit items represented a healthy/alternative selection. Fruit (like chocolate) was chosen as it was highly portable and likely familiar to participants. The variable was scored as a binary categorisation with *1* being awarded for a chocolate selection and *2* for a fruit selection. 'Snack-size' chocolate bars and fruits were used to help ensure all items were roughly the same visual size, thus reducing the likelihood of this confounding the results.

Methods of Data Collection

The current study used an observational data collection procedure. The aforementioned measuring instruments were used at a single time point for each participant in order to gain quantitative data across variables. A limitation of this approach was that changes in participant data could not be tracked over time. However, consistent with cross-sectional research this observational method allowed large amounts of data to be captured in an efficient/cost-effective manner. This approach helped limit recruitment and testing demands for both the researcher and participants. Furthermore, this observational approach consistent with positivism allowed the variables to be quickly and meaningfully conceptualised.

Procedure

The portability of the measuring tools, combined with an observational data collection procedure and convenience sampling allowed for testing at a number of quiet, private locations mutually convenient for participant and researcher. Each participant was individually tested. Participants were given the standardised information sheet before obtaining their informed written consent. Following this participants each completed the four tasks in turn: SC-IAT, questionnaires (SRHI and explicit attitudes scale), food choice task, and height/weight measurements. The order in which these tasks were completed was counterbalanced between participants to control for order/fatigue effects. Following completion of the four tasks participants were thanked for their participation and debriefed using a standardised form. The researcher was on hand to answer any questions about the study. Each participant took approximately no longer than 25 minutes to complete all tasks.

Ethical Considerations.

The current study was guided by Coventry University's ethics protocol, and The Code of Human Research Ethics (BPS, 2014). The main ethical considerations are listed below (Appendix G).

Informed consent.

Participants were briefed on the nature of the study using a standardised information sheet before providing their formal written consent to participate. Participants were informed they had a right to withdraw without penalty until their data becomes fully

anonymised 14 days after participation. A researcher was present to answer any questions participants had about their participation.

Use of deception.

A minor use of ethical deception was employed in order to aid validity of the research. Participants were told they would complete a 'food selection' task but they were not given any further details as to the nature of this task. This was to help limit demand characteristics, and ensure the food choice was spontaneous (rather than having time to deliberate). The true nature of this task and the study as a whole was outlined to participants during the debrief phase.

Risk of harm.

It was considered that being involved in a study related to weight management and/or having BMI measurements taken could produce feelings of anxiety, guilt, and shame. This risk was managed through use of informed consent, debriefing, and relevant signposting for further support. However, no participants involved appeared unduly distressed by taking part. An element of lone working was required by the researcher during the recruitment phase, including testing participants in their homes. A 'buddy system' involving 'checking in' with others upon entering/leaving premises was used to manage this risk.

Confidentiality.

Information obtained from participants was processed in accordance with the Data Protection Act (2018). Confidentially was maintained by fully anonymising information including coding participant data and keeping written consent forms separately from recorded data.

Debrief.

Following participants completing their involvement they were given a standardised debrief form. The form outlined the true nature of the study and offered signposting to relevant agencies (GP, Samaritans, healthy lifestyles and weight management websites etc.) for further support if required.

Ethical approval.

Ethical approval for this study was granted by Coventry University Ethics Department.

Methods of Data Analysis

Statistical analysis procedures were conducted using IBM SPSS Statistics 25 to analyse the data and answer the research questions. Specifically, a series of regression analyses were performed, including: linear, multiple, logistic, and moderated regressions. Power analyses for multiple regressions working with combinations of a maximum three variables (from Implicit and explicit attitudes, habit, food choice, and BMI) were conducted in G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) to determine a sufficient sample size using an alpha of .05, a power of .80, and a medium effect size (f^2=.15). Based on the aforementioned assumptions, the desired sample size was 77. However, adjustment of the *F* to estimate a large effect (f^2=0.35) indicated a sample size of 36 would be statistically sufficient. The final sample size recruited was 54 and therefore should be sufficient in detecting large effects within the regression models. There was no missing data and therefore, the data for all 54 participants was included in each phase of the analysis.

Prior to running the analyses all variables were checked (Appendix H) for approximate normal distribution by examining: normality tests, Skewness and Kurtosis, normal Q-Q plots, and histograms. The variables BMI and Habit were not approximately normally distributed. Therefore, SPSS Log10 transformation procedures were used to correct the positive skews within these variables. Examination of box plots across all variables revealed no outliers of significant concern.

Wherein moderation tests were used to help answer the research questions the SPSS PROCESS macro was used (Hayes, 2018) with ‘Model 1’ moderation selected. This statistical approach is robust and does not require normality within the data. The models were built using 10,000 bootstrap samples and 95% bias-corrected confidence intervals. Continuous predictor variables were mean centred to avoid multicollinearity (Aiken and West, 1991). Linearity assumptions between the predictor and dependent variables were satisfied using scatterplots. To control for the effects of gender, gender was entered as a covariate during all PROCESS analyses.

Results

To explore the general trends of the relationships between the study variables zero order correlations were calculated using Pearson product-moment correlation coefficient. This can be seen in Table 2.2 below along with the mean and standard deviation values for each variable.

Table 2.2. *Descriptives and Zero Order Correlations of Study Variables*

	Implicit Attitudes	Explicit Attitudes	Habit	BMI	Food Choice
Explicit Attitudes	.05				
Habit	.35**	.24			
BMI	.17	-.01	.24		
Food Choice	.44**	.31*	.39**	.17	
M	.05	4.36	2.76	26.57	(Chocolate *n*=28)
SD	.34	.86	1.20	4.69	(Fruit *n*=26)

Note. *p<.05, **p<.01, *M*=mean, *SD*=standard deviation, *n*=number of participants who selected 'chocolate' or 'fruit'.

The findings will now be presented organised around the main research questions (Appendix I).

Research Question 1

Dual attitude models suggest both implicit and explicit attitudes can influence behaviour**.** However, junk food consumption may become habitual through repetition. As such, food choice may often be 'automatic' in nature, thus (consistent with dual attitude models) more influenced by implicit than explicit attitudes. Not all food choice is likely to be automatic however, thus explicit attitudes are also likely to be influential in this process. In order to answer the question *'do implicit and explicit attitudes toward junk food predict food choice?'* a logistic regression was conducted. Logistic regression was employed as the dependent variable (Food Choice) was binary in nature.

As highlighted, outliers and normality for all variables was checked prior to conducting the analyses. Multicollinearity between the predictor variables in the binary logistic regression model (Implicit and Explicit Attitudes) was assessed using correlational

analysis. Pearson's correlation coefficient (*r*) indicated a non-significant weak correlation between Implicit Attitudes and Explicit Attitudes (*r*=.05, *p*=.74). Therefore, multicollinearity should not interfere with interpretation of the logistic regression.

Within the logistic regression model Food Choice was the dependent variable. Implicit Attitudes and Explicit Attitudes were the independent variables. A forced entry method was used to allow the overall model and individual predictors to be examined. The overall model was significant (*Chi-square*=17.18, *df*=2, *p*=.00) with a pseudo *R* value indicating the predictors accounted for approximately 36% of the variance in Food Choice (*Nagelkerke* R^2=.36). Inclusion of the predictor variables increased the classification accuracy of the model from 51.9% by 25.9% giving the overall model a classification accuracy of 77.8%. A summary of the results is shown in Table 2.3 below.

Table 2.3. *Logistic Regression: Implicit and Explicit Attitudes as Predictors of Food Choice*

	b	*SE*	*Wald*	*p*	*ExpB*	$_{Nagelkerke}R^2$
Implicit Attitudes	3.37	1.13	8.93	.00**	28.93	
Explicit Attitudes	.89	.39	5.19	.02*	2.43	
(Overall Model)						.36**

Note.*p<.05, **p<.01, *b*=unstandardised beta coefficient, *SE*=standard error of beta, *ExpB*=odds ratio of beta.

As shown both Implicit Attitudes and Explicit Attitudes were significant contributors within the model. Examination of the odds ratio revealed that a 1 unit increase in (positive) implicit attitudes toward chocolate was associated with participants being almost 29 times more likely to select chocolate than the healthier fruit alternative (*ExpB*=28.93). Whereas when explicit attitudes toward chocolate increased (positively) by 1 unit, participants were 2.4 times more likely to select chocolate (Exp*B*=2.43).

Taken together, results suggest that while implicit and explicit attitudes are not associated, they both significantly influenced food choice. Examination of the relative beta coefficients, significance values and odds ratio however, indicated that explicit attitudes appeared a less strong predictor of food choice than implicit attitudes. Consistent with theory therefore, both forms of attitude were significant predictors of food choice, although implicit attitudes appeared more influential.

Research Question 2

Dual attitude models indicate that implicit attitudes may influence behaviours occurring with automaticity, with explicit attitudes playing less role in this process. Habitual behaviours are behaviors occurring with automaticity, and therefore may be more influenced by implicit attitudes. In order to answer the question *'do implicit and/or explicit attitudes toward junk food predict habitual consumption of junk food'* a multiple regression analysis was conducted.

Prior to the analysis assumptions of multiple regression analysis were satisfied. Cook's *D* indicated no outliers and histogram inspection suggested approximate normality of residuals. A scatterplot was generated to check for independence of residuals. Approximate homoscedasticity and linearity of the relationship between the predictor and dependent variables was observed. Multicollinearity between the predictor variables was low as displayed in question 1, and through inspection of the tolerance values.

Within the regression model Habit was entered as the dependent variable and Implicit Attitudes and Explicit Attitudes were jointly entered as independent variables. The regression model was significant with the predictors accounting for 17% of the variance in Habit (R^2=.17, $_{adj.}R^2$=.14, $F(2,53)=5.37$, p=.01). Examination of the individual beta regression coefficients for the two predictors indicated that Implicit Attitudes were a significant predictor of Habit (b=.20, β=.34, SE=.08, t=2.67, p=.01), whereas Explicit Attitudes were not (b=.05, β=.23, SE=.03, t=1.77, p=.08). Consistent with theory therefore, Implicit Attitudes were a significant predictor of Habit and a stronger predictor of Habit than Explicit Attitudes.

Implicit attitudes were significant predictors of (self-reported) habit. However, as this study also involved a 'behavioural' food choice task, secondary moderation analysis was conducted to further probe the influence of implicit attitudes on habit across food choice. Habit was entered as the dependent variable, with Implicit Attitudes and Food Choice the independent variables. Food Choice was set as the moderator. The independent variables accounted for a significant 21% of the variance in Habit (R^2=.46, $_{adj.}R^2$=.21, $F(4,49)=3.26$, p=.02). The interaction term however, did not increase the explained variance in Food Choice (R^2_{change} =.0000, $F_{change}(1,49)=.03$, p=.96). The results are summarised below in Table 2.4.

Table 2.4. *Moderated Regression: Implicit Attitudes and Food Choice as Predictors of Habit*

	b	*SE*	*t*	*p*	R^2	$_{adj.}R^2$	R^2_{change}
Implicit Attitudes	.79	.67	4.83	.25			
Food Choice	-.70	.34	-2.05	.05•			
Implicit Attitudes x Food Choice	-.05	1.00	-.05	.96			
Gender (covariate)	.24	.31	.78	.44			
(Overall Model)					.46	.21	.02*

Note. •p<.10, *p<.05, b=unstandardised beta coefficient, SE=standard error of beta.

While the interaction effect was non-significant, simple slopes post-hoc analysis was conducted to explore the model further. This was done to avoid missing potentially important trends in the data (given this study was lacking statistical power to detect smaller effects). The relationship between Implicit Attitudes and Habit was examined across the binary Food Choice variable (those who selected chocolate and those who selected fruit). The effect is demonstrated below in Figure 2.1.

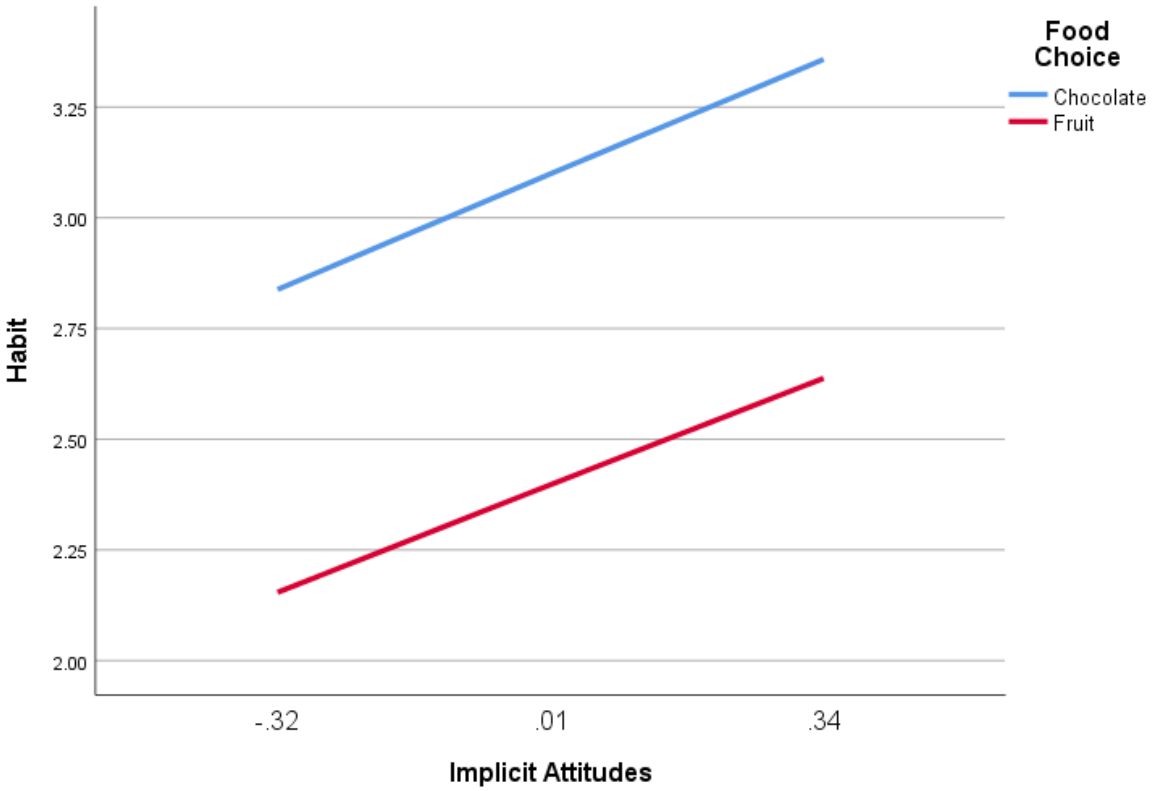

Figure 2.1. Simple slopes: implicit attitudes as predictors of habit moderated by food choice.

As shown, while the interaction effect was non-significant the graph displays interesting results. For individuals who selected fruit during the food choice task there appears to be 'positive' (higher) implicit attitudes toward chocolate, although this is not strongly associated with high Habit. However, for those who selected chocolate, there is a notable increase in habit. Consistent with theory therefore, results across the aforementioned analyses suggest that implicit attitudes may play a role in influencing habitual consumption of junk food.

Research Question 3

Previous research has produced inconsistent findings on associations between implicit attitudes and BMI. Nevertheless, given the failure of health promotion campaigns that have targeted explicit cognition to reduce obesity levels it may be that implicit attitudes would be a stronger predictor of BMI. Furthermore, research question 1 and 2 offered support that implicit attitudes were a significant and stronger predictor of both food choice and habit than explicit attitudes. Therefore, to answer the question *'are implicit rather than explicit attitudes toward junk food a stronger predictor of BMI?'* a multiple regression analysis was conducted.

Prior to this analysis necessary assumptions were satisfied using the same approach detailed in research question 2. BMI was entered as the dependent variable, Implicit Attitudes and Explicit Attitudes were jointly entered as independent variables. The regression model was not significant with the predictors accounting for 0.3% of the variance in BMI (R^2=.03, $_{adj.}R^2$=-.01, $F(2,53)$=.75, p=.48). Examination of the individual beta regression coefficients for the predictors in the regression model revealed that neither Implicit Attitudes (b=.04, β=.17, SE=.03, t=1.22, p=.23), nor Explicit Attitudes were significant contributors (b=-.00, β=-.02, SE=.01, t=-.15, p=.88). However, Implicit Attitudes appeared the stronger of these two non-significant predictors. Implicit and explicit attitudes toward junk food therefore, did not predict BMI. However, more consist with expectation it was implicit rather than explicit attitudes that appeared more influential.

Research Question 4

Although implicit attitudes toward junk food failed to significantly (directly) predict BMI, theory suggests this relationship may become more evident as junk food consumption becomes increasingly habitual. Therefore, to answer the question *'does level of habitual*

consumption of junk food moderate a relationship between implicit attitudes toward junk food and BMI?' moderation analysis was conducted.

Within the model BMI was entered as the dependent variable. Implicit Attitudes and Habit were entered as the independent variables with Habit set as the moderator. The independent variables combined accounted for a non-significant 13% of the variance in BMI (R^2=.36, $_{adj.}R^2$=.13, F(4,49)=1.77, p=.15). Inclusion of the interaction term marginally increased the explained variance in BMI by a non-significant .2% (R^2_{change} =.002, F_{change}(1,49)=.08, p=.77). A summary of the results is provided in Table 2.5 below.

Table 2.5. *Moderated Regression: Implicit Attitudes and Habit as Predictors of BMI*

	b	*SE*	*t*	*p*	R^2	$_{adj.}R^2$	R^2_{change}
Implicit Attitudes	1.60	2.06	.78	.44			
Habit	.99	.58	1.71	.09•			
Implicit Attitudes x Habit	.49	1.72	.29	.77			
Gender (covariate)	-1.92	1.28	-1.51	.14			
(Overall Model)					.36	.13	.002

Note. •p<.10, b=unstandardised beta coefficient, SE=standard error of beta.

The interaction effect was non-significant and only marginally increased the explained variance in BMI. However, simple slopes post-hoc analysis was conducted to examine the nature of the small increase. The relationship between Implicit Attitudes and BMI was examined at three levels of Habit: low (1 *SD* below mean), moderate (mean value) and high (1 *SD* above mean). This is demonstrated in Figure 2.2 below.

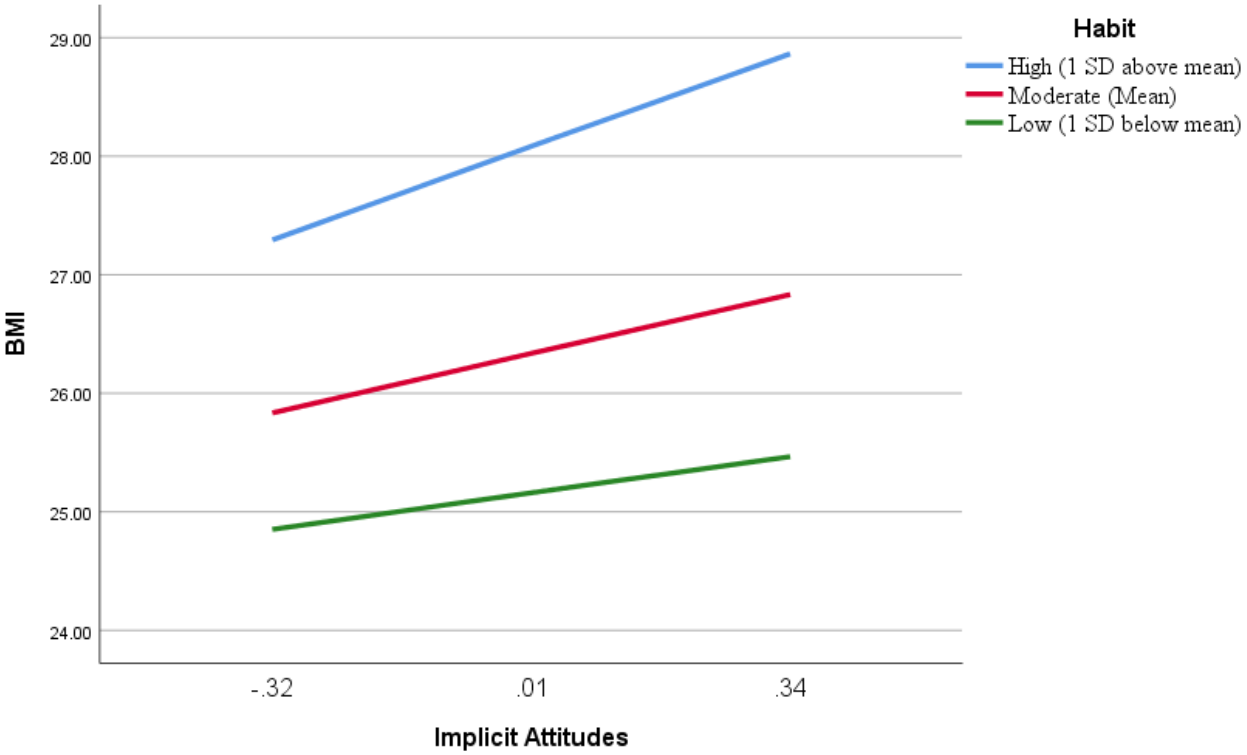

Figure 2.2. Simple slopes: implicit attitudes as predictors of BMI at three levels of habit.

A positive relationship between Implicit Attitudes toward chocolate and BMI at all levels of Habit was revealed. However, the relationship between Implicit Attitudes and BMI appears strongest at high levels of Habit. While not reaching statistical significance there appeared to be some evidence of a modest moderation effect. Consistent with theory, trends in the data suggest that the power of implicit attitudes toward junk food in predicting BMI may increase as consuming junk food becomes more habitual.

Research Question 5

In accordance with theory, implicit attitudes toward junk food may play an important role in food choice (i.e. selecting junk food when presented with an alternative), as this behavior may be occurring outside of awareness (i.e. is 'automatic'), thus leading to risk of overweight/obesity. As such, a positive relationship between implicit attitudes and BMI may be strongest among those whose food choice was chocolate. Thus, to answer the question *'does food choice moderate a relationship between implicit attitudes toward junk food and BMI?'* a third moderation analysis was conducted.

BMI was entered as the dependent variable, Implicit Attitudes and Food Choice were the independent variables, and Food Choice the moderator. The predictor variables combined accounted for a non-significant 8% of the variance in BMI (R^2=.28, $_{adj.}R^2$=.08,

$F(4,49)=1.08$, $p=.38$). Inclusion of the interaction term very marginally increased the explained variance in BMI by a non-significant .03% ($R^2_{change}=.0003$, $F_{change}(1,49)=.08$, $p=.90$). A summary of the results is provided in Table 2.6 below.

Table 2.6. *Moderated Regression: Implicit Attitudes and Food Choice as Predictors of BMI*

	b	*SE*	*t*	*p*	R^2	$_{adj.}R^2$	R^2_{change}
Implicit Attitudes	2.05	2.82	.73	.47			
Food Choice	-1.35	1.44	-.94	.35			
Implicit Attitudes x Food Choice	-.52	4.21	-.12	.90			
Gender (covariate)	-1.78	1.30	-1.37	.18			
(Overall Model)					.28	.08	.0003

Note. *b*=unstandardised beta coefficient, *SE*=standard error of beta.

While the interaction effect was non-significant simple slopes post-hoc analysis was conducted to examine the nature of the small increase in variance accounted for by the interaction term. The relationship between Implicit Attitudes and BMI was examined across the binary nature of the Food Choice variable (those who selected chocolate and those who selected fruit). The effect is demonstrated below in Figure 2.3.

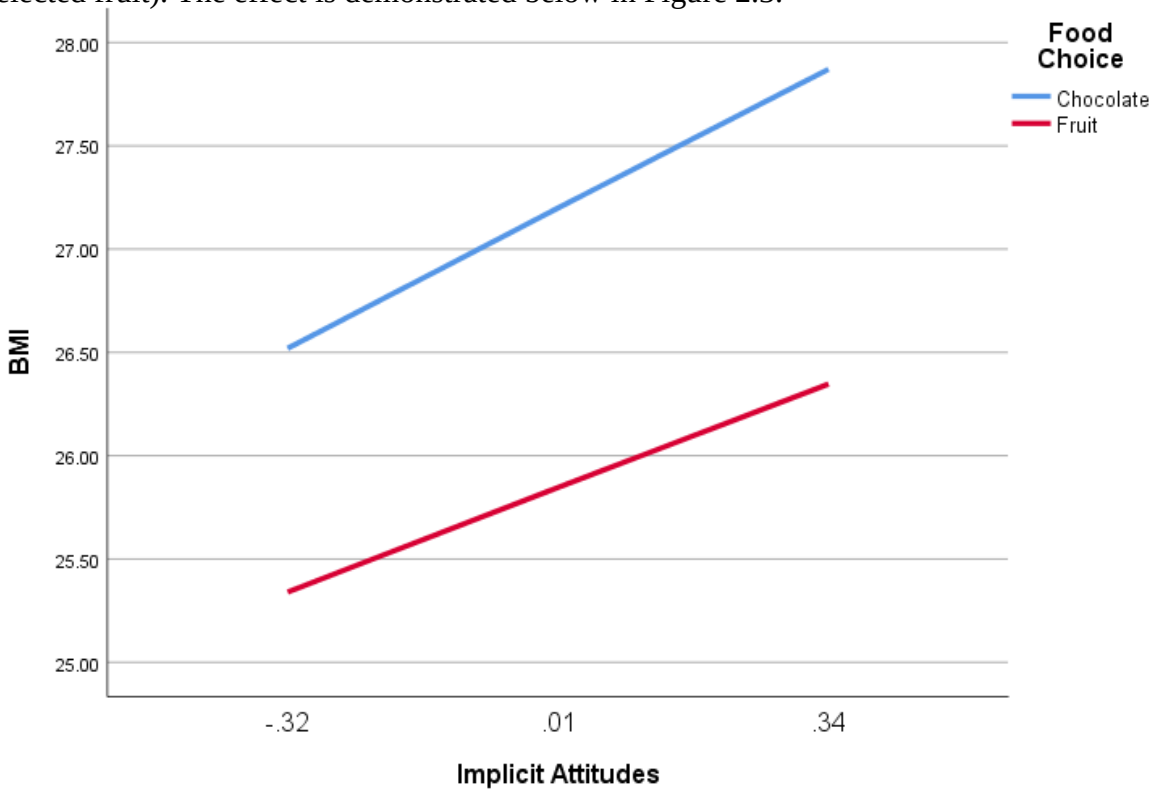

Figure 2.3. Simple slopes: implicit attitudes as predictors of BMI moderated by food choice.

As can be seen a positive association between Implicit Attitudes (favourable to chocolate) and BMI exists in those who selected chocolate and those who did not. However, this relationship appears slightly more evident among people who chose chocolate. Somewhat consistent with theory therefore, it appears that individuals who choose chocolate have slightly more favourable implicit attitudes and higher rates of BMI compared to those who selected fruit. However, as highlighted this interaction effect failed to reach significance.

Discussion

This study aimed to investigate the theoretical assertion that excessive consumption of 'junk food' and the consequential risk of becoming overweight/obese, may be influenced by attitudinal processes and habits under limited control. This study aimed to do this by testing components of dual attitude frameworks (Wilson et al, 2000). Specifically, it examined if implicit rather than explicit attitudes toward junk have greater influence on habitual consumption of junk food and thus risk of becoming overweight/obese.

Irrespective of BMI, both implicit attitudes and explicit attitudes toward junk food appeared to combine in order to determine if somebody selected junk food when presented with a (healthier) alternative (research question 1). However, it was implicit attitudes that were a more powerful predictor of this food choice. Again, irrespective of BMI it was also found that implicit attitudes toward junk food were significant predictors of habitual consumption of junk food whereas explicit attitudes were not (research question 2). This relationship between implicit attitudes and habit was subsequently shown to be strongest in those who selected junk food when presented with an alternative (research question 2). These findings combined suggest that implicit attitudes (rather than explicit attitudes) may play a more significant role in influencing habitual consumption of junk food.

Neither implicit nor explicit attitudes directly significantly influenced BMI, although implicit attitudes appeared the stronger predictor of the two (research question 3). However, some evidence suggested that when moderating variables in the relationship between implicit attitudes toward junk food and BMI were added, the relationship between these variables increased. The positive relationship between implicit attitudes toward junk food and BMI appeared strongest as consuming junk food became increasingly 'habitual' (research question 4). The relationship between implicit attitudes toward junk food and BMI also appeared strongest among individuals who selected junk food when presented with a

healthier alternative (research question 5). However, while these final two trends emerged within the analysis (simple slopes graphics), they failed to reach statistical significance. As such, it is important to interpret them with caution.

The current study divided the analysis into sections in order to clearly examine different components of the relationships between attitudes (implicit and explicit), junk food consumption (habit and food choice) and BMI. However, it is important to consider these components as a whole when determining their overall relationship. Both implicit and explicit attitudes influenced junk food eating behaviour (food choice), with implicit attitudes also additionally influencing habitual consumption of junk food. Overall however, implicit attitudes appeared stronger drivers of food choice and habit, than explicit attitudes (research question 1 and 2). Despite implicit attitudes influencing both food choice and habit, they were not found to significantly influence BMI (either directly or through moderation; research question 3, 4, and 5). However, given that dietary choices are widely recognised in the development of overweight/obesity (Romieu et al., 2017), the current study in demonstrating that implicit attitudes appear to exert a significant influence on the consumption of junk food remains noteworthy. Overall, results suggested that implicit attitudes appear a stronger influence on habitual consumption of junk food, and consistent with theory (and as modestly indicated by non-significant moderation trends) this may increase the risk of overweight/obesity.

The findings offer support for dual attitude models that suggest both implicit and explicit attitudes are important determinants of behaviour (Wilson et al., 2000). Explicit attitudes significantly predicted food choice but not habit. This is highly consistent with theory that suggests explicit attitudes guide behaviours described as deliberate and non-automatic (Muschalik et al., 2019; Stanley et al., 2008). While food choice may be ‘automatic’ on occasion, unlike habit it is not defined by this feature (Verplanken, 2006), thus this behaviour is open to the influences of explicit cognition. Interestingly, implicit attitudes significantly predicted both food choice and habit. This can be explained by both of these processes being at least somewhat automatic (habit to a greater extent). As such, these findings also support assertions that implicit attitudes guide automatic, spontaneous and uncontrolled behaviours (Muschalik et al., 2019; Stanley et al., 2008).

The current study findings additionally offered support that implicit attitudes are important in driving habitual food choices. This was evidenced through implicit attitudes

being a significant predictor of habit (and food choice), but also that the positive relationship between implicit attitudes and habit appeared strongest among individuals who selected junk food. These findings are similar to Conner et al. (2007) who found that habit moderated the relationship between implicit attitudes and food choice. The more habitual food choices were, the more strongly they were predicted by implicit attitudes. The current study findings also add to the existing evidence base that shows implicit attitudes are important influencers of food choice (e.g. Conner et al., 2007; Friese et al., 2008; Konig et al., 2016; Perugini, 2005/2010; Richetin et al., 2007), and thus need to be considered alongside explicit attitudes as influencers of health behaviours.

Previous research has not produced conclusive evidence/consensus on the associations between implicit attitudes and obesity (McKenna et al., 2016). Some previous research has shown that obese individuals display more positive implicit attitudes toward unhealthy (and healthy) food types than healthy weight individuals (Caraeynest et al. 2005; Sartor et al., 2011). However, the reverse has also been shown in that obese adults perhaps have stronger negative implicit attitudes toward unhealthy foods than controls (Roefs and Jansen, 2002). While the present study did not principally aim to directly compare overweight/obese and healthy weight individuals, the present study (like previous research in this area) did not find conclusive evidence of a significant association between implicit attitudes toward junk food and obesity. This study however, in also considering the role of habit and food choice, was able to further probe the relationship between implicit attitudes toward junk food and overweight/obesity.

As highlighted, the present study demonstrated that implicit attitudes predicted both (self-reported) habitual consumption of junk food and selection of junk food. Specifically, as implicit attitudes toward junk food increased, individuals were more likely to habitually consume junk food, and more likely to select junk food when presented with a healthier alternative. Implicit attitudes alone did not account for a significant proportion of the variance in BMI. However, when habit was considered as a moderator in this relationship (while not statistically significant) there was a positive relationship between implicit attitudes and BMI at all levels of habit and this relationship appeared strongest at high levels of habit. Again while not statistically significant, there was also some evidence to suggest that a positive relationship between implicit attitudes and BMI exists and may be stronger in those who selected junk food as opposed to a healthier alternative. It is possible that these observable (and expected) trends failed to reach significance due to the current study being

underpowered. Nevertheless, overall this study appeared to show that implicit attitudes toward junk food can significantly influence habitual consumption of junk food and food choice. Therefore, consistent with theory and knowledge in this area, may play some role in increasing the risk of overweight/obesity.

This study's findings may have potential important implications for health policy. As outlined previously, public health initiatives have attempted to improve the nation's health and reduce rising levels of overweight/obesity through wide dissemination of (explicit) health information. While explicit attitudes were found to influence food choice, implicit attitudes appeared more powerful predictors. Furthermore, only implicit attitudes seemed to influence habitual consumption of junk food. Given that food choice may often be habitual, implicit attitudes may be of additional importance in driving eating behaviours. Public health initiatives in focusing on explicit attitudes may be overlooking the second, and perhaps more important determinant of eating behaviours. The current study results therefore, offer one possible contributing explanation as to why obesity rates continue to rise despite health campaigns attempting to tackle this issue.

Public health initiatives seemingly need to greater acknowledge the potential role of implicit attitudinal processes influencing subsequent 'automatic' eating behaviour/habits. Initiatives could highlight that processes occurring outside of awareness can/do influence eating (and potentially other health) behaviours. This may be validating for the many who fail in their efforts to lose weight/uptake health promoting behaviours despite their best intentions to do so. Health promotion initiatives could also more routinely incorporate strategies to break automatic behaviours and habits, such as disrupting the environment and environmental cues triggering automatic responding (Verplanken, 2006). For example, supermarkets could regularly rearrange products to make it more difficult for individuals to operate on 'autopilot', thus facilitating behaviours to be driven more by explicit cognition. In practice however, such interventions may be difficult to implement. Interventions that target underlying implicit attitudes influencing eating behaviours should also theoretically have efficacy, although how this could be done at a broad public health level is yet to be fully established.

At a clinical level, it may be easier for health promotion/weight-loss management interventions to target implicit attitudes potentially influencing behaviour. In recent years, in addition to emergence of implicit attitude assessment methods (Quinton & Brunton, 2017),

strategies for altering these automatic attitudes (and their influence on behaviour) have been outlined. Strategies include: evaluative conditioning, approach/avoidance training, attention bias modification, behavioural inhibition training, implementation intentions and mindfulness (Papies, 2017; Quinton & Brunton, 2017). Interventions that consider the relative influence of underlying processes, including implicit attitudes, and employ techniques to address these (such as the aforementioned) may help to improve outcomes for some individuals. Nevertheless, it remains important to emphasise that implicit attitudes (toward junk food) and links with habitual consumption of junk food should not be seen as the sole or primary cause of unhealthy BMI. Unhealthy BMI likely results from a combination of interacting factors, including: biological, psychological, environmental and social influences (BPS, 2019). As such, holistic intervention programmes tailored to individual need are likely to have the best efficacy and be the least stigmatising.

Conclusion

In closing, this study has contributed new knowledge to this field by seemingly being the first study to highlight that implicit attitudes toward junk food significantly influence habitual consumption of junk food, and perhaps play more role than explicit attitudes in this process. This study also appeared to be the first study to examine habit and food choice as moderators in associations between implicit attitudes and BMI. While not statistically significant, moderation trends (consistent with theory and knowledge) indicated that implicit attitudes may influence BMI through their involvement in driving habitual consumption of junk food. As such, this study was perhaps the first to empirically show that junk food consumption and habits (and thus potential risk of becoming overweight) might be influenced by attitudinal processes operating outside of awareness.

While this study produced some interesting findings, there are limitations to consider. Firstly, this study operationalised and represented ‘junk food’ by using chocolate only. This focus on chocolate was deemed necessary in order to ensure compatibility with the habit and food choice measure, and to allow the food choice task to be highly portable. While this enabled the research to be conducted in a pragmatic and consistent manner it may limit validity of the findings. Secondly, the food choice task employed was presented to participants ‘spontaneously’ and they were asked to make a ‘quick’ selection. Consistent with dual attitude models this task perhaps leant itself more toward implicit processing, thus

explicit attitudes in food choice may have been underrepresented. Nevertheless, this perhaps reflects many real world settings wherein food choice might be 'spontaneous' in nature.

As highlighted, given the time/resource constraints of this research, a relatively small sample size was used. This led to the study being reduced in statistical power which may have limited the results. Power analysis suggested that the sample was not large enough to detect statistical significance of small/moderate effects. This may account for why some (expected) interesting observed trends did not reach significance. As previously illustrated however, unhealthy BMI is likely result of a complex interaction of biopsychosocial factors (BPS, 2019). Therefore, the observed trends may not have reached statistical significance given that other possible confounding factors (genetics, exercise habits, trauma etc.) that were not controlled for by the present study, may have also been involved in influencing overall BMI. Lastly, this study recruited participants across a relatively small geographical area and recorded limited demographic information. As such, the validity and generalisability of the findings might be reduced.

As this was seemingly the first study to highlight the role of habit and food choice as potential moderators in the relationship between implicit attitudes and BMI more research is needed to build on these findings. Future research may usefully employ a larger/wider sample, and broader range of 'junk foods' to help more clearly identify associations. Future research may also wish to investigate these processes within populations characterised by 'underweight' BMI as often seen in some eating disorders populations (NHS, 2018c). It may be that strong negative/positive implicit attitudes toward certain food groups influence related eating/health behaviours maintaining low BMI. Lastly, more research is warranted to fully examine the efficacy/feasibility of suggested health behaviour interventions to address underlying implicit attitudes and maladaptive eating behaviour/habits (implicated in overweight/obesity). Such approaches may help reduce the distress felt by the many who fail in attempts to enact intentions to improve their health, and ease the current burden of overweight/obesity on public health and healthcare systems.

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Chapter Three

Reflections on the Research Process

Introduction

Reflection is a broad entity encompassing a diverse range of concepts and strategies. While there are many benefits to the process of reflection it has been highlighted that: "learning the practice of reflection is fundamental because it allows people to engage into a thoughtful relationship with the world-life and thus gain an awake stance about one's lived experience" (Mortari, 2015, p. 1). In accordance with the pragmatist perspective on reflection, it allows learning from experience to occur, thus helping increase the effectiveness of similar and related actions in future (Mortari, 2015). The following therefore, is a broad reflection on my experiences of conducting the research outlined in chapter one and two. Reflections cover the entire process, from conceptualisation to completion and beyond. Engaging in reflection across the research process presents useful opportunity to learn from the experiences, thus potentially further shaping my identity as a researcher, practitioner, and clinical psychologist.

Reflections on Choosing this Area of Research

In reflecting on why, of all the possible areas open to clinical psychology, I ended up completing a thesis in this area of research there is perhaps no singular answer. Having played a lot of sport throughout my life, including regularly training and competing in Karate, I became interested from a young age in 'motivation'. I recall numerous internal battles wherein my 'motivation' on a given day to train was low, and subsequently I did not wish to train even though Karate/exercise was so important to me. I also wondered why it was that, even though I did not always want to train, for the most part I did so, despite opposing thoughts/wishes. I also wondered why many people around me going through similar internal battles struggled to train/exercise regularly despite intentions to do so. These experiences throughout my childhood and beyond also enabled me to see the large and immediate positive impacts exercise had on my mood, and taught me that there are links between health promoting behaviours and mood/wellbeing.

After I later began studying undergraduate psychology I naturally developed a particular interest in health psychology and health behavior motivation. I learned about how Acceptance and Commitment Therapy ([ACT] Hayes et al., 2006) can be used to encourage uptake of health behaviours consistent with underlying values by defusing from distressing/unhelpful thoughts. These techniques resonated with me and served me well in consistently engaging in my own value driven health behaviours. These experiences helped

to spark my interest in clinical health psychology which was furthered through subsequent postgraduate study. Under the guidance of a social psychologist during this time, I became aware of concepts within social psychology literature and thought about how they can be applied within clinical psychology to influence health behaviours, public health and wellbeing.

As highlighted, through introspection and evaluating links between my own health behaviours, physical health and wellbeing I become aware of significant overlaps. Through much casual discussion with family and friends around this subject it became apparent that I was not the only person reporting such links. When I later began working in mental health as a support worker, I often worked in people's own homes. I noticed that poor diet quality and lack of health promoting behaviours were common place. Consistent with my own personal experience that wellbeing is greatly influenced by health behaviors therefore, it became apparent to me that there was a clear need for more holistic thinking/interventions. When later working regularly in mental health teams in more clinical roles, I was further surprised that health behaviours (or lack of) are often completely overlooked during both assessment and intervention. I began looking into research in this area, and to my surprise this area was fairly limited, particularly within the field of clinical psychology.

This research opportunity therefore, gave me a platform to take my interest in clinical health psychology and health behaviour motivation further. I was able to not only look at a potential new health behaviour avenue for intervention (i.e. diet interventions for wellbeing), but also to simultaneously research how underlying cognition may influence subsequent engagement in habitual health related behaviours, influencing overall health status (i.e. the currency 'obesity epidemic'). I also hoped to shine somewhat of a 'clinical psychology spotlight' on research that seemingly existed largely within the sphere of social psychology at present.

Reflections on Discrepancies between 'Researcher' and 'Practitioner' Identities

One of the main and perhaps unexpected challenges of the research process stemmed from conflicts between my identity as both a practitioner and researcher. When working as a practitioner I often find myself 'battling' against the dominance of the 'medical model' (Deacon, 2013) that still exists within services. One of my largest criticisms of the medical model approach is how it can at times strip away an individual's identity and personal story. Mental health difficulties (and associated maladaptive behaviours) often arising as an

understandable consequence of lived experience and trauma are too often oversimplified through over-prescribing of diagnostic labels and reductionist use of language.

This reductionist form of understanding leads to 'symptoms' of diagnostic labels being implicitly and/or explicitly indicative of underlying 'mental illness' and thus 'abnormalities of the brain'. The validity and reliability of diagnostic criteria is questionable (Allsopp, Read, Corcoran, & Kinderman, 2019), and no clinically reliable or valid biomarkers for mental health difficulties exist (Venkatasubramanian & Keshavan, 2016). Therefore, the medical model approach within mental health is significantly flawed. In addition to implicitly and/or explicitly indicating the presence of 'brain abnormalities', use of medicalised/reductionist formulation and language, in stripping individuals of their identity and story creates and reinforces stigma for service users. Furthermore, this process in itself can be re-traumatising for some individuals who have previously been abused/let down by people and/or systems in positions of authority and power.

My training and experiences have taught me instead to use and apply biopsychosocial formulation (British Psychological Society, 2011), psychologically and trauma informed approaches (Sweeney et al., 2018), and power-threat meaning frameworks (British Psychological Society, 2018) to greater understand presenting difficulties. It is important to me, and my identity as a practitioner to challenge the dominance of the medical model where possible, and promote person-centered approaches (Royal College of Nursing, 2016). Often to do this, I endeavour to ensure the voice of the service user and their 'story' is heard. I also endeavour to use holistic approaches and to avoid use of stigmatising language where possible. Lastly, I attempt to use humanistic principles, particularly warmth, empathy and unconditional positive regard throughout my practice (Rogers, 1957) to minimise inherent power imbalances and foster collaborative working/therapeutic relationships. Throughout this research process however, I noted numerous occasions wherein this core identity as a practitioner was challenged, and/or conflicted with the research process and my identity as a researcher.

My identity as a research has been shaped over many years. I was taught in my early years as an undergraduate psychology student that positivism and associated research methods were the only true 'scientific' methods, and that these methods propelled psychology into the mainstream and established its status as a credible and respected field. Qualitative research methods rooted outside of positivism were taught as an 'add on'

alongside ‘core’ research methods teaching. However, since this early shaping, research methods (and the teaching of) in psychology have evolved considerably, and now I, the field of psychology, and the scientific community in general see the important value of qualitative research (Wetz, 2014; Willig, 2019). Nevertheless, given my earlier academic experiences, research taking a broadly positivist viewpoint feels most familiar to me and hence formed the backbone of this research thesis. However, taking a positivist approach conflicted at times with my aforementioned identity and values as a practitioner.

Perhaps the largest conflict I observed was the complete contrast between my values of helping to ensure ‘service user voice’ is heard as a practitioner, vs. using positivist research methods that largely relied on measuring, quantifying, clustering and aggregating outcomes/findings. Individuals ‘stories’ for the most part were reduced to groups of outcomes or a series of measurements, ultimately rich stories were reduced to numbers. While I understood this need to be systematic and/or objective, I felt somewhat conflicted given that there was no space for service user/participant voice to be heard. I also noticed that when operating as a ‘researcher’ collecting data through face-to-face contact with participants, times wherein I felt very ‘detached’. This was because I purposefully restricted the core humanistic qualities I usually employ as a practitioner, as to not overly encourage discussions that may have ‘confounded’ results.

A further internal conflict appeared as I was reading the literature as part of this research process. Again this related to the dominance of the medical model and its’ influence on language. Medical terminology was common place, language within the literature often referred to ‘symptoms’, ‘disorders’, and ‘illness’. I felt pressure to conform when writing, pressure to adopt a similar stance to what has gone before in order to ease communication of ideas. When reporting findings from previous research, I also felt conflicted in terms of reporting findings consistent with the typically adopted ‘medical model frame’. I spent time considering how I could adjust the previously reported terminology to accurately report findings using less stigmatising/medicalised language (consistent with my identity as a practitioner).

Lastly, as mentioned, when operating as a practitioner I try to avoid reductionist approaches in favour of adopting holistic understandings. When undertaking this research however, at times I felt that avoiding reductionism was difficult. Positivist research in part, involves highlighting a specific area of interest and attempting to measure/evaluate the area

of study as objectively as possible. In order to do this, it is necessary to somewhat isolate out areas of interest. In taking this highly specific and objective approach however, other areas/explanations can be overlooked. Thus, this specific objective focus felt quite a contrast in comparison to my practitioner role wherein I take a broad 'helicopter' approach in attempt to capture the 'full story'. At times therefore, I wondered if I was doing the topic area 'justice'.

Overall, I felt I was somewhat enacting the criticisms I outlined previously surrounding the 'medical model'. Ironically, my role as a researcher was inadvertently striping away individual's identities and personal stories. There were multiple challenges in striking a balance between practitioner and researcher therefore. Moreover, at times it was necessary to not look for balance, but instead accept that it was appropriate to drop the role of practitioner when operating as a researcher. This was made possible by remembering that ultimately the underlying value/premise connecting both of these roles lies within helping others, despite the way in which this is achieved within these positions being quite different.

Reflections on the Beneficial Shaping of my 'Researcher' Identity

Despite the challenges, these research experiences have greatly helped improve my ability as a researcher/academic. As mentioned, broadly speaking as a practitioner I tend to take an overarching 'helicopter' view of 'problems' in order to formulate within a biopsychosocial framework. In contrast, this process has helped me to be able to hone in and study certain areas in a highly focused systematic/objective way. This has allowed me to appreciate the fine detail in ways in which 'problems' can be analysed. More broadly, this process has helped me to develop an array of tangible research skills, including how to conduct empirical and systematic research. I now feel more confident in performing research and these developed skills are something that I wish to continue using beyond this project.

I also believe this process has helped to develop my skills in critical thinking as an academic/researcher. This has been shaped not only by this research process (of critiquing research) but also through reflecting on and not 'forgetting' my additional practitioner identity and experiences. As highlighted, this process has taught me how to usefully focus in on topics of interest. At the same time however, I have been able to critically appreciate that such problems do not exist in a vacuum, and are instead parts of wider chains/systems. As

such, I feel I have been able to bolster my critical research skills by incorporating elements of my identity as a practitioner.

Conducting this large research project at times felt isolating. Long periods of time were spent alone researching somewhat niche areas of research. I noticed that at times I could spend lengthy periods of time considering minute detail and somewhat 'over-thinking' aspects of the research I considered problematic/incomplete. However, following discussions with research supervisors, such difficulties were often quickly resolved. The process of receiving critical feedback on my work was also useful. While challenging at times to receive, it helped me to identify blind spots and evolve the project. As such, this process taught me the value of using research supervision when operating as an academic. I have learned to utilise support and expertise of others to develop ideas, resolve problems and identify blind spots rather than 'soldering on' in isolation.

Reflections on the Beneficial Shaping of my 'Practitioner' Identity

This process of reflecting on this research and my experiences of operating as a researcher, has helped me to further appreciate aspects and skills that are fundamental to operating as a practitioner. Firstly, I highlighted that at times the process felt detached, both during face-to-face encounters with 'participants' but also the overall process as a whole. This reminded me of the importance (when operating as a practitioner) of 'connecting' with service users to ensure their voice is heard. Furthermore, on reflecting on discrepancies between my identity as a research and practitioner, this process has also made me curious about qualitative research and my need to develop research skills in this area. Using such methods may help me as a researcher to also put the voice/stories of individuals forward. Nevertheless, I have also appreciated and valued using systematic/objective research rooted within positivism to develop subject areas and knowledge. While as highlighted, this form of research can appear 'hyper-focused', when combined with other broader elements that have been similarly isolated and examined in detail, a comprehensive holistic overview rooted in evidenced based research can be gained and utilised.

This reflective process has also helped me consider my own felt and observed experiences of connections between physical health, health behaviours and wellbeing. These experiences have been validated, having been immersed in research considering holistic approaches (including diet) as part of this research project. These combined experiences have underscored the importance to me of considering links between health behaviours and

wellbeing. This is something that I wish to take forward as a practitioner in order to increase the holistic nature of clinical practice and service delivery.

Undertaking this research project has made me reconsider the power of implicit cognition and automatic behaviours/habits. When operating as a practitioner, for the most part I use an integrative approach based largely on cognitive-behavioural (Beck, 2011), ACT (Hayes et al., 2006), cognitive-analytic (Ryle & Kerr, 2002), and systemic (Johnstone & Dallos, 2014) models. Arguably, any form of therapeutic work or intervention perhaps involves elements of bringing processes operating somewhat outside of awareness into consciousness. However, given that explicit attitudes and cognition are more easily 'accessible', it is likely that often these forms of cognitions are more frequently reported/examined within therapeutic sessions and interventions. This research process has highlighted to me the importance of ensuring that implicit cognition is also addressed. Among other approaches, mindfulness has been proposed as a method to ensure this is occurring (Quinton & Brunton, 2017). However, in order to benefit my practice I shall endeavour to continue researching methods that I can employ within clinical settings to address this need.

Reflections on my Emerging Identity as a Clinical Psychologist

I have reflected upon how this process has developed me as both a researcher and practitioner, and thought about the discrepancies between the two. However, my emerging 'third identity' as a clinical psychologist seemingly holds as a place in which these two aforementioned identities can be utilised and balanced. Within this role I can combine the academic skills I have learned in systematic/objective research, with holistic knowledge and methods (including putting the voice of individuals forward in order to hear individual and collective stories). Furthermore, I can use my professional judgment to decide when best to lean toward one of these sub-identities or to strike a balance between the two. As such, in reflecting on this process and the different positions I have occupied, my 'balance point' as a clinical psychologist has somewhat naturally emerged.

Reflections on Managing the Research Process

Conducting this research process has been a large undertaking that has presented many challenges. However, now I am nearing the end of this process I feel somewhat less fatigued than I had anticipated. Given that a chunk of this project has also been completed

during the Covid-19 pandemic I feel this is also an important point to reflect on. From the outset of this research project I have attempted to employ firm boundaries around my time-management. For instance, I broke the overall project down into smaller parts and goals and designated time to complete these steps. I was also very clear and deliberate in scheduling 'down-time' and was disciplined in adhering to boundaries between 'research' and 'down-time'. Previous experiences had taught me the benefit of maintaining work-life balance and therefore, despite the pressures and challenges of this project, this was something I was determined to maintain.

At numerous times throughout this project the 'researcher/academic' identity within me wished to carry on working somewhat relentlessly. I feel I was able to be reflexive within these moments and 'practice what I preach' in terms of maintaining balance. This was made easier by using my 'practitioner' identity and experiences to recall numerous strategies for maintaining wellbeing. Due to environmental factors beyond my sphere of control this was made increasingly difficult, especially during the main 'writing up' phase. However, I feel that engaging in regular health promoting behaviours, utilising various forms of connectedness and support, and as mentioned, maintaining firm boundaries was highly beneficial in this process. This perhaps allowed me to maintain both productivity and wellbeing despite the academic and environmental challenges.

Conclusion

Consistent with a pragmatist reflective position engaging in reflection presents useful opportunity for learning (Mortari, 2015). This process of reflection has enabled me to consider several aspects of the process. While there have been challenges as acknowledged, my identity as both a researcher and practitioner has been usefully shaped via this undertaking and subsequent reflections. I have been able to see how my emerging identity as a clinical psychologist has benefited from these developments, but also how this identity can serve as the integrated space wherein discrepancies between researcher and practitioner can be balanced. Lastly, this process has helped me to consider my motivation for undertaking this research and helped me to connect with an area of personal interest to myself. More broadly, I have reflected on the methods that helped me to navigate this research process and its challenges. In closing therefore, this process has shaped many skills and attributes that I can now take forward with me as I continue my journey as an emerging clinical psychologist.

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Appendix A – Journal Publication Guidelines

BJN – British Journal of Nutrition

British Journal of Nutrition is an international peer-reviewed journal that publishes original papers and review articles across the full spectrum of nutritional science. The focus of all manuscripts submitted to the journal should be to increase knowledge in nutritional science relevant to human or animal nutrition. The BJN welcomes manuscripts that report studies in nutritional epidemiology, nutritional requirements, metabolic studies, body composition, energetics, appetite and obesity. Manuscripts that address interactions of nutrition with endocrinology, genetics, immunology, microbiology, molecular and cell biology, neuroscience and physiology and that report outcomes relevant to health, behaviour and well-being are also within scope for the BJN.

Review Articles

BJN is willing to accept critical reviews that are designed to advance knowledge, policy and practice in nutritional science. Current knowledge should be appropriately contextualised and presented such that knowledge gaps and research needs can be characterised and prioritised, or so that changes in policy and practice can be proposed along with suggestions as to how any changes can be monitored. The purpose or objective of a review should be clearly expressed, perhaps as question in the Introduction, and the review's conclusions should be congruent with the initial objective or question. Reviews will be handled by specialist Reviews Editors. Please contact the Editorial Office with any queries regarding the submission of potential review articles. All reviews, including systematic reviews and meta-analyses, should present the uncertainties and variabilities associated with the papers and data being reviewed; in particular BJN cautions against uncritical acceptance of definitions and non-specific global terminology, the advice of advisory bodies, and reference ranges for example.

Reviews: These articles are written in a narrative style, and aim to critically evaluate a specific topic in nutritional science.

Systematic Reviews and meta-analyses: A systematic review or meta-analysis of randomised trials and other evaluation studies must be accompanied by a completed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement checklist, a guideline to help authors report a systematic review and meta-analysis (see British Medical Journal (2009) 339, b2535). Meta-analysis of observational studies must be accompanied by a completed Meta-analysis of Observational Studies in Epidemiology (MOOSE) reporting checklist, indicating the page where each item is included (see JAMA (2000) 283, 2008-2012). Manuscripts in these areas of review will not be sent for peer review unless accompanied by the relevant completed checklist.

Full detailed Manuscript Preparation Instructions are available at:

https://www.cambridge.org/core/journals/british-journal-of-nutrition/information/instructions-contributors

BJN – British Journal of Health Psychology

Aims and Scope

The British Journal of Health Psychology publishes original research on all aspects of psychology related to health, health-related behaviour and illness across the lifespan including:

- experimental and clinical research on aetiology
- management of acute and chronic illness
- responses to ill-health
- screening and medical procedures
- psychosocial mediators of health-related behaviours
- influence of emotion on health and health-related behaviours
- psychosocial processes relevant to disease outcomes
- psychological interventions in health and disease
- emotional and behavioural responses to ill health, screening and medical procedures
- psychological aspects of prevention

The types of paper invited are:

- papers reporting original empirical investigations, using either quantitative or qualitative methods, including reports of interventions in clinical and non-clinical populations;
- theoretical papers which report analyses on established theories in health psychology;
- we particularly welcome review papers, which should aim to provide systematic overviews, evaluations and interpretations of research in a given field of health psychology (narrative reviews will only be considered for editorials or important theoretical discourses); and
- methodological papers dealing with methodological issues of particular relevance to health psychology.

Full detailed author guidelines are available at:

https://onlinelibrary.wiley.com/page/journal/20448287/homepage/ForAuthors.html

Appendix B – Systematic Review Audit Trail

OVID Medline, OVID Psychinfo, OVID Embase, CINAHL, & Web of Science databases searched during November 2019.

Medline: 212 articles
Psychinfo: 47 articles
Embase: 564 articles
CINAHL: 434 articles
Web of Science: 785 articles

Total articles identified: 2042

Number of duplicates deleted: 369

Total articles reaming: 1673

Screening checks performed (related to research question; not a: meta analysis/review, study protocol, single case report, commentary paper; available in English; full text available; peer reviewed; since 2009)

Articles screened out: 1640

Articles retained for full eligibility checks: 33

Articles later identified through other searches (Nov 19 – Jan 20): 3

Total articles assessed for eligibility: 36

8 studies had no wellbeing measure

1 study reported no follow-up/outcome data

6 studies used combined interventions

1 study involved pregnant women

1 study was a hypocaloric Mediterranean diet

2 studies not a specific Mediterranean diet

1 study had no active intervention

2 studies unable to access full text

1 study a duplicate record

1 study outcome data not yet published

Total studies removed: 24 / Total studies included in review: 12

Appendix C – Systematic Review Boolean Search Strings

Medline, Psychinfo, Embase, and Web of Science:

Mediterranean Diet

And

Wellbeing or well-being or well being

Or

Mental health or mental disorder or mental problem* or mental illness or cognitive functioning or psychological distress or psychosocial distress or quality of life

CINAHL:

Mediterranean Diet

And

Psychological Well-being or quality of life

Or

(MH "Mental Disorders") OR (MH "Mental Disorders, Chronic") OR (MH "Organic Mental Disorders, Substance-Induced") OR (MH "Organic Mental Disorders, Psychotic") OR (MH "Organic Mental Disorders") OR (MH "Mental Disorders Diagnosed in Childhood") OR (MH "Behavioral and Mental Disorders")

Appendix D – Quality Assessment Framework

Criterion	Guidance	Score 0 = not met 1= partially met 2 = fully met
1. Does the title reflect the content?	The title should be informative and indicate the focus of the study. It should allow the reader to easily interpret the content of the study. An inaccurate or misleading title can confuse the reader.	
2. Are the authors credible?	Researchers should hold appropriate academic qualifications and be linked to a professional field relevant to the research.	
3. Does the abstract summarize the key components?	The abstract should provide a short summary of the study. It should include the aim of the study, outline of the methodology and the main findings. The purpose of the abstract is to allow the reader to decide if the study is of interest to them.	
4. Is the rationale for undertaking the research clearly outlined?	The author should present a clear rationale for the research, setting it in context of any current issues and knowledge of the topic to date.	
5. Is the literature review comprehensive and up-to-date?	The literature review should reflect the current state of knowledge relevant to the study and identify any gaps or conflicts. It should include key or classic studies on the topic as well as up to date literature. There should be a balance of primary and secondary sources.	
6. Is the aim of the research clearly stated?	The aim of the study should be clearly stated and should convey what the researcher is setting out to achieve.	
7. Are all ethical issues identified and addressed?	Ethical issues pertinent to the study should be discussed. The researcher should identify how the rights of informants have been protected and informed consent obtained. If the research is conducted within the NHS then there should be indication of Local Research Ethics committee approval.	
8. Is the methodology identified and justified?	The researcher should make clear which research strategy they are adopting, i.e. qualitative or quantitative. A clear rationale for the choice should also be provided, so that the reader can judge whether the chosen strategy is appropriate for the study.	
9. Quantitative: Is the study design clearly identified and is the rational for choice of design evident? Qualitative: Are the philosophical background and study design identified and the rationale of choice of design evident?	Quantitative: The design of the study, e.g. survey, experiment, should be identified and justified. As with the choice of strategy, the reader needs to determine whether the design is appropriate for the research undertaken Qualitative: The design of the study, e.g. phenomenology, ethnography, should be identified and the philosophical background and rationale discussed. The reader needs to consider if it is appropriate to meet the aims of the study.	

10. Quantitative: Is there an experimental hypothesis clearly stated? Are the key variables clearly identified? Qualitative: Are the major concepts identified?	Quantitative: In experimental research, the researcher should provide a hypothesis. This should clearly identify the independent and dependent variables, and state their relationship and the intent of the study. In survey research the researcher may choose to provide a hypothesis, but it is not essential, and alternatively a research question or aim may be provided. Qualitative: The researcher should make clear what the major concepts are, but they might not define them. The purpose of the study is to explore the concepts from the perspective of the participants.	
11. Quantitative: Is the population identified? Qualitative: Is the context of the study outlined?	Quantitative: The population is the total number of units from which the researcher can gather data. It maybe individuals, organisations or documentation. Whatever the unit, it must be clearly identified. Qualitative The population is the total number of units from which the researcher can gather data. It maybe individuals, organisations or documentation. Whatever the unit, it must be clearly identified.	
12. Quantitative: Is the sample adequately described and reflective of the population? Qualitative: Is the selection of participants described and the sampling method identified?	Quantitative: Both the method of sampling and the size of the sample should be stated so that the reader can judge whether the sample is representative of the population and sufficiently large to eliminate bias. Qualitative: Informants are selected for their relevant knowledge or experience. Representativeness is not a criteria and purposive sampling is often used. Sample size may be determined through saturation.	
13. Quantitative: Is the method of data collection valid and reliable? Qualitative: Is the method of data collection auditable?	Quantitative: Informants are selected for their relevant knowledge or experience. Representativeness is not a criteria and purposive sampling is often used. Sample size may be determined through saturation. Qualitative: Data collection methods should be described, and be appropriate to the aims of the study. The researcher should describe how they have assured that the method is auditable.	
14. Quantitative: Is the method of data analysis valid and reliable? Qualitative: Is the method of data analysis credible and confirmable?	Quantitative: The method of data analysis must be described and justified. Any statistical test used should be appropriate for the data involved. Qualitative: The method of data analysis must be described and justified. Any statistical test used should be appropriate for the data involved.	

15. Are the results presented in a way that is appropriate and clear?	Presentation of data should be clear, easily interpreted and consistent.	
16. Is the discussion comprehensive?	In quantitative studies the results and discussion are presented separately. In qualitative studies these maybe integrated. Whatever the mode of presentation the researcher should compare and contrast the findings with that of previous research on the topic. The discussion should be balanced and avoid subjectivity.	
17. Is the conclusion comprehensive? Quantitative Are the results generalizable? Qualitative Are the results transferable?	Conclusions must be supported by the findings. The researcher should identify any limitations to the study. There may also be recommendations for further research, or if appropriate, implications for practice in the relevant field.	

(Caldwell, Henshaw, & Taylor, 2011).

Appendix E – Quality Assessment Data Analysis

1. Parletta 2018		2. Wade 2019		3. Klonizakis 2019		4. Francis 2019		5. Briguglio 2019		6. Wade 2018	
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	1	1	2	2
2	2	2	2	2	2	2	2	0	0	2	2
1	1	1	1	1	1	2	2	1	1	1	1
2	2	2	2	2	2	2	2	1	1	2	2
2	2	2	2	2	2	2	2	1	1	1	2
2	1	2	1	2	2	1	2	0	0	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	1	2	2
2	2	2	2	2	2	2	1	1	1	2	2
2	2	2	2	2	2	2	2	1	2	2	2
2	2	2	2	2	2	2	2	1	1	2	2
2	2	2	2	2	1	2	2	1	1	2	2
33		33		33		33		22		32	

7. O'Connor 2018		8. Jacka 2017		9. Bogomolova 2016		10. Lee 2015		11. Sanchez-Villegas 2013		12. McMillan 2011	
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	1	2	2	2	2
2	2	2	2	2	2	2	2	2	2	2	2
1	1	1	1	1	1	1	1	2	2	1	1
1	1	2	2	2	2	2	2	2	2	1	1
1	2	2	2	1	2	2	2	2	2	2	2
2	1	2	1	1	1	2	2	2	2	2	1
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	1	1	1	2	2	2	2
2	2	2	2	2	2	2	2	2	2	1	1
2	2	2	2	1	1	2	2	1	1	1	2
2	2	2	2	2	2	2	2	2	2	2	2
2	2	2	2	2	2	2	2	2	2	1	1
2	2	2	2	2	2	2	1	2	2	2	2
31		33		30		32		33		29	

Paper 1. Parletta (2018)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	1	0	1
	2.00	1	15	16
Total		2	15	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.638	.327	2.823	.005
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 2. Wade (2019)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	1	0	1
	2.00	1	15	16
Total		2	15	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.638	.327	2.823	.005
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 3. Klonizakis (2019)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	1	0	1
	2.00	1	15	16
Total		2	15	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.638	.327	2.823	.005
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 4. Francis (2019)

MyScores * RaterScores Crosstabulation

Count

		RaterScores			
		.00	1.00	2.00	Total
MyScores	.00	2	0	0	2
	1.00	0	7	1	8
	2.00	0	1	6	7
Total		2	8	7	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.802	.135	4.222	.000
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 5. Briguglio (2019)

MyScores * RaterScores Crosstabulation

Count

		RaterScores			
		.00	1.00	2.00	Total
MyScores	.00	2	0	0	2
	1.00	0	7	1	8
	2.00	0	1	6	7
Total		2	8	7	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.802	.135	4.222	.000
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 6. Wade (2018)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	1	1	2
	2.00	0	15	15
Total		1	16	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.638	.327	2.823	.005
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 7. O'Connor (2018)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	1	1	2
	2.00	0	15	15
Total		1	16	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.638	.327	2.823	.005
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 8. Jacka (2017)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	1	0	1
	2.00	1	15	16
Total		2	15	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.638	.327	2.823	.005
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 9. Bogomolova (2016)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	3	1	4
	2.00	1	12	13
Total		4	13	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.673	.213	2.775	.006
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 10. Lee (2015)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	2	0	2
	2.00	2	13	15
Total		4	13	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.605	.241	2.714	.007
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 11. Sanchez-Villegas (2013)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	1	0	1
	2.00	0	16	16
Total		1	16	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	1.000	.000	4.123	.000
N of Valid Cases		17			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Paper 12. McMillan (2011)

MyScores * RaterScores Crosstabulation

Count

		RaterScores		
		1.00	2.00	Total
MyScores	1.00	4	1	5
	2.00	1	11	12
Total		5	12	17

Symmetric Measures

		Value	Asymptotic Standard Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.717	.187	2.955	.003
N of Valid Cases		17			

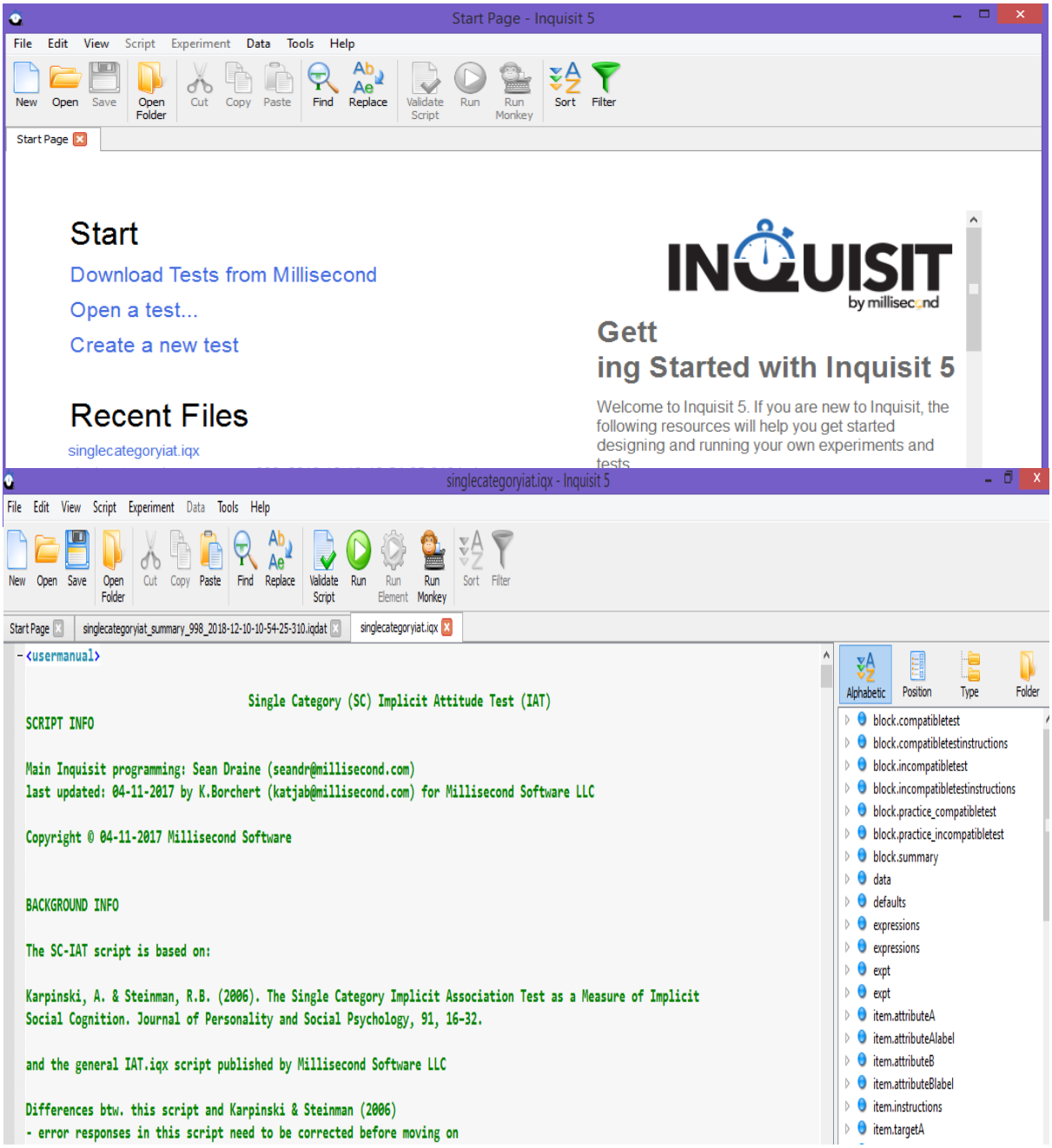
a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Appendix F – Measuring Instruments

SC-IAT:

Karpinski, A. & Steinman, R. (2006). The Single Category Implicit Association Test as a Measure of Implicit Social Cognition. *Journal of Personality and Social Psychology*, 91 (1), 16–32. Doi: 10.1037/0022-3514.91.1.16



SC-IAT Word Lists

Positive Words	Negative Words	Chocolate Words
/1 ="Beautiful"	/1 = "Angry"	/ 1 = "Twix"
/2 = "Celebrating"	/2 = "Brutal"	/ 2 = "Aero"
/3 = "Cheerful"	/3 = "Destroy"	/ 3 = "Mars Bar"
/4 = "Excellent"	/4 = "Dirty"	/ 4 = "Bounty"
/5 = "Excitement"	/5 = "Disaster"	/ 5 = "Crunchie"
/6 = "Fabulous"	/6 = "Disgusting"	/ 6 = "Snickers"
/7 = "Friendly"	/7 = "Dislike"	/ 7 = “Kit-Kat”
/8 = "Glad"	/8 = "Evil"	/ 8 = “Twirl”
/9 = "Glee"	/9 = "Gross"	
/10 = "Happy"	/10 = "Horrible"	
/11 = "Laughing"	/11 = "Humiliate"	
/12 = "Likable"	/12 = "Nasty"	
/13 = "Loving"	/13 = "Agony"	
/14 = "Marvellous"	/14 = "Painful"	
/15 = "Pleasure"	/15 = "Revolting"	
/16 = "Smiling"	/16 = "Sickening"	
/17 = "Splendid"	/17 = "Terrible"	
/18 = "Superb"	/18 = "Tragic"	
/19 = "Paradise"	/19 = "Ugly"	
/20 = "Triumph"	/20 = "Unpleasant"	
/21 = "Wonderful"	/21 = "Yucky"	

Food Choice Task:

Stimuli - Twix, Twirl, Mars Bar, Banana, Orange, and Apple (all ‘snack-size’/’fun-size’).

Standardised instruction – *“When I take this lid off I want you to select only one item as quickly as you can. You can take this item away with you if you wish. Please select the item you are most drawn to immediately by picking it up out of the bowl.*

Do you understand?

Go!”

Explicit Attitudes Scale
(Chocolate)

Instructions: For each question below please circle the one number that most closely resembles the extent to which you agree with the corresponding statement. Please be honest, there are no 'right or wrong' answers.

For a moment, consider only the **POSITIVE** things about chocolate and ignore any negative things about it.

I believe chocolate is…
(please answer each item)

1. …Important.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

2. …Enjoyable.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

3. …Beneficial.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

4. …Pleasant.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

5. …Healthy.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

6. …Satisfying.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

7. …Wise.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

8. …Appealing.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

For a moment, consider only the **NEGATIVE** things about chocolate and ignore any positive things about it.

I believe chocolate is…
(please answer each item)

1. …Unimportant.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

2. …Unenjoyable.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

3. …Harmful.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

4. …Unpleasant.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

5. …Unhealthy.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

6. …Unsatisfying.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

7. …Foolish.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

8. …Boring.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

The Self-Report Habit Index

Instructions: For each question below please circle the one number that most closely resembles the extent to which you agree with the corresponding statement. Please be honest, there are no 'right or wrong' answers.

Eating chocolate is something . . .

1. …I do frequently.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

2. …I do automatically.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

3. …I do without having to consciously remember.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

4. …that makes me feel weird if I do not do it.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

5. …I do without thinking.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

6. …that would require effort not to do it.

Strongly disagree *1* *2* *3* *4* *5* *6* *7* *Strongly agree*

7. …that belongs to my (daily, weekly, monthly) routine.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

8. …I start doing before I realise I'm doing it.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

9. …I would find hard not to do.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

10. …I have no need to think about doing.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

11. …that's typically "me."

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

12. …I have been doing for a long time.

Strongly disagree 1 2 3 4 5 6 7 Strongly agree

Appendix G – Ethical Approval and Documents

Certificate of Ethical Approval

Applicant:

Sam Larcombe

Project Title:

Do Implicit Attitudes toward 'Junk Food' Influence Habitual Consumption of Junk Food in People who are Overweight?

This is to certify that the above named applicant has completed the Coventry University Ethical Approval process and their project has been confirmed and approved as Medium Risk

Date of approval:

14 May 2019

Project Reference Number:

P85753

PARTICIPANT INFORMATION SHEET

A Study of 'Junk Food' Attitudes, Eating Habits and Weight

You are being invited to take part in research on attitudes toward junk food and eating habits and weight. The lead research is: Sam Larcombe, Trainee Clinical Psychologist at Coventry University. Before you decide to take part it is important you understand why the research is being conducted and what it will involve. Please take time to read the following information carefully.

What is the purpose of the study

The purpose of the study is to help greater understand the psychological processes that may play a role in influencing our eating habits and behaviour. Specifically, the aim of this research project is to study attitudes towards junk foods such as chocolate, to investigate how these attitudes might influence our eating habits and behaviour. Through this research we plan to further investigate links between our attitudes, eating habits and body weight (known as 'body mass index').

Why have I been chosen to take part?

We are looking for people to become involved in the study who are: an adult, between the ages of 18 and 65, and are fluent in written and spoken English. Because of the nature of the study, it is also important that you have no significant sight problems that prevent you from clearly reading a computer screen. It is also important that you do not have any recognised learning disabilities or neurological disorders.

What are the benefits of taking part?

By sharing your experiences with us, you will be helping Sam Larcombe, his research team, and Coventry University to better understand the psychological processes that guide eating habits and behaviour. This research may help us to better understand psychological processes that lead to unhealthy weight gain. This study may help to inform future public health and clinical intervention strategies for weight loss and thus could benefit public health and wellness.

Are there any risks associated with taking part?

This study has been reviewed and approved through Coventry University's formal research ethics procedure. There are no known significant risks associated with participation in this research study. However, this study may make you consider issues related to healthy eating habits and wellbeing. Please contact your GP for all physical and mental health related concerns. Alternatively, visit: https://www.nhs.uk/live-well/healthy-weight/ for more information about healthy lifestyles.

Do I have to take part?

No – it is entirely up to you. If you do decide to take part, please keep this Information Sheet and complete the Informed Consent Form to show that you understand your rights in relation to the research, and that you are happy to participate. Please note down your participant number (which is on the Consent Form) and provide this to the lead researcher if you seek to withdraw from the study at a later date. You are free to withdraw your information from the project data set at any point until the data are fully anonymised in our records which will happen 14 days after the date of your participation in this study.

You should note that your data may be used in the production of formal research outputs (e.g. journal articles, conference papers, theses and reports). However, as your data will have been fully anonymised it will not be possible to identify you personally. To withdraw, please contact the lead researcher (contact details are provided at the bottom of this form). Please also contact the Faculty of

Health and Life Sciences Research Support Office (email reception.hls@coventry.ac.uk; telephone +44 (0) 24 7765 5800) so that your request can be dealt with promptly in the event of the lead researcher's absence. You do not need to give a reason. A decision to withdraw, or not to take part, will not affect you in any way.

What will happen if I decide to take part?
If you decide to take part you will be asked to complete several brief tasks:

1. You will be asked to complete 2 questionnaires. These questionnaires will ask you about your attitudes toward, and experiences of, eating chocolate.
2. A brief computer based task wherein you will be required to categorise a range of words that appear on screen by tapping one of several response keys on a keyboard.
3. You will be asked to carry out a food selection test.
4. A member of the research team will also measure your height and weight in order to calculate your body mass index.

These tasks will take place in a safe and quiet environment at Coventry University, or a location and time that is convenient for you and the research team. It should take no more than around 25 minutes to complete these tasks.

Data Protection and Confidentiality
Your data will be processed in accordance with the General Data Protection Regulation 2016 (GDPR) and the Data Protection Act 2018. All information collected about you will be kept strictly confidential. Because your information will be fully anonymised in our records, your data will be referred to by a unique participant number rather than by name. Your data will only be viewed by the research team. All electronic data will be stored on an encrypted and password-protected memory stick and/or OneDrive cloud. All paper records will be stored in a locked filing cabinet at Coventry University. Your consent information will be kept separately from your responses in order to minimise risk in the event of a data breach. All data will be securely stored following the project end date. The data will be destroyed on 30.09.2023 in accordance with the university's data protection policy.

Data Protection Rights
Coventry University is a Data Controller for the information you provide. You have the right to access information held about you. Your right of access can be exercised in accordance with the General Data Protection Regulation and the Data Protection Act 2018. You also have other rights including rights of correction, erasure, objection, and data portability. For more details, including the right to lodge a complaint with the Information Commissioner's Office, please visit www.ico.org.uk. Questions, comments and requests about your personal data can also be sent to the University Data Protection Officer - enquiry.ipu@coventry.ac.uk

What will happen with the results of this study?
The results of this study may be summarised in published articles, reports and presentations. Key findings will always be made anonymous in any formal outputs unless we have your prior and explicit written permission to attribute them to you by name.

Making a Complaint
If you are unhappy with any aspect of this research, please first contact the lead researcher, Sam

Larcombe (email: larcombs@uni.coventry.ac.uk). If you still have concerns and wish to make a formal complaint, please write to:

Dr Anthony Colombo
Research Director for Clinical Psychology
Coventry University
Coventry CV1 5FB
Email: hsx412@coventry.ac.uk

In your letter please provide information about the research project, specify the name of the researcher and detail the nature of your complaint.

Coventry University

Participant No.

INFORMED CONSENT FORM:

A Study of 'Junk Food' Attitudes, Eating Habits and Weight

You are invited to take part in this research study for the purpose of collecting data on attitudes toward junk food and eating habits and weight.

Before you decide to take part, you must **read the accompanying Participant Information Sheet.**

Please do not hesitate to ask questions if anything is unclear or if you would like more information about any aspect of this research. It is important that you feel able to take the necessary time to decide whether or not you wish to take part.

If you are happy to participate, please confirm your consent by circling YES against each of the below statements and then signing and dating the form as participant.

1	**I confirm that I have read and understood the Participant Information Sheet for the above study and have had the opportunity to ask questions**	**YES**	**NO**
2	**I understand my participation is voluntary and that I am free to withdraw my data, without giving a reason, by contacting the lead researcher and the Research Support Office at any time until the data is anonymised as specified in the Participant Information Sheet**	**YES**	**NO**
3	**I have noted down my participant number (top left of this Consent Form) which may be required by the lead researcher if I wish to withdraw from the study**	**YES**	**NO**
4	**I understand that all the information I provide will be held securely and treated confidentially**	**YES**	**NO**
5	**I am happy for the information I provide to be used (anonymously) in academic papers and other formal research outputs**	**YES**	**NO**
6	**I agree to take part in the above study**	**YES**	**NO**

Thank you for your participation in this study. Your help is very much appreciated.

Participant's Name	**Date**	**Signature**
Researcher	**Date**	**Signature**

Coventry University

DEBRIEF FORM

A Study of 'Junk Food' Attitudes, Eating Habits and Weight

Thank you for taking part in our study.

This study aims to look at the relationship between attitudes, eating habits and behaviour, and weight. Particularly, we are interested to see if 'implicit attitudes' (attitudes hidden from our 'conscious awareness') toward junk food can influence habitual consumption of junk food thus leading to weight gain.

The tasks you completed were designed to assess your: implicit and explicit attitudes (attitudes we are consciously aware of) toward chocolate (junk food), the extent to which eating chocolate was habitual for you, your body mass index, and whether you would select chocolate when presented with an alternative. We expect that individuals with a more positive implicit attitude toward junk food (i.e. that show a greater implicit association between 'chocolate' and 'positive') will report greater habitual consumption of junk food and will be more likely to select junk food when presented with an alternative. We also expect that this will subsequently influence body mass index regardless of reported explicit attitudes toward junk food. We believe that it may be possible for implicit attitudes to have a 'stronger' influence on our eating habits than our explicit attitudes, therefore more 'will-power' may be necessary in order to 'break' these habits.

If you feel affected by issues raised by this research and would like to discuss any research related concerns then please contact the lead researcher: Sam Larcombe, by email: larcombs@uni.coventry.ac.uk.

For all physical and mental health questions and queries please contact your GP.

Further information about healthy lifestyles and weight management can be found online by visiting the following websites:
https://www.nhs.uk/live-well/healthy-weight/
https://www.nutrition.org.uk/nutritionscience/obesityandweightmanagement.html
https://www.bbc.co.uk/news/health

The Samaritans also provide a 24 hour 365 days a year telephone support service wherein you can talk in a safe place about anything that you may be finding difficult. They can be contacted free of charge from any phone on **116 123**. Please see their website for more information: https://www.samaritans.org/

Thank you for taking part in our research.

Appendix H – Pre-Statistical Analysis Checks

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
IAT_Implicit_Att	54	100.0%	0	0.0%	54	100.0%
Explicit_Att_Overall	54	100.0%	0	0.0%	54	100.0%
BMI	54	100.0%	0	0.0%	54	100.0%
SRHI_Habit	54	100.0%	0	0.0%	54	100.0%
Food_Choice	54	100.0%	0	0.0%	54	100.0%

Descriptives

			Statistic	Std. Error
IAT_Implicit_Att	Mean		.0515	.04657
	95% Confidence Interval for Mean	Lower Bound	-.0419	
		Upper Bound	.1449	
	5% Trimmed Mean		.0521	
	Median		.0600	
	Variance		.117	
	Std. Deviation		.34219	
	Minimum		-.72	
	Maximum		.79	
	Range		1.51	
	Interquartile Range		.50	
	Skewness		-.007	.325
	Kurtosis		-.525	.639
Explicit_Att_Overall	Mean		4.3611	.11646
	95% Confidence Interval for Mean	Lower Bound	4.1275	
		Upper Bound	4.5947	
	5% Trimmed Mean		4.4013	
	Median		4.5300	
	Variance		.732	
	Std. Deviation		.85580	
	Minimum		1.25	
	Maximum		6.00	
	Range		4.75	
	Interquartile Range		1.15	
	Skewness		-1.040	.325
	Kurtosis		2.158	.639

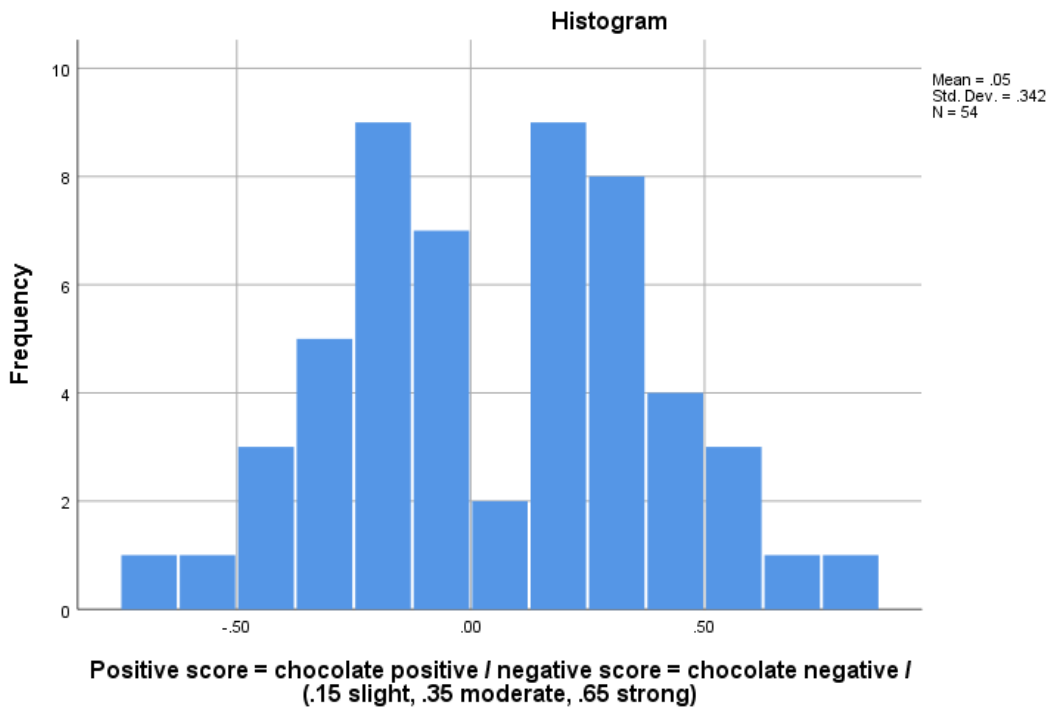
BMI	Mean		1.4182	.00989
	95% Confidence Interval for Mean	Lower Bound	1.3984	
		Upper Bound	1.4381	
	5% Trimmed Mean		1.4151	
	Median		1.4124	
	Variance		.005	
	Std. Deviation		.07271	
	Minimum		1.30	
	Maximum		1.59	
	Range		.29	
	Interquartile Range		.10	
	Skewness		.633	.325
	Kurtosis		-.103	.639
SRHI_Habit	Mean		.3963	.02791
	95% Confidence Interval for Mean	Lower Bound	.3403	
		Upper Bound	.4522	
	5% Trimmed Mean		.4008	
	Median		.4116	
	Variance		.042	
	Std. Deviation		.20512	
	Minimum		.00	
	Maximum		.73	
	Range		.73	
	Interquartile Range		.33	
	Skewness		-.348	.325
	Kurtosis		-.775	.639
Food_Choice	Mean		1.4815	.06863
	95% Confidence Interval for Mean	Lower Bound	1.3438	
		Upper Bound	1.6191	
	5% Trimmed Mean		1.4794	
	Median		1.0000	
	Variance		.254	
	Std. Deviation		.50435	
	Minimum		1.00	
	Maximum		2.00	
	Range		1.00	
	Interquartile Range		1.00	
	Skewness		.076	.325
	Kurtosis		-2.072	.639

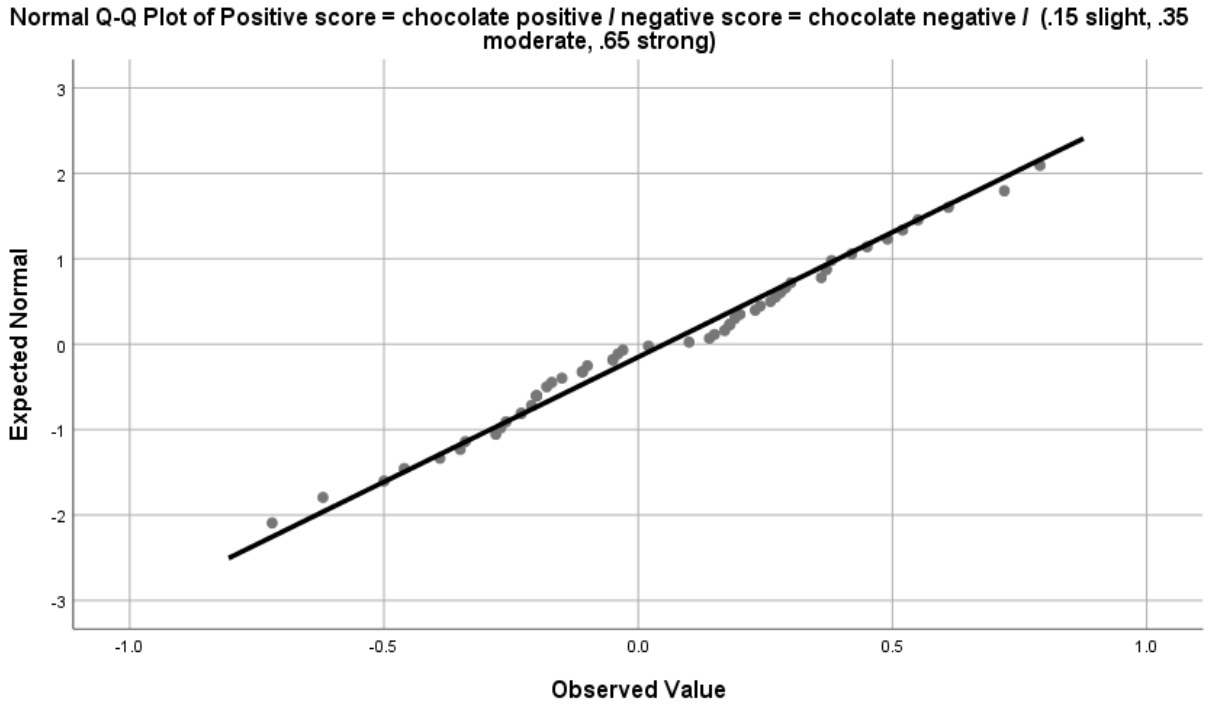
Tests of Normality

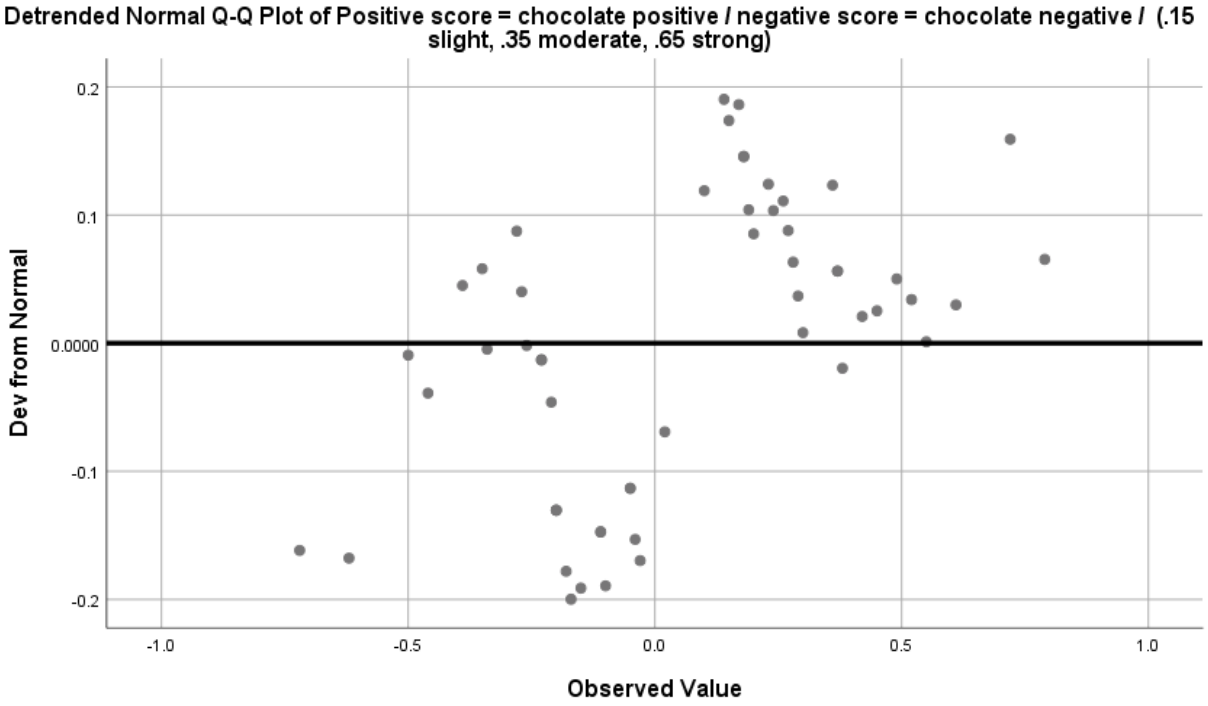
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
IAT_Implicit_Att	.084	54	.200*	.986	54	.769
Explicit_Att_Overall	.138	54	.012	.941	54	.011
BMI	.133	54	.018	.956	54	.043
SRHI_Habit	.087	54	.200*	.952	54	.032
Food_Choice	.349	54	.000	.636	54	.000

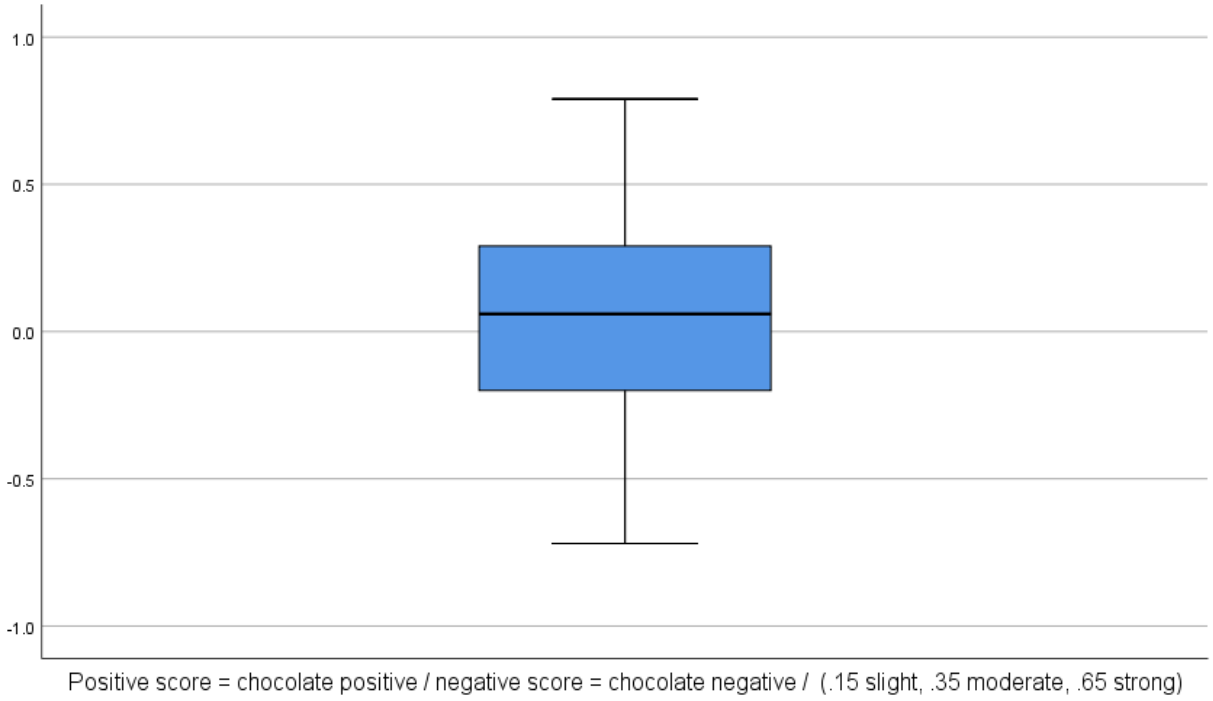
*. This is a lower bound of the true significance.

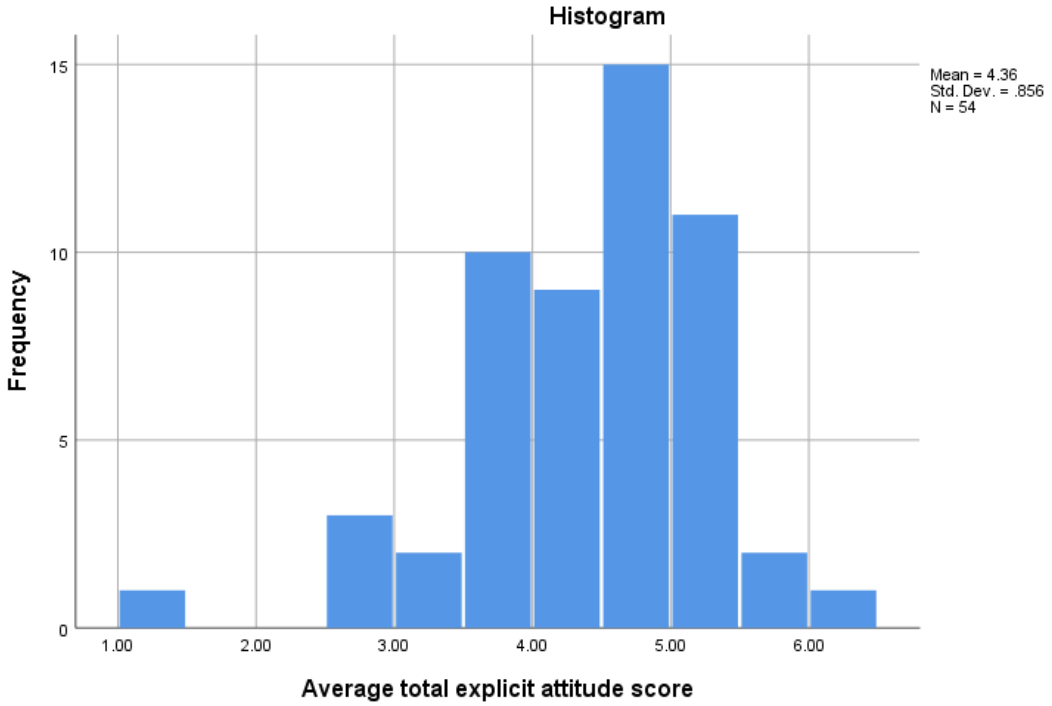
a. Lilliefors Significance Correction

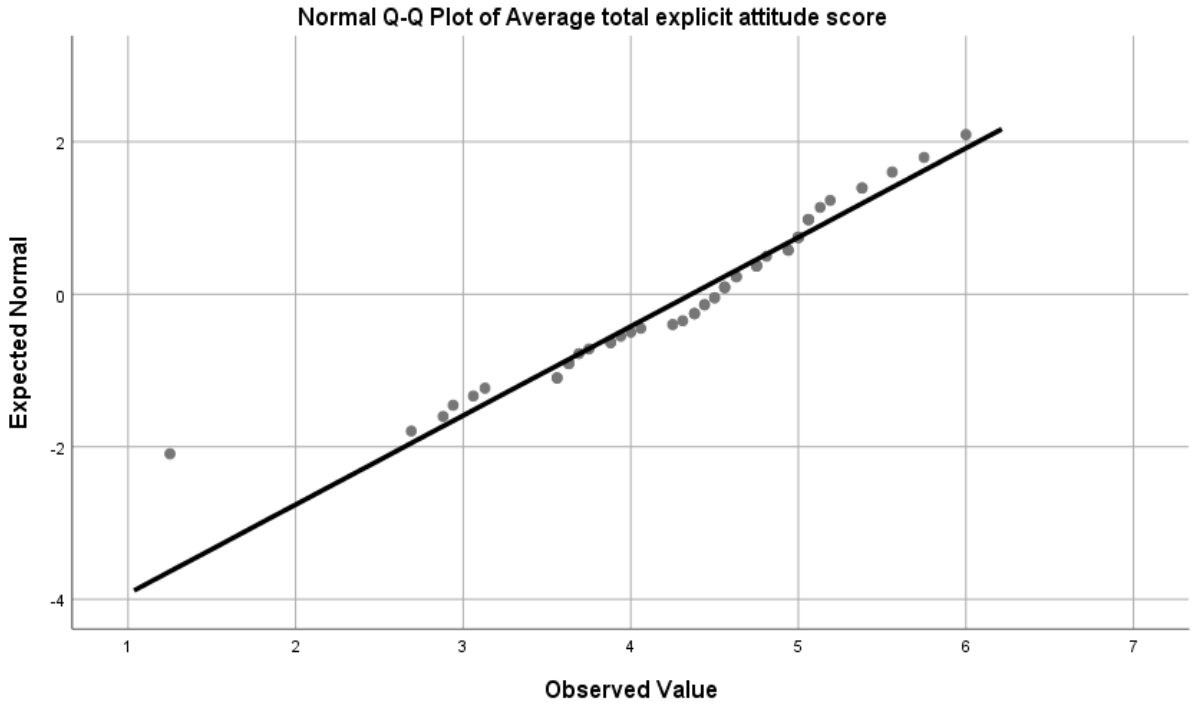


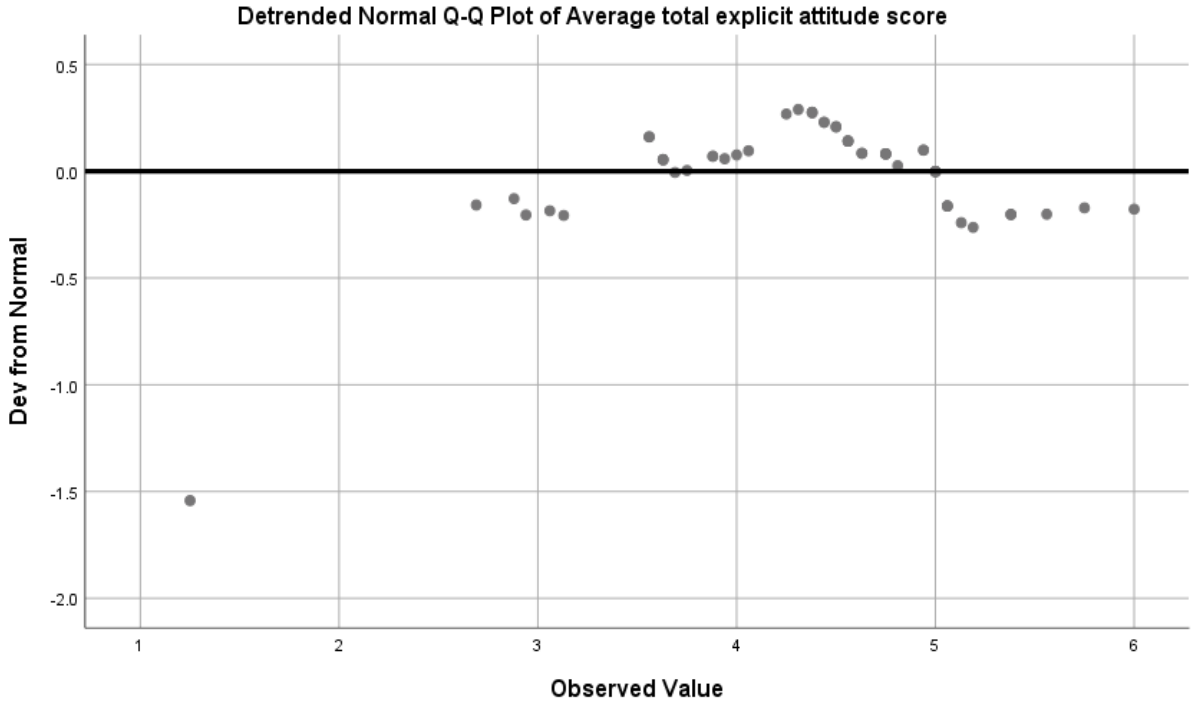

Normal Q-Q Plot of Positive score = chocolate positive / negative score = chocolate negative / (.15 slight, .35 moderate, .65 strong)
Expected Normal
3
2
1
0
-1
-2
-3
-1.0
-0.5
0.0
0.5
1.0
Observed Value

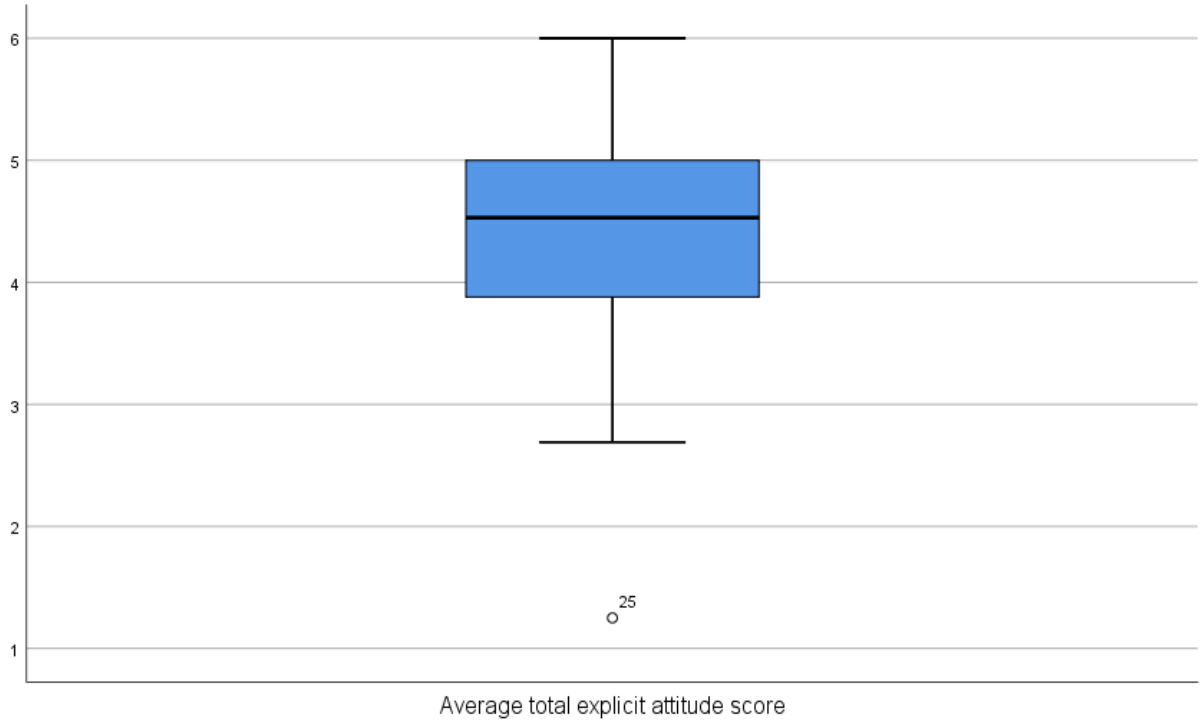

Detrended Normal Q-Q Plot of Positive score = chocolate positive / negative score = chocolate negative / (.15 slight, .35 moderate, .65 strong)
Dev from Normal
0.2
0.1
0.0000
-0.1
-0.2
-1.0
-0.5
0.0
0.5
1.0
Observed Value

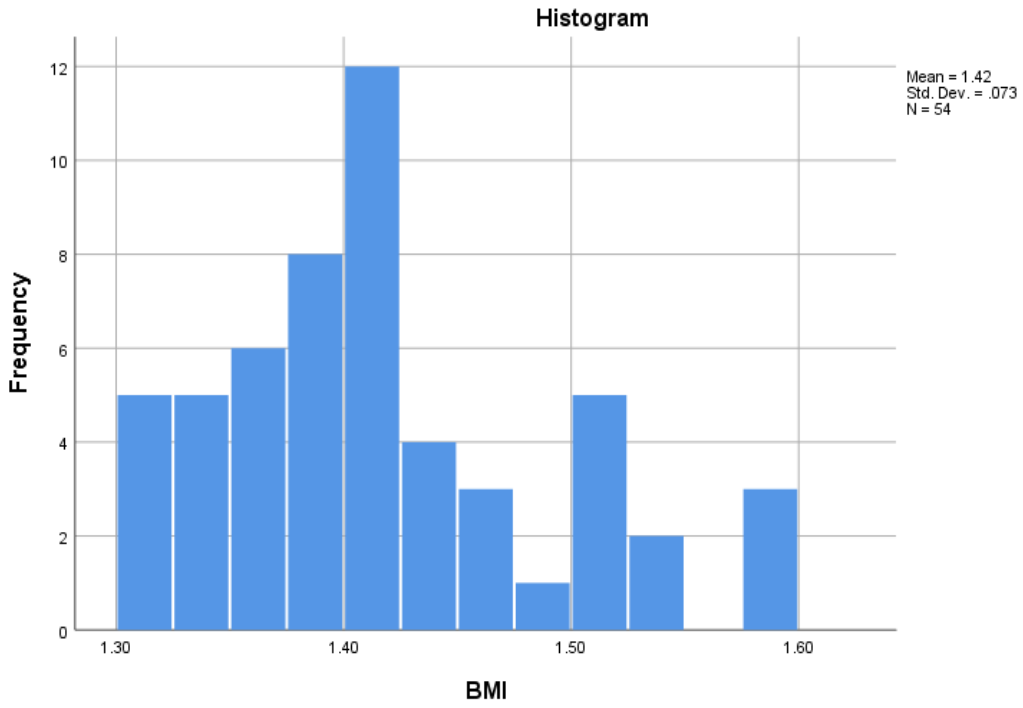

1.0
0.5
0.0
-0.5
-1.0
Positive score = chocolate positive / negative score = chocolate negative / (.15 slight, .35 moderate, .65 strong)

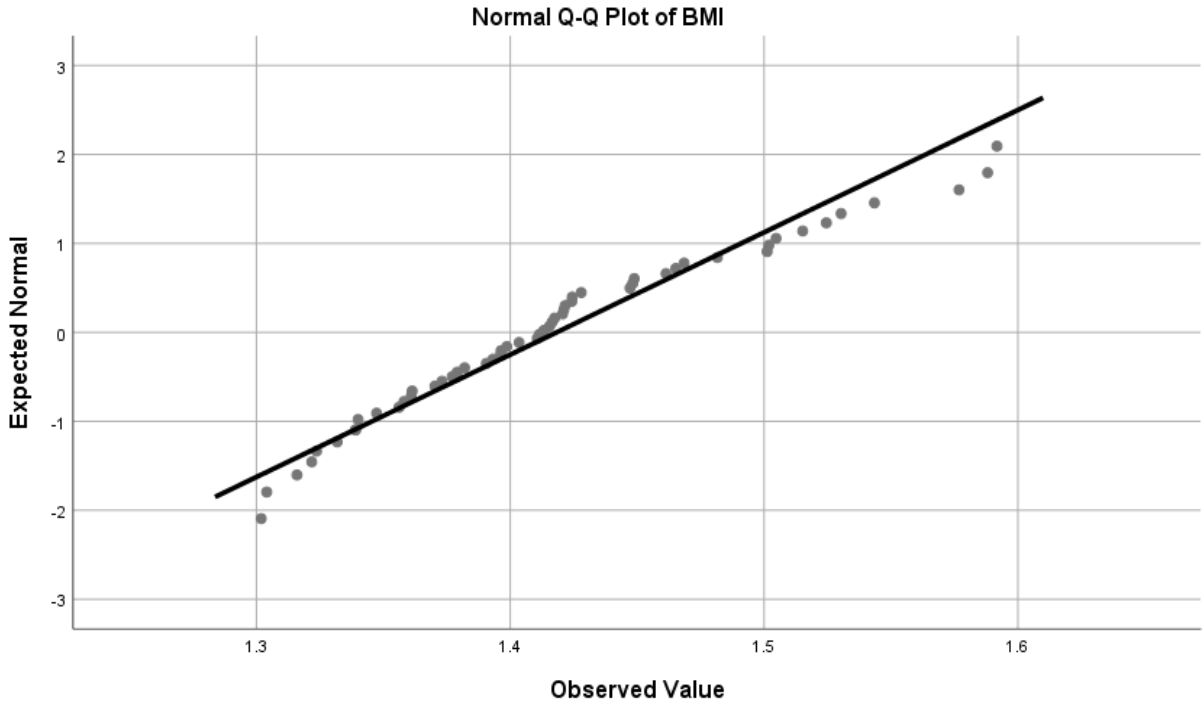

Histogram
Mean = 4.36
Std. Dev. = .856
N = 54
Frequency
15
10
5
0
1.00
2.00
3.00
4.00
5.00
6.00
Average total explicit attitude score

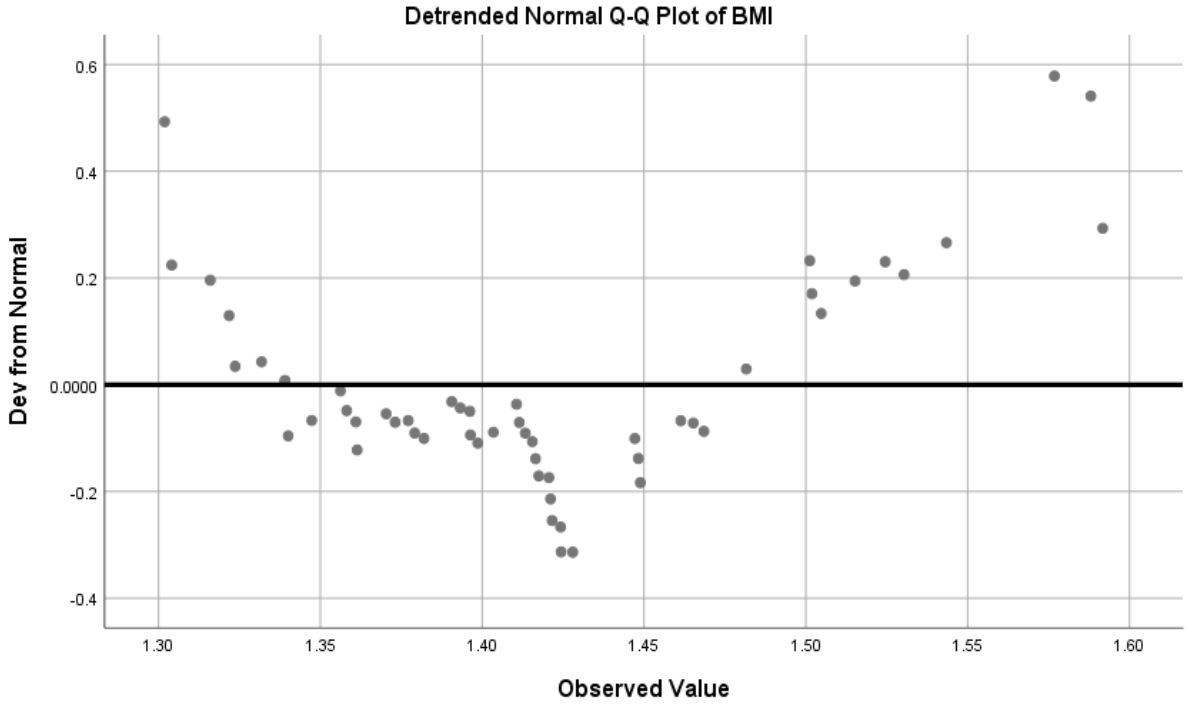

Normal Q-Q Plot of Average total explicit attitude score
Expected Normal
Observed Value
2
0
-2
-4
1
2
3
4
5
6
7

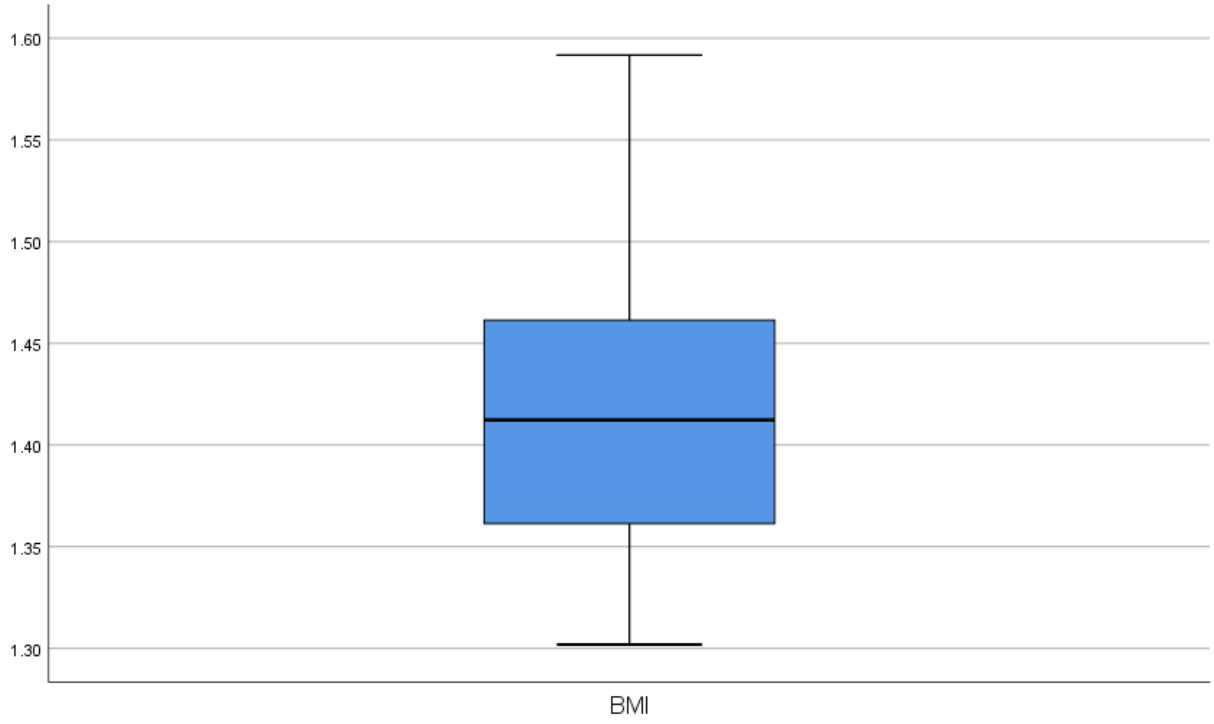

Detrended Normal Q-Q Plot of Average total explicit attitude score
Dev from Normal
Observed Value
0.5
0.0
-0.5
-1.0
-1.5
-2.0
1
2
3
4
5
6

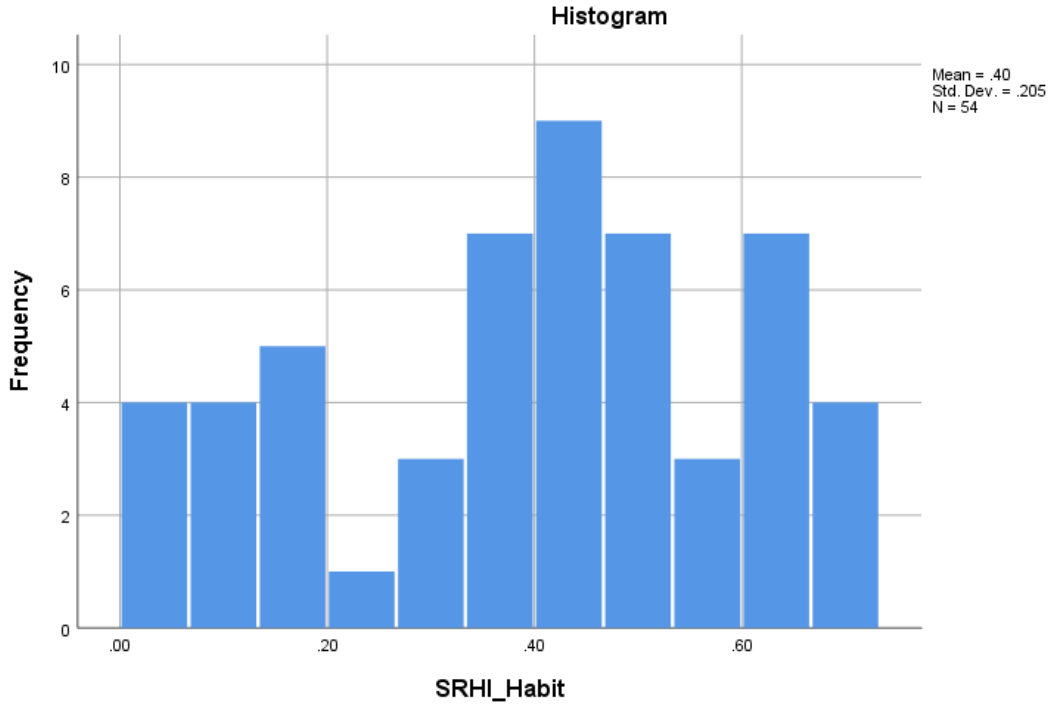

6
5
4
3
2
1
25
Average total explicit attitude score

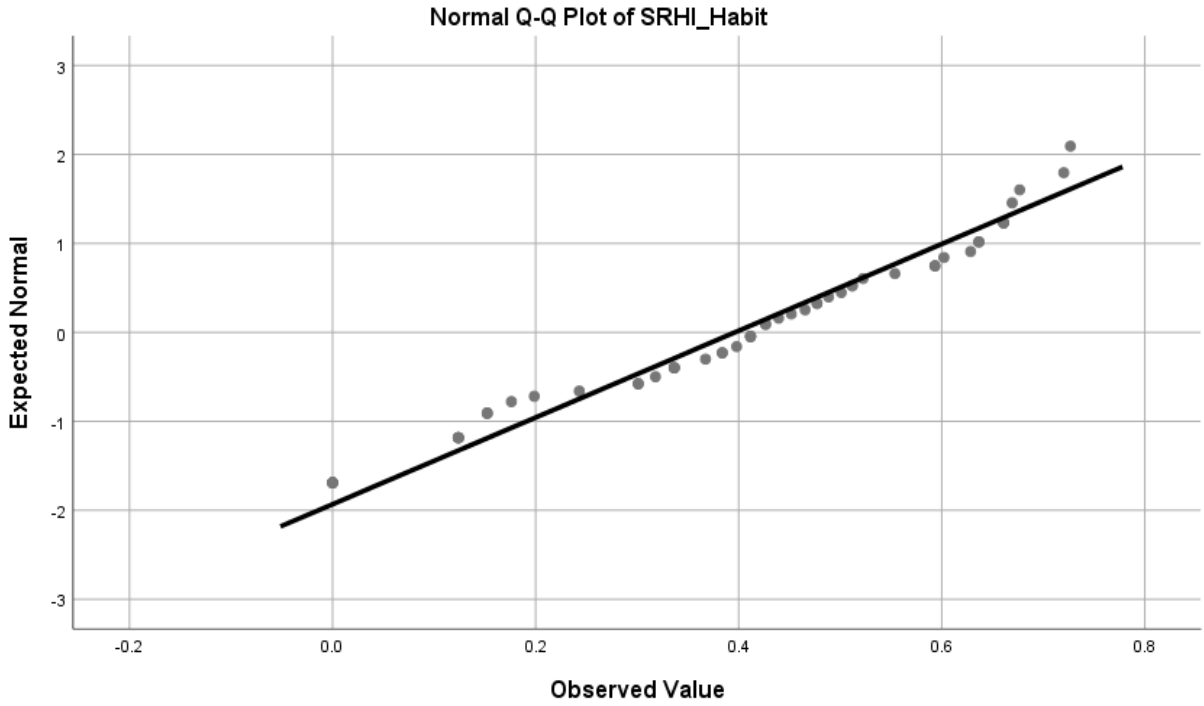

Histogram
Mean = 1.42
Std. Dev. = .073
N = 54
Frequency
12
10
8
6
4
2
0
1.30
1.40
1.50
1.60
BMI

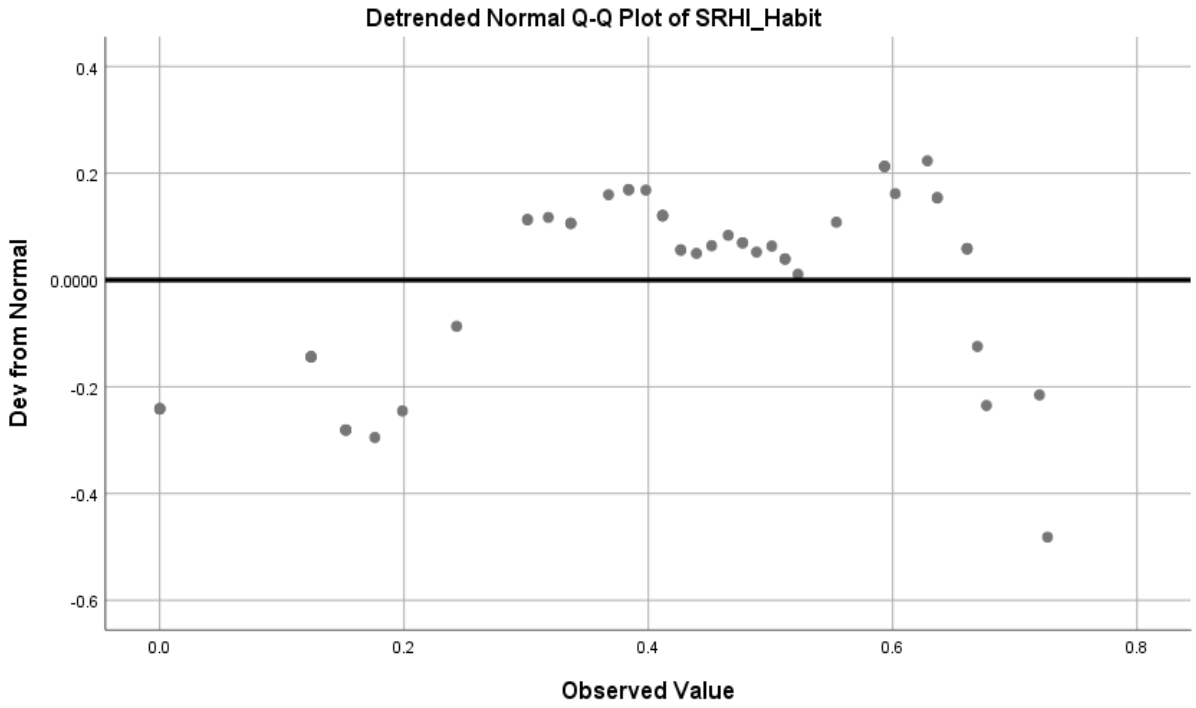

Normal Q-Q Plot of BMI
Expected Normal
3
2
1
0
-1
-2
-3
1.3
1.4
1.5
1.6
Observed Value

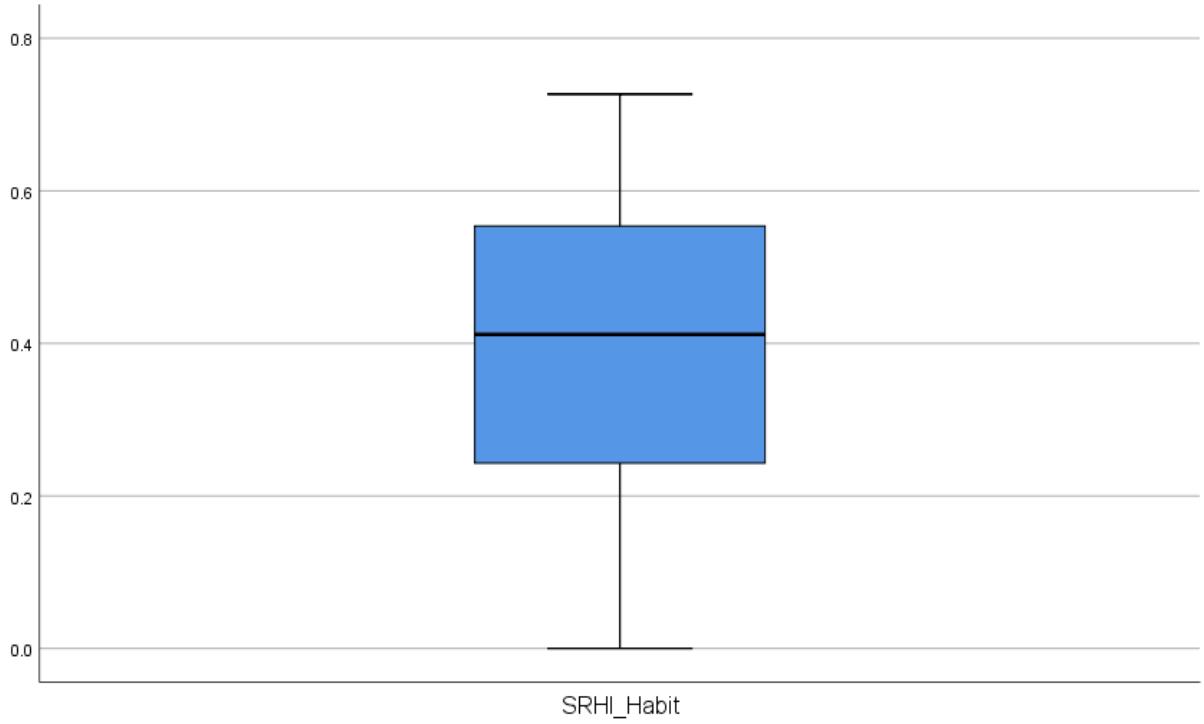

Detrended Normal Q-Q Plot of BMI
Dev from Normal
0.6
0.4
0.2
0.0000
-0.2
-0.4
1.30
1.35
1.40
1.45
1.50
1.55
1.60
Observed Value

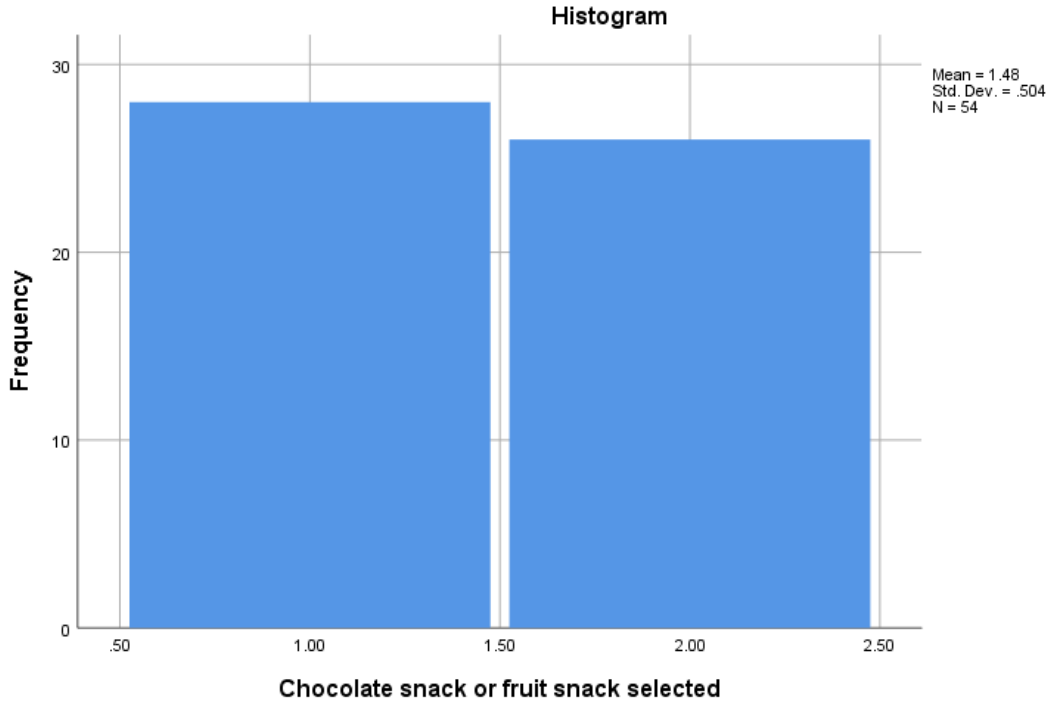

1.60
1.55
1.50
1.45
1.40
1.35
1.30
BMI

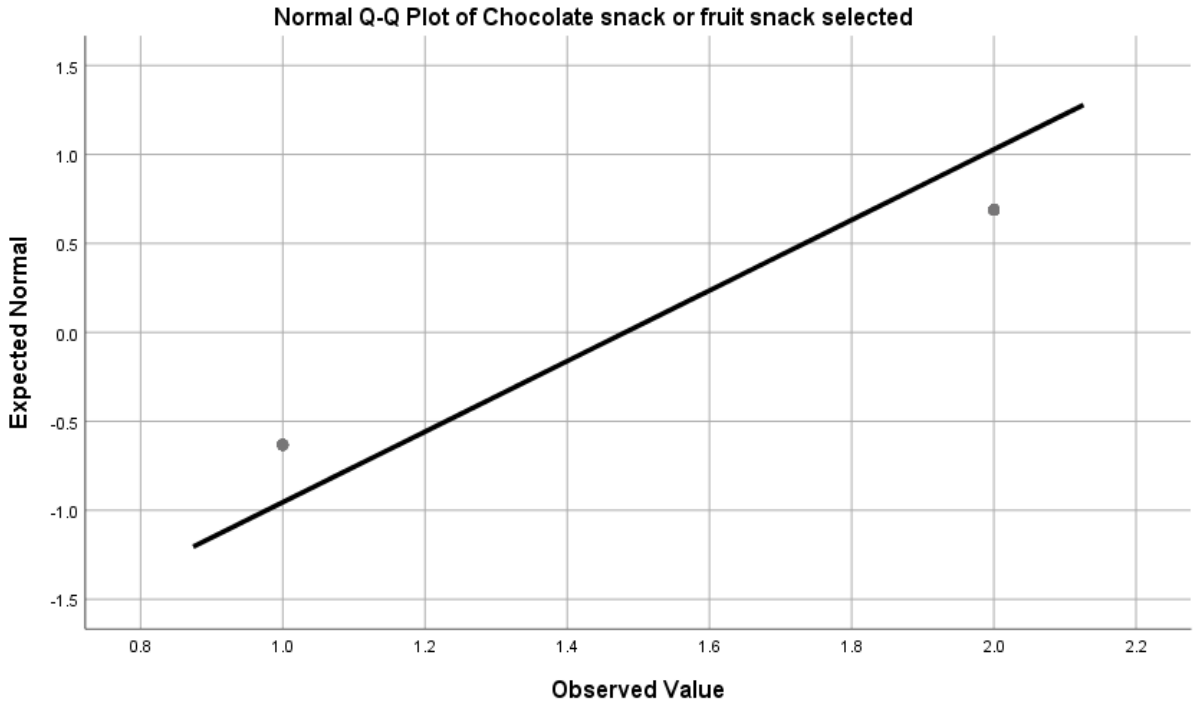

Histogram
Mean = .40
Std. Dev. = .205
N = 54
Frequency
10
8
6
4
2
0
.00
.20
.40
.60
SRHI_Habit

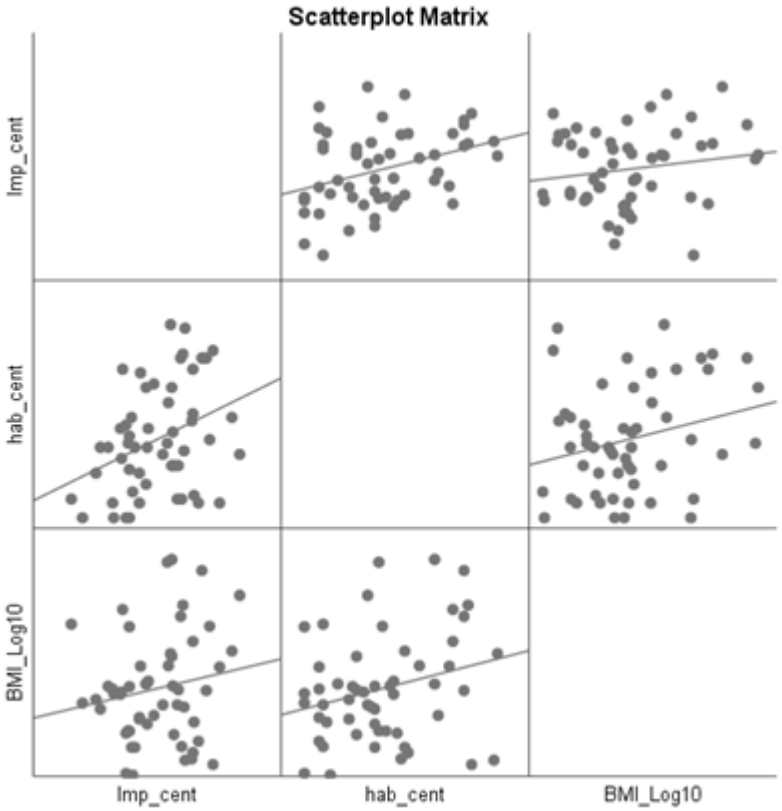

Normal Q-Q Plot of SRHI_Habit
Expected Normal
Observed Value
3
2
1
0
-1
-2
-3
-0.2
0.0
0.2
0.4
0.6
0.8


Detrended Normal Q-Q Plot of SRHI_Habit
Dev from Normal
Observed Value
0.4
0.2
0.0000
-0.2
-0.4
-0.6
0.0
0.2
0.4
0.6
0.8


0.8
0.6
0.4
0.2
0.0
SRHI_Habit

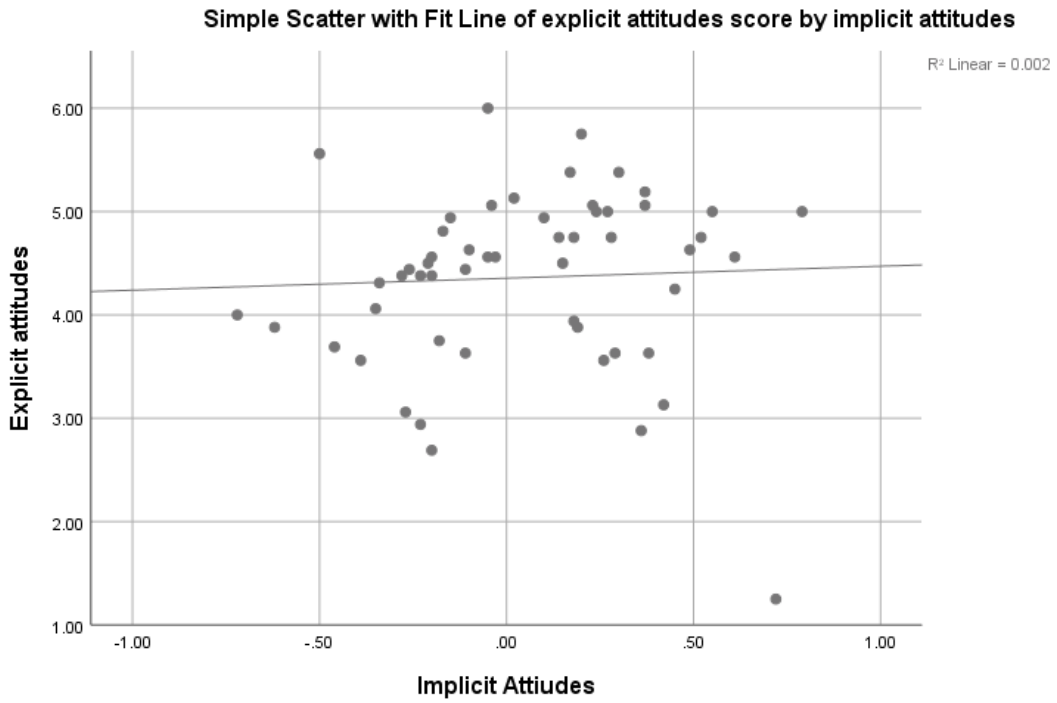

Histogram
Mean = 1.48
Std. Dev. = .504
N = 54
Frequency
30
20
10
0
.50
1.00
1.50
2.00
2.50
Chocolate snack or fruit snack selected


Normal Q-Q Plot of Chocolate snack or fruit snack selected
Expected Normal
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
0.8
1.0
1.2
1.4
1.6
1.8
2.0
2.2
Observed Value


Scatterplot Matrix
Imp_cent
hab_cent
BMI_Log10
Imp_cent
hab_cent
BMI_Log10

Appendix I – Statistical Analysis Output

Correlation (Implicit Attitudes & Explicit Attitudes)



Correlations

		IAT_Implicit_Att	Explicit_Att_Overall
IAT_Implicit_Att	Pearson Correlation	1	.046
	Sig. (2-tailed)		.739
	N	54	54
Explicit_Att_Overall	Pearson Correlation	.046	1
	Sig. (2-tailed)	.739	
	N	54	54

Logistic Regression (Implicit Attitudes & Explicit Attitudes as predictors of Food Choice)

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	54	100.0
	Missing Cases	0	.0
	Total	54	100.0
Unselected Cases		0	.0
Total		54	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
fruit	0
chocolate	1

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Food_Choice		Percentage
	Observed		fruit	chocolate	Correct
Step 0	Food_Choice	fruit	0	26	.0
		chocolate	0	28	100.0
	Overall Percentage				51.9

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.074	.272	.074	1	.786	1.077

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	IAT_Implicit_Att	10.527	1	.001
		Explicit_Att_Overall	5.229	1	.022
	Overall Statistics		15.100	2	.001

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	17.175	2	.000
	Block	17.175	2	.000
	Model	17.175	2	.000

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	57.610[a]	.272	.363

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.398	8	.907

Contingency Table for Hosmer and Lemeshow Test

		Food_Choice = fruit		Food_Choice = chocolate		
		Observed	Expected	Observed	Expected	Total
Step 1	1	4	4.580	1	.420	5
	2	4	4.168	1	.832	5
	3	4	3.577	1	1.423	5
	4	4	3.180	1	1.820	5
	5	3	2.704	2	2.296	5
	6	2	2.365	3	2.635	5
	7	2	1.924	3	3.076	5
	8	2	1.408	3	3.592	5
	9	1	1.042	4	3.958	5
	10	0	1.053	9	7.947	9

Classification Table[a]

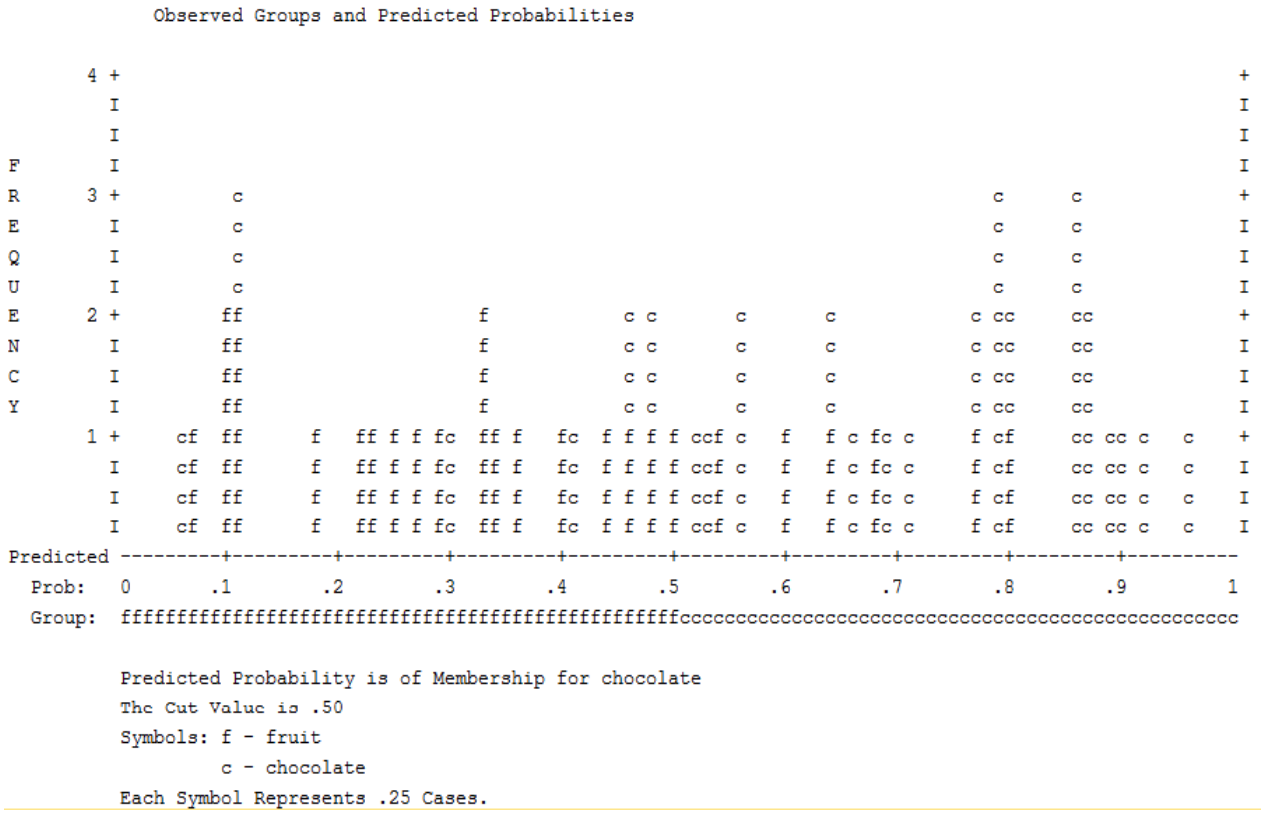
Observed		Predicted: Food_Choice: fruit	Predicted: Food_Choice: chocolate	Percentage Correct
Step 1	Food_Choice: fruit	20	6	76.9
	Food_Choice: chocolate	6	22	78.6
	Overall Percentage			77.8

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	IAT_Implicit_Att	3.365	1.126	8.929	1	.003	28.925
	Explicit_Att_Overall	.888	.390	5.192	1	.023	2.431
	Constant	-3.966	1.742	5.187	1	.023	.019

a. Variable(s) entered on step 1: IAT_Implicit_Att, Explicit_Att_Overall.



Multiple Regression (Implicit Attitudes & Explicit Attitudes as predictors of Habit)

Descriptive Statistics

	Mean	Std. Deviation	N
SRHI_Habit	.3963	.20512	54
IAT_Implicit_Att	.0515	.34219	54
Explicit_Att_Overall	4.3611	.85580	54

Correlations

		SRHI_Habit	IAT_Implicit_Att	Explicit_Att_Overall
Pearson Correlation	SRHI_Habit	1.000	.351	.242
	IAT_Implicit_Att	.351	1.000	.046
	Explicit_Att_Overall	.242	.046	1.000
Sig. (1-tailed)	SRHI_Habit	.	.005	.039
	IAT_Implicit_Att	.005	.	.370
	Explicit_Att_Overall	.039	.370	.
N	SRHI_Habit	54	54	54
	IAT_Implicit_Att	54	54	54
	Explicit_Att_Overall	54	54	54

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Explicit_Att_Overall, IAT_Implicit_Att[b]	.	Enter

a. Dependent Variable: SRHI_Habit

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.417[a]	.174	.142	.19003	1.851

a. Predictors: (Constant), Explicit_Att_Overall, IAT_Implicit_Att

b. Dependent Variable: SRHI_Habit

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.388	2	.194	5.374	.008[b]
	Residual	1.842	51	.036		
	Total	2.230	53			

a. Dependent Variable: SRHI_Habit

b. Predictors: (Constant), Explicit_Att_Overall, IAT_Implicit_Att

Coefficients[a]

		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
Model		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	.150	.136		1.105	.274		
	IAT_Implicit_Att	.204	.076	.341	2.673	.010	.998	1.002
	Explicit_Att_Overall	.054	.031	.226	1.772	.082	.998	1.002

a. Dependent Variable: SRHI_Habit

Collinearity Diagnostics[a]

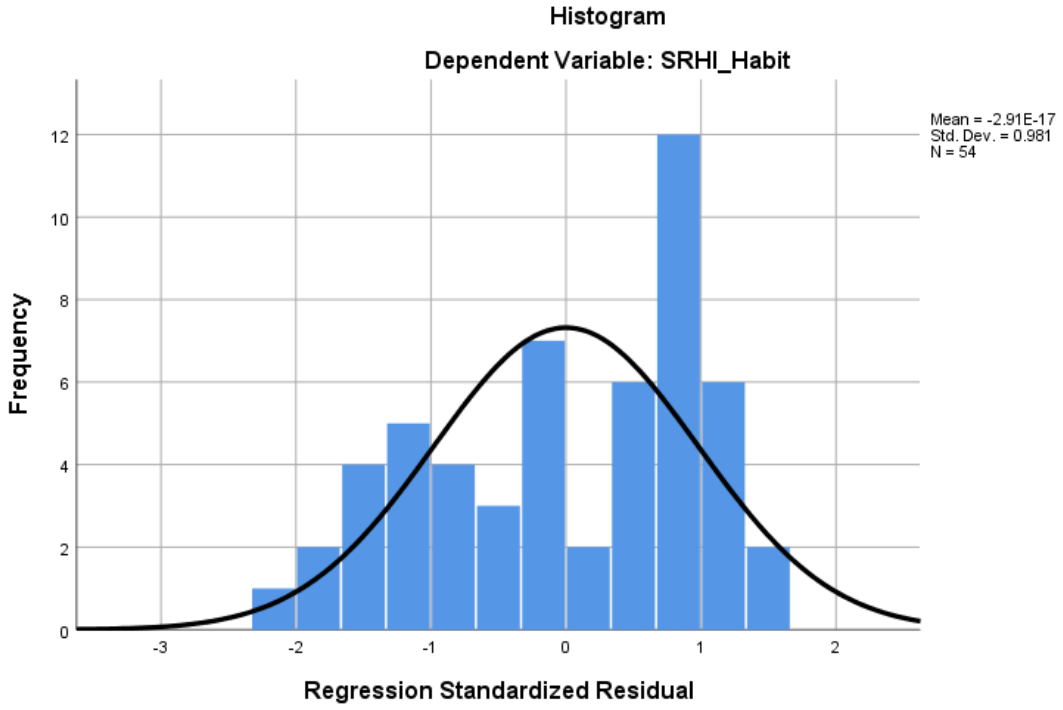
				Variance Proportions		
Model	Dimension	Eigenvalue	Condition Index	(Constant)	IAT_Implicit_Att	Explicit_Att_Overall
1	1	2.027	1.000	.01	.02	.01
	2	.954	1.457	.00	.98	.00
	3	.018	10.508	.99	.00	.99

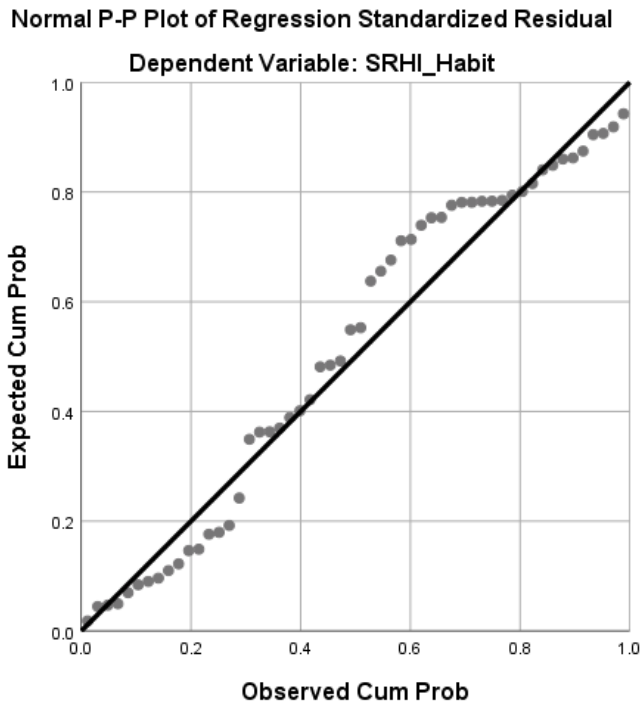
a. Dependent Variable: SRHI_Habit

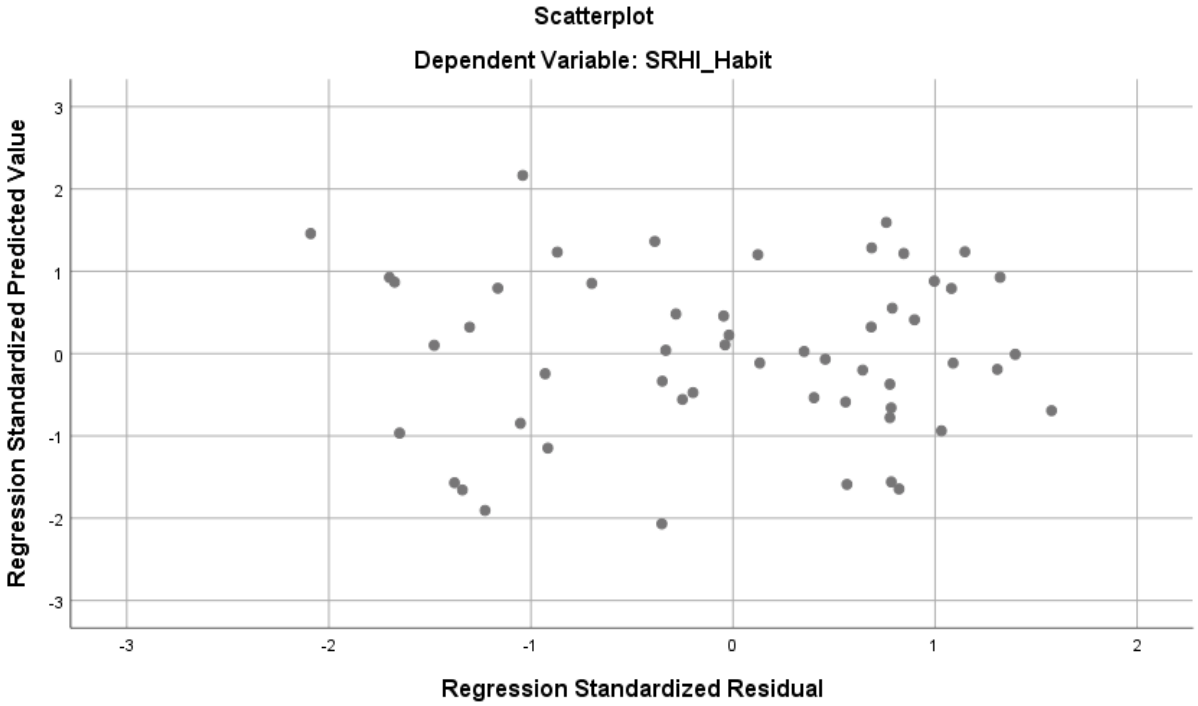
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.2192	.5816	.3963	.08557	54
Std. Predicted Value	-2.069	2.166	.000	1.000	54
Standard Error of Predicted Value	.027	.113	.043	.014	54
Adjusted Predicted Value	.2281	.6071	.3968	.08734	54
Residual	-.39717	.29954	.00000	.18641	54
Std. Residual	-2.090	1.576	.000	.981	54
Stud. Residual	-2.166	1.604	-.002	1.011	54
Deleted Residual	-.42672	.31024	-.00053	.19847	54
Stud. Deleted Residual	-2.251	1.630	-.006	1.021	54
Mahal. Distance	.105	17.729	1.963	2.586	54
Cook's Distance	.000	.169	.022	.031	54
Centered Leverage Value	.002	.335	.037	.049	54

a. Dependent Variable: SRHI_Habit



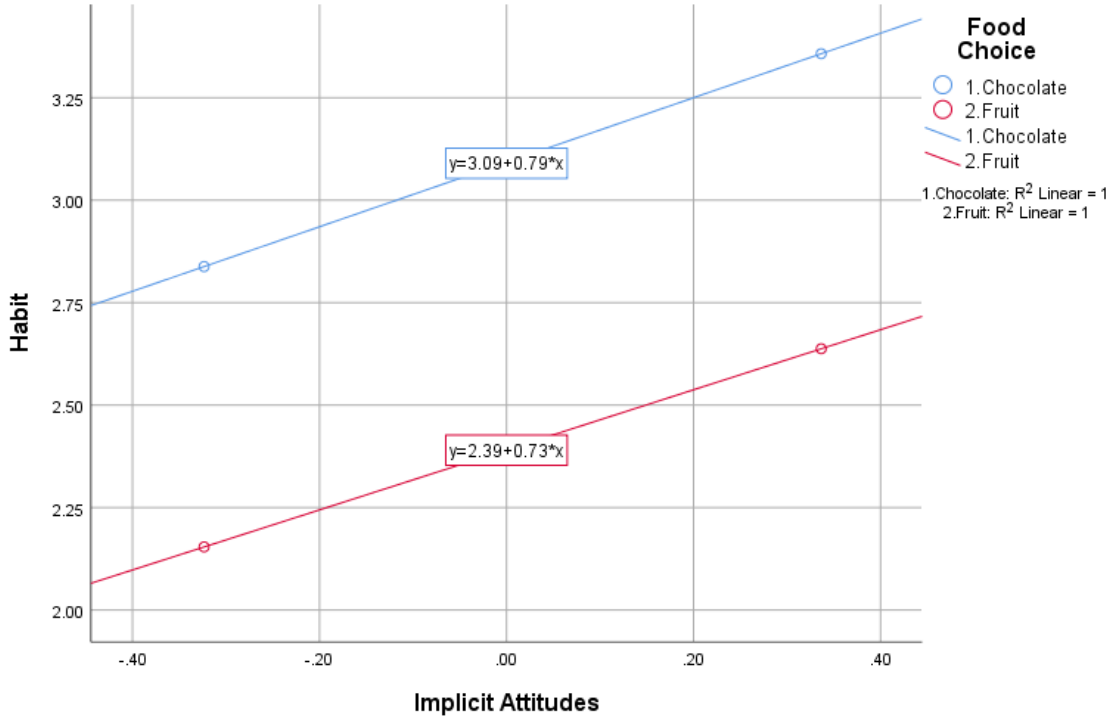

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: SRHI_Habit
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: SRHI_Habit
Regression Standardized Predicted Value
Regression Standardized Residual
-3
-2
-1
0
1
2
3

Moderation (Implicit Attitudes as predictors of Habit moderated by Food Choice)

```
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Version 3.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 1  IMP by Habit, Moderated by Food Choice
    Y  : SRHI_Hab
    X  : IAT_Impl
    W  : Food_Cho

Covariates:
 Gender

Sample
Size:  54

Coding of categorical W variable for analysis:
 Food_Cho       W1
    1.000     .000
    2.000    1.000

**************************************************************************
OUTCOME VARIABLE:
 SRHI_Hab

Model Summary
         R       R-sq        MSE          F        df1        df2        p
        .4583      .2100     1.2394     3.2562     4.0000    49.0000 .0191

Model
              coeff         se          t          p       LLCI       ULCI
constant     2.7109      .5609     4.8327      .0000     1.5836     3.8381
IAT_Impl      .7870      .6705     1.1738      .2461     -.5604     2.1344
W1           -.7016      .3417    -2.0532      .0454    -1.3883     -.0149
Int_1        -.0542     1.0017     -.0541      .9571    -2.0672     1.9588
Gender        .2425      .3097      .7832      .4373     -.3798      .8649

Product terms key:
 Int_1    :        IAT_Impl x        W1

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0000      .0029     1.0000    49.0000      .9571
----------
    Focal predict: IAT_Impl (X)
          Mod var: Food_Cho (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

```
DATA LIST FREE/
   IAT_Impl   Food_Cho   SRHI_Hab   .
BEGIN DATA.
     -.3235     1.0000     2.8381
      .0085     1.0000     3.0994
      .3365     1.0000     3.3575
     -.3235     2.0000     2.1540
      .0085     2.0000     2.3973
      .3365     2.0000     2.6376
END DATA.
GRAPH/SCATTERPLOT=
 IAT_Impl WITH     SRHI_Hab BY       Food_Cho .

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

NOTE: The following variables were mean centered prior to analysis:
          IAT_Impl

NOTE: Variables names longer than eight characters can produce incorrect
output.
      Shorter variable names are recommended.

------ END MATRIX -----
```



Multiple Regression (Implicit Attitudes & Explicit Attitudes as predictors of BMI)

Descriptive Statistics

	Mean	Std. Deviation	N
BMI	1.4182	.07271	54
IAT_Implicit_Att	.0515	.34219	54
Explicit_Att_Overall	4.3611	.85580	54

Correlations

		BMI	IAT_Implicit_Att	Explicit_Att_Overall
Pearson Correlation	BMI	1.000	.168	-.012
	IAT_Implicit_Att	.168	1.000	.046
	Explicit_Att_Overall	-.012	.046	1.000
Sig. (1-tailed)	BMI	.	.112	.464
	IAT_Implicit_Att	.112	.	.370
	Explicit_Att_Overall	.464	.370	.
N	BMI	54	54	54
	IAT_Implicit_Att	54	54	54
	Explicit_Att_Overall	54	54	54

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	Explicit_Att_Overall, IAT_Implicit_Att[b]	.	Enter

a. Dependent Variable: BMI

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.169[a]	.029	-.009	.07306	1.918

a. Predictors: (Constant), Explicit_Att_Overall, IAT_Implicit_Att

b. Dependent Variable: BMI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.008	2	.004	.751	.477[b]
	Residual	.272	51	.005		
	Total	.280	53			

a. Dependent Variable: BMI

b. Predictors: (Constant), Explicit_Att_Overall, IAT_Implicit_Att

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	1.424	.052		27.329	.000		
	IAT_Implicit_Att	.036	.029	.169	1.222	.227	.998	1.002
	Explicit_Att_Overall	-.002	.012	-.020	-.147	.884	.998	1.002

a. Dependent Variable: BMI

Collinearity Diagnostics[a]

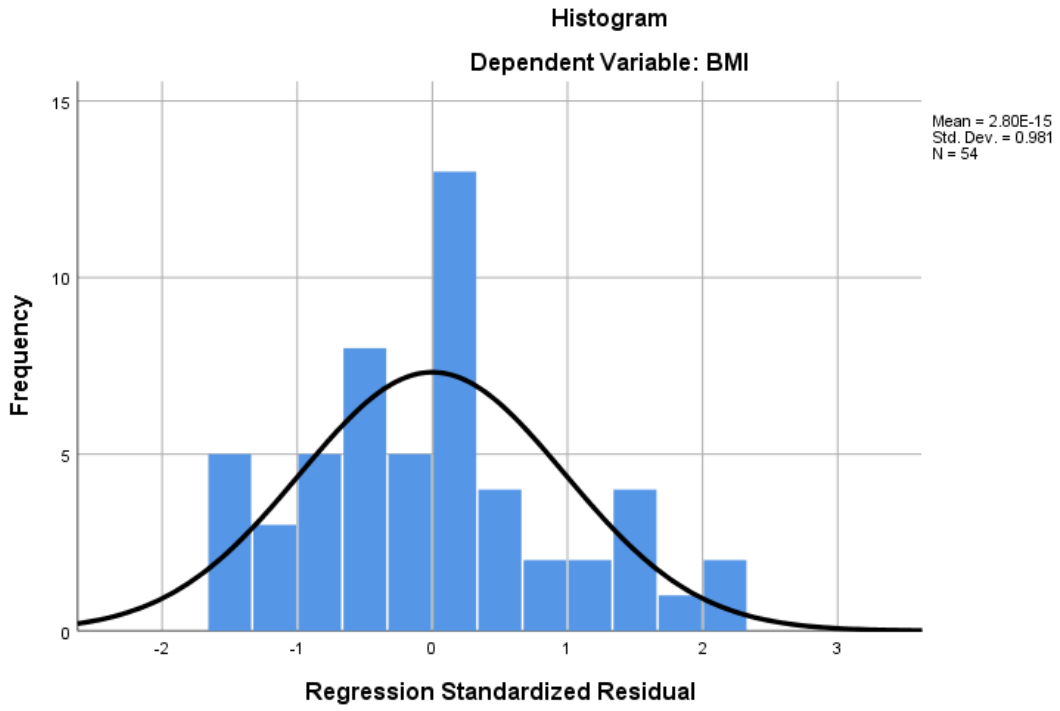
Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	IAT_Implicit_Att	Explicit_Att_Overall
1	1	2.027	1.000	.01	.02	.01
	2	.954	1.457	.00	.98	.00
	3	.018	10.508	.99	.00	.99

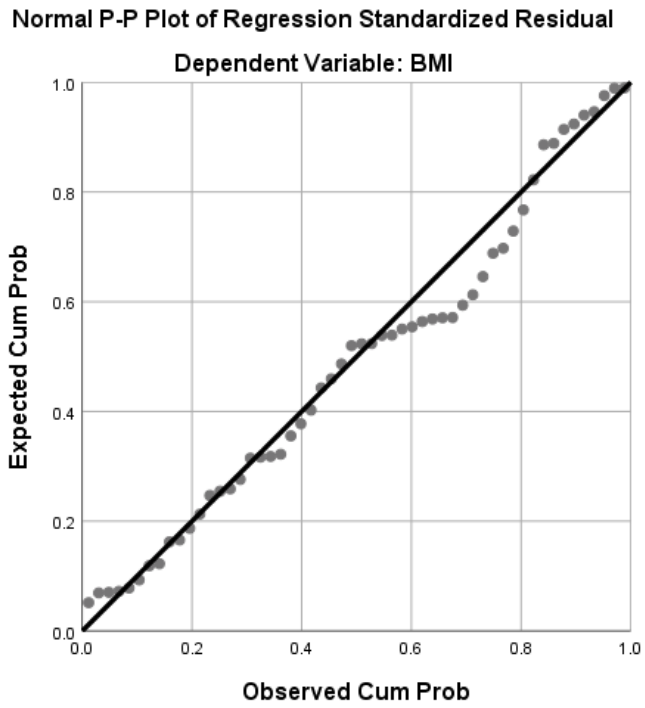
a. Dependent Variable: BMI

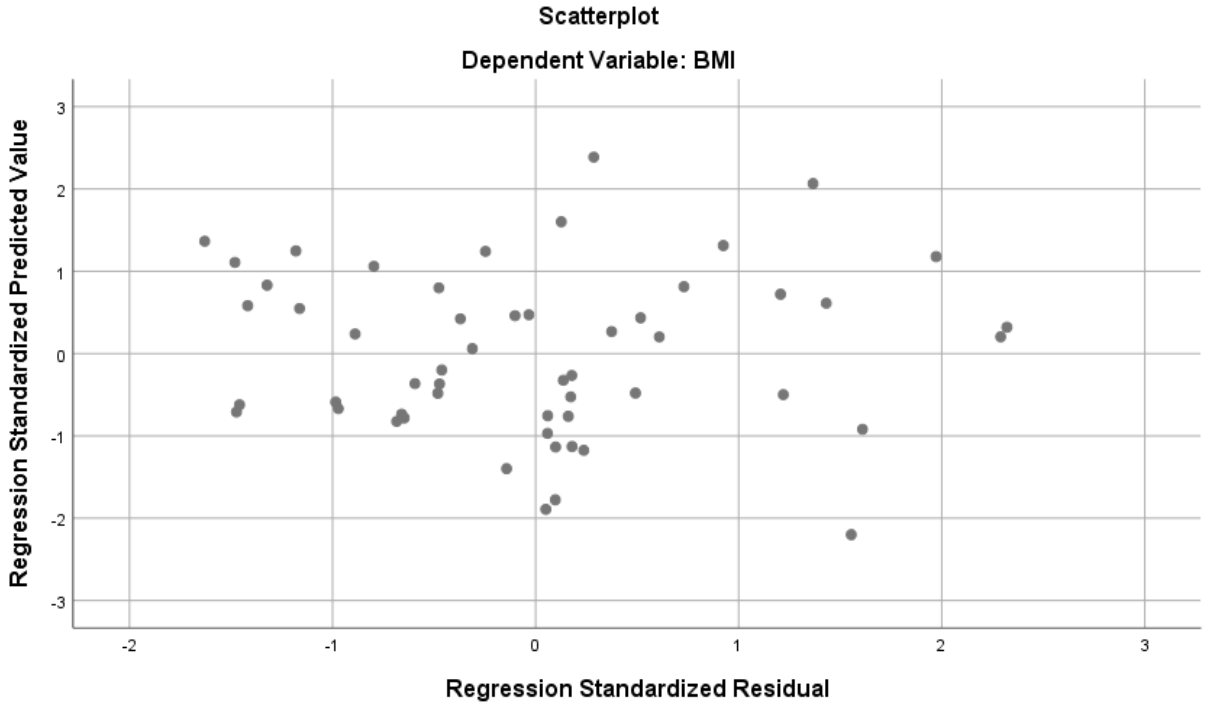
Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.3912	1.4476	1.4182	.01230	54
Std. Predicted Value	-2.200	2.387	.000	1.000	54
Standard Error of Predicted Value	.010	.043	.016	.005	54
Adjusted Predicted Value	1.3762	1.4436	1.4180	.01327	54
Residual	-.11905	.16955	.00000	.07166	54
Std. Residual	-1.630	2.321	.000	.981	54
Stud. Residual	-1.687	2.350	.001	1.008	54
Deleted Residual	-.12764	.17386	.00022	.07575	54
Stud. Deleted Residual	-1.719	2.464	.006	1.027	54
Mahal. Distance	.105	17.729	1.963	2.586	54
Cook's Distance	.000	.120	.019	.028	54
Centered Leverage Value	.002	.335	.037	.049	54

a. Dependent Variable: BMI



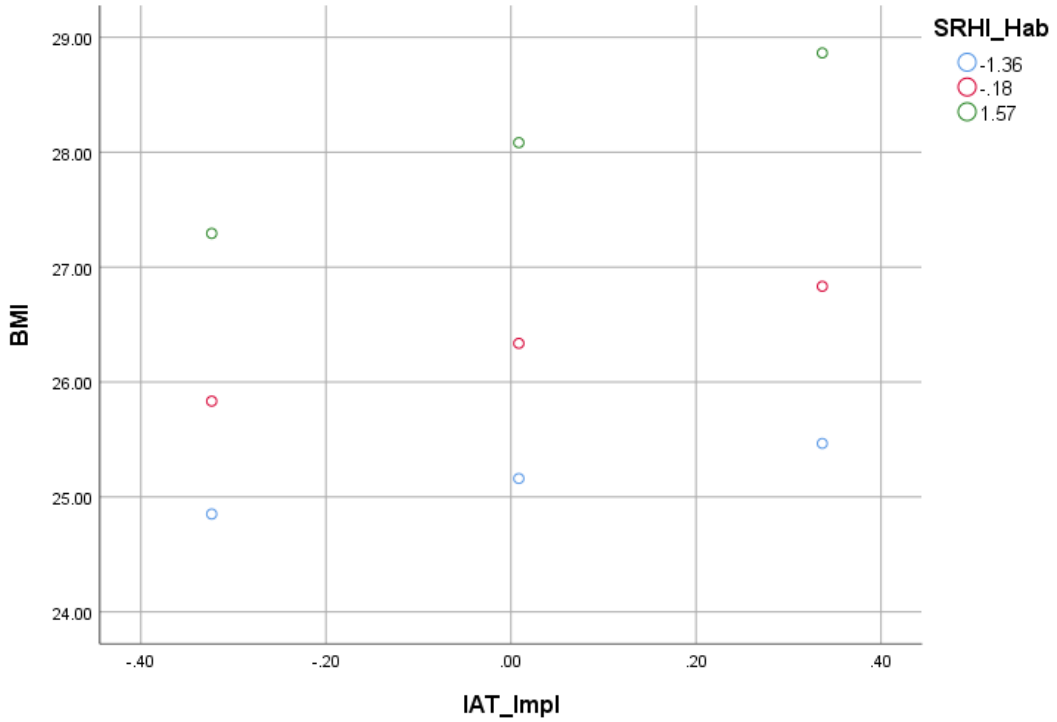

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: BMI
Expected Cum Prob
Observed Cum Prob
0.0
0.2
0.4
0.6
0.8
1.0


Scatterplot
Dependent Variable: BMI
Regression Standardized Predicted Value
Regression Standardized Residual
3
2
1
0
-1
-2
-3

Moderation (Implicit Attitudes as predictors of BMI moderated by Habit)

```
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Version 3.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 1  IMP by BMI, Moderated by Habit
    Y  : BMI
    X  : IAT_Impl
    W  : SRHI_Hab

Covariates:
 Gender

Sample
Size:  54

**************************************************************************
OUTCOME VARIABLE:
 BMI

Model Summary
       R       R-sq        MSE          F        df1        df2          p
    .3555      .1264    20.8060     1.7717     4.0000    49.0000     .1496

Model
              coeff         se          t          p       LLCI       ULCI
constant    29.5288     2.1356    13.8271      .0000    25.2372    33.8204
IAT_Impl     1.6019     2.0608      .7773      .4407    -2.5395     5.7434
SRHI_Hab      .9940      .5810     1.7110      .0934     -.1735     2.1616
Int_1         .4947     1.7158      .2883      .7743    -2.9534     3.9428
Gender      -1.9234     1.2753    -1.5082      .1379    -4.4863      .6394

Product terms key:
 Int_1    :        IAT_Impl x        SRHI_Hab

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0015      .0831     1.0000    49.0000      .7743
----------
    Focal predict: IAT_Impl (X)
          Mod var: SRHI_Hab (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

```
DATA LIST FREE/
   IAT_Impl   SRHI_Hab   BMI        .
BEGIN DATA.
     -.3235    -1.3569    24.8513
      .0085    -1.3569    25.1603
      .3365    -1.3569    25.4656
     -.3235     -.1789    25.8338
      .0085     -.1789    26.3363
      .3365     -.1789    26.8327
     -.3235     1.5711    27.2933
      .0085     1.5711    28.0832
      .3365     1.5711    28.8636
END DATA.
GRAPH/SCATTERPLOT=
 IAT_Impl WITH     BMI      BY       SRHI_Hab .

*********************** ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

NOTE: The following variables were mean centered prior to analysis:
          SRHI_Hab IAT_Impl

NOTE: Variables names longer than eight characters can produce incorrect
output.
      Shorter variable names are recommended.

------ END MATRIX -----
```



Moderation (Implicit Attitudes as predictors of BMI moderated by Food Choice)

```
Run MATRIX procedure:

*************** PROCESS Procedure for SPSS Version 3.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2018). www.guilford.com/p/hayes3

**************************************************************************
Model  : 1 IMP by BMI, Moderated by Food Choice
    Y  : BMI
    X  : IAT_Impl
    W  : Food_Cho

Covariates:
 Gender

Sample
Size:  54

Coding of categorical W variable for analysis:
 Food_Cho       W1
    1.000     .000
    2.000    1.000

**************************************************************************
OUTCOME VARIABLE:
 BMI

Model Summary
        R       R-sq        MSE          F        df1        df2          p
    .2841      .0807    21.8927     1.0757     4.0000    49.0000     .3787

Model
              coeff         se          t          p       LLCI       ULCI
constant    29.9797     2.3576    12.7161      .0000    25.2419    34.7176
IAT_Impl     2.0471     2.8180      .7265      .4710    -3.6158     7.7101
W1          -1.3484     1.4362     -.9389      .3524    -4.2346     1.5378
Int_1        -.5223     4.2101     -.1241      .9018    -8.9829     7.9382
Gender      -1.7776     1.3016    -1.3657      .1783    -4.3933      .8381

Product terms key:
 Int_1    :        IAT_Impl x        W1

Test(s) of highest order unconditional interaction(s):
       R2-chng          F        df1        df2          p
X*W      .0003      .0154     1.0000    49.0000      .9018
----------
    Focal predict: IAT_Impl (X)
          Mod var: Food_Cho (W)

Data for visualizing the conditional effect of the focal predictor:
Paste text below into a SPSS syntax window and execute to produce plot.
```

```
DATA LIST FREE/
   IAT_Impl   Food_Cho   BMI        .
BEGIN DATA.
     -.3235     1.0000    26.5194
      .0085     1.0000    27.1991
      .3365     1.0000    27.8705
     -.3235     2.0000    25.3400
      .0085     2.0000    25.8462
      .3365     2.0000    26.3464
END DATA.
GRAPH/SCATTERPLOT=
 IAT_Impl WITH     BMI      BY       Food_Cho .

************************ ANALYSIS NOTES AND ERRORS ************************

Level of confidence for all confidence intervals in output:
  95.0000

NOTE: The following variables were mean centered prior to analysis:
          IAT_Impl

NOTE: Variables names longer than eight characters can produce incorrect
output.
      Shorter variable names are recommended.

------ END MATRIX -----
```