

**“A Bit of a Grey Area”: A Qualitative Study of Perceptions and Knowledge of the
Relationship between Food and Mental Health**

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*This thesis is submitted in partial fulfilment of the Honours degree of Bachelor of
Psychology.*

The School of Psychology

The University of Adelaide

October 2018

Word Count: 8,821

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Abstract

Literature indicates a bidirectional relationship between food and mental health. The bidirectional interactions between the mind, the brain and the gut, are associated with the pathogenesis of physical and mental health disorders. Some gastrointestinal disorders involve dysfunction of these interactions and highlight the importance of psychological interventions. Research on perceptions of food and mental health, however, is scarce. Recognition of this connection between food and mental health is vital so that dietary interventions and psychological interventions are deemed appropriate for managing health. The current qualitative study aimed to examine the perceptions of the relationship between food and mental health. Laypeople ($N= 21$) participated in focus groups and interviews involving open-ended and semi-structured questions. Two overarching themes were generated through thematic analysis: 'We only know what we know' and 'Gaps in knowledge about the relationship between food and mental health'. Limited awareness of a connection between food and mental health was found. These perceptions and gaps in knowledge contributed to disordered eating and consumption of foods with a limited evidence-base of improving gut health. Improving awareness of this connection is critical, so that dietary interventions are perceived to be appropriate and necessary for enhancing mental health, and psychological interventions are deemed suitable for managing gastrointestinal symptoms. Public education on these associations is required to guide appropriate use of such interventions. Future research may examine health professionals' perceptions and knowledge of the bidirectional interactions between the mind, brain and gut, as health professionals were believed to have limited awareness of this link.

Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University, and to the best of my knowledge, this thesis contains no materials previously published except where due reference is made. I give consent for this copy of my thesis, when deposited in the University Library, to be available for loan and photocopying.

Angie Bon, 2018

Acknowledgements

I wish to sincerely thank my supervisors Dr Ecushla Linedale and Professor Anna Chur-Hansen for their support and guidance throughout the year. I am incredibly grateful to have had this opportunity to work with, and learn from, such talented researchers.

I would also like to thank my parents Anneke and Ted and my sister Bianca. I greatly appreciate all you have done and continue to do for me as I pursue my ambitions.

I am eternally grateful for my Honours friends Issy, Steph, Sophie, Kate, Gemma, Luke and Gregory. You have all played a pivotal role in my Honours year by providing undying encouragement, strength, and inspiration.

Lastly, but not least, I would like to express my gratitude to all the participants in this study.

CHAPTER 1: Introduction

1.1: Overview

Literature demonstrates an interrelationship between food and mental health. Current research indicates diet quality could be a modifiable risk factor for mental health conditions (Marx et al., 2017). This section examines the bidirectional relationship between food choices and mood, the role of nutrition in informing mental health, and the emerging literature on the mind-brain-gut axis. Additionally, this section discusses the public distrust and confusion of food and health discourses, the importance of the biopsychosocial model, and the role of explanatory models in health outcomes.

1.2: Food choices and mood

Like the relationship between food and mental health, the association between food choices and mood is bidirectional. Food can alter temporary feelings and states of mind and vice versa. Specific food can be psychologically comforting and enhance mood (Freeman & Gil, 2004). Through an emotional connection, elicitation of caring, a perception of familiarity or connotation with a significant event effect comfort eating (Wansink & Sangerman, 2000). Food can alleviate stress or adverse emotions, (Torres & Nowson, 2007), while hedonic eating can decrease mood due to feelings of guilt and failure (Macht & Mueller, 2007).

The influence of the reward system means hedonic eating can lead to overeating and obesity (Singh, 2014), as Figure 1 illustrates. The nucleus accumbens in the reward centre releases dopamine and serotonin, once hedonic foods are consumed (De Macedo, De Freitas & Da Silva Torres, 2016). The reward centre is linked to neurons in the hypothalamus that govern appetite regulation. Consequently, consistent consumption of a favourable food overrides signals of satiety and hunger (Singh, 2014).

Signalling of food intake in the brain:

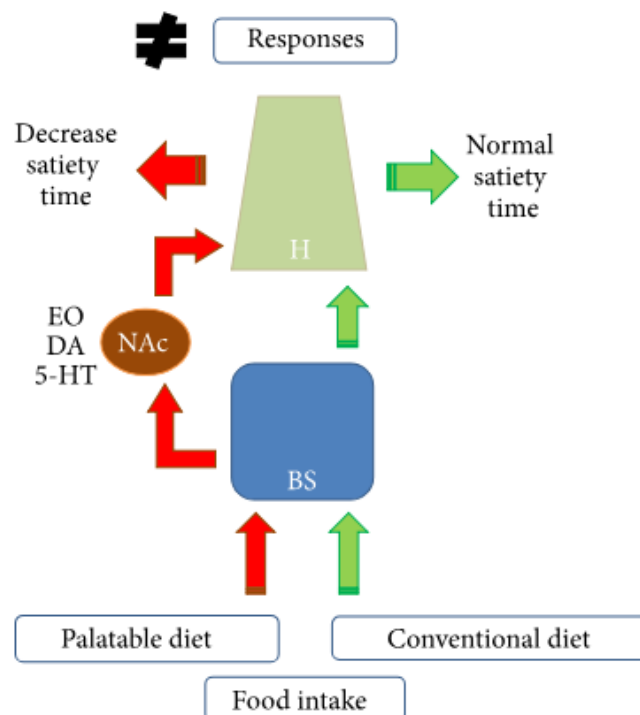


Figure 1. The signalling pathway activated by a conventional diet is shown on the right (green), whereas the signalling induced by a palatable diet is shown on the left (red). H: hypothalamus; NAc: nucleus accumbens; BS: brain stem. EO: endogenous opioids; DA: dopamine; 5-HT: serotonin. (De Macedo et al., 2016, p. 5).

1.3: Nutrition and mental health

A rapidly growing body of research indicates diet plays a critical role in influencing mental health disorders (Marx et al., 2017) and general psychological well-being – that is, “sound cognitive, emotional and perceptual functioning” (McCulloch & Ryrie, 2006, p. 19).

Diet influences symptomatology and the progression of mental health disorders (Lim et al., 2016). Western diets and diets rich in processed foods are a risk factor for developing mental health disorders, while diets consisting of mostly fruits and vegetables, healthy fats, nuts and fish, such as the Mediterranean diet, are a protective factor (Rucklidge & Kaplan, 2016). Several nutritional factors are critical for mental health conditions as they are

precursors for neurotransmitters and consequently assist in enhancing and stabilising mood (Lim et al., 2016; Sathyanarayana Rao, 2008). Individuals with mental health disorders may have deficiencies in precursors for neurotransmitters (Sathyanarayana Rao, 2008). Oxidative stress and inflammation in the brain have been linked to various mental health disorders, such as depression (Gomez-Pinilla & Nguyen, 2012; Marx et al., 2017). This excessive oxidation and inflammation can be combatted by natural antioxidant compounds found in fruits and vegetables (Gomez-Pinilla & Nguyen, 2012). Also, omega-6 fatty acids in western diets replace fatty acids in cell membranes and have been associated with several mental health conditions (Mcculloch & Ryrie, 2006). Omega-3 fatty acids, however, are critical in the functioning of brain cells and neurotransmitter receptors and assisting the brain to adjust to new information as they enhance membrane fluidity (Calder, 2010; Tanaka et al., 2012). Moreover, deficiency in zinc has been associated with elevated depressive symptoms (Vashum et al., 2014) and deficiency in magnesium and iron is associated with depressive and anxiety symptoms (Chen et al., 2013; Jacka et al., 2009).

These nutritional factors are essential for brain functioning and mood. Short-term improvements in mood can be obtained through the consumptions of easily digestible carbohydrates which rapidly elevate energy, followed by increased drowsiness and sedation (Benton, 2002). Foods with low glycaemic index (GI) result in a less intense and more durable effect on brain chemistry, mood and energy levels (Sathyanarayana Rao, 2008). Low GI foods activate insulin, therefore, lowering blood levels of amino acids, enabling admission of tryptophan to the brain, and produce serotonin (Sathyanarayana Rao, 2008; Prasad, 1998). Importantly, neurotransmitters, such as serotonin, enhance mood (Sathyanarayana Rao, 2008). Also, amino acids, which predominantly must be derived from diet, regulate the synthesis of neurotransmitters, including dopamine and serotonin (Mcculloch & Ryrie, 2006; Sathyanarayana Rao, 2008). Synthesis of neurotransmitters is inadequate if there is a lack of

amino acids and this deficiency is associated with low mood and aggression (Sathyanaarayana Rao, 2008).

This link between diet and mental health has implications for the management and prevention of mental health disorders. Australia's clinical guidelines recommend diet in the treatment of depression (Malhi, 2018). Dietary changes reduce the occurrence of mental health issues, as found in a meta-analysis by Li and colleagues (2017). Similarly, benefits of a dietary intervention, based on a Mediterranean diet and the Australian Dietary Guidelines, were found in an RCT with sixty-seven participants with major depression (Marx et al., 2017). Following this 12-week intervention, depression scores improved in the experimental group, demonstrating promising results for the feasibility and clinical benefit of dietary interventions (Marx et al., 2017). Also, nutritional supplements, including omega-3 fatty acids, are effective as an adjunct treatment for mood disorders such as bipolar disorder (Sarris et al., 2009). Similarly, supplements like Vitamin B and zinc may reduce symptoms of anxiety and depression (Nowak et al., 2003).

1.4: The Mind-Brain-Gut Axis

The mind-brain-gut axis exemplifies the relationship between food and mental health (Marx et al., 2017). A growing body of literature has focused on the bidirectional interactions between the brain, the gastrointestinal tract, and the gut microbiome (Mayer et al., 2014). As Figure 2 depicts, the brain can moderate gut functions, along with the perception of visceral sensations, through the emotional motor system (EMS), which consists of the sympathetic and parasympathetic divisions of the autonomic nervous system (ANS), the hypothalamic pituitary adrenal (HPA) axis which regulates behavioural, neuroendocrine and autonomic responses to stress, and endogenous pathways that moderate pain and discomfort. Both interoceptive and exteroceptive stressors enable activation of the EMS

(Rhee, Pothoulakis, & Mayer, 2009). Within this system of bidirectional connections, the gut microbiome interacts across various physiological pathways, such as neuroendocrine and neuroimmune routes and the ANS (Allen, Dinan, Clarke & Cryan, 2017).

Importantly, the gut microbiome, the array of microorganisms within the intestinal tract, mediates the diet-mental health relationship (Marx et al., 2017; Liang, Wu, & Jin, 2018). Gut dysbiosis, imbalance of gut microbiota, has been associated with several psychological, gastrointestinal and nervous system disorders (Clapp et al., 2017).

The mind-brain-gut axis is involved in the pathogenesis of both physical and mental health disorders, and importantly, has resulted in a shift in the conceptualisation of mental health (Allen et al., 2017; Mayer et al., 2014).

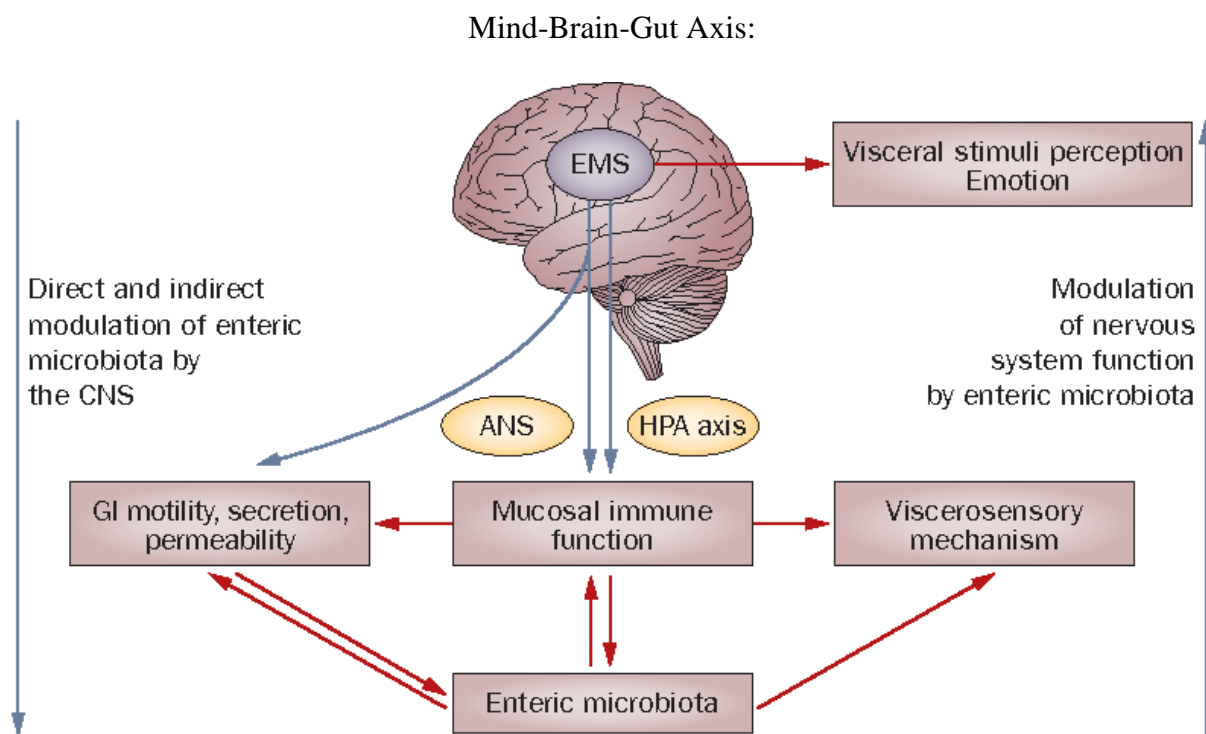


Figure 2. Schematic representation of the pattern of bidirectional brain–gut–microbe interactions. (Rhee et al., 2009).

1.4.1: Mind-Brain-Gut Axis and stress-related disorders

The mind-brain-gut axis plays a pivotal role in stress-related disorders, such as gastrointestinal disorders, anxiety and depression (Foster, Rinaman, & Cryan, 2017). Specifically, the mind-brain-gut axis is associated with the pathophysiology of gastrointestinal conditions such as Irritable Bowel Syndrome (IBS) and Inflammatory Bowel Disease (IBD) (Ballou & Keefer, 2017). IBS is a long-term condition characterised by abdominal pain and discomfort and altered bowel functioning (Ballou & Keefer, 2017). IBD involves several inflammatory disorders distinguished by abdominal pain, diarrhoea, rectal bleeding, weight loss and fatigue (Ballou & Keefer, 2017). Mental health conditions and IBS are interrelated and mental health conditions, such as anxiety and depression, are common in patients with IBS (Whitehead et al., 2002). Importantly, stress and the onset and severity of symptoms of IBS are strongly linked (Pellissier & Bonaz, 2017), and catastrophising and hypervigilance to negative stimuli may cause maintenance of the disorder (Kennedy et al., 2012). Chronic stress similarly exacerbates symptoms in IBD (Ballou & Keefer, 2017). Conversely, exacerbation of IBS symptoms may trigger anxiety and low moods (Fadgyas-Stanculete et al., 2014).

The mind-brain-gut axis influences symptom generation of gastrointestinal disorders, as these disorders involve physiological effects primarily mediated by psychosocial factors (Ballou & Keefer, 2017). Stress and emotional states can alter gastrointestinal motility (Mayer et al., 2017), as well as increase the perception of abdominal pain (Konturek et al., 2011) and the ANS modulates these effects (Pellissier & Bonaz, 2017). Visceral messages, as well as possible emotional regulation, can also be signalled from the gut to the brain in IBS (Mayer et al., 2014). Furthermore, the pathophysiology of IBS symptoms involves dysfunction in the HPA axis (Pellissier & Bonaz, 2017). Specifically, corticotropin-releasing

hormone results in a hyperactive response of the brain and the gut along with varying adrenocorticotropin hormone and cortisol and catecholamine levels (Bravo, Dinan, & Cryan, 2011). Psychological interventions target these physiological processes through decreasing arousal of the ANS, reducing the stress response, and diminishing inflammation (Ballou & Keefer, 2017). Cognitive Behavioural Therapy (CBT), hypnosis and mindfulness-based therapies are psychological interventions for IBS with the most substantial evidence (Ballou & Keefer, 2017). CBT has the strongest evidence base, with RCTs finding CBT to be effective for IBS compared with control groups and traditional medical interventions (Ballou & Keefer, 2017). Also, CBT enhanced bowel symptoms, quality of life, and psychological distress following treatment in several meta-analyses (Ballou & Keefer, 2017). CBT focuses on providing psychoeducation about the association between the stress response and gastrointestinal symptoms, developing awareness about cognitive and behavioural responses to symptoms and/or distress about symptoms and adjusting those responses to alleviate anxiety related to the disorder along with physical reactivity to stress (Ballou & Keefer, 2017). Hypnotherapy is also effective in managing IBS, and the benefits of treatment persisted for 1-5 years in 83% of patients (Ballou & Keefer, 2017). Hypnotherapy involves teaching patients to attain a hypnotic state and follow 'gut-focused' imageries to target physiological symptoms such as gut function, visceral sensitivity and psychological distress (Ballou & Keefer, 2017). Hypnotherapy is also thought to regulate the processing of pain in the anterior cingulate cortex of the brain, which is hyperactive in some IBS patients (Ballou & Keefer, 2017). Likewise, mindfulness-based therapies for IBS management involves teaching patients to recognise and accept both physical and mental discomfort associated to their symptoms to alleviate physical and emotional distress (Ballou & Keefer, 2017).

1.4.2: Mind-Brain-Gut Axis and diet

The relationship between mental health and diet has been researched in relation to inflammation and oxidative stress, and importantly, the gut microbiome has been associated with these processes (Marx et al., 2017). For instance, inflammation of the gastrointestinal tract has been associated with mental health conditions (Clapp et al., 2017). This inflammation triggers the release of cytokines and neurotransmitters, affecting the microbiome and ultimately intestinal permeability (Biesmans et al., 2015; Gądek-Michalska et al., 2013). Rogue molecules from the permeable gut, in turn, affects brain function, which may result in anxiety and depression (Gądek-Michalska et al., 2013, Ohland et al., 2013; Muscatello, 2014). Nutrient-deficiency, such as lack of magnesium, omega-3 fatty acids, probiotics, vitamins and minerals are linked to this inflammatory response (Marx et al., 2017). Furthermore, Western diets comprised primarily of saturated fats and refined sugar and which are low in fibre cause dysbiosis (Marx et al., 2017).

The release of metabolites from gut microbiota elicit the production of stress hormones via HPA activity (Galley & Bailey, 2014) and dysregulation of HPA activity is linked to depression and anxiety (Risbrough & Stein, 2006). Conversely, external stressors activate HPA which has a harmful impact on the gut microbiome (Konturek et al., 2011). These stress signals release neurotransmitters and proinflammatory cytokines that affect gastrointestinal physiology (Konturek et al., 2011). Specifically, stress alters gastrointestinal motility and secretions, negatively effects capacity of regeneration of gastrointestinal mucosa, and leads to adverse effects on the intestinal microbiota (Konturek et al., 2011).

Prebiotics and probiotics may hold several benefits for health, including gut health (Pandey, Naik & Vakil, 2015). However, research involves studies which differ in the strains of bacteria in each probiotic and distinguishing which specific strains are of benefit is in

progress (Sarkar et al., 2016). While limited research also suggests probiotics may improve symptoms in gastrointestinal disorders, there is not much research on healthy populations (Ford et al., 2014). Furthermore, research suggests probiotics may need to be consumed persistently to benefit long-term health (Khalesi et al., 2018).

1.5: Public distrust and confusion of discourses on food and health

Multiple sources of information, from food producers, scientists and policymakers, shape the public's notions of healthy and unhealthy foods (Maddock & Hill, 2016). The public faces an abundance of conflicting information (Maddock & Hill, 2016) along with unfamiliar terminology such as 'probiotics' and 'omega-3' (Maddock & Hill, 2016). Furthermore, advertisers typically employ implicit suggestion which makes it difficult to substantiate factual claims to false claims (Hackley and Hackley, 2014). The growing dominance of food marketers, an increasing suspicion of scientific health claims and decreasing confidence in scientists and medical practitioners, have contributed to confusion and distrust of scientific claims and institutions such as healthcare (Maddock & Hill, 2016; Ward, 2017). Given this distrust and decreased confidence in medicine, public health systems are situated within a society that questions the validity of public health information and pursues alternatives to conventional approaches to health and illness (Ward, 2017).

1.6: Food trends and public perceptions of food and health

Health messages and false health claims communicated by food advertising can influence the public's perception of food along with their food choices (Maddock & Hill, 2016). For example, products and foods, such as kombucha and probiotics, claiming to improve gut health are abundant, resulting in a growing interest in gut health in the media

(Clapp et al., 2017) and food industry (Bischoff, 2011). To date, food advertising has predominantly focused on physiological health claims whereas the link between food and mental health is rarely reflected (Maddock & Hill, 2016). Food advertising messages may be inaccurate since these messages often do not encapsulate the effects of healthy foods on mood and, in contrast, foods resulting in depressed moods are typically associated with “happiness” and “wellbeing” (Maddock & Hill, 2016, p. 13).

Given the prominence of food trends, the public is surprisingly less familiar with the relationship between food and mental health (Dunne, 2010). The public was unfamiliar with the link between food and mental health compared with physiological health risks linked to specific diets in a National Opinion Poll survey conducted with 2122 adults throughout the UK (Maddock & Hill, 2016). Importantly, while perceptions of food and physical health have been investigated (Paquette, 2005), research on perceptions of food and mental health is scarce.

1.5: Perceptions and understandings of the relationship between food and mental health and health-seeking behaviours

Insights of a link between food and mental health are critical to health professionals and public health strategies (Benyamini, 2011; Petrie & Weinman, 2006). Individuals interpret cultural and social influences, such as social myths, which ultimately shape their mental models of health and illness (Benyamini, 2011). These subjective representations guide individuals' behaviours to cope with health issues (Benyamini, 2011). Importantly, coping strategies mediate the association between the perception of illness, particularly causal beliefs, and its outcome (Leventhal et al. 1992). Accordingly, the way this relationship between food and mental health is perceived influence strategies people use to manage their

health. If people recognise that diet can affect their mental health, they are more likely to be open to strategies directed at dietary improvement. Conversely, if this connection between diet and mental health is not acknowledged, people may not be as accepting of dietary interventions.

Explanatory models of illness can be examined using Leventhal's Common-Sense Model (Leventhal et al., 1992). Leventhal and colleagues (1992) posited that five components underlie illness perceptions: 1) 'Identity' refers to the patients' notions about the nature of their illness (i.e. symptoms), 2) 'Cause' refers to ideas regarding aetiology which guide coping behaviours, 3) 'Timeline' comprises perceptions of the duration of illness, 4) 'Cure/control' consists of the patients' beliefs about the cure and control of their illness and their coping strategies and 5) 'Consequences' mirror the subjectively perceived severity of the illness.

Furthermore, illness perceptions are important because they elicit an emotional response and guide behaviour aimed at managing the illness (Petrie & Weinman, 2006). For instance, patients are more likely to be distressed when aetiology is unknown (Sumathipala et al., 2008). Importantly, while coping strategies are deemed appropriate and necessary by the individual based on their mental model, these beliefs about treatment may differ to the medical model (Leventhal et al. 1992). Greater communication of patients' illness perceptions in consultations with health professionals is crucial to enhance mutual trust, adherence to treatment and service provision (Fenenga et al., 2006; Petrie & Weinman, 2006).

Common-Sense Model:

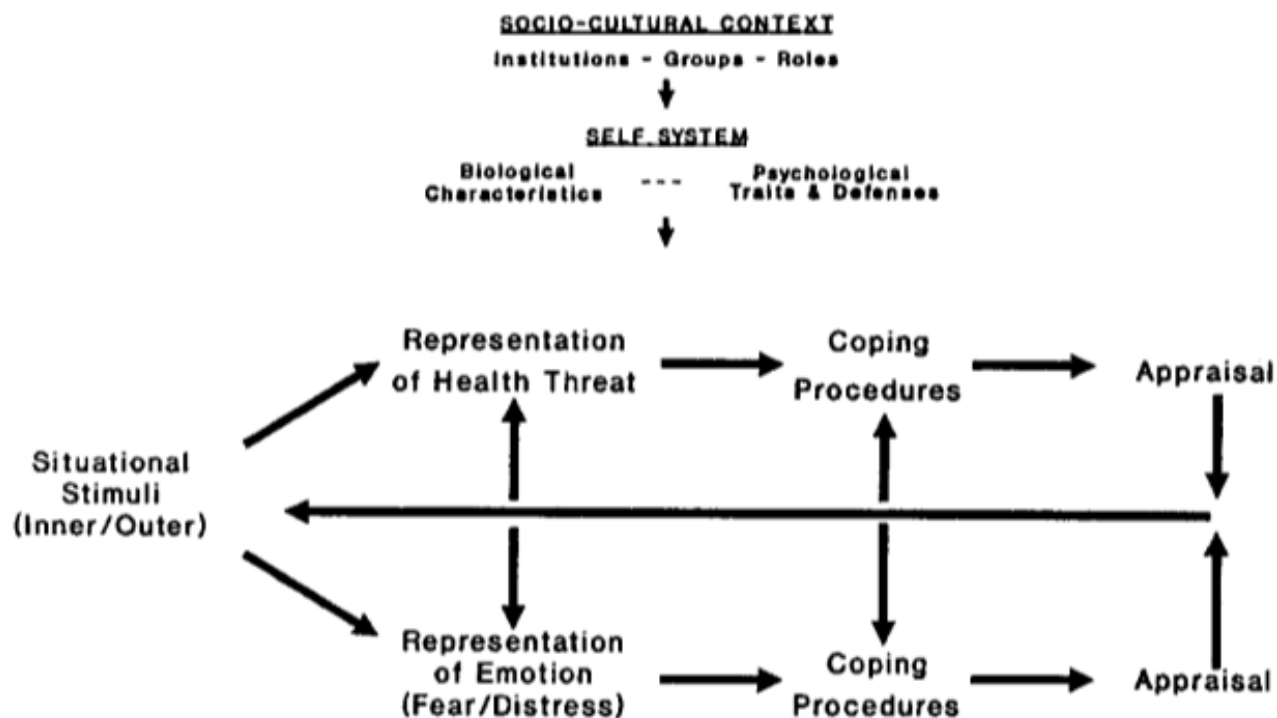


Figure 3. Systems model for analysis of adherence to health promotive and avoidance of health damaging behaviours. (Leventhal et al., 1992).

1.6: The Biopsychosocial Model of Health and Illness

Engel (1977) criticised the biomedical model of health, which until recently dominated western medicine, as it conceptualises the mind and the body as distinct and reduces illness to biological factors. Engel (1977) proposed a holistic approach to health - the biopsychosocial model - and posited illness involves the interaction of biological, psychological and social dimensions which must be attended simultaneously by clinicians. The model emphasises the importance of the patient's subjective experience as a vital factor in health outcomes (Engel, 1977). The mind-brain-gut axis is an example of the biopsychosocial model since it operates via interrelation and interaction of psychological and physiological processes (Wilhelmsen, 2000). Specifically, some gastrointestinal disorders are

characterised by abdominal pain, and the perception of pain can be regulated by anxiety (Wilhelmsen, 2000).

1.7: The Current Study

Research has shown a clear association between food and mental health (McCulloch & Ryrie, 2006, p. 19; Marx et al., 2017). A growing body of research is now examining the mind-brain-gut axis which is involved in the pathogenesis of a series of psychological and physical conditions. Research on perceptions of food and mental health is scarce, and specifically, perceptions of the mind-brain-gut axis have not been investigated. Exploration of these perceptions was approached using the Leventhal's Common-Sense Model, as the model enables insight into explanatory models. Exploration of the way people perceive this relationship may provide insights to guide public education and indicate directions for interventions, particularly within the mind-brain-gut axis. For instance, limited awareness about the axis might mean that people do not recognise the bidirectional link between stress and gastrointestinal symptoms and may therefore not be accepting of psychological interventions.

This study aimed to explore perceptions of a relationship between food and mental health. The following research question guides this study: How do laypeople perceive a connection between food and mental health?

CHAPTER 2: Method

2.1: Participants

A purposive sampling approach was utilised to gain insight into educated laypeople's perceptions (Patton as cited in Braun & Clarke, 2013). Recruitment of participants commenced following approval from the University of Adelaide Subcommittee for Human Research Ethics in the School of Psychology (H-2018-1836). Recruitment involved advertising on the university's online database of first-year psychology students, distribution of an email to second and third-year psychology students via the psychology office administrator, and via campus flyers (Appendix A). After difficulty recruiting participants, further ethics approval was attained to enable individuals outside of the university to participate. Recruitment involved advertising on student clubs' Facebook pages and snowball sampling.

Participants decided between participating in either a focus group or interview. However, when there were insufficient participants for a focus group, participants were offered to participate in an interview instead. Ten participants expressed their interest by signing up via the online database. Eleven participants emailed the researcher. Five of these participants were recruited through snowball sampling.

Participants were over 18 years of age and fluent in English. Participants who were not fluent in English and under 18 were excluded.

2.2: Procedure

Following ethics approval, the researcher conducted interviews and focus groups. The primary supervisor was present at the first focus group in case of an adverse event. The researcher facilitated and conducted the remaining focus groups and interviews. All

participants provided written consent to participate and to be audio-recorded in the interviews and focus groups (Appendix C). Participants' involvement was voluntary, and first-year psychology students at the University of Adelaide received course credit. No other benefit was given or expected for participants (Appendix B).

All focus groups and interviews, besides one telephone interview, were conducted face-to-face and took place in a private room within the University of Adelaide. Interviews ranged between 30 minutes to 50 minutes and focus groups ranged from 45 minutes to 90 minutes. The interviews and focus groups comprised of a series of open-ended, semi-structured questions (Appendix D). Section 2.4 Interview Schedule outlines the development of the interview guide.

The researcher reminded participants of the University of Adelaide's counselling service in the event they experienced distress. Promptly after each interview and focus group, the researcher distributed an email thanking participants for their participation and provided a list of counselling services.

The researcher transcribed all interviews and focus groups with participants' consent. Identifying information was removed from the transcripts to maintain confidentiality and anonymity for participants. Participants' names were thus removed and replaced with numbers. Participants received de-identified transcripts within a week of the focus group or interview. Participants were, therefore, able to certify transcripts were adequately de-identified, hence fulfilling ethical obligations, while also ensuring participant validation. Participant validation is essential to guaranteeing credibility, through allowing participants to critique, collaborate, question and provide feedback concerning findings (Tracy, 2010). Three participants involved in interviews were asked brief follow-up questions via email to ensure clarification and elaboration on particular points. Adjustments were made to the transcripts when requested by participants. De-identified transcripts were also sent to the primary and

secondary supervisor to cross-check themes, thus enhancing the rigour and trustworthiness of findings (Pope et al., 2006).

A recursive method - involving constant movement between phases of analysis - was employed throughout the process of collection of data (Braun & Clarke, 2006). Transcribing and preliminary analysis was conducted for each interview or focus group, before the next interview or focus group. Through this method of constant comparison, saturation of data was able to be identified (Baker & Edwards, 2012).

2.3: Analysis

Thematic analysis was utilised to analyse the data. Thematic analysis is used to identify, analyse and report themes or patterns in data (Braun & Clarke, 2013). As the study explores an under-researched area, thematic analysis is advantageous by enabling rich data (Braun & Clarke, 2006). An inductive and a deductive approach were both taken as the analysis was driven both by the theory and by the raw data (Braun & Clarke, 2013).

The six phases of thematic analysis proposed by Braun and Clark (2006) guided the data analysis. During the first phase, familiarisation with the data, the researcher transcribed interviews and focus groups, actively read and re-read transcripts, and engaged with, and immersed themselves into the data by noting preliminary themes and ideas. In the second phase, the researcher generated initial codes systematically, by working through each data set and electronically highlighting relevant data items. This process was repeated to ensure data was not viewed through the lens of the former data. Extracts were electronically organised into a table and coded. Both latent and semantic codes were generated. Codes were clustered together, along with relevant data extracts, to build and generate potential themes in an electronic file. Potential themes were then reviewed and refined several times, and the researcher checked if themes worked in respect to the coded quotations and the entire data

set. Following consultation with supervisors, the researcher eliminated and adjusted themes and combined themes which overlapped. Themes were defined and named by producing labels for each theme and extract examples were then selected to “compellingly illustrate” each theme (Braun & Clarke, 2006, p. 23). Throughout the phases of analysis, the researcher recorded participants’ perceptions of a link between food and mental health in the audit trail, which involved notes taken following interviews and focus groups along with preliminary analysis. The audit trail provided transparency and evidence of the development of the research and allowed for continual comparison at different phases of analysis, thus enhancing rigour (Tracy, 2010). Throughout the process, the researcher and supervisors worked collaboratively and discussed the themes against the raw data and consequently made further adjustments. Cross-checking the themes with the other researchers reduced the impact of the biases, as recommended by Green and Thorogood’s (2009).

Self-reflexivity contributes to trustworthiness and rigour of qualitative research; therefore, the researcher needs to be self-reflexive by highlighting their personal and intellectual biases (Tracey, 2010). The researcher has a personal interest in gender studies and body image.

2.4: Interview schedule

2.4.1: The use of focus groups and semi-structured in-depth interviews

As the current study examined people’s perceptions and understandings, interviews were ideal as they are used to answer questions relating to people’s experiences (Braun and Clarke, 2013). The interviews were in-depth and semi-structured, guided by the theoretical framework, to allow participants to discuss their beliefs and understandings freely. Focus groups provide a broad range of views, more honest responses from participants compared to

one-to-one interviews and are suitable for examining under-researched areas (Braun & Clarke, 2013). Smaller groups consisting of around 3-8 participants produce rich data (Braun & Clarke, 2013). Thus, both focus groups and interviews were conducted to produce rich data and a deeper understanding of the topic (Braun & Clarke, 2013).

2.4.2: The interview guide utilised within the present study

The interview guide was designed by brainstorming a list of questions related to the research question and guided by the Leventhal's Common-Sense Model (Leventhal et al., 1992). Best practice in qualitative interviewing involves adjustment of questions (Britten, 2006). Adjustments to questions were made after checking their relevance to the research question. Opening questions which were not probing, or direct as later questions assisted in building rapport, which is vital to producing rich and detailed accounts (Braun & Clarke, 2013). Closing questions were generated as they can produce valuable, unexpected data (Braun & Clarke, 2013). Following piloting of a focus group, revisions to the interview guide were made. The use of the interview schedule merely guided interviews and focus groups (DiCicco-Bloom & Crabtree, 2006). Hence, questions were clarified when required. Responses related directly to the research question were explored in more depth.

CHAPTER 3: Results

3.1: Participant characteristics

Participants ($N = 21$), aged between 18 to 25 years of age, participated in 3 focus groups and 8 interviews. Between 3 to 7 participants participated in each focus group. Both women and men participated. Most participants had some background studying health sciences and/or psychology at university. All participants had attained, or are currently attaining, a bachelor's degree.

3.2: Overview of themes

This study explored perceptions and knowledge regarding the link between food and mental health. Through thematic analysis, two overarching themes were generated: 'We only know what we know' and 'Gaps in knowledge about the relationship between food and mental health'. The first theme conveys a lack of awareness about gut health, the influence of food trends on perceptions and knowledge of food and health, and scepticism and perplexity about different food and health discourses. The second theme encompasses findings of perceptions of gut health solely related to food, and lack of awareness about gut bacteria and gut inflammation mediating links between mental health and food. Additionally, this second theme describes lack of awareness of mental health and gut health, limited recognition of the importance of nutrients to promote mental health, and limited knowledge about stress and gut health. Table 1 captures participants' perceptions.

3.3: We only know what we know

3.3.1: We do not know what healthy eating is anymore

Considerable awareness of the importance of gut health, and foods believed to improve gut health were recognised, although participants did not express an underlying knowledge-base. Certain foods and products were believed to contribute to improving gut health, although participants could not identify any specific mechanisms involved:

I know gut health is important, but I don't know how it works at all... I just know what you should eat in order to improve the gut health. (I6, P16, Lines 3301-3392)

Similarly, kombucha was described as “just like medicine” (I8, P21, Line 4245) since it was believed to ease gastrointestinal symptoms. However, this same participant struggled to elaborate on pharmacological mechanisms in greater detail, which further emphasises uncertainty and lack of knowledge about gut health.

Moreover, awareness of gut health was often influenced by the food and health industry. Knowledge of gut health was alluded to being predominantly shaped by advertisements regarding products which claimed to improve gut health. For instance, a participant had “never understood gut health beyond what was explained to [him] in an advert” (I5, P15, Line 3006). This influence of media on perceptions of gut health was further reiterated:

Just on like fitness and health discourses um really... you know in the media um health magazines um Facebook.... all these different health-promoting companies... um talk about having you know healthy gut.... (I1, P8, Lines 1184-1186)

Different discourses on food and health, conflicting information, and rapidly changing information were perplexing and led to difficulty in defining healthy eating. Participants identified multiple and sometimes contradicting discourses about what constituted healthy eating.

Yeah and I think it would be helpful to actually know... what is healthy eating... and what we just see in the media and... things like that... because they say things like 'this is good for you' and the next week 'oh no this is good for you' so... what really is good for you... kind of thing? (FG1, P2, Lines 13-16)

Varying and conflicting information could result in uncertainty and confusion about what constituted healthy eating:

“...you don't know what healthy eating is in today's society” (FG1, P2, Line 218).

Along with confusion, scepticism regarding information on food and health were influenced by contradicting public discourses. Scepticism was expressed about information sourced from media such as commercials, the news and social media:

I feel like the media portrays healthy eating as vegetables, fruits... anything without gluten... sugar... to be honest, I feel like everything can give you cancer if you have too much of it... (I7, P20, Lines 3915-3917)

Moreover, distrust of information on food and health was perceived to be promoted by the dominance of food trends. The health and food industry was perceived to be biased and to prioritise revenue over providing correct information:

...healthy eating is linked way too much on the public image of having a good body when I see an advertisement it's by a female or male with a hot looking body with pecs. It looks so desirable and makes people want to eat healthy which is the purpose of the advertisement it gets people to eat that which is the solely for the revenue of the organisation and not for the purpose of healthy eating. (FG1, P1, Lines 233-238)

Food trends significantly influence perceptions and food choices through distrust of, and confusion about, information on food and health. Even when the effectiveness of a food or a product on gut health was questioned, food trends prompted consumption:

I think to begin with because [kombucha] was trendy and then I found out it was a probiotic and probiotics are meant to be good at flushing out toxins in your body I don't know much about probiotics, but again that's what I've been told so who knows? (I7, P20, Lines 4004-4007)

Distrust of information on food and health was further conveyed by participants questioning if food trends influenced health products or whether scientific findings substantiated their effectiveness. Specifically, a lack of trust of scientific findings and health promotion initiatives were expressed:

.... it's just like what is [healthy eating]? The uhh... the heart tick? It's like oh yeah if the food has that it's fine but like is it fine? Maccas has that for one of its burgers, and you're just like it's the whole company now? It's like no... it's kind of like you just don't know what healthy is anymore. You just need to stick to the basics and hope that that's healthy. (FG1, P2, Lines 591-598)

Uncertainty about food and health and what constituted healthy eating was also understood to be influenced by limited public education. A lack of public education on gut health and mental health through public health campaigns was described:

Even though there has seemingly been a push to increase the public's awareness about mental health, as evidenced by TV adverts, news articles etcetera... I don't recall ever noticing anything in the media about the relationship between gut health and mental health. (I5, P15, Lines 3052-3055)

Furthermore, the media was perceived to be engrossed with advertisements on junk food, consequently overshadowing the limited media coverage on mental health and healthy eating.

There is more advertising on junk food than there is on healthy eating or mental wellbeing. (I6, P16, Lines 3356-3357)

Primary, secondary and tertiary schooling was also observed to provide scarce information and education regarding the association between food and mood or mental health:

Our education system does not go into detail on how eating the right food will affect your mood, vice versa... I remember in primary school we might've touched on some of this. In high school we studied a bit on health during P.E. Even then, it was at most a week's worth of curriculum. (I6, P16, Lines 3347-3350)

Furthermore, the education system was believed to provide inadequate information on factors mediating an association between food and mental health. Knowledge about such mechanisms was understood to be critical in informing health behaviours to promote well-being:

But if you're not studying health, nutrition or science specifically, you won't go into detail on the "hows" and after all, understanding "how" will not only help you remember it but also give you a better understanding and thereby empowering you with better decision-making skills. (I6, P16, Lines 3350-3354)

3.3.2: *The gut is a mystery*

When asked about the definition of gut health, participants were aware of the term, although provided vague explanations, spoke with uncertainty and struggled to elaborate:

... I guess when I think of gut health I think of my stomach and digestive system and that being well regulated and not being out of balance in terms of I don't know I think bad gut health is being bloated or.... (FG3, P19, Lines 3753-3755)

Limited knowledge and ambiguity were reiterated:

[Gut health is] really complicated and a bit of a grey area. (FG3, P18, Lines 3769-3770)

Uncertainty about mechanisms of symptoms relating to the digestive system, such as bloating, changes in bowel functioning, acid reflux, abdominal pain and abdominal cramps, were articulated. For example, the cause of bloating was described as a “mystery” (FG2, P3, Line 1750).

Furthermore, varying conceptualisations of the digestive system were described, with participants asking for clarification about what was meant by the term “gut”.

.....Your gut is... it's where all the food is processed, right? (I1, P8, Lines 1176-1177)

Ambiguity and confusion regarding the role of gut bacteria on gut health were expressed. For example, one participant expressed being “curious” about what gut bacteria were, describing them as “bizarre” (I5, P15, Line 3005). Moreover, a sparse degree of knowledge was articulated, and this participant mentioned his awareness was restricted to a notion of “good and bad bacteria living in [the] gut” (I5, P15, Lines 3006-3007).

Moreover, a lack of awareness about gut health was further emphasised. One participant described gut health as “invisible”, stressing “people don’t understand gut health” (FG3, P18, Lines 3786-3788). Other laypeople were perceived to share a sense of uncertainty when discussing gut health due to limited understanding:

..... Gut health can affect a person in so many ways but is poorly understood or known about at the moment for most people I mean some people would know a lot, but I think yeah for laypeople like us we don’t know a lot. (FG3, P18, Lines 3870-3872)

Educated laypeople were also understood to have limited knowledge of gut health:

...I think this has made me realise that I don’t know nothing and that maybe other students don’t know much either. But I do think it’s really important and the fact I don’t know that much and the fact I’m a university student with an undergraduate degree I think that kind of says a lot that maybe we need to know a bit more. (F3, P18, Lines 3854-3855)

Additionally, a lack of awareness about gut health was not limited to laypeople.

Health professionals were believed to lack knowledge regarding gut health and this negatively impacted patients' psychological wellbeing:

...You might feel really down because you may feel like something's wrong with you especially if people don't really understand or if you don't even know what's going on especially if you see doctors and specialists and they can't even tell you what's happening. (FG3, P18, Lines 3781-3784)

Some health professional's causal beliefs of gut health differed to the causal beliefs of the gastrointestinal symptoms the patient presented with. Rather than adhering to the prescribed medication, the patient consumed fermented foods to manage symptoms. The patient believed that the health professional did not attempt to understand their causal beliefs:

I got misdiagnosed and I was given antibiotics (...) and it killed off all of my good gut bacteria and so I couldn't digest food easily and because the acid levels in my stomach were low (...) it would come up as acid reflux (...) I went to doctors and they gave me antacids which made it worse because it reduces the level of acid in your stomach (...) they didn't really try and understand what I was trying to tell them. (FG2, P13, Lines 2299-3306)

3.4: Gaps in knowledge about the relationship between food and mental health

3.4.1 Gut health is just related to food

Participants predominantly associated with gut health with food and the digestive system. For example, gut health was primarily defined as the digestive process being “regulated and “balanced” (FG3, P19, Line 3754) and “in sync” and “in harmony” (I1, P8, Line 1179). As illustrated in Table 1, fermented foods, probiotics, kombucha and diets high in fibre were perceived to enhance gut health, and specifically, improved digestion, bloating and acid reflux. Abdominal pain, cramps and lethargy were attributed to intolerances to foods, such as dairy and gluten:

With dairy, I get pretty bad stomach cramps sometimes... sometimes if it has dairy in it and I eat it I don't feel too bad like my stomach will growl and kind of cramp up and gluten is the same... (FG2, P2, Lines 1419-1421)

Moreover, poor digestion was attributed to the consumption of fast foods and processed foods:

...when, for example, I eat healthy foods because I have trouble with my digestion especially when I eat fast food and it affects me a lot because when I can't digest food and fast food. (I4, P14, Lines 2562-2564)

Gut health was perceived to be solely mediated by food, and thus the digestive system was conceptualised as independent of the mind and brain. Consequently, the link between gut health and mental health was discarded.

3.3.2: No recognition of, or uncertainty about, the gut microbiome mediating a relationship between food and mental health

The importance of the gut microbiome, in mediating mental health and gut health was rarely recognised, although when it was, its relevance was difficult to explain.

Gut bacteria were rarely described as a mediator between mental health and food consumption. However, the effect of nutrients on inflammation of the gut and in turn inflammation in the brain which is associated with mental health disorders was not mentioned or recognised:

.....so if the neurons are working efficiently due to you eating healthy that would have an impact on whether there is enough dopamine or serotonin or...yeah adrenaline being produced in the brain....other parts of your body.... so that way it would have an impact on your mood but then again, I don't know how strong an evidence-base there is for this. (I2, P12, Lines 2474-2479)

Although processed foods were perceived to influence poor mental health through impairment of brain functioning, the possibility of gut dysbiosis mediating this connection was not mentioned or recognised:

Certain chemicals in some foods are not supposed to be in our bodies... so these chemicals affect many organs throughout our body such as our brain which then affects our mental health. (I8, P21, Lines 4267-4269)

Similarly, an association between mental health and gut health was recognised, although gut bacteria were not mentioned or acknowledged to be a mediator (See Table 1).

Likewise, impairment of gut microbiota due to HPA activity and the effect of external stressors on HPA activity, and ultimately gut bacteria, was not mentioned. Even when a link between the mind, brain and gut was articulated, the complexities and the role of gut bacteria in this link was again not acknowledged:

I think the gut is connected to everything, I think it is the most essential part of the human body because that's where you're getting your energy from and you need that to run, to be a human being and the brain is like the most important part of being a human being and so and it's a big consumer of whatever the gut is producing like whatever energy yeah contributes to making and that is why there is this connection.
(FG2, P12, Lines 2400-2405)

Gut bacteria were rarely recognised to mediate links between mental health and food consumption, and mental health and gut health. When the gut bacteria was recognised to be important, ambiguity was conveyed. A vague awareness of gut bacteria mediating mental health was expressed:

My dad has been into this thing called I think it's called GAPS yeah... gut and psychology syn-- something and it looks at how your mood and your emotional wellbeing is related to the gut flora like the bacteria and the yeah the whole pH value of your gut. (FG2, P12, Lines 2031-2304)

Additionally, gut bacteria were speculated to mediate gastrointestinal symptoms, and again uncertainty was expressed:

...I don't know it's my stomach that happens first and then it's the muscle soreness and then overall feeling lethargic so yeah I don't know if it's changing the bacteria in my stomach or if it's just causing like muscle cramps like abdominal muscle cramps um but yeah it's all like it starts in my gut and comes out so. (FG2, P3, Lines 1917-1921)

3.4.2: Varying and vague understandings of a relationship between food and mental health

Participants expressed varying perceptions and gaps in knowledge regarding mental health and food consumption and mental health and gut health. Food and mental health were perceived to be related, although participants did not mention, and struggled to articulate, the importance of nutrients mediating this link (see Table 1). For example, a mediator between food and mental health was not recognised or difficult to articulate. Mental health was understood to guide food choices, and a persistent poor diet was speculated to impair mental health:

Yeah, I think it can go both ways I do agree that a lot of the times your mental health would inform your food choices, but I definitely think that the food will impact your mental health, but maybe it's more if you do it for a longer period of time... (F3, P18, Lines 3669-3672)

Furthermore, while a link between food and mental health was recognised, limited knowledge or uncertainty about this connection was expressed:

So.... If there's a connection between mental health and what you eat? Yeah, definitely but I'm not sure how I'd define that... (I5, P15, Lines 2971-2973)

Varying and vague conceptualisations of a link between food and mental health were also articulated, along with uncertainty. At times, the importance of nutrition in relation to mental health was not recognised. Specifically, food was recognised as contributing to shifts in mood over the short term but not as contributing to long-term mental health issues:

But in terms of whether it contributes feeling more severe moods like feeling depressed, feeling anxious... I'm not sure but it does I feel contribute to these mini shifts in your mood... but over a long period of a time, I don't know how much of an effect it has in terms of contributing to a clinical diagnosis of depression or anxiety. (I2, P12, Lines 2411-2415)

Additionally, while mental health was perceived to influence food choices, food choices were not understood to impact mental health, discarding the role of diet in informing mental health:

I think it would be mental health first then food choices rather than food choices impacting mental health. (F3, P19, Lines 3663-3664)

The benefits of food on mood were perceived as merely a mental phenomenon, and the influence of food was likened to a “placebo effect” (FG1, P1, Line 618) or mediated by an association to specific events, such as a relationship breakup (FG1, P1, Line 450).

Stress and gut health was perceived to be connected, although conceptualisations of this link varied and were rarely understood to be bidirectional (see Table 1). The role of acute stress on gastrointestinal symptoms was recognised. For instance, the stress response was posited as a possible mechanism for eliciting gastrointestinal symptoms through slowed digestion decreased appetite, and altered bowel function:

... my body is just focusing on the central nervous system is probably completely activated, and then you have the sympathetic one going (...) I mean when people are nervous they um have like... diarrhoea and stuff..... so maybe that has an impact as well um that your body is um focusing on these other factors... the stress levels... (I1, P8, Lines 1213-1220)

While acute stress was recognised, conversely, the effect of chronic mental health problems on gut health was rarely mentioned and more difficult to articulate:

...Mental health maybe over a period of time..... I think that hypothetically depression is a good one to use as an example... your body I guess again may not produce the correct or... that's a tough question yeah...hmm... I don't know.... (I7, P20, Lines 4089-4094)

Uncertainty and limited knowledge were also expressed about a bidirectional link between gastrointestinal symptoms and stress. Additionally, the effect of stress on abdominal pain was recognised although doubt was expressed:

[Abdominal pain and stress] are interrelated, so it seems like when... and health is something that he... worries a lot about when he gets stomach problems, and then when he gets more anxious, it gives him more stomach problems or that's what I think happens anyway. (F3, P17, Lines 3839-3842)

CHAPTER 4: Discussion

4.1: Overview

The current study utilised qualitative methods to explore perceptions and understanding of the link between food and mental health. The two overarching themes that were generated capture these perceptions and understandings: ‘We only know what we know’ and ‘Gaps in knowledge about the relationship between food and mental health’. The first theme highlights the dominance of food trends amid public distrust and confusion. The second theme highlights vague and varying perceptions, and gaps in knowledge, of the relationship between food and mental health. These themes along with related findings are discussed amid this study’s broader implications.

4.2: We only know what we know

4.2.1: *We do not know what healthy eating is anymore*

Perceptions of health and illness are shaped by the individual’s socio-cultural context (Benyamini, 2011). Accordingly, food trends predominantly formed participants’ perceptions and knowledge. The multiple, rapidly changing and regularly contradicting, discourses on food and health often shaped perceptions and knowledge of a relationship between food and mental health. These findings are consistent with literature which stresses laypeople are perplexed by an abundance of varying and conflicting information and unfamiliar terminology (Maddock & Hill, 2016). Consequently, distrust and confusion ensued, as participants sought to make sense of these baffling discourses and terminology, of which they are bombarded with, by multiple sources. Participants’ difficulty in assimilating these messages resulted in uncertainty in discerning what constituted a healthy diet. Moreover, inadequate information on food and mental health were observed to be provided through media and the education system, leading to vague and varying conceptualisations of this

relationship. Insufficient information, along with distrust and confusion of food and health discourses, may amplify the influence of food trends on perceptions and knowledge.

Essentially, advertising discourse is persuasive and compelling in a society predominantly influenced by consumerism (Fairclough, 2003). These findings align with the literature on illness perceptions, as participants attempt to decipher societal and cultural messages about health and illness which inundate them (Benyamini, 2011).

4.2.2: The gut is a mystery

Food trends predominantly influenced limited knowledge and vague conceptualisations of gut health. Participants built these mental models, albeit with limited information and turned to food trends to make sense of gut health. Food advertising messages were sometimes found to restrict participants' knowledge, accounting for their lack of understanding about the aetiology and pathophysiology of gut health. For instance, while participants assigned gastrointestinal symptoms to gut health, they were unable to cite a cause for these symptoms. This uncertainty about causal beliefs leads to ambiguity about strategies to manage gastrointestinal symptoms. Leventhal and colleagues (1992) posit causal beliefs about health significantly guide coping strategies. Although individuals were dubious of food trends, their knowledge, and consequently their food choices, were influenced by rampant messages from the food and health industry. Participants consumed foods lacking an evidence-base for improving gut health to manage symptoms. Public distrust and confusion about information on food and health may generate even more significant influence of food trends on perceptions and knowledge.

Lack of awareness and uncertainty about the aetiology of gut health has further implications on health outcomes. Leventhal and colleagues (1991) posit health threats elicit emotional reactions which interact with representations of illness. Patients are typically more

distressed when aetiology is unknown (Sumathipala et al., 2008), and importantly, heightened stress can exacerbate gastrointestinal symptoms (Pellissier & Bonaz, 2017). The limited understanding of gut health may, therefore, worsen health outcomes, by intensifying anxiety and worsening gastrointestinal symptoms.

Some health professionals were also perceived to be ill-informed about gut health, and this belief may have implications for health outcomes. The possible lack of discussion of, or lack of information provided about, gut health by health professionals may provoke anxiety, in turn, exacerbating gastrointestinal symptoms (Pellissier & Bonaz, 2017).

Furthermore, this study identified that some patients disagreed with the explanatory model of gut health provided by health professionals. The health professional's causal beliefs of gut health differed to the causal beliefs of the gastrointestinal symptoms the patient presented with. Rather than adhering to the prescribed medication, the patient consumed fermented foods to manage symptoms. These findings align with literature which demonstrates that differences between explanatory models of health professionals and patients can effect non-adherence to treatment (Petrie & Weinman, 2006) and poor trust (Fenenga et al., 2016).

Participants' perceived indifference of health professionals towards laypeople's explanatory models of gut health also has implications for health outcomes. Health professionals' understanding of patients' explanatory models can contribute to suitable service provision and establish mutual trust (Fenenga et al., 2016; Petrie & Weinman, 2006). Importantly, this belief may reflect the declining confidence in medical practitioners and reliance on unconventional approaches to illness (Ward, 2017). This distrust of the medical profession and dominance of food trends impacts coping strategies which can be detrimental to health outcomes.

4.2.3: Gaps in knowledge about the relationship between food and mental health

4.3.1: Gut health is just related to food

The growing interest in gut health in the media and subsequent promotion of foods claiming to improve gut health, along with limited information, perpetuate a notion that gut health is solely mediated by food. Accordingly, gastrointestinal symptoms were thought to be caused by food intake or food intolerances, and as a means of alleviating symptoms, people engaged in disordered eating. Specifically, people restricted intake of, or eliminated, certain foods in their diet and skipped or delayed meals. The consumption of foods claiming to enhance gut health to improve gastrointestinal symptoms was also provoked as food was believed to mediate gut health. Evidence to support such health claims, however, is scarce and underway (Ford et al., 2014; Khalesi et al., 2018). Leventhal and colleagues (1992) theorise beliefs about the causes of illness guide people's coping strategies. Accordingly, as gut health was solely believed to be mediated by food, this causal belief prompted disordered eating and consumption of foods claiming to improve gut health for which there is a limited evidence base.

4.3.2: No recognition of, or uncertainty about, the gut microbiome mediating a relationship between food and mental health

The significance of gut microbiome and its link to mental health and physical health disorders were largely discarded in this study (Cryan & Dinan, 2012). Essentially, the gut microbiome was merely associated with the digestive system. Occasionally, awareness of gut bacteria was conveyed, although uncertainty and limited knowledge of their role were expressed. For instance, while specific diets were recognised to impair brain functioning, the impact of diet on gut dysbiosis and inflammation, and ultimately on mental health were not

mentioned (Marx et al., 2017). Additionally, the impact of stress on the gut microbiome and its effect on mental health was also not recognised (Allen et al., 2017; Galley & Bailey, 2014). Individuals may not be informed to make the appropriate changes to improve their health due to the limited awareness about the importance of the gut microbiome. Specifically, the significance of following a diet which does not impair the gut microbiome and managing stress, such as through psychological interventions, are discarded.

4.3.3: Varying and vague understandings of a relationship between food and mental health

Participants were found to lack knowledge and articulated perceptions which were vague, varied and sometimes inconsistent with the literature. Importantly, their conceptualisations disregarded the importance of nutrition in promoting mental health. In some cases, limited knowledge and uncertainty about what a relationship between food and mental health entailed were expressed. Conversely, participants expressed a more sophisticated understanding of food choices and mood, as demonstrated in Table 1. For instance, diet was believed to affect mood over the short term but was not recognised to contribute to long-term mental health disorders. Mental health was similarly speculated to guide food choices, but food choices were not believed to influence mental health.

Research demonstrates an association between diet and mental health (McCulloch & Ryrie, 2006). Nutritional factors are important as they mediate this association (Lim et al., 2016; Sathyanarayana Rao, 2008). For instance, nutritional factors act as precursors for neurotransmitters and subsequently assist in enhancing and regulating mood (Lim et al., 2016; Sathyanarayana Rao, 2008), and individuals with mental health disorders are deficient in these precursors (Sathyanarayana Rao, 2008). Importantly, if individuals do not recognise the significance of nutrients mediating this connection between food and mental health, they are less likely to follow a diet to improve their health, and so dietary interventions are of little

use. As causal beliefs are strongly associated with coping strategies, (Leventhal et al., 1992), knowledge of this connection is vital, so that diets are perceived to be appropriate and necessary for promoting mental health.

Participants had limited awareness of the mind-brain-gut axis. Varying and vague perceptions of an association between stress and gut health were found, and this relationship was rarely recognised to operate bidirectionally. For instance, the stress response and psychosocial factors were identified to trigger gastrointestinal symptoms. Nevertheless, limited awareness and understanding of a bidirectional relationship between abdominal pain and stress were found. This lack of awareness about the mind-brain-gut axis means the importance of its role in mental health and physical health are discarded. Consequently, people may not recognise that psychological interventions are crucial to health issues arising from dysfunction of the mind-brain-gut axis by reconciling psychological and physical discomfort and distress (Ballou & Keefer, 2017). Psychological interventions play a critical role in the management of some gastrointestinal symptoms, and distress associated with these symptoms (Ballou & Keefer, 2017). Lack of awareness could mean an individual may not recognise stress can prompt abdominal pain and, subsequently, discard the significance of psychological interventions. CBT could be particularly useful by providing psychoeducation on the stress response and its impact on abdominal pain (Ballou & Keefer, 2017). Through developing awareness into cognitive and behavioural responses to and fear of abdominal pain and altering these responses to alleviate anxiety as well as physical discomfort (Ballou & Keefer, 2017). While stress provokes the onset of gastrointestinal symptoms, stress can also amplify the severity of gastrointestinal symptoms (Pellissier & Bonaz, 2017), further highlighting the importance of psychological interventions (Ballou & Keefer, 2017). For instance, hypnotherapy moderates abdominal pain by directly improving visceral sensitivity, gastrointestinal function, cognitive patterns, anxiety and depression which heighten the

experience of discomfort (Ballou & Keefer, 2017). Hypnotherapy may also regulate pain processing in the anterior cingulate cortex (Ballou & Keefer, 2017). Lack of awareness about the possibility of stress amplifying the perception of abdominal pain and the way abdominal pain can, in turn, affect stress could mean people do not recognise the importance of psychological interventions to manage symptoms.

While the effect of acute stress on gut health was recognised, limited understanding of long-term mental health and gut health was found. Literature highlights the occurrence of mood disorders is predictive of developing gastrointestinal disorders such as IBS and IBD (Koloski, Jones & Talley, 2016). Also, chronic stress worsens IBD (Ballou & Keefer, 2017) and IBS is associated with dysfunction of an acute stress response (Kennedy et al., 2012). Catastrophising and hypervigilance to negative stimuli could further result in maintenance of IBS (Kennedy et al., 2012). Given the role of persisting stress, psychological interventions target physiological processes by diminishing arousal of the autonomic nervous system, moderating stress-response, and decreasing inflammation are critical (Ballou & Keefer, 2017). Addressing unhelpful thinking patterns, which cause both distress and physical reactivity, through CBT have been shown to be beneficial in the management of gastrointestinal symptoms (Ballou & Keefer, 2017). Beliefs about aetiology and timeline of illnesses are strongly linked to coping strategies (Petrie & Weinman, 2006; Leventhal et al., 1992). Accordingly, if the impact of long-term stress and cognition on severity and maintenance of gastrointestinal symptoms are not recognised, people are less likely to adopt strategies to decrease their stress to manage their symptoms. Psychological interventions would therefore not be perceived as appropriate or necessary (Leventhal et al., 1992). Subsequently, worsening of symptoms and maintenance of symptoms may ensue.

4.4: Implications

4.4.1: Health promotion

Public health campaigns may involve media advertisements, as the media and specifically television advertising, was perceived to fail in raising awareness of the relationships between gut health and mental health and food consumption and mental health.

4.4.2: Health professionals

Participants' insights obtained in this study may have implications for healthcare delivery. These findings highlight the importance of health professionals to establish rapport to diffuse public distrust of healthcare and enhance treatment adherence. Furthermore, participants' perceptions demonstrate a lack of understanding of diet on mental health and lack of awareness about the mind-brain-gut axis. It is possible health professionals do not discuss or provide information on gut health. It is vital health professionals provide patients with insight into the appropriate diet to maintain and enhance mental health and to communicate the role of the mind-brain-gut axis on health. It is vital to ensure health professionals provide education on the role of stress and cognitive patterns in triggering and exacerbating gastrointestinal symptoms, and the importance of recognising stress and cognitive patterns in alleviating both distress and physical symptoms. By providing patients with appropriate information, patients are more likely to grasp the relevance of psychological interventions, to best promote their health.

4.4.3: Curriculum within university, secondary school and primary school

University curriculum was believed to not provide adequate education on gut health, the relationship between gut health and mental health, and the relationship between diet and mental health. Primary and secondary education, too, was observed to fail in addressing the

association between food and mental health. To enhance understanding of these links, the education system ought to utilise a biopsychosocial approach and thus provide awareness of the interaction of biological, psychological and social factors which influence health.

4.5: Strengths

The primary strength of this study is its contribution to a scarce body of research. Food trends were found to influence limited awareness of a connection between gut health and mental health, and consequently, this may mean people do not recognise the importance of diet or psychological interventions. Accordingly, this finding is valuable to the research on the mind-brain-gut axis by demonstrating that socio-cultural context impacts on treatment within the axis.

The use of a qualitative design was advantageous in the study. The utilisation of focus groups and interviews allowed investigation of perceptions and generation of rich data. Participants were both women and men, thus producing rich data as a diverse range of perspectives were explored.

The utilisation of Leventhal's Common-Sense Model as a theoretical framework and guide for interviews allowed a comprehensive exploration of participants' perceptions and understandings, producing rich data.

As data saturation was reached, it can be assumed adequate data were collected in the study (Tracy, 2010). Credibility was enhanced through participants' genuine interest in the purpose of the study, evidenced by reading their interview transcripts and responding to follow-up emails (Tracy, 2010). This interest suggests participants found the study valuable and meaningful (Tracy, 2010). Trustworthiness and rigour were enhanced as the project

supervisors cross-checked themes, preliminary analysis and interview transcripts (Tracy, 2010). Transparency was improved using an audit trail (Tracy, 2010).

The researcher's acknowledgement of the role of their assumptions and biases in the research is critical (Tracy, 2010). Accordingly, the researcher was required to be conscious of assuming female participants similarly perceived food and mental health through a gendered lens. To mitigate these biases, the researcher actively recognised her interests and values throughout the study.

4.6: Limitations and future research

The study captures a specific population as all participants were tertiary educated, predominantly had a background in health sciences and typically expressed interest in health, fitness and dieting. All participants resided in South Australia. Due to time constraints, participants' ages were restricted to range between 18 and 25, thus producing less diverse responses and allowing rapid data saturation. Future research exploring perceptions across different age groups, educational backgrounds, and various states would be valuable to gain richer insight.

Additionally, these findings demonstrate a gap in knowledge and may guide quantitative research within public health by examining large-scale perceptions of the mind-brain-gut axis.

Participants held varying understandings of gut health and the digestive system. EMs vary across societies (Fenenga et al., 2016) and interpretations of gastrointestinal symptoms vary across cultures (Francisconi et al., 2016). Future research could investigate perceptions across different cultural backgrounds.

Participants perceived health professionals as lacking understanding about gut health. Perhaps health professionals are ill-informed. However this cannot be concluded by the current research as health professionals were not interviewed. There could be several other explanations: health professionals may not discuss the role of the mind-brain-gut axis in symptom generation; health professionals may not communicate clearly, or at a level the patient understands, or the patient may not be accepting of any further information following negative test results. To clarify these findings, future research could involve triangulation with health professionals, to explore their perceptions and understanding of the mind-brain-gut axis.

4.7: Conclusion

This study emphasises a lack of public awareness of the relationship between food and mental health. This study provides insight into the way broader trends at an interpersonal, societal and cultural level impact upon the mind-brain-gut axis and indicate directions for interventions within the axis. Specifically, food trends are rampant and were found to perpetuate a notion that the digestive system was independent of the mind and brain. Sparse knowledge was largely derived from these food and health discourses. This limited knowledge contributed to disordered eating and consumption of foods with a limited evidence-base of improving gut health. Potentially, a lack of awareness can lead to poorer health outcomes by resulting in heightened anxiety and worsening of gastrointestinal symptoms. Meanwhile, the significance of psychological interventions in managing gastrointestinal symptoms and the role of diet in mental health were discarded. Greater knowledge of this connection is vital, so that dietary interventions are perceived to be appropriate and necessary for enhancing mental health, and psychological interventions are deemed suitable for managing gastrointestinal symptoms. Public education through health

promotion, ensuring health professionals provide appropriate information and addressing curriculum in the education system is required to therefore guide appropriate use of such interventions. Furthermore, the current research prompts for further research to gain insight into health professionals' perceptions and knowledge of the mind-brain-gut axis, to improve communication in consultations and health outcomes. Additionally, these findings may guide quantitative research within public health that examines public perceptions of the mind-brain-gut axis.

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Tables

Table 1

Participants' perceptions of a connection between food and mental health.

| LABEL | CAUSE | TIMELINE | CURE/CONTROL | CONSEQUENCES |
|---|--|-------------------|---|--|
| <p>Mental health informing food choices</p> <p>Poor mental health and restricting or amplifying food in-take</p> | <p>Food beliefs (Labelling foods)</p> <p>Unknown mechanism Uncertainty about mechanism - Food is a coping mechanism Self-worth Individual differences</p> | <p>-</p> <p>-</p> | <p>Psychological intervention Change food beliefs</p> <p>-</p> | <p>Disordered eating (e.g. restrictive eating, binge-eating, emotional eating)</p> |
| <p>Recognition of a relationship between food and mental health, uncertain about what this link entails</p> | <p>Uncertainty Unknown mechanism</p> | <p>-</p> | <p>-</p> | <p>-</p> |

| LABEL | CAUSE | TIMELINE | CURE/CONTROL | CONSEQUENCES |
|--|--|------------------|--|---|
| <p>Mood informing food choices Comfort eating/Stress eating/Binge eating</p> <p>Emotional eating</p> | <p>Motivation/Lethargy Self-worth Food is a coping mechanism Taste is rewarding</p> <p>Hormones and stress levels inform cravings Emotional connection: Associating food with events/situations Conditioning – certain foods used to reward behaviour in childhood</p> | <p>Temporary</p> | <p>Changes in mood change food choice</p> | <p>Weight gain/weight loss Guilt/self-blame</p> <p>Guilt/self-blame</p> |
| <p>Food choices influencing mental health</p> | <p>Food beliefs (Labelling foods)</p> | <p>-</p> | <p>-</p> | <p>Guilt Self-esteem Social life and social activities Daily life Social relationships (Externalising anger) Self-esteem and self-concept</p> |

| LABEL | CAUSE | TIMELINE | CURE/CONTROL | CONSEQUENCES |
|--|---|---------------------|--|--------------|
| Food choice influencing mental health | Food beliefs (Labelling foods as “good/bad”, “healthy/unhealthy”) | - | Changing food beliefs | - |
| Associating certain foods with a relationship break-up Cooking for family enhances mood | Placebo effect Emotional connection Conditioning emotions to foods Association to an event Evocations of caring | - Temporary | Changing food beliefs Macro-counting Changing food beliefs | - - |
| Junk food = Feeling lethargic, irritated, depressed or anxious | Lack of nutrients (impact brain functioning) | - | Changing diet Probiotics Kombucha | - |
| Neurotransmitter production influencing mood and ultimately mental health | Nutrients (regulate neurotransmitter production) | - | - | |
| Both psychological and biological mechanisms on mental health (Mechanisms intertwine or could be separate) | Food beliefs and physiological reactions to food | Change food beliefs | Change food beliefs | - |
| Either psychological or biological mechanisms | Food beliefs or physiological reactions to food | Change food beliefs | Change food beliefs | - |

| LABEL | CAUSE | TIMELINE | CURE/CONTROL | CONSEQUENCES |
|--|---|------------------------|--|---|
| Food choice influencing mood | Blood sugar levels | Temporary | Change diet | - |
| | Nutrients (Energy provision or depletion) | Temporary | Change diet | No mental preoccupied with food |
| | Taste is rewarding | Temporary | - | - |
| Food impacting brain functioning Diet enhancing brain functioning Diet impairing brain functioning | Blood sugar levels Nutrients | - | - | - |
| | Chemicals in foods | - | - | - |
| Bidirectional relationship between food and mental health Food beliefs, food choice and food consumption reflect mental health | Nutrients (Energy provision or depletion) Nutrients (Carbohydrates) Food is a coping mechanism Uncertainty Individual differences Food beliefs | - Temporary | - Change in mood Changing food beliefs Improving mental health/self-image | - Unhealthy relationship with food = Disordered eating e.g. Binge eating, restrictive eating, Healthy, positive relationship with food = Balanced diet, not restricting food intake or food groups |

| LABEL | CAUSE | TIMELINE | CURE/CONTROL | CONSEQUENCES |
|---|--|---|---|---|
| <p>Gut health influencing mental health</p> <p>Gut disorders influencing mental health</p> <p>Gastrointestinal symptoms result in stress</p> | <p>Unknown mediator Uncertainty</p> <p>Mind-brain-gut axis - Visceral messages</p> <p>Symptoms provoke anxiety Anticipation of symptoms provoke anxiety</p> <p>Psychosocial factors: Self-esteem Social isolation (alienation)</p> | <p>-</p> <p>-</p> <p>Distress occurs in anticipation of gut problems, during and after</p> <p>-</p> | <p>-</p> <p>-</p> <p>Changing diet to ease bloating Drinking water</p> <p>-</p> | <p>-</p> <p>-</p> <p>Daily life (university attendance) Social life Social activities Poor self-esteem Social withdrawal Daily life Social activities</p> |
| <p>Mental health influencing gut health</p> <p>Chronic mental health problems</p> | <p>Unknown mediator Uncertainty</p> | <p>-</p> | <p>-</p> | <p>-</p> |
| <p>Acute stress influencing gastrointestinal symptoms (e.g. altered bowel function, poor digestion) and decreased food-intake</p> | <p>Stress response Gut bacteria Uncertainty</p> | <p>Temporary</p> | <p>-</p> | <p>-</p> |

| LABEL | CAUSE | TIMELINE | CURE/CONTROL | CONSEQUENCES |
|--|--|------------------|--|--|
| <p>Bidirectional link between mental health and gut health Abdominal pain and stress are interrelated</p> | <p>Unknown mediator Uncertainty</p> | <p>-</p> | <p>-</p> | <p>-</p> |
| <p>No connection between gut health and mental health Food intolerances (Abdominal pain/cramps/lethargy) Poor diet = poor gut health Processed foods/foods high in fat = poor digestion</p> | <p>Difficulty articulating mechanism Food beliefs Food intolerances (e.g. dairy, gluten) Fatty foods Carbonated drinks High salt diet Gut bacteria Stomach acid levels</p> | <p>Temporary</p> | <p>Restricting certain foods Probiotics Kombucha Improving diet High fibre diet Fruit and vegetables Nutrients Fermented foods Plant-based diet</p> | <p>Disordered eating (e.g. restrictive eating, skipping/delaying meals) Poor self-esteem</p> |

Appendix A: Flyer



YOU ARE WHAT YOU EAT... RIGHT?



PARTICIPATE IN A PSYCHOLOGY STUDY!

Focus groups and interviews are being run to explore your insights on:

- Healthy eating
- Food and health
- Certain foods (e.g. probiotics and fermented foods)
- What influences your understandings


WHO CAN PARTICIPATE?

Anyone who is:
Between 18-25 years
Fluent in English

WHEN?

Focus groups
Thu 7 June - 10 AM
Thu 21 June - 10AM
Interviews
Arranged at a time
that suits you

HOW CAN I GET INVOLVED?

Contact the student researcher:

1st year psychology students sign up via
the RPS to receive 1.5 credits

The study has been approved by the Human Ethics Research Committee

Appendix B: Participant Information Sheet

PARTICIPANT INFORMATION SHEET

PROJECT TITLE: Lay understandings of the connection between gut health and overall health
APPROVAL NUMBER: H-2018-1836
PRINCIPAL INVESTIGATOR: [REDACTED]
STUDENT RESEARCHER: [REDACTED]
STUDENT'S DEGREE: Honours in Psychology

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

The research project aims to explore people's perceptions of the connection between gut health and overall health. People's understandings of gut health, healthy eating, what influences understandings of healthy eating, and how the food they eat impacts their overall health will be examined.

Research into people's perceptions of gut health, healthy eating and how the food they eat impacts their overall health is limited. The present study aims to further our understanding in this under-researched area.

Who is undertaking the project?

This project is being conducted by Angie Bon, under the supervision of Dr. [REDACTED]. [REDACTED] This research is part of the requirements of a research thesis for the degree of Honours in Psychology at the University of Adelaide. The focus groups will be conducted by [REDACTED] and [REDACTED] is involved as the secondary supervisor.

Why am I being invited to participate?

Your insights regarding gut health and overall health would be greatly appreciated.

Do you meet the following criteria?

- You are a first-year psychology student at the University of Adelaide
- You are over 18 years of age
- You are fluent in English

What am I being invited to do?

You are being invited to participate in a focus group that will take approximately 90 minutes. The focus group will consist of approximately 8 people and take place at the University of Adelaide. The focus group will involve a discussion regarding the connection between gut health and overall health. You will be asked about your thoughts on health foods, such as probiotics and fermented foods, and their impact on gut health and overall health.

Upon your consent, the focus group will be audio-recorded by the student researcher and notes will be taken by the student's supervisor.

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How much time will my involvement in the project take?

The focus group will take approximately 90 minutes. You will receive 1.5 course credits on completion of the focus group.

Are there any risks associated with participating in this project?

The focus group involves discussion on perceptions of healthy eating. It is possible that you may feel uncomfortable or emotionally distressed if you currently experience, or have experienced, eating disorders or other mental health issues. If you feel uncomfortable or distressed at any time of the focus group, you have the right to leave the focus group. You will be reminded of your right to withdraw at any point during the study before the focus group commences.

What are the potential benefits of the research project?

You will receive course credits for completing this study. The research will further our understanding and knowledge of lay perceptions of the connection between gut health and overall health. These potential benefits outweigh the burden and risks to participants, which are minimal.

Can I withdraw from the project?

Participation in this project is completely voluntary. If you agree to participate, you can withdraw from the study at any time. If you decide to withdraw at any stage during the commencement of the focus group, you will still receive the course credits.

What will happen to my information?

The information gathered in the focus group will form the basis of the student researcher's Honours thesis. The Honours thesis will become available at the Barr Smith Library at the University of Adelaide. If appropriate, the researchers will seek to publish the project in a peer reviewed psychology journal.

Your names will not be mentioned in the study. In transcribed data and the final report, you will therefore be given a number and any identifiable information will not be mentioned.

All audio recordings, notes and transcripts from the interviews will be stored on a university password-protected computer. These will be accessible only to the student researcher. The anonymised and de-identified transcripts will be stored on the same computer as the recordings. All recordings and transcriptions from focus groups will be removed from the computer and destroyed at the end of the project. A copy of the final transcripts will also be provided to the primary supervisor on a USB device and stored in the School of Psychology for a period of seven years, after which time they will be deleted and destroyed.

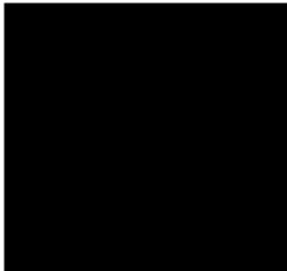
You may be provided with the final report via email if you request so in the consent form.

Your information will only be used as described in this participant information sheet and it will only be disclosed according to the consent provided, except as required by law.

Who do I contact if I have questions about the project?

If you have any questions you can contact the researchers via email.

Below are the contact details of the researchers:



What if I have a complaint or any concerns?

The study has been approved by Prof. Paul Delfabbro at the University of Adelaide (approval number H-2018-1836). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (2007). If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact Prof. Paul Delfabbro on:

Phone: 08 8313 4936

Email: paul.delfabbro@adelaide.edu.au

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.]

If I want to participate, what do I do?

If you are interested in participating, you may sign up to a focus group through SONA, an online database consisting of first year psychology students. There will be three focus groups available and you can sign up to one focus group at your convenience. After signing up to the focus group, the student researcher will email you to confirm your involvement in the study.

Yours sincerely,


Honours Psychology Student


Secondary Supervisor


Primary Supervisor

Appendix C: Consent form

CONSENT FORM

1. I have read the attached Information Sheet and agree to take part in the following research project:

| | |
|--------------------------------|---|
| Title: | Lay understandings of the connection between gut health and overall health |
| Ethics Approval Number: | Researcher to insert this number (allocated once the project has been approved). |

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.
3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
4. I understand I will receive 1.5 course credits for completing the study.
5. I agree to participate in the activities outlined in the participant information sheet.
6. I agree to be:
- Audio recorded
7. I understand that I am free to withdraw from the project at any time and that this will not affect my study at the University, now or in the future.
8. I would like to receive a summary of the research findings:
- Yes No
9. I have been informed that the information gained in the project will be used in the researcher's honours thesis and may be published online in a peer reviewed journal and in the Barr Smith Library at the University of Adelaide.
10. I have been informed that I will not be named and no identifiable information will be included in the published materials.
11. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.
12. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Appendix D: Interview Guide

Identity – What is the illness called? What are the symptoms?

- What does health mean to you?
- What does 'healthy eating' mean to you? Why?
- How important is what you eat?
- How do you feel when you eat these foods?
- Have you heard about the mind-brain-gut axis?
 - What do you think it might be?
- Is gut health a phrase you have heard?
 - What do you think it might be?

Cause - Personal ideas about aetiology, patient's ideas about the likely cause or causes of the illness, triggers

- Do you consume probiotics or fermented foods such as [kombucha, kafir, sauerkraut]? How do you believe these foods work or don't work?
- How do you think a connection between the brain and gut might work?
- Do you think there is a connection between mental health and what you eat? How do you think this connection may work?
- How do you feel after eating these (e.g. fermented foods, probiotics or foods they label as healthy) foods?
- How do you think these foods might work?
- How do you think mood might be related to what you eat?
- Present the pathophysiology of the mind-brain-gut axis and ask about this
- These will mostly be the 'how' questions

Time-line - The perceived duration of the illness, their perceptions of the likely duration of their health problems and these have been categorised as acute/short-lasting, chronic, or cyclical/episodic

- How long do these symptoms last?

- When do these symptoms stop?
- What do you think will make the symptoms go away?

***Consequences* - reflects the individual's beliefs about the illness severity and likely impact on physical, social and psychological functioning. Positive and negative changes.**

- Why do you think the mind-brain-gut axis might be important?
- Why do you think gut health might be important?
- How do these symptoms affect you?

***Cure/control* - how one controls or recovers from the illness. Indicates the extent to which the patient believes their condition is amenable to cure or control.**

- What alleviates the symptoms (e.g. stress, bloating)?
- Do you believe you can control these symptoms? How?
- How do you believe you may prevent these symptoms?

Knowledge of illness

- Where do you find information about healthy eating? (e.g. social media)
- Do you think that your degree / courses have influenced your understandings of the topic?
- How do you think it works?
- Do you think you understand it? Why? Why not?
- Why do you think it works?
- Where did you hear about the term?
- Where do you get information from?