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**Psychosocial Factors Predicting Adherence to the Metabolic Reset Diet**

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of the requirements for the degree of  
MASTER OF SCIENCE IN EXPERIMENTAL PSYCHOLOGY

By

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# Psychosocial Factors Predicting Adherence to the Metabolic Reset Diet

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## Psychosocial Factors Predicting Adherence to the Metabolic Reset Diet

### **Abstract**

Obesity and diabetes have very high prevalence rates in the modern world and are two key characteristics of metabolic syndrome. This in turn has been linked to other chronic diseases like cardiovascular disease, kidney disease, cancer, arthritis, and schizophrenia. Different health models and theories implicate certain variables that appear to play key roles in motivating people to adopt healthy behaviors like dietary changes, which are often challenging to adhere to. The current research examined how well three psychosocial factors (health self-efficacy, healthy eating mindset, and sense of community) correlated to adherence to the Metabolic Reset Diet (MRD). This diet is highly restrictive and involves primarily, the consumption of meat, cheese, and eggs for 30 days. It was hypothesized that those who have high self-efficacy, a healthy mindset, and a strong sense of community would be more likely to adhere to the MRD. Further, a sense of community might also be strong enough to moderate the effects of low self-efficacy and health mindset. Participants were recruited from the Martin Clinic Facebook group and page, whose founder developed this MRD. Prior to starting the diet, individuals completed measures for the three predictors, a demographic questionnaire, and questions regarding prior experience with the MRD. Each day they are on the diet, they checked in online with a report regarding adherence to the diet foods. After 30 days, they completed a follow-up survey. All data was collected online. A multiple regression analysis yielded non-significant results. The conclusion of the current study is that health self-efficacy, healthy eating mindset and sense of community are not good predictors for adherence to the MRD. However, a larger sample size might have yielded

significant correlations. Future research might examine additional factors such as familial support and health literacy.

*Keywords:* self-efficacy, health mindset, sense of community, adherence, diet

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# **Psychosocial factors predicting adherence to the Metabolic Reset Diet**

## **CHAPTER 1**

### **Introduction**

People's diets changed over the course of several decades leading to increased prevalence of obesity and diabetes. Obesity became a "lifestyle disease" with approximately 42 percent of Americans being considered obese (Centers for Disease Control and Prevention, 2022a). The increase in obesity and overweight individuals is also linked to an increase in the number of individuals diagnosed with Type 2 diabetes. Currently there are more than 37 million people in just the US who have diabetes (Centers for Disease Control and Prevention, 2022b). Often linked to obesity and diabetes, is metabolic syndrome which saw a 35% increase in prevalence from 1988 to 2012 (Moore et al., 2017). High consumption of sugar and processed carbohydrates can lead to insulin resistance (Iacovides et al., 2019; O'Neill & Raggi, 2020; Tay et al., 2016). This leads to a pro-inflammation response, followed by an increase in fat storage and obesity (O'Neill & Raggi, 2020). With the increase in health issues, knowledge about dieting has also increased, particularly fad diets that offer quick weight loss options (Khawandanal & Tewfik, 2016).

Adherence to a particular diet depends on the motivation and intention for behavioral change (Contento, 2008). Theoretical models such as the Health Belief Model, the Salutogenic Health Model, Self-Determination Theory, Social Cognitive Theory, and others attempt to explain the motivations underlying health changes, such as a change in diet. The first part of this introductory chapter is a review of these models of health behavior which includes a general description of the model or theory and how specific constructs within the model relate to the motivation to change health behaviors. The second part of this chapter

will describe metabolic syndrome, the diets that can help mitigate health risks, and the challenges that individuals face adhering to such diets. The last section proposes a new study that explores how certain psychosocial factors derived from these models such as health self-efficacy, healthy mindset, and sense of community might predict adherence to an exceptionally restrictive elimination diet like the Metabolic Reset Diet (MRD).

## **Theoretical Models of Health Behavior**

### ***Health Belief Model***

The Health Belief Model (HBM) states that a person must push towards the motivation or initiation of health behavior change (Adefolalu, 2018; Barley & Lawson, 2016; Hochbaum et al., 1952). HBM is an intervention model for behavior and works to understand what interventions might facilitate adherence or a push for commitment to diets (Elder et al., 1999). The model has a cue to action that is either internal to the individual or external (Barley & Lawson, 2016). The model includes six constructs that predict health behavior: risk susceptibility, risk severity, benefits to action, barriers to action, self-efficacy, and cues to action (Khodarahimi, 2018). Literature on the HBM consistently indicates that self-efficacy is a strong factor of behavior change (Adefolalu, 2018; Barley & Lawson, 2016; Hochbaum et al., 1952; Jones et al., 2015). Those who fear that their behaviors might lead to dangerous health outcomes, such as heart disease, diabetes, or death, tend to be more motivated to engage in health change (Houlden et al., 2021; Jones et al., 2015). The HBM also proposes that a positive influential change in a person's belief precedes the behavior change (Shojaei et al., 2016).

Research using the HBM generally focuses on adherence to behavior change. These changes could be different health behaviors such as changing diets, smoking cessation,

physical activity, and disease prevention (Barley & Lawson, 2016; Elder et al., 1999; Hossain et al., 2021; Khodarahimi, 2018; Rejeski & Fanning, 2019). The overarching focus of the health belief model appears to be on motivation. The next model uses a more holistic view of health to explore the aspect of health behavior change.

### ***Salutogenic Model***

The salutogenic model (SM) proposes a holistic health perspective (Antonovsky, 1996). This model focuses on health changes that are more preventative in nature rather than treatment focused. Most approaches or interventions are used after someone gets sick, not while someone is still healthy (Antonovsky, 1996). What underlies the SM is health promotion using the sense of coherence theory (SOC; Bringsen, 2009). The sense of coherence theory explains a person's view of life and how well they can respond to stressful situations (Lindstrom & Eriksson, 2005). In other words, the SOC theory focuses on self-efficacy. According to Bandura, self-efficacy is someone's capability of coping with stressful situations in one's life (Bandura, 197); it is essential in behavior change to have an elevated level of self-efficacy.

To develop strong SOC, the SM proposes that individuals utilize general resistance resources (GRR) (Antonovsky, 1996). GRRs include resources from genetic, constitutional, and psychological aspects of preventative health orientation; from a psychological perspective, GRRs are social connections, mindset, and self-efficacy (Lindstrom & Eriksson, 2005).

### ***Self-Determination Theory***

The Self-Determination Theory states that the motivation aspect of behavior change occurs when someone enjoys the task; the theory also places emphasis on their social ties

(Rejeski & Fanning, 2019). Motivation in this theory is a continuum, and one must be intrinsically motivated, face motivation, and meet three psychological needs which are autonomy, competence, and relatedness (Pietrabissa et al., 2020). Thus, the self-determination theory differs from the other models focusing on motivation in its emphasis on the need for autonomy and belonging as factors that indicate the fulfillment of the change (LaCaille et al., 2020). A feeling of community helps support and direct someone's behavior, especially when trying to change problematic behavior (Kitchen et al., 2011). The environment gives opportunity, knowledge, and skills to act or behave in a certain way. This model supports both the individualistic aspect of change and the social part.

High levels of intrinsic motivation are needed to change a diet or add in physical activity to combat obesity, Type 2 diabetes, and other chronic conditions (Pietrabissa et al., 2020). Further support for this theory comes from research in the fields of health, education, work, and sports (Carbonneau et al., 2021).

### ***Theory of Reasoned Action***

According to the Theory of Reasoned Action (TRA; Ajzen and Fishbein, 2000), the performance of a particular behavior (for example, eating a healthy diet) is under an individual's control because of three crucial factors: intention, attitude, and subjective norms (Esmaeili et al., 2016). The behavior or desire for the behavior change makes the TRA successful in predicting or understanding adherence to health change (Adefolalu, 2018; Kusnanto et al., 2017). A subset of the TRA is the Theory of Planned Behavior which stipulates that behavioral intention is the primary determinant of behavior (Adefolalu, 2018). Additionally, three factors must be present for behavior change: subjective norms, attitudes, and self-efficacy (Adefolalu, 2018). Of these, self-efficacy is the most crucial (which also

supported by several other models, as stated previously). According to the TRA, one is successful if one has a strong belief in one's ability to maintain this behavior, perceives the health risks when not doing the behavior and avoids these risks by changing behavior (Adefolalu, 2018; David et al., 2014; Esmaceli et al., 2016; Kusnanto et al., 2017).

### ***Health Action Process Approach***

The Health Action Process Approach or HAPA (Schwarzer & Renner, 2000) is a health behavior theory based on Bandura's Social Learning Theory (SLT). The SLT states that learning occurs in a social context with dynamic and reciprocal interaction with a person, environment, and behavior (Schwarzer & Renner, 2000). HAPA states that adopting, initiating, and maintaining health behaviors can fluctuate between the two phases: the motivation phase and the volition phase. The motivation phase is where the intention to change is addressed, which may depend on risk awareness, outcome expectancies evaluations, and task self-efficacy (Mullan et al., 2014). The volition phase is where the intention is put into action because the person realizes that their health is hurting them or needs to adopt a healthier habit (Mullan, et al., 2014; Schwarzer & Renner, 2000). Thus, the HAPA is a cognitive behavioral approach to health behavior change that focuses on intentions and motivations, like several other health behavior models. Evidence suggests that self-management programs, such as the HAPA can improve health status in just six months such as increasing physical exercise (Mullan, et al., 2014) and dietary changes (Ranjbaran et al., 2022).

A limitation of research based on this theory is the focus on intervention to reduce health risks (Mullan et al., 2014) instead of direct interaction with health behavior. Another

issue with this theory is that it assumes that the person is a rational decision-maker (Radtke et al., 2014), which is not always the case for everyone trying to change.

The next theory focuses on the self, one's enjoyment of tasks, and the social ties of the individual making a change.

### ***Social Cognitive Theory***

The Social Cognitive Theory (SCT), also known as the Social Learning Theory, focuses on the interactions between cognition and behavior, emphasizing self-efficacy and outcome expectancy (Elder et al., 1999). According to the SCT, someone who is successful in a behavior change has high self-efficacy and positive outcome expectancies. This model overlaps with several of the previously mentioned models and theories in its emphasis on self-efficacy and outcome behavior (Adefolalu, 2018; Tougas et al., 2015). Self-management is the key factor promoting success for the behavior. A connection to the community helps moderate self-management and improves or promotes health changes (Smith et al., 2020).

This SCT can be used for different kinds of health changes. Interventions based on this model improved chronic health conditions like cardiovascular disease, multiple sclerosis, cystic fibrosis, and asthma (Tougas et al., 2015). Research was also done on glycemic control for Type 2 Diabetics, where SCT based interventions enhanced the problem-solving skills of those with Type 2 diabetes, as well as providing them with diabetes self-management tips and knowledge (Smith et al., 2020).

Another key component of the SCT is behavior modification (Elder et al., 1999). Those who see that their behavior is paying off or their performance is not hitting a deficit will successfully adhere to this change (Elder et al., 1999). SCT views diet change behavior in a complex way by examining someone's self-efficacy (Elder et al., 1999; Smith et al.,

2020; Nieuwenhuijsen et al., 2006). A limitation of using the SCT is that sometimes, it is difficult to definitively find the most effective intervention (Smith et al., 2020).

### ***Expectancy Value Theory***

A meta-analysis examining the Expectancy-Value theory helped to describe the perception of social support in facilitating the motivation to change behavior. This analysis focused on physical education for younger children, testing motivational factors and physical activity implementation (Shang et al., 2022). With the meta-analysis, the researchers attempted to understand the relationship between students' motivation and learning behaviours in terms of goals of education. They found that social support had a positive influence on student motivation, particularly from teachers and peers (Shang et al., 2022).

EVT explains the motivation one has for changing a behavior in terms of social support. This theory connects back to other theories such as the theory of planned behavior as well as TRA from Ajzen and Fishbein (2000). EVT, similarly to the TRA and other health theories focuses on self-efficacy as a driving force for behavior change.

### ***Social Impact Theory***

Another theory that supported behavior change was the Social Impact theory (SIT). The SIT proposed that the amount of influence someone has in a group is based on three things, namely the strength of the group, immediacy of the group and number of people in the group (Baumeister & Vohs, 2007). Latané (1981) found that with social influence the impact grows in proportion to the amount of people that are involved in the group itself. Research on social connection influencing adherence to any form of behavior change indicated that social pressure could sway finalization of changed behavior. Social forces and physical forces were examined within the theory (Latané, 1981). One of those social forces

being immediacy. Immediacy connects to physical distance, the closer someone is the better the social connection (Latanè, 1981). In behavior change, research supports that someone can have the intrinsic motivation and high self-efficacy (Gandoy-Crego et al., 2016; Pietrabissa et al., 2020) to continue on in a diet. But in examining the SIT along with a sense of community this might help understand how identity within a group influences dietary behavior change.

### **The Present Study**

The health models and theories discussed thus far implicated certain variables that appear to share a key role in motivating people to adopt and adhere to behaviors that could promote substantial health change. The present study examined the roles of health self-efficacy, health eating mindset, and more importantly a sense of community as psychosocial predictors of adherence to a restrictive diet program. The following is a description of the variables involved in the study:

#### ***Diet Adherence***

For the present study, adherence was operationally defined as how often someone broke from the diet weighted by the number of days on the diet. The closer the score was to zero, the weaker the adherence, whereas a score closer to one indicated a stronger adherence. Thus, adherence equals frequency of deviation from the diet divided by the number of days on the diet.

Existing research showed that healthy eating mindset, self-efficacy and sense of community are all good predictors of adherence (Gandoy-Crego et al., 2016; Swiatonioska-Lonc et al., 2021; Boles et al., 2021). The first step in the current study was to test whether this relationship existed among those who adopted to follow the MRD. Additionally, we predicted that even under the conditions of low self- efficacy and healthy mindset, a strong



sense of community might moderate adherence to the diet. Support for this hypothesis would provide an explanation for individuals who adhere to the diet as a result of being a part of the group more so than having high self-efficacy and a healthy mindset.

### ***Health Self-Efficacy***

Health self-efficacy is defined as one's ability to cognitively believe that their actions and behaviors shall improve and impact overall health (Gandoy-Crego et al., 2016). Having a higher self-efficacy indicates being better to cope and adjust to the possible challenges when changing behavior, which can also predict a longer-lasting health change (Schwarzer & Renner, 2000). Those with higher self-efficacy are also more responsive to programs that will increase, improve, or alter their health and ask more questions when in the doctor's office (Elder et al., 1999). Those who do not have strong social support or are low in self-efficacy tend not to have the motivation or drive to adhere to a particular behavior change (Schwarzer & Renner, 2000).

Self-efficacy is also essential in dealing with situations with high stressors as coping mechanisms and self-efficacy influence each other (Wiedenfeld et al., 1990). Research indicates that those with higher coping self-efficacy, or higher self-efficacy in general are more successful in health changes (Schwarzer & Renner, 2000). With higher levels of self-efficacy, the ability to face problems and react in the appropriate way can help lower stress levels (Wiedenfeld et al., 1990).

In the present study, self-efficacy in the context of health was assessed using the Health Self-Efficacy scale (Grandoy-Crego et al., 2000). Health self-efficacy was operationally defined as the extent to which an individual believes that they can adopt and adhere to health-related behavior changes.

### ***Health Mindset***

Each of the health behavior models discussed previously indicated that someone needs the motivation to be successful; a strong mindset may help someone adhere to the behavior change. Mindset refers to the beliefs related to how people perceive their ability to pursue goals. People who see themselves with a growth mindset tend to be more malleable in their learning and adjustments to their plans compared to those with a fixed mindset (Williams & Lewis, 2021). A positive, growth mindset is essential for adapting, changing, and maintaining a healthy habit. Thus, there is a strong link between mindset and behavior (Güntner et al., 2018). Healthy attitudes allow for healthy beliefs, leading to a more vital adherence to the administered intervention (Boles et al., 2021). To change one's eating behavior, one must have a growth mindset that includes the ability to plan, start, and maintain overall healthy eating behavior. Although a healthy mindset is a factor in maintaining a nutritious diet, not all people will have a growth type mindset; they may have a fixed mindset instead (Williams & Lewis, 2021).

In the present study, health mindset in the context of eating behavior was assessed using the Health Mindset Eating scale (Boles et al., 2021). A health mindset about eating was operationally defined as the extent to which an individual views the process of eating healthy as appealing (i.e., has a positive mindset) or unappealing (i.e., has a negative mindset).

### ***Sense of Community***

Sense of community refers to people's perceptions of interconnection and interdependence, along with their shared responsibility and common goals (Davidson & Cotter, 1991; Kitchen et al., 2011). When defining sense of community, Davidson, and Cotter (1991) mention four components, membership, influence, integration, and fulfillment

of needs. Those who had these four things had a feeling of belonging to the group as well as a strong emotional bond and investment toward the particular group. A sense of belonging to a group can provide emotional and physical support which in turn can help promote several aspects of health, including diet adherence (Smith et al., 2018; Schwarzer & Renner, 2000; Broadbent et al., 2011; Bloom et al., 2017; Swiatonioska-Lonc et al., 2021).

Social support can also directly increase diet promoting behaviors (i.e., following the diet, implementing physical activity, or modifying their diet) over general diet self-efficacy (Yang et al., 2021). Yang et al (2021) examined participants with Type 2 Diabetes in China and their diet self-management, sense of community, and the mediating factor of diet self-efficacy. They focused on people with Type 2 diabetes for more than a year, as well as self-management, and taking diabetes medication. Using a survey/ cross sectional design researchers measured their sense of community, diet self-efficacy, and diet management of the type 2 diabetes diet. They found that social support directly increased diet promoting behavior (i.e., following the diet, implementation of physical activity, modifying their diet) over general diet self-efficacy. Leaning on family and friends for support and health knowledge or health literacy were found to improve diet promoting behaviors (Yang et al., 2021).

According to Smith et al. (2018), health knowledge or health literacy gets distributed throughout social networks, which can help promote self-management of chronic conditions and a feeling of positive support for their health outcome. For example, feeling a sense of community is essential for those with Type 2 diabetes to continue healthy behaviors, as seen with models like the SCT (Smith et al., 2020). In addition, having a strong sense of community improves healthier habits such as going to the gym, going for walks, eating more

vegetables and fruits, to name a few (Smith et al., 2018; Kitchen et al., 2011; Apostolaki et al., 2021).

Community can influence a sense of efficacy when the community itself presents an aid or solution to the individual's problem (Davidson & Cotter, 1991), especially if the resources are already known to the individual and are successful in helping them fulfill their needs. This support is also seen in online communities. Researchers found that users who trust their online community and believe that their online community supports them are more likely to seek health information and follow health recommendations (Roundtree, 2017).

Sense of community and its influence on behavior change has particularly been studied in those with Type 2 Diabetes since maintaining a diet is an essential part of living with Type 2 diabetes (Smith et al, 2018). Researchers found that social support brings about greater health literacy, stronger feelings of competency, and healthier habits (Smith et al., 2018; Kitchen et al, 2011; Apostolaki et al., 2021; Yang et al., 2021). Social psychologists have also found the importance of social capital in healthy behaviors, specifically on eating behaviors (Smith et al., 2018; Kitchen et al., 2011). Social capital describes the networks and the environment that one lives in.

Research on the sense of community and social capital (which describes the networks, relations, and activities that people share) reveals that social isolation is detrimental to positive health outcomes (Smith et al., 2018). Health knowledge, support networks, and external motivation are needed for a positive health change. Compared to those who are socially isolated, individuals who feel connected can find a strong social capital in their environment and tend to have healthier eating habits and quality of life (Apostolaki et al., 2021).

In the present study, sense of community was assessed using the Brief Sense of Community scale (Peterson et al., 2007). A sense of community was operationally defined as the extent to which an individual believes that they are a part of a community. In the present study, this was an online community of individuals interested in a specific dietary program.

### ***Metabolic Reset Diet (MRD)***

Metabolism is how fast one can digest food and is comprised of the synthesis and degradation of complex molecules. Insulin is an important digestive aspect of metabolism functioning. It is a hormone secreted by the pancreas that helps sugar enter the cells so that it can be used for energy. Inefficiencies in insulin production and or function can lead to insulin resistance, which in turn leads to abnormal levels of sugar in the bloodstream (Gutierrez-Rodelo et al., 2015).

Metabolic health refers to how effectively the body assesses the rates of energy consumption versus fat consumption, and how the body releases fat as energy (Grundy et al., 2004; Martin & Martin, 2020). Poor metabolic health can include elevated blood pressure and weight measurements outside the normal healthy ranges (Jones et al., 2015; Li et al., 2022). A disorder in metabolic health seen in those with obesity and Type 2 diabetes is called metabolic syndrome (Jones et al., 2015). The metabolic syndrome tends to be comorbid with other health issues like irritable bowel syndrome and insulin resistance, implying that most gut issues stem from poor metabolic health (Barazzoni et al., 2017; Conlon & Bird, 2015; Grundy et al., 2004; Lotta et al., 2015; Misra & Vikram, 2004; Oozeer et al., 2010). Dietary restrictions and lifestyle changes are recommended for those who have metabolic syndrome or any of the comorbidities. Diets like Atkins, Ketogenetic, Mediterranean, high fat-low carb diets, high carb-low fat diets, and others are different ways to improve metabolic health.

The present study examined the metabolic reset diet (MRD) created by Dr. Anthony Martin Sr., to improve metabolism in those with metabolic syndrome and other diet related health issues (Martin & Martin, 2020). The MRD includes primarily consuming eggs, meat, and cheese for 30 days while avoiding fruits, veggies, or carbs. Proponents of the diet state that this will allow one's digestive system to reset, putting the body into ketosis to burn fat energy instead of sugar energy to fuel the body (Martin & Martin, 2020). This diet is classified as an elimination diet because of its extreme form of food restriction. The difference between the MRD and other restrictive diets is that the MRD is a 30-day program. After 30 days, the person can either continue the diet or start to reintroduce certain foods back into their diet.

Other research has been done on diets like the MRD to improve metabolic functioning. Diets containing simple proteins with the removal of sugars showed improvements in depression, anxiety, diabetes, skin complaints, digestive issues, pain, and weight loss (David et al., 2014). A decrease in weight and an improvement in the gut bacteria in the digestive tract was also found (David et al., 2014). While the ketogenic and low carbohydrate diets are more popular, people have difficulty adhering to these diets because of the level of food restriction (Gasior et al., 2006). These diets try to force the body to use different metabolic pathways to develop energy. Consequently, some people might face flu-like symptoms after a few days of no carbohydrates (Batch et al., 2020; Comerford & Pasin, 2016). Due to this “keto flu” a lot of people revert back to eating carbohydrates.

Social and community factors also impact adherence to these types of diets (Apostolaki et al., 2021). Food selection in restaurants, especially fast-food places, do not always accommodate for low carbohydrate diets. Another reason people cannot always stick

to these types of diets is the availability of food items (Mackenbach et al, 2017). If someone cannot afford or access the food items needed to fulfil the diet, other not as healthy food options are chosen, especially if the food is cheaper (Lee et al., 2013).

The present research project examined the predictors of a restrictive diet like the MRD to determine how well psychosocial factors were related to adherence to this diet. Based on existing health models and theories (discussed earlier in this chapter), the three psychosocial factors – health self-efficacy, health mindset, and sense of community were selected as possible factors. It was hypothesized that individuals who had a high self-efficacy, healthy mindset, and strong sense of community, were more likely to adhere to the MRD. It was also hypothesized that even when self-efficacy, and healthy mindset might be low, a strong sense of community might moderate adherence to the diet.

## CHAPTER 2

### Method

#### Participants

Participants were recruited through convenience sampling from the Martin Clinic Facebook Group and through the Martin Clinic Facebook page. Individuals were recruited in two separate rounds of data collection, once in October 2022 ( $n = 15$ ) and again in January 2023 ( $n = 27$ ). Of the 110 individuals that accessed the study link, 42 completed the study in its entirety. The final sample had a mean age of 64 years ( $SD = 8.07$ ) and included 38 female (90.5%) and 4 male (9.5%) participants. Most of the participants (97.6%) identified as white. Geographically, 83.3% resided in Canada. With regards to education level, 40.5% had completed high school and 38% had obtained an undergraduate degree. More detailed demographic data is presented in Appendix A.

#### Apparatus & Materials

##### *Qualtrics®*

This survey program was used to administer the informed consent, questionnaires, and scales.

##### *Demographic Questions*

Questions were asked about background information such as age, ethnicity, and education level. Participants were also asked if they had any prior experience doing the MRD.

##### *Self-efficacy & Health Scale (SEH)*

The SEH measured health self-efficacy (Gandoy-Crego et al., 2016). This measure gave ten statements about the person and their overall state of health. Participants responded



to the statements using a 4-point Likert scale, with options ranging from “totally disagree” (1) to “totally agree” (4) (see Appendix B for the SEH).

### ***Healthy Mindset Eating Scale (MHE)***

This scale examined different opinions relating to one's mindset while eating healthy (Boles et al., 2021). The MHE gave eight opinions on a 4-point Likert scale, with response options varying across items. For this study, this measure examined a healthy mindset focused on eating behavior while on the MRD (see Appendix C for the MHE).

### ***Brief Sense of Community Scale (BSCS)***

The brief sense of community index (Peterson et al., 2007) asked eight questions about one's feeling of community specific to the Martin Clinic Facebook group. This included four different subscales within the index: needs fulfillment, group membership, influence, emotional connection. Responses for questions ranged on a 5-point Likert scale from “Strongly Agree” (1) to “Strongly Disagree” (5) (see Appendix D for the BSCS).

### ***Follow-up Survey***

These final questions gathered information about why someone did this diet and how they felt finishing the diet. There was also a question asking them about any challenges they faced while on this diet. These questions helped collect more information about diet and other adherence factors, beyond the scope of the three main measures.

### **Design & Procedure**

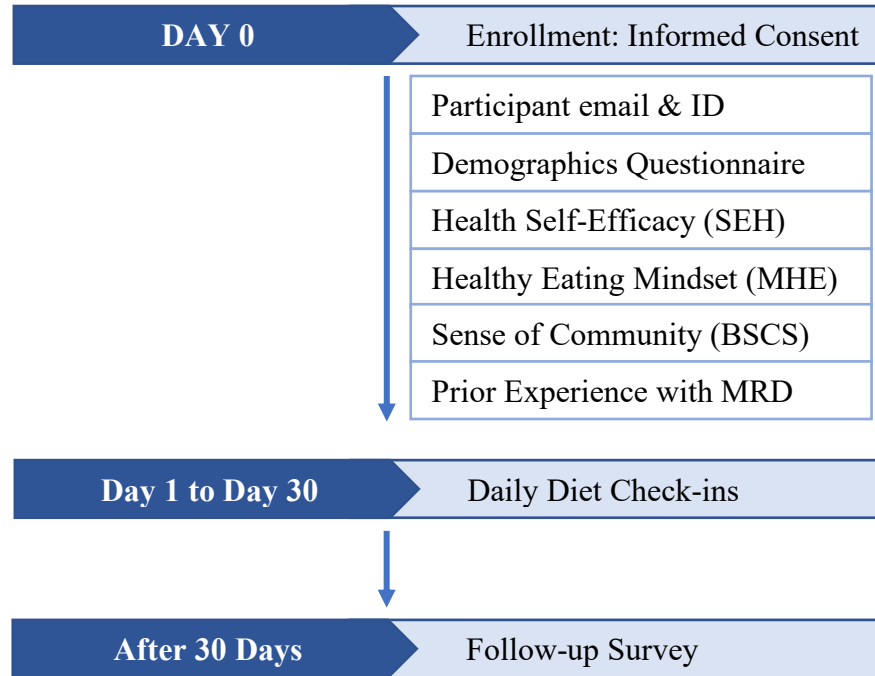
The present study utilized a cross-sectional design. The entire procedure was completed online through Qualtrics® (Figure 1 presents the sequence of measures completed). The study link with instructions was posted via a wall post on the Martin Clinic Facebook group page as well as the Martin Clinic Facebook, (Thus, participants were those

who followed the page and likely had knowledge of the MRD). Upon clicking the link, participants first saw a statement of informed consent, which also included a description of the study and procedures. Once consent was digitally given, the participants entered their preferred email address for communication with the researcher for daily check-ins. The participants were asked to create their participant ID number, which was their first and last name initials, birthdate (mm/dd/yy format), and the first initial of their country. This ID number was used to track the participant through the course of the study. After the creation of the ID number, the demographics questionnaire was presented. Next, participants were required to complete the SEH followed by the MHE. Next, they were asked to think about the support provided by others in the Martin Clinic Facebook group, while filling the BSCS. Once they finished the BSCS, participants were able to exit the survey after being reminded to check their emails for the link for the daily check-in that was sent every day at 8pm US central time. The first survey with the three measures took no more than 20-30 minutes to complete and could be completed on a smartphone or computer.

Participants were asked to fill out the daily check-ins for the next 30 days, while they completed the MRD. Participants were given a list of approved food items and they were to report any deviations from these items in the daily check-in. These check-ins were completed on a phone or computer and took no more than 5-10 minutes to complete. Once they completed thirty days, a follow up survey was sent out to their emails asking questions about their time on the MRD. The follow up survey took no more than five minutes to complete.

**Figure 1**

*Schematic Diagram of the Study Procedure*



## CHAPTER 3

### Results

#### Response Rates

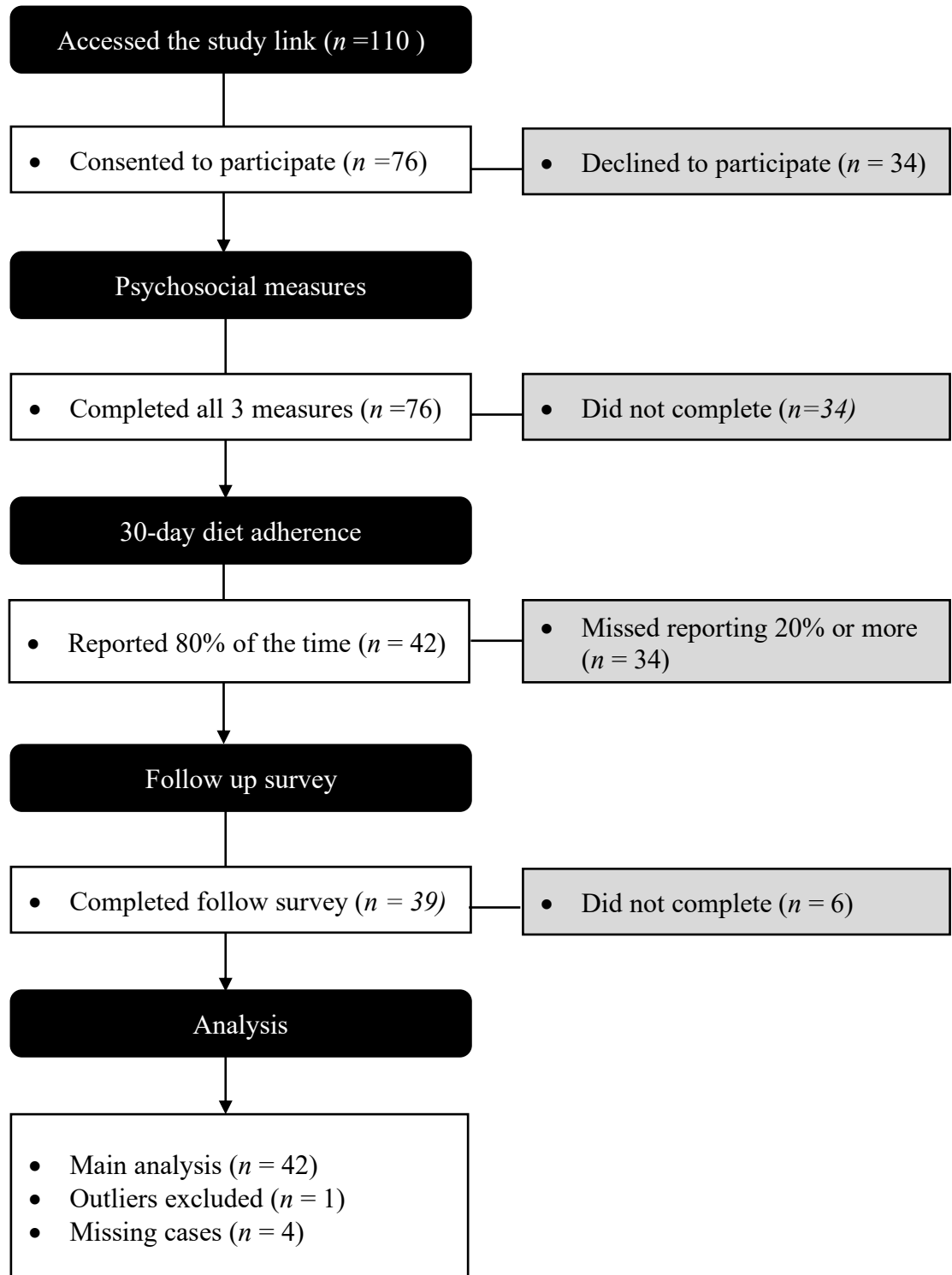
Three types of participants were identified based on their level of study completion. The first type ( $n = 5$ ) included those who completed all parts of the study (i.e., the three psychosocial scales and 30-days of daily check-ins). The second type ( $n = 37$ ) were those who completed the three scales but missed their daily check-ins intermittently (i.e., less than 20% of the time or 6 days or fewer). These two types of participants were included in the data analysis. The third type included those who completed the three study measures but did not submit daily check-ins for 30 days ( $n = 32$ ). These individuals along with one extreme score were excluded from the study analysis.

There were three other participants who started the diet and made it about 1-2 weeks of reporting daily check-ins before they stopped. However, they completed the follow-up survey so were included in the follow-up data report but not in the main data analysis.

Figure 2 presents the details of the flow of participants through the data collection process, including the number of participants included and excluded at each stage.

**Figure 2**

*Flow of participants through each study stage*



## **Statistical Analysis**

Data spreadsheets were managed using Microsoft® Excel® and data were analyzed using IBM® SPSS® statistics software.

### **Data Screening**

#### ***Skewness, Kurtosis, and Transformations***

Skewness and kurtosis describe the shape of a distribution and can be used to assess how much a distribution veers from being normally distributed. Skewness refers to the asymmetry of the data distribution. Kurtosis refers to the relative concentration of scores in different parts of the distribution (such as in the tails compared to the center). When the sample size is small, it runs the risk of not being normally distributed (Tabachnick et al., 2018).

Skewness and kurtosis were examined in the four study variables. Both SEH and MHE were found to have mesokurtic and unimodal distributions. BSCS and adherence were both negatively skewed. To meet the criteria of skewness of  $\pm 1$ , BSCS and adherence were transformed using a reverse square root transformation and a reverse log transformation, respectively. Transformations can be done when the distribution of the scores is skewed and the mean may not be a good indicator of the central tendency score of the original distribution (Tabachnick et al., 2018).

#### ***Missing Data***

Four missing cases occurred after performing the reverse log transformation on the adherence scores. These are system missing data errors SPSS® that may occur when performing the reverse log transformation (Field, 2017; Tabachnick & Fidell, 2018). Nothing was done in the final data set to the four missing cases.

### ***Extreme Values***

Outliers had to fit the criteria of being further than 3 standard deviations from the mean and when converted to a z score being greater than 3.29 (Tabachnick et al., 2018). There was one outlier for adherence with a score of .27 which was trimmed from the data set. There were three other outliers found in BSCS distribution and those were dealt with by winsorizing the data, instead of trimming the data. Winsorizing the data sets the outliers equal to a specified percentile of the data (Field, 2017).

### **Testing Assumptions**

#### ***Test for Normality***

Testing for normality reduces the likelihood of type one and type two errors as well as determining if the variables are similar to one another. A one-sample Kolmogorov-Smirnov (K-S) test was performed in SPSS® on the four study variables: SEH, MHE, BSCS, and adherence. The test was performed after the data was cleaned and checked for skewness and kurtosis. To meet the assumption of normality, the K-S test statistic should have  $p > .01$ . All four study variables met the condition for normality: SEH  $p = .31$ , MHE  $p = .200$ , BSCS  $p = .076$ , Adherence  $p = .05$ .

#### ***Multicollinearity***

Multicollinearity was examined to determine if two or more variables in the regression model were correlated (Daoud, 2017). Multicollinearity can either inflate or deflate the standard error of the coefficient which may lead to the coefficient being falsely nonsignificant or significant (Tsagris & Pandis, 2021). A tolerance value of less than 0.1 or 0.2 (Tsagris & Pandis, 2021) and a variance inflation factor (VIF) higher than 4 indicate the possibility of multicollinearity (Bhandari, 2023). Tests indicated that multicollinearity was

not a concern for the three psychosocial predictors: SEH, *Tolerance* = .941, *VIF* = 1.06; MHE, *Tolerance* = .884, *VIF* = 1.13; BSCS, *Tolerance* = .918, *VIF* = 1.09.

### ***Homoscedasticity***

Homoscedasticity is examined as an assumption in multivariate statistics to determine if the variability in scores for one continuous variable is similar to all the other continuous variables. For the present study, homoscedasticity was examined using a bivariate scatter plot (Tabachnick et al., 2018) for each predictor (SEH, MHE, BSCS) in relation to adherence. The scatter plots indicated that there was no homoscedasticity.

### **Reliability Tests**

Reliability tests were done on the SEH, MHE, and BSCS to ensure that the smaller sample sizes would not compromise the internal consistency of the measures. Generally, Cronbach's alpha values of 0.7 or higher is an acceptable level of internal consistency (Taber, 2017). Results for the three psychosocial measures scores stayed within the acceptable range and are presented in Table 1.

**Table 1**

*Cronbach's alphas for the SEH, MHE, and BSCS*

Measure	Item Count	Cronbach's alpha ( <i>N</i> = 42)
SEH	10	.78
MHE	8	.88
BSCS	8	.90

*Note.* SEH is the Health Self-efficacy scale, MHE is the Healthy Eating Mindset scale, and the BSCS is the Brief Sense of Community Scale.



### **Bivariate (Pearson) Correlations**

The relationships between health self-efficacy, healthy eating mindset, sense of community, and adherence to the MRD were analyzed using Pearson correlation tests. No significant relationships were found between the variables when tested at an alpha = .05. Results of the correlational tests are presented in Table 2, along with the descriptive statistics (mean and standard deviation) for each variable.

**Table 2**

*Descriptive Statistics and Correlations for Study Variables*

Variable	M	SD	SEH	MHE	BSCS	Adherence
1. SEH	2.99	.42	1.00			
2. MHE	3.01	.55	.246	1.00		
3. BSCS	.772	.31	-.126	-.276	1.00	
4. Adherence	-.932	.32	-.064	.105	-.158	1.00

*Note.* N = 42; SEH is the Health Self-efficacy scale, MHE is the Healthy Eating Mindset scale, and the BSCS is the Brief Sense of Community Scale. Adherence mean comes out to be negative due to reverse log transformation.

### **Multiple Regression Analysis**

The directional relationships of BSCS, SEH, and MHE in relation to adherence (hypothesis 2), was assessed using a standard multiple regression. Pearson correlation analyses had indicated non-significant bivariate relationships between all four study variables. Thus, the multiple regression was not expected to produce significant results. Results of model one of a multiple linear regression indicated that while BSCS explained

25% of the variance in adherence, this was not significant,  $F(1, 41) = .819$   $p = .372$ . Model two included all three predictors: BSCS, SEH and MHE. While these variables explained 39% of the variance in adherence, this model was also found to be non-significant,  $F(2,41) = .407$ ,  $p = .749$ . The results are reported in Table 3. The path analysis is presented in Figure 3.

**Table 3**

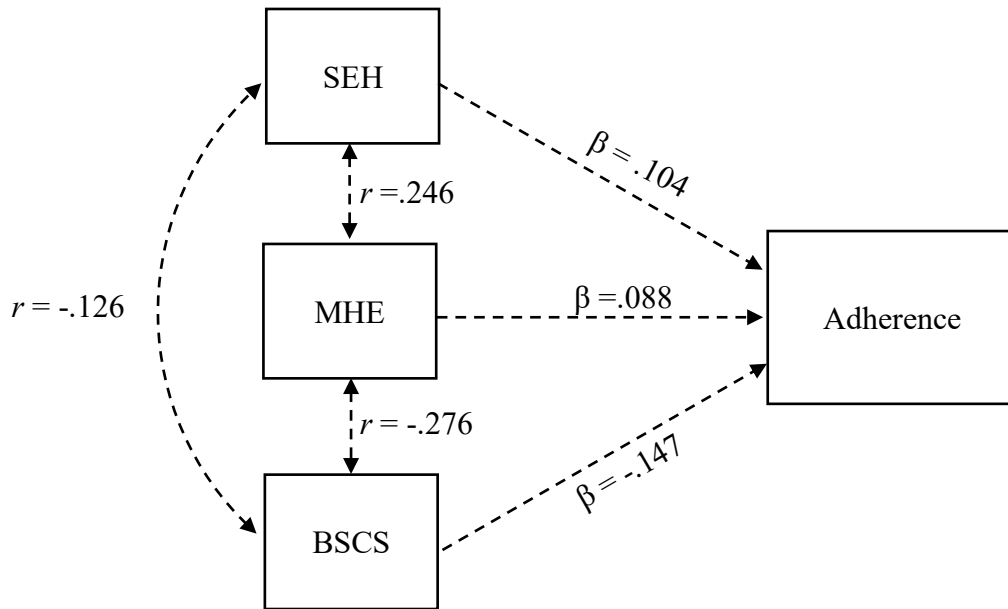
*Multiple regression analysis of BSCS, SEH, MHE with adherence*

Variable	Model 1			Model 2		
	<i>B</i>	$\beta$	SE	<i>B</i>	$\beta$	SE
Constant	-.812		.144	-.746		.519
BSCS	-.158	-.158	.174	-.147	-.147	.187
MHE				.050	.088	.107
SEH				-.075	-.104	.133
R <sup>2</sup>	.025			.039		

*Note.* N = 42. In Model 1, BSCS was entered to predict adherence. In Model 2, BSCS, SEH, and MHE were entered as predictors.

**Figure 3**

*Multiple Regression Path Diagram*



*Note.* The path diagram shows associations between SEH, MHE, BSCS and adherence. Coefficients presented are standardized linear regression coefficients ( $\beta$ ) on the arrows towards adherence. Coefficients between the three predictors are Pearson correlation coefficients ( $r$ ). Dotted lines indicate non-significant relationships.

### **Results of the follow up survey**

Responses to the follow up survey were examined from those participants who completed all 30-day daily check-ins and the follow up surveys. However, there were also a few cases that were from people who did not fully finish the 30 days but did between 7-14 of the days. Overall, responses from 39 participants were examined. Out of those who responded to the follow up survey, 28.2 percent reported that they did not face any

challenges to adhering to the MRD for 30 days. The remaining 71.8 percent reported one or more obstacles or challenges.

Many reported additional obstacles than what was provided in the selection list on the survey. These included attending birthday parties, either their family members or themselves getting sick, lack of variety in food, and being previously vegan. These led to deviations from the diet or modifications to the diet. Three of the next highly frequent responses included health concerns, lack of family support, and accessibility to food. In comparison, fewer individuals included lack of peer support, time constraints, money concerns, and motivation levels as obstacles.

**Table 4**

*Results of the follow up survey regarding obstacles to adhering to the diet*

Obstacles or Challenges	Frequency of Response
Did not face any challenges	11
Health Concerns	9
Lack of Family support	9
Accessibility to food	9
Lack of peer support	3
Time Constraints	2
Money Concerns	2
Motivation level	1
Other obstacles/ Challenges	13

*Note.* Participants were asked to select all the types of obstacles that they faced while on the MRD. N = 39

## CHAPTER 4

### **Discussion**

Several theoretical models that discuss behavior change suggest that certain factors such as self-efficacy, mindset, and social support commonly drive the process, especially in the context of health behavior change. With metabolic syndrome being a health concern implicated in a host of other diseases or disorders, the present study investigated the role these factors might play in facilitating adherence to a restrictive diet designed to improve metabolic syndrome. More specifically, the present study examined how strongly health self-efficacy, healthy eating mindset, and a sense of community predicted adherence to the metabolic reset diet. A positive correlation between self-efficacy, healthy mindset, sense of community, and diet adherence was expected. However, the data that was collected indicated that these were not good predictors of adherence to this diet.

It was also hypothesized that sense of community might moderate the effects of health self-efficacy and healthy mindset. More specifically, the present study attempted to examine how a strong sense of community may predict adherence to the diet when self-efficacy and healthy mindset are low. Considering that there were no significant correlations between the variables from the test of the first hypothesis, it was not surprising that the models for the second hypothesis were also non-significant.

There are other factors that may be more strongly related to adherence than the three investigated in this study. Non-adherence can occur due to various reasons which may include financial factors, side effects, complex treatment regimens, inadequate health literacy, and lack of social support (Affusim & Francis, 2018).

Research has indicated that health literacy is positively correlated to adherence (Jamieson & Gougeon, 2019; Rintala et al., 2013). Health literacy is defined as the degree to which individuals have the capacity to process, obtain, and understand basic health information (Smith et al., 2018). The health literacy pathway model (Smith et al., 2018) which argues that health literacy skills are distributed through a social network to promote self-management would be a great model to have examined here in this study.

While the current study did not find social support as a good predictor of adherence, we did not examine family support separate from social support, which was reported as a challenge to adherence by several participants in the follow up survey. The role of family support in diet adherence has been found to have a predominantly positive relationship (Miller & DiMatteo, 2013), specifically in research with diabetic patients.

### **Issues Defining and Measuring Adherence**

The measurement of adherence utilized in this study was developed to provide a quantitative value (i.e., a ratio of the number of deviations from the diet to the number of days on the diet). Adherence in the existing literature seems to be primarily reported in two ways: 1) the number of individuals who achieve the dietary recommendations, or 2) the differences in dietary intake between participant groups (Desroaches et al., 2010). Having a more standardized approach to defining and assessing adherence would help future researchers conduct more consistent research.

For example, Ebrahimpour-Koujan et al. (2019), examined psychological disorders and adherence to a low carbohydrate diet and found no significant association between low carbohydrate diets and psychological disorders. However, they did not measure deviations

from the low carb diet in their calculation of adherence. Instead, their diet measurement included a comparison of carb intake to fat and protein intake, with better adherence scores for those who had low carb intake in their diet overall (Ebrahimpour-Koujan et al., 2019).

### **Limitations**

Prior to concluding that the theoretical models this study was based on (HBM, SM, SDT, TRA, HAPA, SCT, EVT, and SIT) provide insufficient support for the examining the MRD, it is important to note certain limitations.

The findings of the study are highly limited due to the small sample size. Even though 110 individuals accessed the online study, only 42 individuals completed all components of the study including reporting diet adherence for 30 consecutive days. Participants who missed reporting their daily check-ins could have still adhered to the diet. Likewise, individuals could have deviated from the approved diet items, yet failed to report that. Hence, there could have been both response bias and non-response bias.

There were factors that we could not control for due to the duration of the data collection period. During this time, participants may have experienced holidays, birthdays, vacations, as well as health issues, all of which had the possibility of impacting their ability to adhere to the diet. These were also reported by some individuals in the follow up survey.

Prior experience with the MRD could have been a factor. Of the 42 participants that were used in the main analysis, only 3 individuals had never done the diet before. The remaining participants (92.9%) had done the MRD more than once. However, we did not notice any ceiling effects in any of our psychosocial measures which could have been a result of prior experience with the diet.

## **Future Directions**

### ***Age and Sex of the Participants***

The age of the participants was an interesting factor. Of the 42 people who completed the study, 41 of them were over the age of 50 years and 28 were above the age of 60 years. Overall, the mean age of participants was 64 years. In general, there is a weakening relationship between physical activity and age (Chernoff, 2001). Yet, older adults are also more likely to seek out information about changing their health behaviors to improve health status and overall quality of life. They are interested in getting healthier when there are programs and clearer information directed to them (Chernoff, 2001).

Most of the participants in the present study were female (90.5%) which is often seen in studies involving diets (Carbonneau et al., 2021). While the age and sex of the participants limits generalizability of the results, it would be interesting to see if the results would be different with a larger sample size.

### ***COM-B System***

A more comprehensive analysis of the metabolic reset diet might be conducted utilizing the COM-B system. This was proposed by Mitchie et al. (2011) following a systematic review of frameworks of behavior change interventions. This approach examines interventions in terms of capability, opportunity, and motivation. It would be interesting to assess the metabolic reset diet from this perspective: the physical and psychological capability of maintaining the diet, opportunity to engage in the behavior, and motivation. According to the COM-B model, these can influence each other as well.



## **Conclusion**

Overall, present study failed to find any significant association between self-efficacy, a healthy eating mindset, sense of community and adherence to the metabolic reset diet.

Research specifically on the MRD is extremely limited and this study is one of the few that has examined this diet. A larger sample size may reveal significant correlations between the variables; hence we cannot draw definitive conclusions regarding the role of these variables in diet adherence based on the findings of this study. One contribution this study makes is providing a quantitative measure of adherence to a diet over a set duration of time, which might be of interest to other researchers.

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APPENDIX A

**Demographics Characteristics of Participants**

Characteristic	n	%
<b>Age (in years)</b>		
40-49	1	2.4
50-59	14	33.3
60-69	17	40.5
70-79	9	21.4
80-89	1	2.4
<b>Sex</b>		
Male	4	9.5
Female	38	90.5
<b>Ethnicity</b>		
Asian	0	0
Black or African American	0	0
LatinX or Hispanic	0	0
Native American or Alaska Native	0	0
White or Caucasian	41	97.6
Multiracial	1	2.4
<b>Country of Residence</b>		
Australia	1	2.4
Canada	35	83.3
England	1	2.4
USA	5	11.9
<b>Highest Education Level</b>		
Less than High school	2	4.8
High School	17	40.5
Undergraduate Degree	16	38.0
Master's Degree	7	16.7
Doctorate Degree	0	0

## APPENDIX B

### Self-efficacy and Health Scale (SEH)

Presented below are 10 statements about you and your state of health. We request that you read each one of them and express if you totally disagree (1), disagree (2), agree (3), or totally agree (4). For each question, pick only one answer from the four mentioned. There are no right or wrong answers; what is important is your opinion, so we ask for your honesty.

Questions	Totally disagree	Disagree	Agree	Totally agree
<b>I largely believe that the ability to overcome an illness or disease depends on me</b>	1	2	3	4
<b>I am a healthy person, and I do not commonly suffer ailments</b>	1	2	3	4
<b>The majority of people are in worse health than I am</b>	1	2	3	4
<b>I avoid going to health services, and I try to solve my health problems by myself</b>	1	2	3	4
<b>I feel optimistic about my state of health</b>	1	2	3	4
<b>When faced with a health problem, I first think about how I can solve it for myself</b>	1	2	3	4
<b>I think that telling others about one's own health problems does not help to overcome them</b>	1	2	3	4
<b>I feel happy</b>	1	2	3	4
<b>I believe I have problems in my life, but not as many as others</b>	1	2	3	4
<b>I have many things to worry about, and health is not a main one</b>	1	2	3	4

**Thank you very much. You are finished.**

*Reference:* Gandoy-Crego, M., Clemente, M., Gomez-Cantorana, C., Gonzalez- Rodriguez, R., & Reig-Botella, A. (2016). Self-efficacy and health: The SEH scale. *American Journal of Health Behavior*. 40(3), 389-395. doi:<http://dx.doi.org/10.5993/AJHB.40.3.11>



## APPENDIX C

### Healthy Mindset Eating Scale (MHE)

The following statements are different opinions about what it is like to eat healthy. Please select an option on each row that best describes how you feel about engaging in eating healthy.

Eating healthy is:

(1)	(2)	(3)	(4)
1. Very difficult	Somewhat difficult	Somewhat easy	Very easy
2. Very unpleasant	Somewhat unpleasant	Somewhat pleasurable	Very pleasurable
3. Very stressful	Somewhat stressful	Somewhat relaxing	Very relaxing
4. Very depriving	Somewhat depriving	Somewhat indulgent	Very indulgent
5. Very boring	Somewhat boring	Somewhat fun	Very fun
6. Very lonely	Somewhat lonely	Somewhat social	Very social
7. Very inconvenient	Somewhat inconvenient	Somewhat convenient	Very convenient
8. Very bad tasting	Somewhat bad tasting	Somewhat good tasting	Very good tasting

**Scoring:** Scores are calculated by taking the mean of individual's responses.

*Reference:* Boles, D. Z., DeSousa, M., Turnwald, B. P., Horii, R. I., Duarte, T., Zahrt, O. H., Markus, H. R., & Crum, A. J. (2021). Can exercising and eating healthy be fun and indulgent instead of boring and depriving? Targeting mindsets about the process of engaging in healthy behaviors. *Frontiers in Psychology*. 12, <https://doi.org/10.3389/fpsyg.2021.745950>

APPENDIX D

**Brief Sense of Community Scale (BSCS)**

Below are a set of statements about your online community. Please indicate the extent to which you agree or disagree with these statements.

BSCS Items	Strongly Agree	Somewhat Agree	Neutral	Somewhat Disagree	Strongly Disagree
1. I can get what I need in this community.					
2. This community helps me fulfill my needs.					
3. I feel like a member of this community.					
4. I belong in this community.					
5. I have a say about what goes on in my community.					
6. People in this community are good at influencing each other.					
7. I feel connected to this community.					
8. I have a good bond with others in this community.					

**Scoring:**

Values: Strongly Agree = 5; Somewhat Agree = 4; Neutral = 3; Somewhat Disagree = 2; Strongly Disagree = 1

Scales: Needs fulfillment: Mean of items 1 & 2; Group membership: Mean of items 3 & 4;

Influence: Mean of items 5 & 6; Emotional connection: Mean of items 7 & 8.

*Reference:* Peterson, N. A., Speer, P. W., & McMillan, D. W. (2007). Validation of A brief sense of community scale: Confirmation of the principal theory of sense of community. *Journal of Community Psychology*, 36(1), 61–73. <https://doi.org/10.1002/jcop.20217>