Testing Whether Alternative Goals of Multifinal Means

are Considered Helpful in Working Towards a

Primary Dietary Goal in College Students

by

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ABSTRACT

Multiple health-related benefits have been associated with adherence to plant-based diets, including vegan, vegetarian, and pescatarian dietary patterns. Despite a consistent body of evidence on the importance of healthy diets, Americans continue to find difficulty in establishing and adhering to dietary goals that could elicit long-term health benefits. Recent research suggests an important role for goal-setting strategies in health behavior change attempts, with some success shown in dietary behavior change, specifically. The current study thus aimed to explore whether having multiple goals alongside one primary goal of following a vegetarian, vegan, or pescatarian diet would increase the achievability of that goal. Participants of this study were broken into two groups: currently following a plant-based diet (ADHERE) and striving to follow a plant-based diet (STRIVE). Researchers hypothesized that the number of health and/or diet related alternative goals set by participants would differ between the two groups, that the ADHERE group would report that their alternative goals were more helpful and less interfering in achieving their dietary goal than the STRIVE group, and that a higher rank of importance of the dietary goal would predict being in the ADHERE group. Results showed that the number of health and/or diet related alternative goals did not differ between groups. The ADHERE group and STRIVE group did not have significantly different helpfulness and interference reports. Although, in an exploratory analysis, it was shown that those participants who reported at least 2 health/diet related alternative goals found those goals to be significantly more helpful than those who reported 0 or 1 health/diet goal. Results showed that rank of dietary goal did not predict group assignment. Overall, the results from this study showed that the type of alternative goal

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was very important when pursuit of multiple goals was in effect. Type of alternative goal

seemed to be a higher predictor of the perceived helpfulness of the alternative goals than

previous achievement of goals.

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CHAPTER 1

INTRODUCTION

Statement of the Problem

Obesity remains a considerable and enduring health concern in the United States, with annual deaths related to obesity reaching over 280,000.[1] Not only does obesity cost lives, it also costs money: healthcare for obese individuals is 30% higher than those of normal weight.[2] These issues are in part due to the connection between obesity and increased risk for other non-communicable diseases, such as type 2 diabetes, cardiovascular disease, stroke, hyperlipidemia, and cancer.[3] Dietary and other interventions are therefore necessary to prevent, manage, and reduce obesity to lower its prevalence and impact on public health.

More broadly, dietary interventions are necessary for improvements in a wide array of dietary behaviors and outcomes as Americans generally fail to adhere to sensible dietary recommendations, such as the U.S. Dietary Guidelines for Americans.[4] The Guidelines state that the optimal diet for health and prevention of non-communicable diseases is one rich in fruits and vegetables, whole grains, and a variety of protein foods, including non-meat sources.[5] According to National Health and Nutrition Examination Survey (NHANES) data, however, the average American fails to consume sufficient fruit, vegetables, whole grains, and legumes, but often exceeds the recommendation for red meat and problematic nutrients.[5] Despite a thriving diet industry and intense focus on dietary choices, Americans continue to consume relatively unhealthy diets, and the inability to adhere to positive dietary changes hampers public health efforts to prevent disease and disability.

Background

        Plant-based diets – those that are high in vegetables, fruits, grains, legumes, beans, and nuts, and low in dairy, poultry, fish, and meat – have been shown to reduce the risk of obesity[6], as well as type 2 diabetes[7], cardiovascular disease[10], and many other diseases.[10] Plant-based diets have also been shown to reduce cholesterol values, body mass index (BMI), and a host of other factors that contribute to disease risk.[6-13] Not only do plant-based diets have a positive effect on health, but studies have shown plant-based having a positive effect on mood as well.[14] Given the wide-ranging benefits of plant-based diets, it is possible that interventions built around their adoption could have a significant impact on poor health outcomes due to unhealthy lifestyle behaviors. To date, however, while many studies exist describing motivations, barriers, and health of following a plant-based diet, very few studies have explored factors that might promote adherence to plant-based diets when such a dietary behavior is adopted. In particular, little has been done to investigate goal-setting in relation to striving for and adopting plant-based diets.

        While plant-based diets have been studied extensively, deficiencies remain in the literature. Few studies, to the researcher's knowledge, have explored various processes and factors that might facilitate the adoption of a plant-based diet. Instead, current studies only describe circumstances during which adoption might have occurred. For example, research has shown that there are two rates of adopting a plant-based diet: gradual and abrupt.[24] In one study, those who adopted the diet gradually eliminated red meat first, then poultry, fish, and lastly dairy and eggs.[24] Those who adopted abruptly were generally younger and did so following an incident that caused them to question the

ethics of their food choices.[24] Another contextual factor that has been shown to affect one's ability to switch to a plant-based diet is a life-transition, such as moving away to college or getting a divorce.[24] While these and other studies have offered some insight into the context surrounding adoption of a plant-based diet, more research is needed to understand what might facilitate adoption and adherence. Insight into these factors could be crucial in building more effective dietary interventions that address the significant diet-related health issues facing many Americans today.

Goal-setting involves determining which goals one wants to pursue and the criteria for judging success.[41] Goal-setting may be an ideal way to encourage and support increased intake of plant foods, as various researchers have studied goal-setting as a strategy for increasing fruit and vegetable intake.[35-40] Furthermore, setting multiple goals may enhance one's ability to achieve goals, as previous research has shown that setting multiple goals simultaneously lowers the amount of acceptable means to reach the goals, and facilitates achievement of the focal goal as well as the alternative goals.[44,45]

Purpose

The aim of this study was therefore to examine the listing of multiple goals (related to or not related to diet) alongside a main plant-based diet adoption goal and adherence to a plant-based diet. The focus of this study was on college students, as previous research[24] has shown adherence to a dietary change comes easier when it is concurrent with a life transition, such as starting college. The primary hypothesis of this study was that participants who successfully adhered to a plant-based diet would identify a higher number of health-related goals compared to participants who strived for but did

not yet adhere to, a plant-based diet. Researchers based this hypothesis on the theory that setting multiple goals that are closely related to a focal goal will increase one's ability to achieve the focal goal as well as the alternative goals. This theory is called the multifinality constraints effect.[45] The multifinality constraints effect theorizes that when multiple goals are set alongside a focal goal, the acceptable means of achieving the goal will narrow to such a focal set of means that they advance the pursuit of the additional goals as well as facilitate achievement of the focal goal.[45] One of the boundaries of this theory is feasibility; the goals must have a reasonable amount of multifinal means (means that help achieve both the focal goal and the alternative goals).[45] In other words, the goals must be similar enough to be achieved simultaneously, through the same actions. Therefore, we theorized that when participants set health/diet related goals alongside their plant-based diet adherence goal, they would be more likely to adhere to a plant-based diet than those who set other, non-health/diet related goals. We also hypothesized that goals would be significantly more helpful and significantly less interfering among participants who were already adhering to a plant-based diet compared to those who were striving for a plant-based diet.

The third hypothesis was that ranking of the plant-based diet goal would predict group assignment, such that a higher ranking would predict adherence while a lower ranking would predict striving. Researchers based this hypothesis on the second boundary of the multifinality constraints effect, focal goal importance. This boundary suggests that when the person places the focal goal at a much higher emphasis than the alternative goals, the person will shield the focal goal and inhibit the alternative goals.[44,45] The increased importance of the focal goal could cause an individual to lose sight of

alternative goals and as such fail to attempt to find multifinal means. In this way, we hypothesized that a high ranking of the plant-based diet goal would predict the participant adhering to the plant-based diet, and a low ranking predicting the participant to be striving to adhere to the plant-based diet.

Limitations and Delimitations

The delimitations of this study include only having participants from one class, at a college campus in the Phoenix-metropolitan area and using close-ended response questions in the surveys. One limitation of this study was that it was likely underpowered in at least one of the groups. Although, this was an exploratory study, and the researchers attempted to recruit as many plant-based dieters as possible. Another study limitation was the lack of a second coder on what goals were included as health/diet related goals to establish intercoder reliability. The criteria for what was included was established on a theoretical basis, the theory of multifinality constraints effect, and is detailed in the methods section of this thesis. Other limitations include the data being self-reported, having a small number of participants who follow the diet compared to many participants who are trying to switch to the diet, and utilizing a survey that has not been tested for reliability and validity. However, much of the survey comprises validated measures.

Definition of terms

Dietary Intervention: A dietary action taken to improve a health outcome.

The Dietary Guidelines for Americans: Federal nutrition policy, updated by the USDA (United States Department of Agriculture) and HHS (Health and Human Services).

Provide dietary recommendations for healthy Americans that promote health and prevent disease.

Goal-setting: The process of deciding one wants to do something and devising a plan to achieve the desired result.

Plant-based diet: A diet that is rich in fruits, vegetables, nuts, legumes, and grains, but low in dairy and meat.

Practitioner: Medical professional.

Vegan: A person who does not use or consume any animal derived products.

Vegetarian: A person who does not consume meat but does consume animal derived products such as dairy.

Pescatarian: A person who does not consume meat, does consume dairy, and does consume fish.

Life transition: Planned or unplanned events and/or changes that alter a person's life drastically.

Multifinal means: Actions through which multiple goals are satisfied.

Multifinality constraints effect: Through setting multiple goals simultaneously, the set of means to achieve the focal goal will narrow to include means that will achieve the focal goal and alternative goals.

CHAPTER 2

REVIEW OF LITERATURE

Motivations and Factors Related to Following a Plant-Based Diet

The common motivations for following a plant-based diet are well understood, and multiple studies exist describing why individuals choose to reduce or eliminate meat. One such study, called "Model of the Process of Adopting Vegetarian Diets: Health Vegetarians and Ethical Vegetarians," aimed to increase understanding of the complex factors involved in making a dietary change, and to develop theoretical understanding of the process.[24] Researchers examined the process of adopting a vegetarian diet as well as the process of moving into a stricter vegan diet.[24] Most participants included in this study were married, middle-aged, upper to middle class, well-educated, European-American females who had been following a vegetarian or vegan diet for at least 4 years.[24] Researchers collected information through one open-ended, semi-structured interview that included questions on reasons for adopting a vegetarian diet, factors aiding and hindering their adoption and progression of the diet, and the overall process of adopting the diet.[24] Results showed two main categories of motivations behind following a plant-based diet: health and ethics.[24] The health-motivated participants initiated a vegetarian diet after they or someone they knew experienced a physical disease, commonly heart disease, or after they made a diet-health connection.[24] Ethical motivations, however, were the reason behind most of the participants' decision to switch to a vegetarian diet.[24] Older and younger ethical vegetarians commonly made the switch after making a connection between the food consumed and the animal it came from, as well as after collecting information on animal welfare.[24]

This study also identified interesting process-related factors that participants utilized to adopt vegetarian diets. Results showed that for ethical vegetarians, the switch was made concurrently with other big life changes, such as moving to a new area, attending college, or going through a divorce.[24] Moving to a new environment where they were surrounded by a large number of people who had already adopted a vegetarian or vegan diet was noted as a considerable influence in their ability and willingness to switch, because they inherited more information and support more often.[24] Based on these results, researchers identified two processes that vegetarians used to adapt to the diet, including 'abrupt' and 'gradual.'[24] Most participants, ethical- or health-motivated, followed a gradual process of adoption, often eliminating red meat, then chicken and fish, then dairy and eggs.[24]

This foundational study was used as a reference for many other studies regarding vegetarian and vegan diets and paved the way for research regarding differences between the two classes of motivations behind following plant-based diets. One such study showed that age played a strong role in which category of vegetarian or vegan individuals fell into.[27] Study results showed that older people ages 21 and above were most likely to adopt a plant-based diet due to health reasons, and younger people under the age of 20 were more likely to switch due to ethical reasons.[27] This may be related to an increase in health concern as one gets older, as well as the rise in younger people becoming more aware of ethics and politics.

The two classes of motivations behind following a plant-based diet are important because individuals in each group may vary in characteristics. One recent study explored these differences, specifically in relation to conviction, nutrition knowledge, dietary

restrictions, and years of following the diet based on motivation.[29] Researchers

hypothesized that ethically motivated vegetarians would score higher on all categories, as

previous research had shown that ethical vegetarians had more effectiveness with

following the diet and stricter dietary restrictions.[29] This study was cross-sectional, data

was collected through surveys, and participants were excluded if they stated more than

one reason for becoming vegetarian.[29] Results showed that ethically motivated plant-

based dieters scored higher on the conviction test, compared to health-motivated dieters,

while the groups scored equally well for nutrition knowledge.[29] The conviction test was

created by the researchers to assess how much the participant believed statements about a

vegetarian/vegan diet, such as "I am openly vegetarian/vegan; I do not hide my

vegetarianism from anyone", "I encourage others to become vegetarian and/or vegan",

and "I consider my vegetarianism/veganism when making important decisions in my

life".[29] For dietary restrictions, results showed that ethical plant-based dieters were more

restrictive with current dietary goals but scored equally well with health-focused plant-

based dieters on restrictiveness when adopting the diet.[29] People who became vegetarian

or vegan for ethical reasons had also been following the diet for significantly longer than

health-based vegetarians or vegans.[29] Results suggested that the more ethically motivated

vegetarians and vegans are, the more likely they may be to adhere to a restricted diet.

However, health-motivated individuals may have more nutrition knowledge, which has

been cited as one of the most important aspects to following a vegetarian/vegan diet.[27]

  Pribis and colleagues conducted a study to examine nutrition knowledge in plant-

based dieters, and found that nutrition knowledge was positively correlated with attitudes

towards following a plant-based diet, and vice versa.[27] More nutrition knowledge led to a

higher chance of being plant-based, and being plant-based led to more nutrition knowledge.[27] It was also found that nutrition knowledge had a negative effect on nutrition misconceptions and a positive effect on health food beliefs.[27] Researchers also showed through their study that with more nutrition knowledge comes more motivation to follow a plant-based diet, suggesting that increasing nutrition knowledge is a good first step for a dietary change intervention focused on following a plant-based diet. This study did not categorize participants by motivations of health and ethics, but it is likely that improving nutrition knowledge may be an important first step when switching to a vegetarian/vegan diet, no matter what the underlying motivations are.

Along these lines, Cherry and colleagues examined what factors contributed to youth's recruitment into a vegan/vegetarian diet and lifestyle, as well as what encouraged retention to the diet.[30] The results of this study helped to define what was important in this age group when introducing a vegan/vegetarian diet and adhering to that diet outside of internal motivations. Study results showed that recruitment into the diet was influenced by learning, reflection, and identity work.[30] Learning and reflection often included "catalytic experiences" that pushed youths to become vegetarian or vegan right away[30], not following the typical gradual process mentioned in previous studies.[24,27] Identity work included reflecting on how their diet and lifestyle impacted what they learned, and how their lifestyle was contributing to the issues they may have learned about.[30] This caused them to change their behavior and lifestyle in order to better fit their new goals and social identity, and reconstruct their identity around moral and ethical issues.[30]

It was found that, while these catalytic experiences and new social identity were enough to begin the diet, they were not enough to be able to maintain the diet over time.[30] Results showed that for maintenance of the diet, social support was crucial.[30] Participants reported it was very hard to maintain the diet while being surrounded by people who weren't following the diet, and that they were often questioned and ridiculed for being vegetarian/vegan by their non-vegetarian/vegan friends and family.[30] This was especially true for participants who lived with their family, and it was found that once they moved out on their own they were able to adhere to the diet more consistently.[30]

However, self-identifying as vegan/vegetarian might not be enough to maintain the diet; social and cultural tools may also be needed to help facilitate the actions and continue the motivation to follow the diet.[30] For example, social networks may offer cultural tools that inform plant-based practices and shape identities, something referred to as a "virtuous circle".[30,31] A virtuous circle is a group of individuals who share similar beliefs that lead them to live a certain lifestyle.[31] A virtuous circle not only provides social support for following the diet, it also provides the individual with a place to attain new knowledge and new motivation to stick to a behavior. It was highlighted in this study that people who were involved in a virtuous circle had an easier time adhering to plant-based diets, stressing the importance of having social support when adhering to a certain lifestyle and strict diet.[30] Across studies, it is clear that social and environmental support are crucial to adherence to plant-based diets.[24,30,31]

Barriers and other Factors Affecting Adherence to Plant-Based Diets

While motivations to follow plant-based diets are important to analyze, it is also important to look at the barriers and factors that can hinder one's ability to adopt the diet. There have been many studies published on the perceived benefits and barriers of following a plant-based diet.[25,26] One study showed that a lack of information about plant-based diets is often the number one barrier to following a plant-based diet.[25] This goes along with results found in a previous study, that the more nutrition knowledge someone has, the more likely they are to adopt the plant-based diet.[27] An unwillingness or inability for individuals to alter their present dietary habits and a lack of availability of plant-based options when eating at a restaurant were cited as barriers to following a plant-based diet as well.[25] Gender may also be an important consideration when developing a dietary intervention, as men and women have different perceived barriers to following a plant-based diet[25,28], and therefore may need different strategies to be able to adhere to the dietary change. In one study, men tended to have a higher belief that humans are meant to eat large quantities of meat, that someone else decides what should be consumed, and that a plant-based diet would not be tasty enough.[25] A similar study found that men justify eating meat using more direct strategies, such as following pro-meat attitudes, denying animal suffering, and believing that animals are lower in the food chain than humans.[28] Women used more indirect approaches, such as dissociating meat with animals and avoiding thinking about animal welfare.[28]

One study published by the Journal of the American Dietetic Association aimed to look at women's perceptions and practices of following a vegetarian or non-vegetarian diet.[33] One of the purposes of this study was to explore how vegetarian dietary practices

change over time, including an assessment of former vegetarian's motivation and rationale for resuming an omnivorous diet.[33] The study used a quantitative and qualitative study design.[33] The participants, all women, filled out a written instrument that examined demographics, perceptions of meat and dairy products, common dietary protein sources (food frequency questionnaire), and vegetarian status.[33] Current vegetarians were asked whether their diet had changed or if they saw their diet changing in the near future, and past vegetarians were asked why they chose to resume an omnivorous diet.[33] A small portion of participants agreed to participate in the qualitative aspect of the study, in-depth interviews that included questions about vegetarian eating, personal practices and attitudes related to consumption or non-consumption of various animal products, rationales for those practices, and beliefs about health consequences of vegetarianism.[33] Dietary change results from the quantitative part of this study showed that 63% of vegetarians ate fewer animal products than they did when they first started the diet, 27% had not changed their diet, and 10% now included more animal products than when they first started.[33] Similar results were shown with the qualitative aspect of this study; over 50% of current vegetarians reported restricting more animal foods as time went on.[33] These results show that a gradual adoption may be the best way to adapt to the vigorous dietary changes of a plant-based diet, rather than adopting it all at once. Participants who once followed a vegetarian diet but decided to resume an omnivorous diet most commonly cited health-related reasons for stopping, such as weakness, fatigue, and anemia.[33] Other reasons included changes in living situations (i.e., moving in with meat eaters).[33] During the interviews, former vegetarians noted health concerns and lack of social support being the main reasons for continuing an omnivorous diet.[33] The findings

from this study aligned with other study results mentioned in this review, including that nutrition knowledge is a factor when it comes to successfully following a vegetarian diet[27], as well as social support.[24,30,31] It is noted that a change in the environment can positively affect adherence to a plant-based diet (i.e., moving somewhere with many plant-based eaters, or moving out of a meat-eating home)[24], but can also negatively affect adherence (i.e., moving in to a meat-eating home).[33]

Not only does public perception affect one's ability to adopt a plant-based diet, but also one's willingness to change. Because meat is often seen as the central item of a meal, it is often seen as very difficult and limiting to cut out meat. Willingness to cut out meat has been studied in the literature, including an article "Meat Beyond the Plate…" published by *Appetite*.[34] The study involved participants varying in age, gender, education, employment status, residence, and diet.[34] The study explored how representations of meat, perceived impacts of meat, and rationales for changing/not changing habits were associated with willingness to adopt a more plant-based diet.[34] Researchers asked participants to write down eight words, thoughts, or feelings when prompted with two statements: (1) "Meat makes me think, feel, or imagine…" and (2) If I was forced to stop eating meat I would feel…".[34] To get data on the participants' perceived impact of meat, researchers asked the participants' opinions on how eating meat may impact (1) nature and the environment, (2) public health and (3) animals.[34] Methods used to determine willingness to adopt a plant-based diet included having the participants read about how consumption of meat affects the environment, health and animals, and fill out yes/no questions about their desire to cut out meat immediately after.[34]

The results of this study showed that representations of eating meat were pleasurable by 41% of participants and were marked with disgust by only 11% of participants.[34] Representations of no meat were marked "well" by 20% of participants, "sad" by 19%, and "missing something" by 12%.[34] The largest perceived impact of meat consumption to animals was related to mass production and artificial methods (i.e., industry), and the largest perceived impact to the environment was related to pollution.[34] Sixty percent of participants (after reading the excerpt given by researchers) said that they were willing to change their meat-eating behaviors, and 48% of participants said they were willing to reduce their meat consumption.[34] The results from this study showed that the general public belief of meat consumption is positive.[34] Although the majority of people said that they would be willing to change their meat consumption after reading information about the negative aspects of meat consumption, it was unclear whether individuals would succeed in the change after the study.

Health Benefits and Potential Risks of Plant-Based Diets

There are many health benefits of plant-based diets. People who follow some sort of plant-based diet are less likely to be overweight or obese.[6,7] A study published by The American Journal of Clinical Nutrition found that vegans, lactovegetarians, and semi-vegetarians had significantly lower risk of overweight/obesity than did omnivores.[6] Results showed that even a modest reduction in meat can have positive health outcomes. Other studies have found similar results with a dose-dependent effect: the less meat an individual consumes, the lower their BMI and body weight.[5,6] In other words, the health

effects of a plant-based diet do not start with the complete exclusion of all meat; they start as soon as meat intake is reduced.

Vegetarians, vegans, lacto-ovo vegetarians, semivegetarians, and pescatarians have less prevalence of type II diabetes, according to a study by Tonstad.[7] Tonstad and colleagues looked at a large group of Seventh-Day Adventists, with varying age, gender, and dietary preferences.[7] BMI was a grouping factor: BMI over 30 and BMI under 30.[7] The study examined the prevalence of type II diabetes (fasting glucose measurement > 126mg/dL) within the BMI categories and types of vegetarianism reported via a food frequency questionnaire.[7] Tonstad found that for the group BMI at or over 30, type II diabetes prevalence was 8% in vegans, 9.4% in lacto-ovo vegetarians, 10.4% in pescatarians, 11.4% in semi-vegetarians, and 13.8% in non-vegetarians.[7] For the group BMI under 30, the prevalence of type II diabetes was 2% in vegans, 2.1% in lacto-ovo vegetarians, 3.3% in pescatarians, 3.7% in semi-vegetarians, and 4.6% in non-vegetarians.[7] These trends reflected those seen in previous research, in particular that type II diabetes prevalence increases at a BMI over 30, and that type II diabetes is less prevalent in diets restricting meat.[8] In a multiple logistic regression analysis, the vegetarian's diets had a lower prevalence of type II diabetes, and when BMI was removed from the analysis, vegetarian diets were still associated with less diabetes prevalence.[7] The most substantial conclusion that could be drawn from this study was that vegan and lacto-ovo vegetarian diets were associated with a nearly 50% reduction in risk of type II diabetes compared with non-vegetarians, with an adjustment of socioeconomic and lifestyle factors, as well as BMI, that is commonly associated with vegetarian diets.[7] These data further suggest that eliminating meat in some capacity will

lead to positive health outcomes, specifically a reduction in the risk and prevalence of type II diabetes. These benefits could also be due to an increase in fruit and vegetable consumption, which may have protective measures against type II diabetes.

Vegetarians are also at a 24% reduced risk of dying from ischemic heart disease compared to non-vegetarians, according to Key.[9] Plant-based diets have been shown to lower BMI, cholesterol, blood triglycerides and other risk factors for the development of heart disease.[9,10,12,13] In a study titled "The BROAD study: A randomized controlled trial using a whole food plant-based diet in the community for obesity," researchers studied the effectiveness of a community-based dietary program that involved a whole food, plant-based diet.[10] The intervention included facilitated meetings twice weekly for 12 weeks and followed a non-energy-restricted whole food plant-based diet, with a vitamin B12 supplement.[10] The intervention focused on creating long-term behavioral changes through developing practical skills, especially cooking.[10] The dietary approach was low-fat, plant-based and included whole grains, legumes, vegetables, and fruits.[10] The intervention ran for 12 months, with BMI and cholesterol being tested at baseline, 3 months, 6 months, 9 months, and 12 months.[10] At 6 months, mean BMI reduction for the intervention group was 4.4, and at 12 months was 4.2.[10] Mean weight reduction in the intervention group at 6 months was 12.1 lbs, and at 12 months was 11.5 lbs.[10] For the control group, there were no significant reductions in BMI at month 3 and month 6.[10] At month 6, there were between group differences for BMI, a reduction of 3.9 and for weight, a reduction of 10.6 lbs.[10] The BMI reduction and weight reduction was highest in the intervention, though changes were seen with the control group as well.[10] Cholesterol was also measured in the participants, with the intervention group showing a significant

mean reduction at all time points, while the control group only had reduced measurements at month 3.[10] Medication use, cardiovascular risk factors, quality of life, and adherence were also tested in this study.[10] Medication use increased by 8% in the control group at month 6 of the study and decreased by 29% in the intervention group by 12 months.[10] Hemoglobin A1c (glycosylation of hemoglobin) decreased in the intervention group, and quality of life increased.[10] Overall, the results from this study showed that a plant-based diet was effective for lowering factors related to heart disease, such as BMI, cholesterol, and hemoglobin A1c.[10] Following a plant-based diet also allowed the participants to decrease medication consumption, improve their quality of life, and improve their general and nutritional self-efficacy.[10] These results also showed that not only was following a plant-based diet beneficial for health, but it also provided individuals with more self-confidence in general and within dietary conditions and changes.

There have also been studies published exploring the various risks that may be associated with a plant-based diet. One potential risk could be a reduced bone mass, since certain components of the diet (such as calcium, protein, alkali, and vitamin K) may be limited in those following plant-based diets. Many studies have explored this possible risk[15,16,17], including one cross-sectional study done by Knurick and Johnston.[17] The aim of the study was to investigate the associations between indicators of bone health and bone mineral density in young, healthy, non-obese, sedentary adults following a meat-based, lacto-ovo vegetarian, or vegan diet.[17] Participants had been following their respective diet for at least one year, and were not competitive athletes or training for an endurance event.[17] The study included a 24-hour diet recall conducted by a trained

nutritionist, whole body dual-energy X-ray absorptiometry (DXA) scan, 24 hour urine sample, and a fasting blood sample.[17] The results of this study showed that bone mineral density was reduced 4-5% in individuals following a lacto-ovo vegetarian or vegan diet compared to those following a meat-based diet, although this reduction was not statistically significant.[17] Calcium excretion was 34% higher in the meat eaters, urinary pH was more alkaline in the vegetarian groups, and dietary potential renal acid load (PRAL) was reduced over 100% in the vegetarian groups.[17] These study results align with those of previous studies that have reported lower PRAL values (yielding a more alkaline load) with vegetarians and a larger acidic load with meat-eaters.[18] Previous studies have shown that a more alkaline diet (or consuming alkali supplements) decreases bone resorption, and increases bone mineral density.[19] Knurick and Johnston also found that the vegetarian groups consumed 30% less protein than the meat-eaters, and had a lower intake of vitamin B12.[17] However, the vegetarian groups had higher intakes of magnesium, folate, and vitamin K.[17] Dietary protein was correlated with bone mass density and urinary calcium in all participants.[17] The results from this study show that while plant-based dieters may have lower consumption of necessary nutrients for bone health, such as protein, the alkaline nature of the diet and an increase in other nutrients related to bone health may make up for that loss.[17]

Another potential risk of following a plant-based diet is a deficiency in vitamin B12, a nutrient only found in meat derived foods. The large prevalence of vitamin B12 deficiency in plant-based dieters has been shown in previous research.[20] One consequence of a deficit of vitamin B12 is hyperhomocysteinemia, a condition associated with arterial endothelial dysfunction and a risk factor for cardiovascular

disease.[21] A review article published by the American Journal of Preventive Medicine reported that vegetarians had an overall higher level of homocysteine than omnivores, the prevalence of hyperhomocysteinemia was higher in vegetarians than in omnivores, and that the prevalence of hyperhomocysteinemia among vegetarians could be higher than omnivores who had been diagnosed with Cardiovascular Disease.[22] These findings show that hyperhomocysteinemia could be a potential risk of following a plant-based diet, and could lead to negative health consequences.[22] Even so, the Academy of Nutrition and Dietetics has stated that plant-based dieters who do not consume meat could still consume an adequate amount of vitamin B12 through diary, fortified foods, and/or dietary supplements.[23]

Goal-setting and Dietary Interventions

While there have been no studies published that examine goal-setting as a strategy to adhere strictly to a plant-based diet, there have been a multitude of studies conducted focusing on goal-setting as an intervention to promote a positive dietary change.[35] Specifically, researchers have included goal-setting in various interventions with the aim to increase fruit and vegetable intake.[36-40] One such study by O'Donnell examined the effect of a web based intervention that utilized goal-setting on fruit and vegetable consumption and physical activity on college students.[38] Participants included college students from eight different institutions in the Eastern United States.[38] It was noted that at the beginning of this study, only a small proportion of the participants were meeting the fruit and vegetable recommendation, but over half were meeting the physical activity recommendations.[38] The inclusion criteria included being enrolled in one of the

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institutions, being 18-24 years old and having a BMI greater than 18.5.[38] The exclusion

criteria included being pregnant or breastfeeding, being a nutrition or exercise science

major, and having adverse health conditions that would limit participation in a nutrition

and physical activity program.[38] The web-based intervention included 10 online lessons

(1 lesson per week), interactive questions, and personal feedback.[38] The first lesson

included guidelines on how to make a SMART goal; the other lessons included facts

about fruit and vegetable consumption recommendations, eating healthfully, enjoyable

physical activity, and size acceptance and non-dieting principles.[38] A SMART goal was

defined as a goal that was specific, measurable, achievable, relevant, and time bound. At

the end of the weekly lessons, participants reported their average fruit and vegetable

consumption and physical activity and set a goal for each behavior for the following

week.[38]

The key results from this study included a significant ($p < .001$) increase in fruit

and vegetable consumption over time, and a significant correlation between goal and

behavior each week.[38] The correlation between goal and behavior increased over time,

suggesting that the participants became more effective at reaching their goals over time.[38]

The proportion of participants who reached the target for fruit and vegetable consumption

increased from 1.1% to 8.4% from week 2 to week 10, and the proportion of participants

who met their personal goal rose from 28.9% at week 2 to 58% at week 10.[38] For

physical activity, there was no significant change in proportion meeting target, or

achieving personal goal.[38] Results of this study also showed that subjects who achieved

more goals consumed more fruit and vegetables and engaged in more physical activity

than those who were less effective at achieving goals.[38] It can then be assumed that goal

achievement was related to improved behavior outcomes.[38] In this study, setting weekly goals was more effective for following a dietary change (consuming more fruits and vegetables) than an action (physical activity).[38] Researchers suggested that these results supported the idea that goal-setting is more effective for a behavior change rather than simply maintaining behavior.[38]

These results also aligned with those of another study done by Cullen and colleagues that examined the effectiveness of a web-based intervention on increasing fruit and vegetable consumption and physical activity in teenagers.[39] Teens who completed the intervention that included goal-setting had an average of 3-4 servings higher consumption of fruits and vegetables than teens who did not have any intervention.[39]

A dissertation written by Lutz examined the effects of three different newsletters on increasing fruit and vegetable consumption in employees covered by a Health Management Organization, called Healthsource.[40] The control group had no access to any newsletter. Experimental groups received either a newsletter that was generic and had non-tailored nutrition information, a newsletter with tailored nutrition information without goal-setting, or a newsletter with tailored nutrition information and with a goal-setting component.[40] The newsletters were all arranged in the same style and format, and written by the same team of nutritionists and health educators.[40] The participants' fruit and vegetable consumption was measured through self-evaluation via a survey given at baseline, and post-intervention.[40]

Within the results, it was first noted that participants were more likely to remember that they had received the newsletter if they received the tailored with goal-

setting, rather than the non-tailored or the tailored without goal-setting.[40] Also, of the

participants who remembered the newsletter, 71% reported reading through the entire

newsletter.[40] These results indicated that goal-setting was something that drew readers in,

and may have made the intervention more memorable, therefore creating more lasting

effects. For daily intake of fruits and vegetables, the group who received the tailored with

goal-setting newsletter showed the greatest increase, followed by the tailored without

goal-setting, then the non-tailored.[40] Although tailored with goal-setting was the most

effective, all newsletters caused an increase in fruit and vegetable consumption in the

participants compared to the control group of no newsletter.[40]

Multiple Goal Pursuits

There is a large body of research on both the risks and benefits of setting multiple

goals simultaneously. Emmons and King reported that the pursuit of multiple goals

causes goal competition, and can lead to negative cognitive and behavioral

consequences.[42] Goal competition refers to a person prioritizing one goal and having to

lessen or fully stop the effort of secondary goals while pursuit of the prioritized goal

continues until completion.[45] Louro and colleagues developed and tested a model of

multiple-goal pursuits that aimed to specify how individuals assigned resources and

efforts to multiple goals over time.[43] Results of their longitudinal diary study showed that

positive and negative emotions, as well as distance from the goal, have large effects on

resource and effort allocation between goals.[43] It was shown that when a focal goal was

distant, positive emotions, coming from prior successes, led to an increase of effort in the

area of the focal goal, while negative emotions led to a decrease of effort towards the

focal goal.[43] These results were seen to be switched when the focal goal was near, being

that positive emotions led to the person decreasing the effort they put into achieving their

focal goal, and negative emotions triggered an increase in effort on their focal goal.[43]

When an increased amount of effort was put into the focal goal, less effort went into the

alternative goals, and when less effort was put into the focal goal, more effort went into

the alternative goals.[43] This study proposed that with multiple goal pursuit comes an on-

going prioritization of goals where limited resources are allocated to the goals based on

proximity of the focal goal and emotions towards the focal goal that stem off prior

experiences with goal achievement.[43] This study reported that the prioritization process of

multiple goals comes more naturally to participants than attempting to find multifinal

means.[43]

In a study done by Orehek and Vazeou-Nieuwenhuis, it was found that there were

two strategies people used when trying to pursue multiple goals. The first strategy,

sequential goal pursuit, involved the person assigning resources to one goal at a time and

focusing on that one goal until it is completed, then moving onto the next goal.[44] This

method would likely lead to prioritization of goals, much like Louro and colleagues

study.[43,44] A common strategy of sequential goal pursuit was goal shielding, where the

person protected the focal goal by inhibiting the other goals.[44] Concurrent goal pursuit

was the second strategy, and involved giving attention to multiple goals at one time.[44]

This happened only when the person was able to find a single course of action that had

the potential to satisfy their multiple goals.[44] Although it has been shown that this strategy

initially puts more demand on the individual[42], this study proved it was able to be used as

an effective strategy for goal achievement.[44] Orehek and Vazeou-Nieuwenhuis reported

that in order for multifinal means to be pursued, several conditions must be met. The first

was that the multiple goals needed to be activated at the same time, otherwise the other

goals would not be considered when the participant was attempting to find multifinal

actions.[44] The second condition was that there must have been means available to achieve

the multiple goals using the same actions.[44]

The process of finding single means to satisfy multiple goals simultaneously was

referred to as the multifinality principle.[44] Whether or not a person attempted to find

multifinal means and therefore achieve multiple goals simultaneously was determined by

priority or importance of the focal goal and alternative goals.[44] When the importance of

the goals was similar, or when the person desired a compromise between goals,

concurrent goal pursuit would be sought out.[44] However, when a goal was placed at a

higher importance than the other goals, it was likely that the person would attempt to

accomplish the more important goal first, and then move onto the other goals. Overall,

this study showed that multiple goal pursuit was likely determined by priority, activation

of goals, and ability to find multifinal means.[44]

The multifinality principle has been studied more in depth. One such study by

Kopetz and colleagues hypothesized that the simultaneous activation of multiple goals

would narrow the set of acceptable means of the focal goal, and would advance, or not

stop, the pursuit of additional goals.[45] The researchers called this the multifinality

constraints effect, where the mutifinal actions reduced the number of actions that could

be done to achieve the focal goal, causing the person to focus only on those actions and

therefore achieve their focal goal as well as their alternative goals.[45] Kopetz and

colleagues reported that there are two boundary conditions of the multifinality constraints

effect; feasibility of identifying the multifinal actions and the enhanced importance of the focal goal.[45] Feasibility of identifying multifinal actions referred to how possible it was for the person to find mutifinal actions of their goals.[45] This boundary is similar to what was outlined in the previous study, that the decision to go after multiple goals simultaneously was partially dependent on the availability of actions to reach the multiple goals.[44] The most important consideration to feasibility was how similar or alike the goals were.[45] The more similar the goals were, the more chance the person would have of figuring out mutifinal means that would accomplish all goals, without seriously narrowing the actions that could be taken to achieve the goals.[45] When feasibility was high, finding multifinal actions would be easy, and result in very few reductions in the actions that would accomplish all goals (compared to the actions that would only accomplish the focal goal).[45] When feasibility was moderate, finding multifinal actions was more difficult, and result in a more narrow set of actions that could accomplish all goals.[45] When feasibility was low, finding multifinal actions would be very difficult, and would most likely result in goal competition, leading the person to temporarily give up on the alternative goals.[45] Kopetz and colleagues reported that the second boundary to the multifinality constraints effect was the importance of the focal goal compared to the alternative goals.[45] If the focal goal was of much greater importance than the alternative goals, it could lead to goal shielding via the inhibition of alternative goals.[45]

Kopetz and colleagues ran 5 studies to test these theories. The first study tested the hypothesis that the activation of multiple goals would narrow the actions considered acceptable to the pursuit of a given focal goal.[45] Participants in this study were college students at the University of Maryland who were getting lunch in the student union.[45]

There were two groups, uncompleted goals and completed goals, as well as two outcomes, hard to get food vs easy to get food.[45] All students' focal goal was to get lunch.[45] The uncompleted goals group was asked to report three activities they had planned to do the rest of that day, while the completed goals group was asked to report three activities they had already completed that day.[45] Participants were then asked to choose the foods they desired for lunch out of 20 foods listed, 10 being readily available at the union and 10 that were accessible at the student union (harder to get).[45] It was assumed that the food that was accessible at the union would be multifinal, because it would accomplish their focal goal of getting lunch as well as saving time so that alternative goals could be met.[45] The results from this study showed that, first, the groups did not differ in hunger.[45] The uncompleted goals group selected fewer foods, and selected more easy-to-get foods than hard-to-get foods compared to the completed goals group.[45] Participants who were in the completed goals groups did not have a preference over easy- vs hard-to get-foods.[45] These results supported the hypothesis by Kopetz and colleagues, that adding in alternative goals along with a focal goal narrows the means by which the focal goal could be achieved to only those actions that would help achieve all goals.[45] This was seen through this study by the participants who were introduced or reminded of their alternate goals (uncompleted goals group) being more likely to choose less and easier-to-eat foods, accomplishing both the focal goal of eating lunch while still making time to complete the alternate goals they had for the day.[45]

The second study done by Kopetz et al. investigated the boundary of feasibility in the multifinality constraints effect.[45] Results showed that, like study 1, addition of an alternative goal reduced the number of actions participants felt would satisfy their

goals.[45] The study results supported the feasibility hypothesis, that the level of feasibility has a relationship with the reduction of possible actions that could be taken in order to satisfy the goals.[45] It was shown that goals with high feasibility (goals that were perceived to share many common means) resulted in little to no reduction in the number of means (actions that could be taken to achieve the focal goal).[45] Furthermore, goals with moderate feasibility (goals that were perceived to only share a few common means) resulted in a substantial reduction in the number of means.[45] It was shown that participants who had goals with low feasibility (shared very few to no common means) were less selective in the means they chose, very little restriction existed on the focal goal means, and the selected means were not helpful to the alternative goals.[45] In this case, participants appeared to shield the focal goal while inhibiting the alternative goals.[45] These results showed that the feasibility of the focal goal and the alternative goals was strongly associated with the number of multifinal means, and must be considered when a person is attempting to complete multiple goals simultaneously.[45]

The third study done by Kopetz examined the ability for participants to find multifinal means to accomplishing multiple goals along with one focal goal, when the importance of one goal was placed higher.[45] The participants, as with the previous studies, were students going to lunch.[45] The control group had two goals of equal importance; good tasting food and low calorie food, while the experimental group had the same two goals, but good tasting food was placed at a higher importance.[45] The participants were asked to list foods they would like for lunch.[45] The main dependent variable in this study was number of foods listed by each group, because the hypothesis was that if one goal was placed at a higher importance than the others, the means of

reaching the goals would become larger, because the participant would not try to find multifinal means, they would only be focusing on achieving the more important goal.[45] This hypothesis was proven correct, as the group with food tastiness at a higher importance listed more food choices than the control group.[45] The researchers then looked at the foods listed to see if the experimental group differed in food choices compared to the control group.[45] Results showed that participants in the experimental group chose more food that was perceived as more tasty than low-calorie, while the control group selected foods that were perceived as equally tasty and low-calorie.[45] These results demonstrated the possible ways goals could influence individuals' ability to find multifinal means to complete multiple goals at once.[45]

CHAPTER 3

METHODS

Participants

The participants for this study were college students enrolled in Psychology 101 at Arizona State University during the Fall semester of 2017. No age limit was applied, but the majority of students were freshman or sophomores, aged 17-20 years old. The only exclusion criteria were potential participants indicating that they were not currently vegetarian, vegan or pescatarian, or were not striving to follow one of these diets. Subjects for this study were recruited at the beginning of the Fall 2017 semester, through the Psychology 101 course at Arizona State University via a listserv email. A pre-screening survey was initially sent out to over 2,000 students.

Researchers determined eligibility and group assignment through analysis of the pre-screening survey. The flow chart for the whole study is seen in appendix E. Eligible participants were excluded from the final dataset if they selected they had changed their dietary goals from what they initially put on the pre-screen survey. No laboratory analyses were used during the completion of this study. A statistical power analysis was run to determine the desired sample size. With an alpha = .05 and power = .80, the projected sample size needed (G Power 3.1 software)[46] was approximately n = 51 for the between group comparisons.

Students who filled out the pre-screening survey and were thus identified as candidates for one of two study groups (striving to be vegetarian, vegan or pescatarian [STRIVE], or currently vegetarian, vegan or pescatarian [ADHERE]) were invited to take part in the study survey via email. This study received approval from the Arizona State

University International Review Board (see Appendix A). The study team received consent from all participants as they completed the pre-screening survey. The consent form (see appendix B) was attached to the top of each survey. Consent included general information about the study, the purpose of the research, the risks associated with the study, and the benefits of participating. The contact information of the researchers was included in the consent form to address any further questions participants had. Students who qualified to take the study and did so received 0.5 credits to go towards their research credits required for the Psychology 101 course at Arizona State University. The study followed IRB protocol.

Survey Design

This study was a cross-sectional design with no intervention. After researchers received the pre-screen survey responses, the eligible participants were sent an invitation via email to complete a follow-up survey. Follow-up surveys were tailored to the study group. Strivers completed a survey for striving to become vegetarian, vegan, or pescatarian (see appendix C) and current vegetarians, vegans, or pescatarians completed the survey for current followers (see appendix D). A total of 88 participants completed the STRIVE survey, and 49 completed the ADHERE survey.

The surveys contained various validated measures unrelated to the hypotheses, as well as questions generated by the researchers to more closely evaluate the hypotheses. The entire survey, including the validated measures and generated questions, was designed to examine adherence to a plant-based diet and various social and motivational factors. The social and motivational factors examined included resources used by

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participants for goal pursuit, goal-self efficacy, emotion regulation, and the influence of others on dietary goal achievement. The purpose of the larger study was to determine how various social and motivational factors influence one's ability to adhere to a dietary goal, by comparing those who were already adhering to the diet and those who were striving to follow the diet.

The first question of the surveys asked participants if they were still either currently following a vegetarian, vegan, or pescatarian, or striving to follow one of those diets. This question was included to ensure that participants were still eligible to take the survey. The surveys asked participants to write in three current, medium range goals they had set for themselves. There was no restriction on the type of goals the participant could write. Participants were then asked to rank those goals along with their dietary goal (continuing to follow or striving to follow a vegetarian, vegan, or pescatarian diet) in order of importance (1-4, 1 being most important) with their alternative goals. Next, the participant was asked to rank how much each of the additional medium-range goals helped their ability to achieve their dietary goal and interfered with their ability to achieve their dietary goal. These questions were developed by researchers in relation to stated hypotheses.

Researchers cleaned the data through three rounds of elimination. On the first round, all participants who left incomplete questionnaires, or who had outlier responses, were removed from analyses. The second round included dropping all participants who responded to both the STRIVE and ADHERE surveys. On the final round, researchers removed participants who did not fit the appropriate time limit for the survey. See figure 2.

Figure 2.
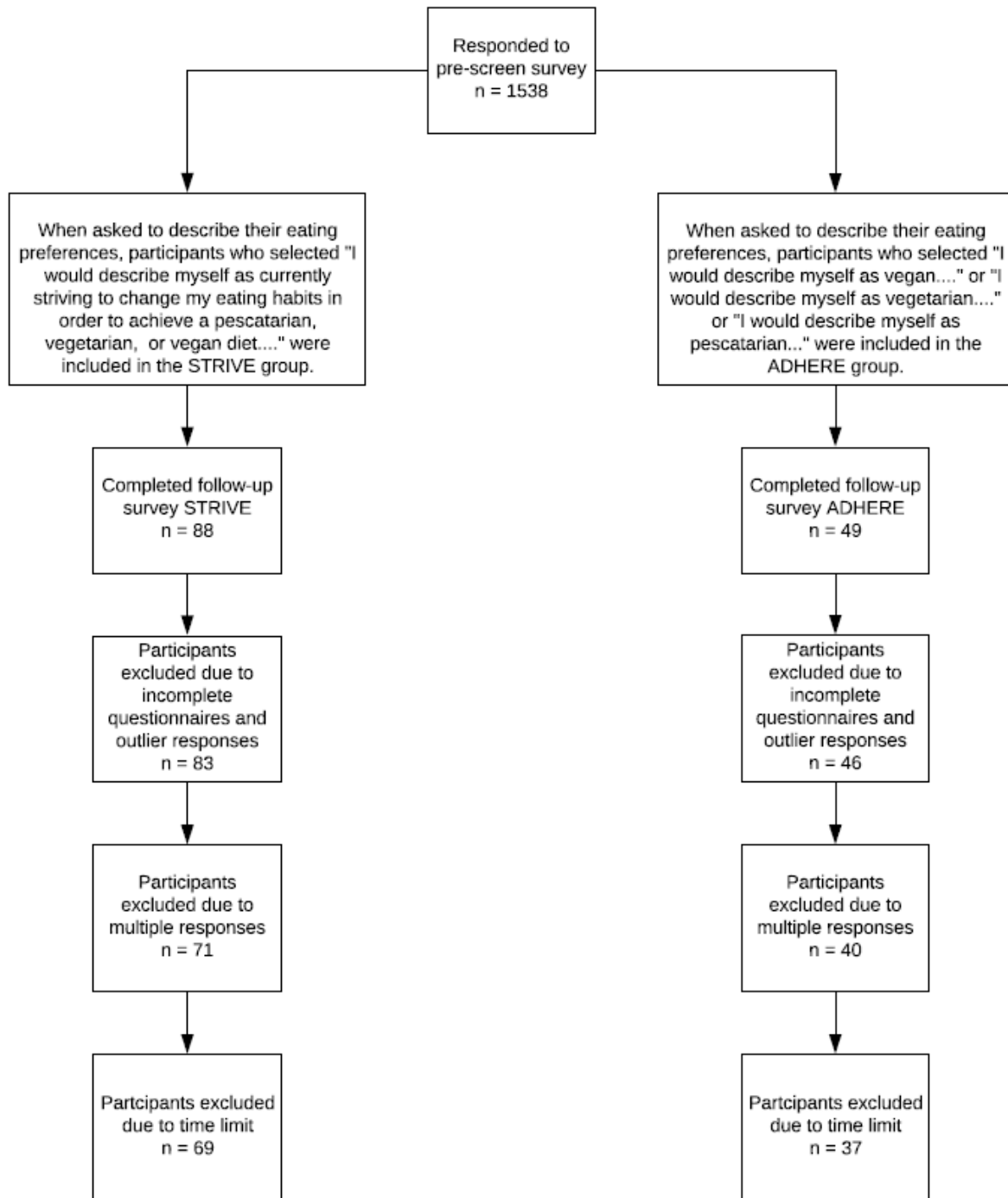
Data Analysis

SPSS version 20 was used to run the data analysis. Statistical analysis was drawn from the data of the questions mentioned above. The first question asked the participant to list and rank 3 current medium-range goals they currently had for themselves. The second question used a scale to ask how much each of those goals helped the participant achieve their dietary goal. The third question used the same scale to ask how much each of those goals interfered with their ability to achieve their dietary goal.

A descriptive test was run on all data from both groups to describe the demographics (age, gender, BMI) of each group. The data were checked for normality before running any tests and transformed if non-normal. If the data was still non-normal after transformation, the original data points and non-normal statistical tests were used. To test the first hypothesis that participants who successfully adhered to a plant-based diet would identify a higher number of health/diet-related goals compared to participants who strived for, but did not yet adhere to, a plant-based diet, an independent t-test was to be used. However, if the data was non-normal, a Mann-Whitney test would be used. Prior to this analysis, researchers categorized goals identified by participants as health/diet-related or non-health/diet related using a consistent coding scheme. Next, participants were organized into groups based on how many health and dietary goals they reported (zero to three). Groups were constituted with those who reported zero health/diet goals, those who reported one health/diet goal, those who reported two health/diet goals, and those who reported three health/diet goals. The researchers based this hypothesis off the multifinality constraints effect feasibility theory that setting alternative goals with similar means of achievement as the focal goal will increase one's ability to achieve the focal

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goal and the alternative goals. To have similar means of achievement, the goals

themselves must be at least somewhat similar, so researchers wanted to include any goals

that could be related (have similar means) to their plant-based diet goal. For this reason,

health and diet goals were grouped, such as "lose weight," "learn to consistently meal

prep," and "live a healthy lifestyle." All these goals likely share similar means of

achievement to the focal goal, adhering to a plant-based diet. Goals that were not

included on this basis included, for example, "improve fitness levels and appearance by

incorporating more HIIT workouts," "I want to consistently work out," and "train for a

marathon." Along with the health/diet goals category, researchers created groups of those

who put zero, one, two, and three non-health/diet goals as well.

To test the second hypothesis that additional goals would be significantly more

helpful and significantly less interfering among participants who adhere to a plant-based

diet compared to those who strive for a plant-based diet, a two-way MANOVA was run.

The dependent variables included in the two-way MANOVA were goal helpfulness and

goal interference scores, while the independent variables were STRIVE and ADHERE

group assignment. The purpose of this analysis was to examine the differences in goal

helpfulness and interference scores considering whether the participant was adhering to

the plant-based diet or was striving to follow the diet.

Finally, logistic regression was utilized to test the third hypothesis that ranking of

the plant-based diet goal would predict group assignment, such that a higher ranking (one

or two) would predict adhering to the diet and a lower ranking (three or four) would

predict striving to follow the plant-based diet. Before running this test, researchers

separated participants into groups: people who set their dietary goal as a first or second

ranking, and those who ranked their dietary goal as third or fourth in importance. Logistic

regression was used to determine if the ranked importance of the dietary goal was

predictive of either being a STRIVE or ADHERE member.

CHAPTER 4

RESULTS

A total of 106 participants were included in the study. Sixty-nine reported they

were striving to follow a plant-based diet, while 37 reported they were currently

following a plant-based diet. The mean +/- standard deviation for BMI for the STRIVE

group was 22.29+/-4.40, and the mean +/- standard deviation for BMI for the ADHERE

group was 18.14+/-7.65. The mean +/- standard deviation for age for the STRIVE group

was 19.03+/-1.74 and 19.62+/-3.15 for the ADHERE group. A Chi-Square test was run

on gender and group assignment and no significant difference was found p = .253. To

compare the mean BMI and mean age between groups, and non-parametric tests was used

due to the normality of the data. Results from a Mann-Whitney test showed that there was

not a significant difference in age between groups, p = .400, but there was a significant

difference in BMI between the groups, p = .003. This is consistent with previous

literature that states that adherence to a plant-based diet is correlated with a lower BMI.[6,7]

See figure 3 for the descriptive results.

| | STRIVE (n=69) | | ADHERE (n=37) | | |
	Mean	+/-Standard deviation	Mean	+/-Standard Deviation	P-value
Sex					.253*
BMI	22.29	+/-4.40	18.14	+/-7.65	.003**
Age	19.03	+/-1.74	19.62	+/-3.15	.400**

Figure 3. Descriptive data of participants.
*Chi-square test to determine correlation of gender with group assignment.
**Mann-Whitney tests to compare medians between groups.

Number of health and diet related goals compared between ADHERE and STRIVE groups

To test the hypothesis that number of health and diet related goals reported would differ between the ADHERE and STRIVE groups, an independent t-test was planned. Prior to running this test, data was assessed for normality. Visual interpretation of the histogram showed the data positively skewed. Shapiro-Wilk test reported the significance as $p < .001$, and therefore the data was non-normal. To attempt to normalize data, data was log transformed and square root transformed. Log transformation of the data came back non-normal, Shapiro-Wilk significance $p < .001$. Square root transformation came back non-normal as well, Shapiro-Wilk significance $p < .001$. Based on the normality of the data, a Mann-Whitney test was used, rather than an independent t-test. Researchers did not control for any variables in this analysis, due to the small number of participants. Results of the Mann-Whitney test showed there was no significant difference in the medians between groups, significance $p = .276$, $U = -1.088$. Medians did not differ between the ADHERE group ($Mdn = 1.00$) and the STRIVE group ($Mdn = 1.00$).

Helpfulness and interference of goals will differ between groups

To test the hypothesis that goals would be reported as significantly more helpful and less interfering among the ADHERE group compared to the STRIVE group, a two-way MANOVA was used. Results showed that helpfulness and interference scores did not differ significantly between the two groups, $F (2,92) = .363$, *Pilai's Trace* $= .008$, $p = .697$, *partial n^2* $= .008$. Although it was shown that BMI significantly correlated with

group assignment, researchers did not control for BMI due to the small sample size in this study.

Exploratory MANOVAs were run. Researchers assessed whether there was a difference in helpfulness and interference scores in participants who reported one or more diet/health related goals, regardless of group assignment, and those who reported zero diet/health related goals. The dependent variables in this MANOVA were goal helpfulness and interference scores, and the independent variables were 0,1,2,3 health/diet goals reported. The results showed that there was a significant difference in goal help scores between the number of dietary goals reported, $F(3,92) = 13.232$, $p <$ .001, *partial n^2* = .301, but not for goal interference scores, $F(3,92) = 1.334$, $p = .268$, *partial n^2* = .042. Further post-hoc tests on goal helpfulness scores and number of diet/health related goals showed that there was not a significant difference in goal help scores between participants who reported zero health/diet related goals and those who reported one health/diet goal, $p = .232$, *95% CI* (-1.1317, .1775), but there was a significant difference between those who reported zero diet/health goals and those who reported two diet/health goals, $p < .001$, *95% CI* (-2.1151, -.6645). Furthermore, there was a significant difference between zero and three health/diet goals, $p < .001$, *95% CI* (- 2.4094, -.7893). It was also shown that there was a significant difference in goal help scores between those who reported one health/diet goal and those who report two health/diet goals, $p = .010$, *95% CI* (-1.6563, -.1691), and between those who reported one and three health/diet related goals, $p = .003$, *95% CI* (-1.9486, -.2958). See figure 5 for these results. There were no other significant differences between number of dietary goals reported and goal help scores.

Health/diet goals	Goal Help Scores	Goal Interference Scores
0	2.538	2.118
1	2.974	1.655
2	3.998 * +	1.684
3	4.278 *+	2.125

Figure 5. Difference between number of health/diet related goals and goal help and goal interference scores.
*significantly different from 0 dietary goals, $p < .001$
+ significantly different from 1 dietary goal, $p < .02$

Rank of Plant-Based Diet Goal Predicts Group Assignment

To assess whether ranking of the plant-based diet goal could predict group assignment, a logistic regression test was used. Due to the small sample size in this study, no variables were controlled for in this analysis. The hypothesis was that ranking the plant-based diet goal higher (one or two) than the alternative goals would predict the participant being in the ADHERE group, and that ranking the plant-based diet goal lower (three or four) would predict the participant being in the STRIVE group. The logistic regression model was not significant, $x^2 (1) = 1.212$, $p = .271$, *Nagelkerke R^2* (.020). When the rank of dietary goal was added to the model, group classification was not increased.

CHAPTER 5

DISCUSSION

Number of health and diet related goals

Previous studies have highlighted the importance of setting goals that have multifinal means to achieve multiple goals simultaneously.[43,44,45] The participants for the present study had one focal goal: adhering to or continuing a vegan, vegetarian, or pescatarian diet, as well as three other medium-range goals, which did not have to be diet or health related. Based on the multifinality constraints effect theory, researchers hypothesized that those participants who had a higher number of alternative goals that were diet or health related would be more likely to be adhering to the plant-based diet (be in the ADHERE group) than those who had a lower number of diet or health related goals. If the alternative goals were diet or health related, the feasibility of finding multifinal means to accomplish both the focal goal and the alternative goals would be high, and therefore encourage goal achievement. If the participant set alternative goals that were not diet or health related, they would not be able to find multifinal means, and therefore would have a more difficult time achieving the focal goal and alternative goals. The findings of the current study did not support this hypothesis. We found no significant difference in number of diet or health related goals between the ADHERE and STRIVE group. This could be due to the participant following sequential goal pursuit[44] and not attempting to achieve the goals simultaneously, rather prioritizing their focal and alternative goals. As seen in previous research, prioritizing goals rather than attempting to find means that achieve all goals leads to goal competition, or the participant favoring one goal over the others. Goal competition leads to goal shielding, in that participants

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shield their focal goal through inhibition of the alternative goals. If the dietary change goal was not indeed the most important goal to the participant, the goal may also have been pushed aside while the participant focused on other goals. This would happen regardless of the nature of the goal. When goal competition and goal shielding present themselves, research suggests that individuals stop looking for multifinal means because they stop thinking about the alternative goals.[45] Goal competition and goal shielding make it very difficult to achieve multiple goals simultaneously but is a common method of dealing with pursuing more than one goal.[43,44]

Helpfulness and interference of alternative goals

We hypothesized that the reported helpfulness and interference of the alternative goals on the focal goal would differ between the ADHERE and STRIVE group, such that helpfulness would be greater in the ADHERE group and interference would be greater in the STRIVE group. It has been shown in previous studies that accomplishing a goal will likely lead to accomplishing another, and another, and so on.[38] It has also been shown that previous goal achievement leads to positive emotions toward working for goals and may encourage allocating more resources and effort towards achieving their current focal goal, making goal achievement easier.[43] The ADHERE group had already accomplished a large goal: to adhere to a vegan, vegetarian, or pescatarian diet, and therefore may find it easier to accomplish goals in general. For the STRIVE group, they had not accomplished their focal goal, and therefore may have negative feelings towards working for a goal, and may end up not putting as much effort into their focal goal and instead putting effort into their alternative goals.[43] If the participant was putting more effort into

their alternative goals, it is likely that they would find those alternative goals to be less helpful and more interfering while trying to achieve the dietary goal. When we compared helpfulness and interference between groups, our results showed no significant results. The STRIVE group members and ADHERE groups members did not have a significant difference of perceived helpfulness and interference of their alternative goals to their focal goal.

However, when we conducted exploratory analyses comparing helpfulness and interference by total number of health/diet goals, regardless of group, some significant differences were noted. While this was not an initial hypothesis, researchers thought that there could be differences in goal helpfulness scores based on what type of goal the participant wrote down. We found that those participants who reported two or three health/diet related goals had significantly higher helpfulness scores than those who reported zero or one health/diet related goal. This means that participants who reported more health/diet related goals as their alternative goals said that those goals were more helpful when it came to their ability to achieve their focal, dietary, goal. Within this finding there was a trend present. It was shown that the more diet or health related goals the participant had, the higher their helpfulness score was. This was most likely because the participant was able to achieve both the focal goal and the alternative diet or health related goals using the same actions. They were able to find multifinal means. According to previous research, certain conditions must be met in order for a person to attempt to satisfy multiple goals at once.[44] The first condition is that all goals must be activated at the same time.[44] In the present study, the focal goal and the alternative goals were all active, as we asked participants for their current goals. The second condition is that there

must be actions by which the multiple goals are able to be achieved.[44] When participants

set diet or health related goals, rather than school or work goals for example, that

condition was more likely met. Those who had zero or one diet or health related goals

likely found that their other goals were not able to be accomplished using actions utilized

to accomplish the dietary goal, and therefore did not find those goals as helpful. The

participant may have attempted to find multifinal means but could not due to the nature

of the alternative goals. The feasibility of them finding multifinal means was low, and

therefore it is likely that sequential goal pursuit was utilized, rather than concurrent. The

findings from the current study align with those of previous research. Feasibility of

finding multfinal means seems to be correlated with the similarity of the goals and is very

important when it comes to whether or not the participant finds their alternative goals to

be helpful when trying to achieve their focal goal. These findings also suggest that goal

similarity (i.e., finding multifinal means) plays a bigger role in multiple goal achievement

than previous experiences of accomplishing goals.

Rank of plant-based diet goal

The last hypothesis of this study was that ranking of the plant-based diet goal

would predict group assignment, such that a higher ranking (one or two) of the dietary

goal would predict the participant falling into the ADHERE group, and lower ranking

(three or four) would predict assignment into the STRIVE group. A high rank of the

dietary goal would mean that the goal was very important to the participant and therefore

the participant was likely to have already achieved it. On the other hand, ranking the

dietary goal lower would mean the goal was unimportant to the participant, and might

predict the participant was not yet achieving the goal. The results of this study did not support this hypothesis. We found no significant difference in the ranking of the plant-based diet goal between the ADHERE and STRIVE group. This might have been due to goal competition and shielding. Although ranking a goal highly might seem like a productive method of achieving a goal, previous research has reported that when it comes to achieving multiple goals, prioritizing those goals is not necessarily an effective strategy.[43-45] This relates, perhaps, to the second boundary of the multifinality constraints effect: perceived importance.[45] Prioritizing goals can lead to goal competition and goal shielding, neither of which are effective strategies to achieving multiple goals. Another possible explanation for this finding is that those who were already following a plant-based diet, and therefore had achieved a large goal, may place the goal of continuing the diet at a lower importance.

CHAPTER 6

CONCLUSIONS AND APPLICATIONS

This study focused on the utilization of setting multiple goals and adhering to a plant-based diet. Participants were split into two groups based on whether their current dietary goal was to continue following a vegan, vegetarian, or pescatarian diet, or their goal was following one of those diets. Participants were asked to write down three of their current medium-range goals they had for themselves currently. To the researcher's knowledge, this is the only study that has looked at the use of multiple goal-setting and adherence to a plant-based diet.

Although multiple proposed hypotheses were not supported in this research, exploratory results showed that the type of alternative goal the participant had was an important indicator of whether the participant found the alternative goals to be helpful in the pursuit of their focal goal. Participants who noted more health and diet related alternative goals found those goals to be more helpful in achieving their dietary goal than those who noted more non-health and diet related alternative goals. While no studies have gone into multiple goal pursuit and adherence to a plant-based diet specifically, previous research has shown that when multiple goals are set it is more helpful to have alternative goals with similar means to the focal goal. This is due to the ease of finding means that accomplish multiple goals simultaneously. If a participant had goals to "live a healthy lifestyle", "eat healthier", and "lose weight", they would likely find a lot of activities that satisfy those goals along with their goal to follow a plant-based diet, such as eating more fruits and vegetables. Conversely, if a participant had goals to "maintain a high GPA", "go to sleep earlier", and "lift heavy weights", they would have a more difficult time

finding activities that satisfy those goals and their goal of adhering to a vegan, vegetarian, or pescatarian diet.

The results from this study indicated that the total number of health and diet related goals (zero to three) did not differ between groups. Those who were already following the plant-based diet did not report a larger or smaller number of health and diet related goals than those who were trying to follow the diet. The participant population were students enrolled at Arizona State University, which may indicate that a lot of their goals, in either group, were more related to school than health. Results also showed that the participants who were already following a plant-based diet did not find their alternative goals to be more helpful than the participants who were trying to follow the diet. These same results were seen for interference of alternative goals as well. Results showed that ranking of the focal dietary goal was not a good predictor of whether or not the participant was following the plant-based diet or trying to follow the diet. Overall, our results suggest that the type of alternative goal matters more than whether or not the participant has already achieved a goal when it comes to how helpful they find their alternative goals are.

Results from this study provide further evidence that when multiple goals are trying to be achieved simultaneously, the type of alternative goals matters a large amount. These findings are consistent with other literature. Areas for further research include comparing goal achievement with participants setting one large goal, and participants setting one large goal with multiple (similar) alternative goals. According to previous research, and the results from the current study, participants may find it easier to

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accomplish the focal goal when there are similar alternative goals also set, because those

alternative goals will be helpful in achievement of the focal goal.

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APPENDIX A

IRB APPROVAL FORM

APPROVAL: EXPEDITED REVIEW

Paul Karoly
Psychology
480/965-5404
KAROLY@asu.edu

Dear Paul Karoly:

On 7/18/2017 the ASU IRB reviewed the following protocol:

Type of Review:	Initial Study
Title:	Motivational and Social Factors in the Pursuit and Maintenance of Dietary Goals
Investigator:	Paul Karoly
IRB ID:	STUDY00006523
Category of review:	(7)(b) Social science methods, (7)(a) Behavioral Research
Funding:	None
Grant title:	None
Grant ID:	None
Documents Reviewed:	• Recruitment - Motivational and Social Factors in the Pursuit and Maintenance of Dietary Goals, Category: Recruitment Materials; • Protocol - Motivational and Social Factors in the Pursuit and Maintenance of Dietary Goals, Category: IRB Protocol; • Consent , Category: Consent Form; • Dietary Preference Screen, Category: Screening forms; • STRIVE Group - follow up , Category: Measures (Survey questions/Interview questions /interview guides/focus group questions); • VEG Group follow-up, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);

The IRB approved the protocol from 7/18/2017 to 7/17/2018 inclusive. Three weeks before 7/17/2018 you are to submit a completed Continuing Review application and required attachments to request continuing approval or closure.

If continuing review approval is not granted before the expiration date of 7/17/2018 approval of this protocol expires on that date. When consent is appropriate, you must use final, watermarked versions available under the "Documents" tab in ERA-IRB.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator

APPENDIX B

CONSENT FORM

IRB: Please note that the consent form is included at the beginning of the online follow-up survey. It is reprinted here.

Title of research study: Motivational and Social Factors in the Pursuit and Maintenance of Dietary Goals

Investigator: Paul Karoly

Why am I being invited to take part in a research study?

We invite you to take part in this research study because we are interested in understanding the factors that relate to your current dietary goals and food preferences. We are surveying students who describe themselves as vegan, vegetarian, pescatarian, or striving to reduce consumption of animal products. Your answers to the prior large PSY 101 survey indicate that you fall into one of these categories of dietary preference.

Why is this research being done?

This research is intended to find how social and motivational factors may influence students' ability to pursue and maintain their dietary goals. This study will obtain data on participants' dietary and non-dietary goals, resources for goal pursuit, and emotional and social factors relating to dietary goals.

How long will the research last?

We expect that individuals will spend 20-40 minutes participating in an online survey. Data will be deleted after completing analysis and will not be kept longer than three years.

How many people will be studied?

We expect that 400 will participate in the follow-up survey.

What happens if I say yes, I want to be in this research?

You are free to decide whether you wish to participate in this study. If you participate, you will be asked to complete an online survey containing questions regarding diet related and other goals, and behavior.

What happens if I say yes, but I change my mind later?

You can leave the research at any time and it will not be held against you.

Is there any way being in this study could be bad for me?

There are no known risks due to participation in this study.

Will being in this study help me in any way?

You will receive 1 course credit for your participation in the follow up survey.

What happens to the information collected for the research?

The results of this study may be used in reports, presentations or publications but your name will not be used. Your responses are confidential and protected. Data for this study will be stored on a password-protected electronic device kept in secure storage. The results of this study may be used in reports, presentations, and publications but your name and identifiable information will never be used. Data will be aggregated and made anonymous. Your identity (name and email address) will need to be known so that 1) the PSY 101 system can assign you credit for participation and 2) we can send you information about the results of the study. Identifying information will be removed from the survey data before analysis. Survey data will be deleted after a period of 1 to 3 years after aggregation and analysis is completed.

Who can I talk to?

If you have questions, concerns, comments, or complaints, email Paul Karoly, pkaroly@asu.edu or Andrew Berardy, aberardy@asu.edu

This research has been reviewed and approved by the Social Behavioral IRB. You may talk to them at (480) 965-6788 or by email at research.integrity@asu.edu if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research participant.
- You want to get information or provide input about this research.

Your participation in the survey is your consent to take part in this research.

APPENDIX C

STRIVE GROUP SURVEY

Q1 In the previous "Introduction to Psychology Survey", you described yourself as striving to change your eating habits. You stated that you were CURRENTLY trying to modify your diet to achieve a pescatarian, vegetarian, or vegan diet. BUT, you stated that you are NOT ALWAYS SUCCESSFUL. How true is this description today?
○ Not at all true (1)
○ Slightly true (2)
○ Moderately true (3)
○ Very true (4)
○ Completely true (5)

Q2 How important is it to you to achieve a vegan diet?
○ Not at all important (1)
○ Slightly important (2)
○ Moderately important (3)
○ Very important (4)
○ Extremely important (5)

Q3 How important is it to you to achieve a vegetarian diet?
○ Not at all important (1)
○ Slightly important (2)
○ Moderately important (3)
○ Very important (4)
○ Extremely important (5)

Q4 How important is it to you to achieve a pescatarian diet?
○ Not at all important (1)
○ Slightly important (2)
○ Moderately important (3)
○ Very important (4)
○ Extremely important (5)

Q5 The following refers to your goal to achieve a pescatarian, vegetarian, or vegan diet. Throughout the rest of this survey, we will refer to this as your "dietary goal".Please keep your dietary goal in mind for the next set of questions. For each of the following statements, indicate the number that best describes your work on this goal.

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	Not at all (1)	Slightly (2)	Moderately (3)	Very Much (4)	Extremely (5)
I possess the necessary skills to attain this goal. (1)	○	○	○	○	○
I'm aware of my day-to-day behavior as I work toward this goal. (2)	○	○	○	○	○
I try not to let other goals interfere with this goal. (3)	○	○	○	○	○
I reward myself for working hard on this goal. (4)	○	○	○	○	○
Working toward this goal is exciting. (5)	○	○	○	○	○
This goal is valuable to me. (6)	○	○	○	○	○
I try to plan out in advance the steps necessary to reach this goal. (7)	○	○	○	○	○

I evaluate my progress on this goal by comparing myself to peoplewho are also working on it, but are doing worse than I am. (8)	○	○	○	○	○
I have the necessary knowledge to reach this goal. (9)	○	○	○	○	○
Thinking about this goal gives me an uneasy feeling. (10)	○	○	○	○	○
I try not to let other people interfere with my work on this goal. (11)	○	○	○	○	○
This goal is worthwhile. (12)	○	○	○	○	○
I evaluate my progress on this goal by comparing myself to people who are also working on it, but are doing better than I am. (13)	○	○	○	○	○

I reward myself when I make progress toward this goal. (14)	○	○	○	○	○
keep track of my overall progress toward this goal. (15)	○	○	○	○	○
This goal is important to me. (16)	○	○	○	○	○
The thought of not achieving this goal frightens me. (17)	○	○	○	○	○
I have what it takes to reach this goal. (18)	○	○	○	○	○
Working on this goal makes me feel happy. (19)	○	○	○	○	○
I evaluate my progress toward this goal in comparison to how well other people are doing in pursuing it. (20)	○	○	○	○	○

I treat myself to something special when I make progress toward this goal. (21)	○	○	○	○	○
I routinely criticize myself for unsatisfactory work toward this goal. (22)	○	○	○	○	○
Working toward this goal brings me joy. (23)	○	○	○	○	○
I tend to notice my successes while working toward this goal. (24)	○	○	○	○	○
This goal is meaningful to me. (25)	○	○	○	○	○
I carefully schedule my activities, so I have enough time to pursue this goal. (26)	○	○	○	○	○
This goal is a source of pleasure for me. (27)	○	○	○	○	○

When working on this goal, I criticize myself for not always having what it takes to succeed. (28)	○	○	○	○	○
I am on the lookout for potential obstacles that might interfere with my progress on this goal. (29)	○	○	○	○	○
Working on this goal makes me feel somewhat panicky. (30)	○	○	○	○	○
I have the ability to reach this goal. (31)	○	○	○	○	○
I evaluate my progress on this goal by comparing myself to people who are very much like me in terms of background and ability. (32)	○	○	○	○	○

I tend to criticize myself when I'm not making progress toward this goal. (33)	○	○	○	○	○
I am tense or jittery when working on this goal. (34)	○	○	○	○	○
I congratulate myself when things are going well on this goal. (35)	○	○	○	○	○
I routinely criticize myself if I don't work hard enough on this goal. (36)	○	○	○	○	○

Q6 In the space below, please list three of your CURRENT, MEDIUM-RANGE goals - that is, goals toward which you will be working for a minimum of several weeks up to a maximum of a year. Please do not answer in terms of short term goals (things achievable in a few hours or days) or in terms of long term objectives (things achievable only after several years). We are interested in the 3 CURRENT, MEDIUM-RANGE goals that are most important to you now. They need not be diet-related.

    Goal 1 (1)
    Goal 2 (2)
    Goal 3 (3)

Q7 Rank your dietary goal and each of your other 3 goals in order of importance. Click and drag each goal to the appropriate rank in the list, with 1 being most important and 4 being least important.

_____ Your dietary goal (1)
_____ ${q://QID6/ChoiceTextEntryValue/1} (2)
_____ ${q://QID6/ChoiceTextEntryValue/2} (3)
_____ ${q://QID6/ChoiceTextEntryValue/3} (4)

Q8 Rate how much each of your 3 goals INTERFERES with your your dietary goal.

	Doesn't interfere at all (1)	Interferes a little (2)	Interferes a moderate amount (3)	Interferes a lot (4)	Really interferes a great deal (5)
${q://QID6/ChoiceTextEntryValue/1} (1)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/2} (2)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/3} (3)	○	○	○	○	○

Q9 Rate how much each of your 3 goals HELPS you to work on your dietary goal.

	Doesn't help at all (1)	Helps a little (2)	Helps a moderate amount (3)	Helps a lot (4)	Really helps a great deal (5)
${q://QID6/ChoiceTextEntryValue/1} (1)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/2} (2)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/3} (3)	○	○	○	○	○

Q10 Take a moment to think about the person in your life who is most important to you. Select the ROLE that this person plays in your life from the options below.

- ❍ Mother (1)
- ❍ Father (2)
- ❍ Sister (3)
- ❍ Brother (4)
- ❍ Other relative (5)
- ❍ Friend (6)
- ❍ Romantic partner (7)

Q11 Please rate the degree to which each of the following statements describes the behavior of the MOST IMPORTANT PERSON in your life in relation to your dietary goal.

	Not at all descriptive 0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)	Extremely descriptive 6 (7)
Seemed pleased with my progress on my dietary goal. (1)	❍	❍	❍	❍	❍	❍	❍
Prevented or discouraged other people from helping me. (2)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she thought I was doing a good job. (3)	❍	❍	❍	❍	❍	❍	❍
He/She used resources (e.g., money or materials) that I needed for my dietary goal. (4)	❍	❍	❍	❍	❍	❍	❍
Helped me to think about different ways to achieve my goal. (5)	❍	❍	❍	❍	❍	❍	❍
Gave misleading advice or information. (6)	❍	❍	❍	❍	❍	❍	❍

Showed that he/she thought I would fail. (7)	❍	❍	❍	❍	❍	❍	❍
Shared my enthusiasm about my goal. (8)	❍	❍	❍	❍	❍	❍	❍
Tried to help me with the goal and made mistakes. (9)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she hoped I would succeed. (10)	❍	❍	❍	❍	❍	❍	❍
Helped me to evaluate the work I'd already done on the project. (11)	❍	❍	❍	❍	❍	❍	❍
Made me feel worse when I felt discouraged. (12)	❍	❍	❍	❍	❍	❍	❍
Understood my feelings about my dietary goal. (13)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she thought my goal wasn't important. (14)	❍	❍	❍	❍	❍	❍	❍

Comforted me when I was feeling bad about my goal. (15)	○	○	○	○	○	○	○
Made so many demands on me that I had less time or energy to work on my dietary goal. (16)	○	○	○	○	○	○	○
Criticized my efforts. (17)	○	○	○	○	○	○	○
Made fewer demands on me so I could work on my dietary goal. (18)	○	○	○	○	○	○	○
Wasted time when he/she was working with me on my goal. (19)	○	○	○	○	○	○	○
Showed faith in my ability to succeed. (20)	○	○	○	○	○	○	○

Q12 On any given day, who are you most likely to eat with?

- ○ Mother (1)
- ○ Father (2)
- ○ Sister (3)
- ○ Brother (4)
- ○ Other relative (5)
- ○ Friend (6)
- ○ Romantic partner (7)
- ○ Roommate (8)

Q13 Please rate the degree to which each of the following statements describes the behavior of the the Person You are Most Likely to Eat With in relation to your dietary goal.

	Not at all descriptive 0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)	Extremely descriptive 6 (7)
Seemed pleased with my progress on my dietary goal. (1)	❍	❍	❍	❍	❍	❍	❍
Prevented or discouraged other people from helping me. (2)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she thought I was doing a good job. (3)	❍	❍	❍	❍	❍	❍	❍
He/She used resources (e.g., money or materials) that I needed for my dietary goal. (4)	❍	❍	❍	❍	❍	❍	❍
Helped me to think about different ways to achieve my goal. (5)	❍	❍	❍	❍	❍	❍	❍
Gave misleading advice or information. (6)	❍	❍	❍	❍	❍	❍	❍

Showed that he/she thought I would fail. (7)	❍	❍	❍	❍	❍	❍	❍
Shared my enthusiasm about my goal. (8)	❍	❍	❍	❍	❍	❍	❍
Tried to help me with the goal and made mistakes. (9)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she hoped I would succeed. (10)	❍	❍	❍	❍	❍	❍	❍
Helped me to evaluate the work I'd already done on the project. (11)	❍	❍	❍	❍	❍	❍	❍
Made me feel worse when I felt discouraged. (12)	❍	❍	❍	❍	❍	❍	❍
Understood my feelings about my dietary goal. (13)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she thought my goal wasn't important. (14)	❍	❍	❍	❍	❍	❍	❍

Comforted me when I was feeling bad about my goal. (15)	○	○	○	○	○	○	○
Made so many demands on me that I had less time or energy to work on my dietary goal. (16)	○	○	○	○	○	○	○
Criticized my efforts. (17)	○	○	○	○	○	○	○
Made fewer demands on me so I could work on my dietary goal. (18)	○	○	○	○	○	○	○
Wasted time when he/she was working with me on my goal. (19)	○	○	○	○	○	○	○
Showed faith in my ability to succeed. (20)	○	○	○	○	○	○	○

Q14 How much personal control do you feel you have over your dietary goal?
- ○ Very little control (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ Complete control (7)

Q15 To what extent do you see yourself as capable of achieving and maintaining your dietary goals in the future?
- ○ Not very capable (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ Very capable (7)

Q16 How difficult do you think it will be to achieve and maintain your dietary goals in the future?
- ○ Not very difficult (1)
- ○ 1 (2)
- ○ 2 (3)
- ○ 3 (4)
- ○ 4 (5)
- ○ 5 (6)
- ○ Very difficult (7)

Q17 How true for you are the following statements?

	Not at all true (1)	Hardly true (2)	Moderately true (3)	Exactly true (4)
I can always manage to solve difficult problems if I try hard enough. (1)	○	○	○	○
If someone opposes me, I can find the means and ways to get what I want. (2)	○	○	○	○
It is easy for me to stick to my aims and accomplish my goals. (3)	○	○	○	○
I am confident that I could deal efficiently with unexpected events. (4)	○	○	○	○
Thanks to my resourcefulness, I know how to handle unforeseen situations. (5)	○	○	○	○
I can solve most problems if I invest the necessary effort. (6)	○	○	○	○
I can remain calm when facing difficulties because I can rely on my coping abilities. (7)	○	○	○	○

When I am confronted with a problem, I usually find several solutions. (8)	○	○	○	○
If I am in trouble, I can usually think of a solution. (9)	○	○	○	○
I can usually handle whatever comes my way. (10)	○	○	○	○

Q18 How true for you is each of the following statements?

	Not at all true (1)	A little true (2)	Moderately true (3)	Very true for me (4)
If I want to, I can get myself emotionally "charged up" (1)	○	○	○	○
I can use my emotions or feelings to my advantage (2)	○	○	○	○
I can hold onto a feeling or emotion (3)	○	○	○	○
No matter how intensely I may be feeling a particular emotion, I can almost always make myself calm down (4)	○	○	○	○
When the need arises, I can cut short an emotional response (5)	○	○	○	○
I can stop an emotion before it overwhelms me (6)	○	○	○	○
Prior to a stressful situation, I can get myself into a calm state that actually prevents me from feeling bad when the stressful event happens (7)	○	○	○	○

I can control my emotional reaction to events or situations (8)	○	○	○	○
If I wanted to, I could turn UP the intensity level of whatever emotion I may be feeling (9)	○	○	○	○
I can harness the energy of my emotions to enhance my performance (10)	○	○	○	○
I can readily make myself tone down the intensity of any emotion that I might be feeling (11)	○	○	○	○
When I know in advance that an upcoming situation is gong to make me feel a particular emotion (such as sadness or anger), I am able to do things that prevent the feelings from occurring when that situation arises (12)	○	○	○	○
I can deepen the feeling of an existing emotion (13)	○	○	○	○

I can get emotionally "revved up" to enhance my performance (14)	○	○	○	○
I can choose to remain calm in almost any situation (15)	○	○	○	○
I can do things that will enrich my emotional experience (16)	○	○	○	○
When I know in advance that I will be faced with an exciting or stressful situation, I could (if I wanted to) remain calm (17)	○	○	○	○
I can do things that will deepen my emotional experience (18)	○	○	○	○

APPENDIX D

ADHERE GROUP SURVEY

Q1 In the previous "Introduction to Psychology Survey", you described yourself as either pescatarian, vegetarian, or vegan for 12 months or more. How true is this description of you today?
- ○ Not at all true (1)
- ○ Slightly true (2)
- ○ Moderately true (3)
- ○ Very true (4)
- ○ Completely true (5)

Q2 How important is it to you to maintain your current diet?
- ○ Not at all important (1)
- ○ Slightly important (2)
- ○ Moderately important (3)
- ○ Very important (4)
- ○ Extremely important (5)

 Q5 The following refers to your goal to maintain a pescatarian, vegetarian, or vegan diet. Throughout the rest of this survey, we will refer to this as your "dietary goal". Please keep your dietary goal in mind for the next set of questions. For each of the following statements, indicate the number that best describes your work on this goal.

	Not at all (1)	Slightly (2)	Moderately (3)	Very Much (4)	Extremely (5)
I possess the necessary skills to attain this goal. (1)	❍	❍	❍	❍	❍
I'm aware of my day-to-day behavior as I work toward this goal. (2)	❍	❍	❍	❍	❍
I try not to let other goals interfere with this goal. (3)	❍	❍	❍	❍	❍
I reward myself for working hard on this goal. (4)	❍	❍	❍	❍	❍
Working toward this goal is exciting. (5)	❍	❍	❍	❍	❍
This goal is valuable to me. (6)	❍	❍	❍	❍	❍
I try to plan out in advance the steps necessary to reach this goal. (7)	❍	❍	❍	❍	❍

I evaluate my progress on this goal by comparing myself to peoplewho are also working on it, but are doing worse than I am. (8)	❍	❍	❍	❍	❍
I have the necessary knowledge to reach this goal. (9)	❍	❍	❍	❍	❍
Thinking about this goal gives me an uneasy feeling. (10)	❍	❍	❍	❍	❍
I try not to let other people interfere with my work on this goal. (11)	❍	❍	❍	❍	❍
This goal is worthwhile. (12)	❍	❍	❍	❍	❍
I evaluate my progress on this goal by comparing myself to people who are also working on it, but are doing better than I am. (13)	❍	❍	❍	❍	❍

I reward myself when I make progress toward this goal. (14)	○	○	○	○	○
keep track of my overall progress toward this goal. (15)	○	○	○	○	○
This goal is important to me. (16)	○	○	○	○	○
The thought of not achieving this goal frightens me. (17)	○	○	○	○	○
I have what it takes to reach this goal. (18)	○	○	○	○	○
Working on this goal makes me feel happy. (19)	○	○	○	○	○
I evaluate my progress toward this goal in comparison to how well other people are doing in pursuing it. (20)	○	○	○	○	○

I treat myself to something special when I make progress toward this goal. (21)	○	○	○	○	○
I routinely criticize myself for unsatisfactory work toward this goal. (22)	○	○	○	○	○
Working toward this goal brings me joy. (23)	○	○	○	○	○
I tend to notice my successes while working toward this goal. (24)	○	○	○	○	○
This goal is meaningful to me. (25)	○	○	○	○	○
I carefully schedule my activities, so I have enough time to pursue this goal. (26)	○	○	○	○	○
This goal is a source of pleasure for me. (27)	○	○	○	○	○

When working on this goal, I criticize myself for not always having what it takes to succeed. (28)	○	○	○	○	○
I am on the lookout for potential obstacles that might interfere with my progress on this goal. (29)	○	○	○	○	○
Working on this goal makes me feel somewhat panicky. (30)	○	○	○	○	○
I have the ability to reach this goal. (31)	○	○	○	○	○
I evaluate my progress on this goal by comparing myself to people who are very much like me in terms of background and ability. (32)	○	○	○	○	○

I tend to criticize myself when I'm not making progress toward this goal. (33)	○	○	○	○	○
I am tense or jittery when working on this goal. (34)	○	○	○	○	○
I congratulate myself when things are going well on this goal. (35)	○	○	○	○	○
I routinely criticize myself if I don't work hard enough on this goal. (36)	○	○	○	○	○

Q6 In the space below, please list three of your CURRENT, MEDIUM-RANGE goals - that is, goals toward which you will be working for a minimum of several weeks up to a maximum of a year. Please do not answer in terms of short term goals (things achievable in a few hours or days) or in terms of long term objectives (things achievable only after several years). We are interested in the 3 CURRENT, MEDIUM-RANGE goals that are most important to you now. They need not be diet-related.

    Goal 1 (1)
    Goal 2 (2)
    Goal 3 (3)

Q7 Rank your dietary goal and each of your other 3 goals in order of importance. Click and drag each goal to the appropriate rank in the list, with 1 being most important and 4 being least important.

_____ Your dietary goal (1)

_____ ${q://QID6/ChoiceTextEntryValue/1} (2)

_____ ${q://QID6/ChoiceTextEntryValue/2} (3)

_____ ${q://QID6/ChoiceTextEntryValue/3} (4)

Q8 Rate how much each of your 3 goals INTERFERES with your your dietary goal.

	Doesn't interfere at all (1)	Interferes a little (2)	Interferes a moderate amount (3)	Interferes a lot (4)	Really interferes a great deal (5)
${q://QID6/ChoiceTextEntryValue/1} (1)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/2} (2)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/3} (3)	○	○	○	○	○

Q9 Rate how much each of your 3 goals HELPS you to work on your dietary goal.

	Doesn't help at all (1)	Helps a little (2)	Helps a moderate amount (3)	Helps a lot (4)	Really helps a great deal (5)
${q://QID6/ChoiceTextEntryValue/1} (1)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/2} (2)	○	○	○	○	○
${q://QID6/ChoiceTextEntryValue/3} (3)	○	○	○	○	○

Q10 Take a moment to think about the person in your life who is most important to you. Select the ROLE that this person plays in your life from the options below.
- ○ Mother (1)
- ○ Father (2)
- ○ Sister (3)
- ○ Brother (4)
- ○ Other relative (5)
- ○ Friend (6)
- ○ Romantic partner (7)

Q11 Please rate the degree to which each of the following statements describes the behavior of the MOST IMPORTANT PERSON in your life in relation to your dietary goal.

	Not at all descriptive 0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)	Extremely descriptive 6 (7)
Seemed pleased with my progress on my dietary goal. (1)	○	○	○	○	○	○	○
Prevented or discouraged other people from helping me. (2)	○	○	○	○	○	○	○
Showed that he/she thought I was doing a good job. (3)	○	○	○	○	○	○	○
He/She used resources (e.g., money or materials) that I needed for my dietary goal. (4)	○	○	○	○	○	○	○
Helped me to think about different ways to achieve my goal. (5)	○	○	○	○	○	○	○
Gave misleading advice or information. (6)	○	○	○	○	○	○	○

Showed that he/she thought I would fail. (7)	❍	❍	❍	❍	❍	❍	❍
Shared my enthusiasm about my goal. (8)	❍	❍	❍	❍	❍	❍	❍
Tried to help me with the goal and made mistakes. (9)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she hoped I would succeed. (10)	❍	❍	❍	❍	❍	❍	❍
Helped me to evaluate the work I'd already done on the project. (11)	❍	❍	❍	❍	❍	❍	❍
Made me feel worse when I felt discouraged. (12)	❍	❍	❍	❍	❍	❍	❍
Understood my feelings about my dietary goal. (13)	❍	❍	❍	❍	❍	❍	❍
Showed that he/she thought my goal wasn't important. (14)	❍	❍	❍	❍	❍	❍	❍

Comforted me when I was feeling bad about my goal. (15)	○	○	○	○	○	○	○
Made so many demands on me that I had less time or energy to work on my dietary goal. (16)	○	○	○	○	○	○	○
Criticized my efforts. (17)	○	○	○	○	○	○	○
Made fewer demands on me so I could work on my dietary goal. (18)	○	○	○	○	○	○	○
Wasted time when he/she was working with me on my goal. (19)	○	○	○	○	○	○	○
Showed faith in my ability to succeed. (20)	○	○	○	○	○	○	○

Q12 On any given day, who are you most likely to eat with?
- ○ Mother (1)
- ○ Father (2)
- ○ Sister (3)
- ○ Brother (4)
- ○ Other relative (5)
- ○ Friend (6)
- ○ Romantic partner (7)
- ○ Roommate (8)

Q13 Please rate the degree to which each of the following statements describes the behavior of the Person You are Most Likely to Eat With in relation to your dietary goal.

	Not at all descriptive 0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)	Extremely descriptive 6 (7)
Seemed pleased with my progress on my dietary goal. (1)	○	○	○	○	○	○	○
Prevented or discouraged other people from helping me. (2)	○	○	○	○	○	○	○
Showed that he/she thought I was doing a good job. (3)	○	○	○	○	○	○	○
He/She used resources (e.g., money or materials) that I needed for my dietary goal. (4)	○	○	○	○	○	○	○
Helped me to think about different ways to achieve my goal. (5)	○	○	○	○	○	○	○
Gave misleading advice or information. (6)	○	○	○	○	○	○	○

Showed that he/she thought I would fail. (7)	○	○	○	○	○	○	○
Shared my enthusiasm about my goal. (8)	○	○	○	○	○	○	○
Tried to help me with the goal and made mistakes. (9)	○	○	○	○	○	○	○
Showed that he/she hoped I would succeed. (10)	○	○	○	○	○	○	○
Helped me to evaluate the work I'd already done on the project. (11)	○	○	○	○	○	○	○
Made me feel worse when I felt discouraged. (12)	○	○	○	○	○	○	○
Understood my feelings about my dietary goal. (13)	○	○	○	○	○	○	○
Showed that he/she thought my goal wasn't important. (14)	○	○	○	○	○	○	○

Comforted me when I was feeling bad about my goal. (15)	○	○	○	○	○	○	○
Made so many demands on me that I had less time or energy to work on my dietary goal. (16)	○	○	○	○	○	○	○
Criticized my efforts. (17)	○	○	○	○	○	○	○
Made fewer demands on me so I could work on my dietary goal. (18)	○	○	○	○	○	○	○
Wasted time when he/she was working with me on my goal. (19)	○	○	○	○	○	○	○
Showed faith in my ability to succeed. (20)	○	○	○	○	○	○	○

Q14 How much personal control do you feel you have over your dietary goal?
- ❍ Very little control (1)
- ❍ 1 (2)
- ❍ 2 (3)
- ❍ 3 (4)
- ❍ 4 (5)
- ❍ 5 (6)
- ❍ Complete control (7)

Q15 To what extent do you see yourself as capable of achieving and maintaining your dietary goals in the future?
- ❍ Not very capable (1)
- ❍ 1 (2)
- ❍ 2 (3)
- ❍ 3 (4)
- ❍ 4 (5)
- ❍ 5 (6)
- ❍ Very capable (7)

Q16 How difficult do you think it will be to achieve and maintain your dietary goals in the future?
- ❍ Not very difficult (1)
- ❍ 1 (2)
- ❍ 2 (3)
- ❍ 3 (4)
- ❍ 4 (5)
- ❍ 5 (6)
- ❍ Very difficult (7)

Q17 How true for you are the following statements?

	Not at all true (1)	Hardly true (2)	Moderately true (3)	Exactly true (4)
I can always manage to solve difficult problems if I try hard enough. (1)	○	○	○	○
If someone opposes me, I can find the means and ways to get what I want. (2)	○	○	○	○
It is easy for me to stick to my aims and accomplish my goals. (3)	○	○	○	○
I am confident that I could deal efficiently with unexpected events. (4)	○	○	○	○
Thanks to my resourcefulness, I know how to handle unforeseen situations. (5)	○	○	○	○
I can solve most problems if I invest the necessary effort. (6)	○	○	○	○
I can remain calm when facing difficulties because I can rely on my coping abilities. (7)	○	○	○	○

When I am confronted with a problem, I usually find several solutions. (8)	○	○	○	○
If I am in trouble, I can usually think of a solution. (9)	○	○	○	○
I can usually handle whatever comes my way. (10)	○	○	○	○

Q18 How true for you is each of the following statements?

	Not at all true (1)	A little true (2)	Moderately true (3)	Very true for me (4)
If I want to, I can get myself emotionally "charged up" (1)	❍	❍	❍	❍
I can use my emotions or feelings to my advantage (2)	❍	❍	❍	❍
I can hold onto a feeling or emotion (3)	❍	❍	❍	❍
No matter how intensely I may be feeling a particular emotion, I can almost always make myself calm down (4)	❍	❍	❍	❍
When the need arises, I can cut short an emotional response (5)	❍	❍	❍	❍
I can stop an emotion before it overwhelms me (6)	❍	❍	❍	❍
Prior to a stressful situation, I can get myself into a calm state that actually prevents me from feeling bad when the stressful event happens (7)	❍	❍	❍	❍

I can control my emotional reaction to events or situations (8)	○	○	○	○
If I wanted to, I could turn UP the intensity level of whatever emotion I may be feeling (9)	○	○	○	○
I can harness the energy of my emotions to enhance my performance (10)	○	○	○	○
I can readily make myself tone down the intensity of any emotion that I might be feeling (11)	○	○	○	○
When I know in advance that an upcoming situation is gong to make me feel a particular emotion (such as sadness or anger), I am able to do things that prevent the feelings from occurring when that situation arises (12)	○	○	○	○
I can deepen the feeling of an existing emotion (13)	○	○	○	○

I can get emotionally "revved up" to enhance my performance (14)	○	○	○	○
I can choose to remain calm in almost any situation (15)	○	○	○	○
I can do things that will enrich my emotional experience (16)	○	○	○	○
When I know in advance that I will be faced with an exciting or stressful situation, I could (if I wanted to) remain calm (17)	○	○	○	○
I can do things that will deepen my emotional experience (18)	○	○	○	○

APPENDIX E

STUDY FLOW CHART

Initial screening survey sent to students enrolled in Psychology 101 at Arizona State University September 2017.

Participants split into two groups based on screening survey responses. Striving to achieve plant-based diet = STRIVE Adhering to plant-based diet = ADHERE. Participants who did not fit one of the groups were excluded.

Invitiation to complete follow-up survey emailed to eligible participants. Survey links were accessible through ASU SONA system and completed on Qualtrics.

Email reminders sent every two weeks to those who have not yet completed survey until survey closed on December 2017.

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