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Three Dimensional Nutrition: Exploring nourishment of spirit, mind, and body during a 28-day Daniel Fast at Southern Adventist University

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Three Dimensional Nutrition: Exploring nourishment of spirit, mind, and body during a 28-day
Daniel Fast at Southern Adventist University
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Abstract

A person who is living well can be said to be “making lifestyle choices with God’s help to support optimum physical, mental, emotional, and spiritual health and experiencing His gift of abundant life” (Tryon, 2009). All of these “dimensions” of health are interrelated, and in order for a person to truly flourish, each area must be nourished. Dietary choices can have an especially interesting impact on these dimensions. Eating healthfully is not always viewed as a joyous endeavor, but when viewed from a multi-dimensional perspective, it can become a more rewarding and intriguing pursuit.

One way to promote a nutritional experience that is enjoyable, sustainable, and beneficial in all three dimensions of health is through a type of religious fasting known as the Daniel Fast. As a dietary restriction fast, the content of the diet is modified while the quantity of food remains unlimited. The restriction to unlimited quantities of plant-based, nutrient-dense foods allows individuals to experience enjoyment and satisfaction during the fasting experience.

Ministry leaders on the campus of Southern Adventist University observed participants in a 28-day Daniel Fast and explored whether or not the fast was an effective method for promoting healthy lifestyle choices spiritually, mentally, and physically. All participants were invited to provide feedback about the spiritual and mental dimensions, and a specific group was selected for studying the physical effects.

By focusing on the development of sustainable lifestyle habits regarding spiritual growth and healthful eating, the fast went beyond dieting for weight loss. Participants were found to experience spiritual progress, academic improvement, increased mental clarity, and physical benefits. Ultimately, the observations reinforced the connection between spiritual, mental, and physical health and showed that each dimension can be positively impacted by spiritually-based nutrition choices.

**Three-Dimensional Nutrition: Exploring nourishment of spirit, mind, and body during a
28-day Daniel Fast at Southern Adventist University**

Wholeness

In 1946, the World Health Organization defined health as a “state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (Thygeson & Larson, 2006). This definition alone draws health out of just the physical realm and into an intricate holistic world of interrelated dimensions. This principle is known as wellness—seeking balance as a whole person, in every dimension of health—and is defined as the process of becoming more aware of a successful existence and making choices to reach that existence (Thygeson & Larson, 2006).

Similar to wellness, wholeness is the principle of abundant health in all dimensions of one’s existence. The word wholeness originates from the Greek *holokleria*, meaning completeness. In the spiritual and biblical context, this wholeness could represent the abundant life available to the children of God through Jesus Christ (John 10:10). Using this biblical foundation to build upon the definition of wellness, a person who is living well can be said to be “making lifestyle choices with God’s help to support optimum physical, mental, emotional, and spiritual health and experiencing His gift of abundant life” (Tryon, 2009). All of these dimensions of health—physical, mental, emotional, and spiritual—are interrelated, and in order for a person to truly flourish, each area must be nourished and cared for. Even if just one dimension is neglected, it can negatively impact all of the others and lead an individual further away from the benefits of a healthy lifestyle. The reverse is also true. When one dimension is nourished, each of the others is often impacted in a way that makes life more balanced and abundant.

Lifestyle is how an individual chooses to live life and encompasses choices regarding things such as exercise, cleanliness, rest, time management, stress management, relationships, nutrition, spirituality, and environment (Tryon, 2009). The multiple dimensions of health can be either positively or negatively influenced by such lifestyle factors. In fact, 75% of “Western diseases” can be traced to and are directly related to lifestyle choices—especially choices regarding smoking, physical activity, and diet (Ford, Croft, Posner, Goodman, & Giles, 2013). These behaviors specifically, along with maintaining a healthy weight, have been recognized as the top four modifiable health behaviors for improving health and well-being. Each of these behaviors is a lifestyle choice indicating that all individuals have an opportunity to take responsibility for health and to choose to be well. Despite this opportunity, only 3% of adults in the United States practice all four behaviors, demonstrating the need for promoting healthy lifestyle choices which can lead to risk reduction and enhanced quality of life (Reeves & Rafferty, 2005).

Nutrition’s Role

Of all the important lifestyle factors, one of the most intriguing yet neglected factors is the element of nutrition. When Campbell, Ph.D. and Campbell II, M.D. examined the relationship between animal product consumption and chronic illness, their study led to the authorship of one of the most popular books in modern nutritional science. Through what is now commonly known as The China Study, these researchers found that eating a plant-based, whole foods diet minimizes and may even reverse the development of certain chronic diseases (Cummings, 2012). Accordingly, eating fruits and vegetables at least five times a day was one of the top four modifiable health behaviors related to disease and well-being; however, research has also shown that only 23.3% of American choose to follow this behavior (Reeves & Rafferty, 2005). Despite extensive promotion and encouragement, good nutrition seems to remain

excluded from the lifestyle choices of many people, thereby preventing them from experiencing the potential benefits of a healthy diet.

Perhaps presenting nutrition in a three-dimensional light would bring more conviction that nutrition really does make a difference. The China Study specifically explored the effects of good nutrition on different components of health and found that it creates health in every area of one's existence. The researchers write, "The process of eating is perhaps the most intimate encounter we have with our world; it is a process in which what we eat becomes part of our body. But other experiences are also important, such as physical activity, emotional and mental health, and the well-being of our environment. Incorporating these various spheres into our concept of health is important because they are all interconnected" (Campbell & Campbell, 2004, p. 238). Although no component of wellness can be ignored, the nutritional experience is especially interesting and impactful. Eating healthfully is not always viewed as a joyous endeavor, but when viewed from a multi-dimensional perspective, it can become a more rewarding and intriguing pursuit.

Florida Hospital, one of the largest Protestant healthcare providers in the nation, recently published a book entitled *8 Secrets to a Healthy 100* in which a chapter about nutrition focuses on these three main aspects of man's being: "Feeding the Body, Nurturing the Mind, Inspiring the Spirit" (Cummings, 2012). Although the purpose of nutrition is feeding and fueling the body, it has been shown to encompass much more than just the intake of a certain number of calories (scientifically referred to as kilocalories) or intake of nutrients in specific proportions. As shown in The China Study, eating food is connected to the heart and the soul. It is an intimate encounter with the world in which the mind and the spirit are deeply engaged.

Florida Hospital's book is an inspiration to refuse settling for just another diet. Instead, one can pursue a "lifestyle highlighted by total nutrition" (Cummings, 2012, p. 122). This

includes not only eating healthy, plant-based food, but also feeding the mind and spirit with positive thoughts, intellectual stimulation, and purposeful living. Perhaps reaching out to the nutritional needs of people, not only physically but also spiritually and mentally, could be one of the greatest opportunities to promote this healthy lifestyle choice.

The Original Plan

When God created Adam and Eve, He set in place a lifestyle of total nutrition, which can serve as a model for today. The simplicity of God's plan in the Garden of Eden reveals the original intention of how food would be fuel for the body. White (1946) says that "grains, fruits, nuts, and vegetables constitute the diet chosen" by the Creator (p. 81). Because God designed the body, He knew the best way to nourish it and He set the proper plan in place from the beginning. Recently, much research has been devoted to studying this way of eating, providing a scientific foundation for the original nutrition plan.

As supported by research, whole foods such as fruits, vegetables, grains, and beans constitute the nourishing fuel the spirit, mind, and body need to thrive. According to the Adventist Health Study, which studied the life span of Seventh-day Adventist Christians in Southern California for 30 years, strict vegetarians may live anywhere from six to nine years longer than non-vegetarians (Cummings, 2012). A second Adventist Health Study also supported the relationship between a plant-based diet and reduced chance of mortality (Orlich et al., 2013). The relationship between plant-based eating and the length of life is strong. However, the decision to eat in this manner remains difficult for many due to challenges such as a familiarity with eating processed foods or a concern that hunger will increase as a result.

These challenges to healthy eating can be overcome; in fact, they can be repudiated. The China Study observed that people who avoided animal proteins and fats and consumed mostly whole foods experienced higher satisfaction, more loss of weight, and more feelings of fullness

(Cummings, 2012). Additionally, Dr. Fuhrman, a family physician specializing in Nutritional Medicine, also found that perceptions of hunger change when on a more “nutrient-dense” diet (Fuhrman, Sarter, Glaser, & Acocella, 2010). A nutrient-dense diet consists of foods such as legumes, fruits, vegetables, and whole grains rather than animal proteins, animal fats, and processed or refined foods. Those who adjust to regularly eating a more nutrient-dense diet experienced reduced cravings, hunger, fatigue, weakness, cramps, tremors, headaches, moodiness, and were less prone to overeating due to perceived satisfaction with their food (Furhman et al., 2010). White (1946) writes that “the perseverance in a self-denying course of eating and drinking will soon make plain, wholesome food palatable, and it will soon be eaten with greater satisfaction than the epicure enjoys over his rich dainties” (p. 190). This more pleasant experience with hunger can make the nutritional experience more enjoyable and sustainable and increase the chance of success in eating healthfully.

The Daniel Fast

One way to promote a nutritional experience that is enjoyable, sustainable, and beneficial in all three dimensions of health is through religious fasting. During the past 20 years, investigations examining the impact of religious fasting on health have been increasing. As the basis for these investigations, fasting has been defined as “partial or total abstention from all foods, or a select abstention from prohibited foods” (Trepanowski & Bloomer, 2010, p. 1). Three types of fasts have been studied specifically—caloric restriction, alternate-day, and dietary restriction fasts. A caloric restriction fast reduces the caloric intake by a certain percentage of normal consumption, an alternate-day fast consists of a feasting period and a fasting period, and a dietary restriction fast involves restricting the content of dietary intake with little or no reduction in total calories consumed (Trepanowski & Bloomer, 2010). When these types of fasts were examined in a religious context, each was found to promote great improvement in physical

health while also fostering healthy lifestyle choices and spiritual growth (Trepanowski & Bloomer, 2010).

One specific type of dietary restriction fast known as the Daniel Fast has become especially popular during recent years. At least two books have been published on the topic and, as of February 2011, there had been more than 6 million hits using “Daniel Fast” on Internet search engines (Bloomer et al., 2011). This religious fast has increased in popularity because instead of involving total abstention from food, it simply requires abstaining from every “stimulating” type of food and the “proper use of wholesome, simple food which God has provided in abundance” (White, 1946, p. 188). Also practiced because of the physical and spiritual benefits, the fast typically lasts 21 days, with many Christians choosing to fast for longer or shorter periods of time based on personal conviction.

The guidelines for the Daniel Fast are derived from the biblical story of Daniel’s exile to Babylon, found in the first and tenth chapters of the book of Daniel. In Daniel 1:8-9, the Bible says, “Daniel resolved not to defile himself with the royal food and wine, and he asked the chief official for permission not to defile himself this way. Now God had caused the official to show favor and sympathy to Daniel, but the official told Daniel, ‘I am afraid of my lord the king, who has assigned your food and drink. Why should he see you looking worse than the other young men your age? The king would then have my head because of you’” (NIV). Because the guard was hesitant to agree to his request, Daniel suggested that the guard test him and his three friends for 10 days and then compare them to the appearance of the other young men who continued to eat the food and wine assigned by the king. After the 10 days, Daniel and his friends were found to be not merely acceptable, but exceptional before the king (Daniel 1:19). After eating only “pulse” (food grown from seed) and water instead of the royal food and wine, Daniel and his

friends looked healthier and better nourished than those who indulged in the royal food (Bloomer et al., 2010).

Another instance of Daniel's dietary discretion and restriction is found in the tenth chapter of Daniel. This time, he mourned for three weeks, or 21 days, during which he "ate no choice food; no meat or wine touched [his] lips..." (Daniel 10:2-3, NIV). During this time Daniel was seeking the will of God for Israel. God rewarded Daniel's efforts to honor Him and Daniel benefitted from his choices spiritually, mentally, and physically (Daniel 10).

The modern-day Daniel Fast was developed as a 21-day fast based on this biblical foundation. It is now well-known, widely practiced, and strongly supported by scientific research. As a dietary restriction fast, the content of the diet is modified while the quantity of food remains unlimited. This characteristic qualifies the Daniel Fast as what is scientifically referred to as an *ad libitum* diet—it allows for unlimited intake of food as long as the type of food is restricted to fruits, vegetables, whole grains, legumes, nuts, and seeds, and excludes sweeteners, additives, refined food, white flour, caffeine, dairy, eggs, and meat. Similar to the restriction seen in the book of Daniel, no sweet indulgences, meat, or wine are allowed during the fast. However, the restriction to unlimited quantities of plant-based, nutrient-dense foods allows individuals to experience enjoyment and satisfaction during the fasting experience.

The Daniel Fast at Southern

Sponsored by Campus Ministries, the Daniel Fast was a wellness ministry implemented on the campus of Southern Adventist University (SAU) during the winter semester of 2013. Ministry leaders observed participants and explored whether or not the Daniel Fast was an effective method for promoting wholeness and healthy lifestyle choices in three dimensions of health—spiritual, mental, and physical. All participants were invited to provide feedback about the spiritual and mental dimensions, and a specific group was selected for studying the physical

effects. Each of these areas was measured independently and will be discussed separately in the following sections.

Details of the SAU Daniel Fast were closely modeled after the principles set forth a book called *The Daniel Fast* (Gregory, 2010) with only a few modifications. The most significant modification was increasing the length of the fast to 28 days. Although Gregory's book and most previous studies are based on 21-day Daniel Fasts, research has shown that as people adjust to a nutrient-dense and plant-based diet, they may develop sustainable eating patterns that lead to both short-term and long-term improvements in health (Furhman et al., 2010). To this end, a fourth week was added to the SAU Daniel Fast in order to better encourage participants to adjust to healthy eating and to develop dietary and spiritual habits that they could carry forward with them as a lifestyle.

Leadership predicted that the Daniel Fast would facilitate the development of beneficial lifestyle habits and would encourage the wholeness of students in all three dimensions—mind, body, and spirit. Accordingly, the overall aim of observation was to investigate the spiritual, mental, and physical effects of a 28-day Daniel Fast on college-aged participants at Southern Adventist University, while also providing the support, love, prayers, and structure needed to facilitate an authentic and meaningful experience with God throughout the journey.

Nutrition for the Spirit

Lewis writes in *Mere Christianity*, “God designed the human machine to run on Himself. He Himself is the fuel our spirits were designed to burn, or the food our spirits were designed to feed on. There is no other” (1952). The body can be healthy and the mind as sharp as glass, but God is the one who brings joy to the heart and peace to the mind so that one can flourish in abundant life. Just as food fuels the body, time spent with God brings vigor to the spiritual dimension of each being.

The true purpose of religious fasting is to facilitate this spiritual nourishment and growth in relationship with God (Isaiah 58, NIV; Gregory, 2010). The SAU Daniel Fast was created based on this foundation, creating an opportunity for participants to live more abundantly with God, hear His voice more clearly, and desire His presence more than anything else in the world. Spiritual progress would be observed through spiritual surveys and through the sharing of experiences at the end of the fast.

Recruitment and Spiritual Preparation

The spirit of true fasting described in Isaiah 58 is rooted in spirituality—in giving up the mind and desires of the heart to God (White, 1946). In her book, Gregory (2010) emphasizes the importance of the spiritual component of the fast and reinforces the biblical foundation found in Daniel. Gregory (2010) writes, “In addition to restricting or changing our eating habits, fasting always has to do with our spiritual life. Without that aspect, it’s “just a diet”” (p. 12).

Advertising the Daniel Fast on campus made it clear that this was to be more than a way to lose weight or sharpen the mind—the biblical foundation was clear, and the spiritual component was paramount. Those who did choose to participate knew the journey would be difficult, but they were not to be left behind in discouragement. They were encouraged that it would not be by their own strength that they run the race marked out for them, but by the strength of Jesus Christ who would give His Holy Spirit to help them on their way (Philippians 4:13).

All of the participants who signed up for the Daniel Fast were invited to attend information meetings before the fast began. At these meetings, they were given a Spiritual Preparation Worksheet (see *Appendix A*). The four-step preparation process was outlined in this worksheet and each participant completed it independently.

The first of the four steps in spiritual preparation was including God in the fast. Because religious fasting is for God, prayerful consideration of motivation and priorities is vital before beginning the fast. This first step encouraged participants to reflect thoughtfully and prayerfully on what is pleasing to the Lord, referencing Isaiah 58 for God's thoughts on fasting. Ultimately, the aim was for each participant to fast in order to seek God's heart, to glorify Him, and to draw closer to Him.

The second step of spiritual preparation was to make a commitment. Without a firm commitment to self and with God, staying strong against temptation would be more difficult. Because struggling with temptation, especially with food and cravings, is a natural part of any fast, making a solid decision and commitment before temptations arose was vital to staying strong. With the Holy Spirit's strength and discernment, each person would be more prepared to honor this commitment throughout the 28 days.

Commitment was important, but determining a focus gave purpose to that commitment. The next step of preparation was to focus with God and ask Him why one should fast. Almost anything that weighs on the heart could be a reason to fast, be it a difficult decision, financial trouble, strength to resist temptation or change a habit, healing from the past, or guidance for the future. The endless possibilities provided opportunities for participants to seek God's restoration in their lives in a very personal way during the fast.

The last step of spiritual preparation was to make a plan. Planning was necessary in order to facilitate honoring the commitment. Although the Campus Ministries team provided the list of appropriate foods, daily devotionals, and weekly worships, other details of the fast were left to individual discretion. Because of this, each participant was encouraged to develop a plan to provide structure and details about how the fast would be implemented in their personal life.

Most participants chose to plan devotional time (what, where, and when) and practical ways to foster successful food choices during the fast. Participants were also encouraged to guard time reserved for prayer, scripture reading, and journaling in order to enhance the fasting experience. Although this recommendation was made, individual discretion advised participants to take time away from social networking sites, to-do lists, books, music, videos, tempting foods, social activities, or other potential distractions. Ultimately, whether planning devotional time, limiting distractions, or planning healthy meals, participants were simply encouraged to follow God's leading in order to deepen the fasting experience.

Spiritual Assessment

Before beginning the fast, students were asked to complete a spiritual survey. Campus Ministries had used this survey for previous assessments at SAU. Thirty-nine students completed the pre-fast survey, distributed as a paper copy. After the fast, a second survey was sent to all participants electronically and was completed by 43 students. This survey asked some of the same questions that were on the pre-fast survey, and a structured comparison between the two surveys was used to observe the spiritual experience of participants.

The first section of the survey asked participants to define the frequency in which they usually participate in certain spiritual activities. The options were *never*, *once in awhile*, *at least once a month*, *at least once a week*, and *daily*. Several categories of questions did not show any significant change between the pre-fast and post-fast survey results. For example, responses indicated that the frequency of prayer and reading the Bible only increased by an average of 1.5% and 2.0% respectively. However, the percentage of those who read the Bible *daily* increased by almost 10%. The group reading only *at least once a month* decreased by 9% indicating that although average changes were small, some participants did shift to reading the Bible much more often than before.

Despite varied changes in frequency of reading the Bible and of prayer, “expression of faith through music or art” increased by an average of 15.4% during the course of the fast. Before the fast, 18% answered *at least once a week*. This percentage increased to 33% after the fast (an average change of about 15%). The largest change, however, came from those who, before the fast, indicated that they *never* express faith through art or music. This group decreased by 16% indicating that respondents were more likely to experience expression of their faith through music or art as a result of the Daniel Fast (see **Figures 1.1** and **1.2** found in **Appendix B**).

The second section of survey questions asked participants to indicate how often they experienced certain feelings or convictions while at church or attending a worship service. The options for these questions were *rarely*, *sometimes*, *usually*, and *always*. The survey inquired about feelings such as inspiration, joy, spontaneity, sensing God’s presence, fulfilling a sense of obligation, boredom, and frustration. Interestingly, all categories *except* boredom and frustration increased (see **Figures 2.1** and **2.2**).

Increased feelings of inspiration, joy, and sensing God’s presence were expected, but the increased feelings of spontaneity and of fulfilling an obligation were more surprising. Perhaps respondents had a greater sense of fulfilling an obligation due to the nature of a fast and the focus placed on spiritual growth during the 28 days. Perhaps, attending worship services and church were viewed as something that is expected during a time of fasting. By engaging in such activities, it is possible that participants perceived they were fulfilling an obligation. However, it is important to reemphasize that the questions on the survey were defined subjectively, according to each individual perception of the question. One may have viewed “fulfilling an obligation” as beneficial, while another viewed it as a burden. Although questions were asked in the same way to every participant, each individual could have viewed a question differently, leaving room for ambiguity when observing these results.

After completing the two sections of the survey, participants were also asked how close they felt they came to fulfilling the spiritual purpose of their fast by writing in a free-text field. This allowed participants to answer with personal thoughts and words rather than simply choosing a pre-written response. “Not close enough” and “pretty close” were the most common answers, with students reporting struggles, distractions, and frustrations along the way. However, in the middle of these frustrations, many students experienced something new spiritually. One student, whose purpose had been to become more spiritually focused by consciously making time for prayer and devotions, said that he began to pray and read the Bible almost every day. Another student said he had three prayer requests during the fast and was excited to share the processes by which God had been answering those requests. Yet another student stated, “I believe He is guiding, and I know this fast helped me to intentionally give Him my worries and intentionally focus on His will and not mine.” “I fulfilled my spiritual purpose beyond my wildest expectations,” was another response.

Despite the possibility for ambiguous results due to subjectivity, spiritual surveys were a useful tool and they indicated a rich spiritual experience in the life of participants during the Daniel Fast. Using the sum of all responses, each respondent was given an overall spiritual survey score that served as an indicator of spiritual change during the fast. A higher change in score indicated more change in the spiritual life of the participant. The average percent change was a 5.9% increase in overall score, indicating a deepening spiritual experience during the Daniel Fast (see *Figure 3*).

The Agape Feast

At the end of the 28 days of fasting, all participants were invited to attend a communion service and Agape Feast sponsored by Campus Ministries. The Agape Feast provided an opportunity for participants to come together and celebrate the victory of completing the Daniel

Fast with God by their side. Together, they gave testimonies of God's goodness throughout the fast and gave Him glory for the whole journey.

After praying and finishing the fast together with bread, vegetables, fruit, soup, and dessert, participants were invited to share the story of their journey through the Daniel Fast. More than ten participants voluntarily spoke up front, testifying to new life found in God, a greater desire for a personal relationship with Him, and newfound strength to resist temptation. Some testified of a greater reliance on God that began to override preoccupation with food in their lives. Others spoke of peace found during the Daniel Fast as they listened to God's voice above all of the other voices fighting for their attention each day. Each experience shared was a blessing for both the person testifying and for the hearers of that testimony. The testimonies made the Agape Feast a memorable event that would symbolize the growth experienced during the Daniel Fast, encouraging reflection on God's goodness and faithfulness for months to come.

Spiritual Progress

Based on the spiritual survey responses and the testimonies at the Agape Feast, the spiritual journey through the Daniel Fast was found to be a very individualized experience. Some individuals felt like they grew closer to God in ways they never could have imagined while others were unsure if they had grown at all. Results and testimonies varied from person to person based on diverse present and past life experiences. Despite these differing experiences, however, one common theme was observed: the spiritual experience of the Daniel Fast seemed to be a "step in the right direction" or "a good start." Most participants expressed the intention and desire to continue a spiritual life journey with God after the fast.

Spiritual growth involves developing a relationship with God and deepening that relationship. As with any relationship, progress cannot always be measured. What is most important is that progress is made. Similarly, the goal of a religious fast is not to reach a certain

level of spiritual growth—rather the purpose of such a fast is to facilitate progress. Although the amount of change cannot be precisely measured, the fast successfully facilitated some amount of spiritual progress for most, if not all, participants.

Conclusion

The Daniel Fast provided a way for participants to deepen their relationship with God by seeking ultimate satisfaction in Him. As the mind was “set on things above and not on earthly things” (Colossians 3:2, NIV), the experience nourished the spirit with “spiritual food,” providing health and vigor to the spiritual life. Again, the journey was very personal, and the amount of progress varied from person to person. But as long as participants made progress in the right direction with God, by coming into a deeper understanding and knowledge of Him (Jeremiah 9:23-24), it could be said that the spirit had been nourished during the fast. The effects of the fast went beyond this spiritual experience, however. Participants in the Daniel Fast did not only spiritual nourishment through seeking God, but they also experienced mental and physical nourishment as well.

In 1 Thessalonians 5:23, Paul writes a challenge to his listeners, “May God Himself sanctify you through and through. May your whole body, soul and spirit be kept blameless at the coming of our Lord Jesus Christ” (NIV). Spiritual nourishment leads to abundant life that should flourish in all three dimensions highlighted in Paul’s challenge for the Thessalonians: mind, body and spirit. Thus, the spiritual nature of the fast, combined with healthful eating, provided the foundation, purpose, and direction for two more dimensions of nutrition—Nutrition for the Mind and Nutrition for the Body.

Nutrition for the Mind

Beyond experiencing nourishment for the spirit during the Daniel Fast, many participants experienced other benefits as well. One of these benefits was improved perceived mental clarity

and cognitive functioning—the effect on the mind of each individual. These observed changes, supported both biblically and scientifically, indicate that wholesome nutrition does not only fuel the body but can also nurture the mind and sharpen the intellect. The effects are interesting, especially for academically-focused students in an university environment.

Intellectual Assessment

Improved clarity and cognitive functioning during this Daniel Fast were measured by surveying participants. Before the fast began, two intellectual surveys were prepared, one for pre-fast and one for post-fast. Although survey completion was optional, all participants were asked to complete the surveys online and were reminded several times. At the end of the fast, the results from the post-fast survey showed several interesting results related to the mental clarity and cognitive functioning of participants.

Observations

The intellectual surveys provided an overview of several improvements in relation to mental clarity and cognitive functioning. Since the beginning of the fast, 29% of those who completed the survey (n=44) reported increased reading speed and 41% observed an improvement in their attention span. Forty-eight percent experienced an improvement in reading comprehension and recollection, and 62% reported an improved ability and quickness to learn and understand new concepts. Half of the respondents indicated they had an improved memorizing speed and 29% indicated an improved ability to do mental math. Forty-eight percent observed an improved ability to study shortly after a meal (see *Figures 4-9*).

Many of the survey questions focused on tasks necessary for proficient study habits. These indicators of improved cognitive functioning could have positively affected students academically. Accordingly, participants were asked, “Do you believe that your academic performance has changed since the start of the Daniel Fast?” Many participants reported a

significant improvement. In response to subjective questions, several reported a large change in time necessary to study for classes. Two reported a decrease of 6 hours and one reported a decrease of 10 hours. Overall, 41% of respondents said clarity of mind had improved, and 38% said it improved greatly (see **Figure 10**). When participants were asked whether or not their mind became sharper while doing the Daniel Fast, 85% responded *yes* (see **Figure 11**). These responses indicated that regardless of how other survey questions were answered, the fast did improve mental clarity and sharpness to some extent for a majority of participants.

Relating these results to academic performance, responses included everything from being able to recall information easier for a class or having better testing performance to watching test and quiz grades for Anatomy and Physiology class “shoot up.” Another said chemistry became easier to understand and the concepts easier to grasp. One participant said, “I have been able to focus better and get more done in my study time.” Another participant said, “Yes, my academic performance and achievements have been much higher than I ever thought possible.” Overall, participants seemed very encouraged by their improvement because as college students, academic achievement is of great importance and requires mental focus and attention.

Biblical Discussion

In accordance with the spiritual experience of the Daniel Fast, participants were encouraged to seek overall wholeness not only physically or spiritually but also mentally. They could achieve this through the “renewing of the mind” (Romans 12:2, NIV)—by seeking God while simultaneously making good nutritional choices. This principle of eating healthfully for the sake of renewing the mind is rooted in the word of God, deepening the connection between the mental and spiritual dimensions of the fast.

Self control and discernment.

Mental improvement is important because the mind is where emotions are managed, intellect is exercised, thoughts are monitored, and decisions are made. According to White (1946), appetite indulgence “is *the* greatest hindrance to mental improvement” (p. 45, emphasis added). White (1946) also points out that “[t]he controlling power of appetite will prove the ruin of thousands, when, if they had conquered on this point, they would have had moral power to gain the victory over every other temptation of Satan. But those who are slaves to appetite will fail in perfecting Christian character” (p. 59). Followers of God thus have a duty to maintain a clear mind and quick perception. A healthy mind allows believers to appreciate the character of God through study of His word and to develop sharp resistance to temptations of the enemy.

Since the Daniel Fast is an *ad libitum* eating plan, the guidelines restricted the quality of food eaten without restricting portion sizes. This allowed participants to eat as much as they wanted as long as they chose certain types of whole foods. However, even when the quality of food is strictly regulated, one can seek to honor God with the amount of food consumed. White (1946) writes, “Those who place so much food upon the stomach, and thus load down nature, could not appreciate the truth should they hear it dwelt upon. They could not arouse the benumbed sensibilities of the brain to realize the value of the atonement...” (p. 47). When the stomach is loaded with excess food, the brain is affected and the thoughts are clouded rather than kept sharp; self-indulgence in eating can lead to disease in and numbing of the brain’s nerves (White, 1946). Since even the amount of food one chooses to eat can have such an impact on the brain, one should take great care to develop dietary habits that benefit the brain and cognitive functioning capacity. To this end, participants were encouraged to develop self-control and strengthen the mind through healthful food and portion choices during the fast.

For many participants, portion control while on the Daniel Fast was not an issue. Participants consumed whole foods, which do not naturally lead to overeating; thus, they did not

tend to consume more food than was needed. However, portion control was difficult for some due to individuals feeling like they could not “get full” easily while on the fast. Whatever the level of struggle with portion size, leaders still emphasized the importance of portion control and discretion. Participants were reminded that although they could eat as much as they wanted, they should take care to only eat as much as their body needed and to ask the Holy Spirit for guidance to choose how much that amount should be. If they did desire to eat large portions, they were encouraged to examine their motives and contemplate whether the desire was due to unhealthy cravings or due to a healthy physiological need of nutrients.

As evidenced during this Daniel Fast, choosing healthy portions and healthful foods does not only maintain brain health, but can improve it as well. Controlling the diet can “preserve the intellect and give mental and moral vigor...” (White, 1946, p. 59). Thus, proper dietary choices have the potential to make an individual more fit for service professionally at work, personally with the family, academically when studying, and spiritually in service to God.

Scriptural support.

The story of Daniel provides an example of the potential effects of self-control and discernment used in making nutritional choices. Daniel and his three friends resolved not to eat the royal food and wine set before them by the king, and after 10 days were found to look healthier and better nourished than any of those eating from the king’s table (Daniel 1:15). Because of this, they were allowed to continue eating healthfully throughout the three years of training for the king’s service. At the end of three years, the king found no others equal to Daniel and his friends. They were found to be exceptional before the king once again, especially intellectually—“In every matter of wisdom and understanding about which the king questioned them, he found them ten times better than all the magicians and enchanters in his whole kingdom” (Daniel 1:20, NIV). Through prayer and healthful eating, Daniel and his friends had

developed the physical and intellectual strength to please the king of Babylon and devote themselves unto God's service.

Through this story of Daniel, the Bible demonstrates how a proper diet coupled with a firm spiritual purpose can positively impact intellectual potential. Daniel's clear mind, firm purpose, and strong intellect were all greatly influenced by his simple diet in addition to his dedication to prayer (White, 1946, p. 82). Without prayer, his connection with God would not have been strong enough to make use of his sharp mind or to give him firm purpose. God cultivated a strong character in Daniel, and Daniel's faithfulness in caring for his spirit, mind, and body made him more fit to be an unstoppable force for God's purposes.

Jesus' teachings, too, support the need for all believers to give effort to strengthening their minds. In Luke 10:27, He taught that the greatest commandment of all was to "Love the Lord your God with all your heart and with all your soul and with all your *mind* and with all your strength" (NIV, emphasis added). Carefully developing healthy eating habits is one of the ways believers can fully engage in loving God as Jesus taught. Specifically, one can love the Lord with the entire mind by choosing healthy foods and portion sizes because such choices keep the brain clear, the thoughts sharp, and the resistance against temptation strong.

Scientific Discussion

While biblical sources provide guidance and a spiritual basis for that guidance, they do not give details on how eating actually affects the brain on the neurological cell level. Scientific research on the human mind as it relates to dietary intake goes beyond the biblical guidelines and provides the scientific ground necessary to support the writings of E.G. White, the story of Daniel, and the teaching of Jesus. Although no invasive research was conducted in this study, the findings of past research provide a practical explanation as to how the mind can potentially be impacted by dietary restriction.

Neuronal autophagy.

Previous research has found that intermittent fasting boosts several components of brain health. One such component of brain health is called neuronal autophagy, a “self-eating” process by which the brain cells, or neurons, clear out waste material and are able to repair themselves as needed (Alirezaei et al., 2010). This process is key to brain health because it helps to maintain homeostasis, or balance (Alirezaei et al., 2010). According to a study done by the Department of Immunology and Microbial Science at the Scripps Research Institute, disrupting the process of brain autophagy can actually cause neurodegeneration—the breaking down of brain structure and the death of neurons—which is highly prevalent in diseases such as Alzheimer’s and Parkinson’s (Alirezaei et al., 2010). Because of this, maintaining neuronal autophagy is important and increasing the levels of autophagy can be highly beneficial.

One of the ways autophagy can be increased in the brain is by restricting food. By using transmission electron microscopy to observe brain activity, researchers are able to observe the levels of autophagy. Using this method, the researchers from Scripps Research Institute speculated that sporadic fasting that restricts food intake is a potentially safe way to promote the therapeutic process of autophagy in the brain, therefore promoting brain health (Alirezaei et al., 2010). In other words, they found that one can shape the health of his or her brain by restricting dietary intake, which increases levels of neuronal autophagy.

Autophagy can also be an indicator of metabolic health which is a key component addressed in the physical dimension of nutrition for this study. A decrease in the autophagy processes can lead to metabolic derangement including increased body fat and decreased ability to regulate the uptake of glucose (Coupe et al., 2012). The brain’s lack of autophagy may indicate metabolic dysfunction—both brain health and metabolic health may be simultaneously affected by the dietary choices of the individual.

Brain-derived neurotrophic factor.

Another component of brain health in which fasting may affect brain function involves the Brain-Derived Neurotrophic Factor (BDNF), a protein that works with the parts of the brain involved in memory, learning, and high-level cognitive-functioning (Ye, Tai, & Zhang, 2012). This BDNF protein is important because it promotes both the survival and growth of neurons as well as facilitating the connections between them known as synapses. According to a study led by the University of California San Diego, a lack of BDNF can be linked to brain cell death, loss of memory, and less efficient cognitive functioning (Ye et al., 2012).

Diseases such as Alzheimer's and Huntington's Disease (which both involve neurodegeneration) have been studied in relation to BDNF levels. Research approved by Johns Hopkins University School of Medicine on Huntington's Disease actually tested the effects of dietary restrictions on BDNF levels (Duan et al., 2003). The hypothesis—based on previous research showing that dietary restrictions could indeed increase levels of BDNF—was that dietary restriction such as skipping or eating less at a meal may be an effective method of delaying the onset and progression of Huntington's disease as related to low BDNF (Duan et al., 2003). The effects on Huntington's disease need to be further studied, but research has suggested that types of dietary restriction can increase the levels of BDNF protein, promoting more efficient cognitive functioning and less memory loss (Ye et al., 2012).

Summary.

Although this study on the Daniel Fast did not include scientific tests on neuronal autophagy or BDNF levels, it can be speculated that brain health may have improved for similar reasons. Due to the dietary restriction involved in the fast, most of the participants consistently consumed fewer calories, less sugar, and less processed food. Because dietary restriction

promoted these important neurological processes in previous studies, such restriction may have promoted the same neurological processes during the Daniel Fast (Alirezai et al., 2010).

Conclusion

The improvements in mental clarity and cognitive functioning observed during this Daniel Fast appeared beneficial for participants, especially academically. The practice of self-control combined with the physiological effects of wholesome nutrition may significantly impact the mind. And, when combined with spiritual purpose, this increased strength of mind appears to enhance overall spiritual and mental well-being. But the effects of the Daniel Fast go beyond the spiritual and mental dimensions. In order to gain a comprehensive nutritional perspective, one final dimension must be explored—Nutrition for the Body.

Nutrition for the Body

As seen in the previous two sections, nutrition can have an impact on both the mind and spirit. But food does not only affect these two dimensions. Researchers have found indications that a proper diet is probably the most powerful weapon humans have against disease and sickness (Campbell & Campbell, 2004, p. 3). The type of fuel chosen to nourish the body relates to how well the body functions and how at risk it is for disease (Fraser, 2003). Since consumption of food is literally the fuel the body needs to function efficiently, the dietary restriction involved in a Daniel Fast can influence not only the spirit and mind, but also physical health (Trepanowski & Bloomer, 2010).

Background

Research on the Daniel Fast has found that individuals with metabolic and cardiovascular diseases can experience improvements in disease prognosis if they implement the dietary habits of the fast (Bloomer et al., 2010). Although centered on a spiritual purpose, the Daniel Fast utilizes principles of good nutrition as a foundation and provides an opportunity to explore the

impact of whole foods and religious fasting on the body.

Before exploring the effects of the Daniel Fast, a foundational understanding of metabolism is necessary. The most basic measurement of metabolism is known as the resting energy expenditure (REE)—the amount of energy in the form of calories—required to maintain all body functions while the body is in a state of rest (Manore, Berry, Skinner, & Carroll, 1991). This amount of energy required to keep the processes of the body performing at rest is also known as the resting metabolic rate (RMR) and accounts for 60-65% of the total daily energy expenditure used during a 24-hour period (Kinucan & Kravitz, 2006). The REE is also a primary indicator of whether or not the body is efficient in using food for energy.

Every food consumed contains calories, or energy units. Some of these energy units are more nutrient-dense than others. By choosing more nutrient-dense calories, an individual can get the best quality for the least cost in calories, thereby making a better energy investment. Just as the goal of a budget is to balance the expenses with income, the goal of metabolism is to achieve energy balance with caloric energy units. This energy balance occurs when the number of calories used is equal to the number of calories consumed, resulting in the canceling out of calories and maintenance of weight. Energy balance is important because the more that caloric intake exceeds expenditure, the more energy tends to be stored as fat resulting in weight gain which can be a contributing risk factor for lifestyle diseases (Goris & Westerterp, 2007).

A study on the efficiency of the metabolism regarding exercise and weight loss defined skeletal work efficiency as the ratio of work accomplished to the total energy expended during the activity (Amati, Dube, Shay, & Goodpaster, 2008). The same principle of efficiency applies to the resting metabolism as well: the efficiency of resting metabolism can be viewed as a ratio of work accomplished to carry out normal bodily functions at rest to the total energy expended during the activity. In other words, metabolism is most efficient when more bodily functions are

done with less energy. Ultimately, the body is trying to be efficient, utilizing available energy for energy needs. Although meals only occur occasionally throughout the day, the metabolism never stops working to achieve this energy efficiency. When the calories consumed are put to good use instead of being stored, they are being utilized efficiently, making the body run smoothly and effectively, as it is designed to do.

Beyond the complexity of caloric intake and the efficient use thereof, metabolism includes another very important component: the Respiratory Quotient (RQ). The RQ is a ratio that provides a quick indication of what the body's metabolism actually uses for energy. The body can use different types of fuel—also referred to as substrates—and the two primary options are fat and carbohydrate (CHO). By looking at the percentage burned, or oxidized, from each substrate, energy balance can be explored more thoroughly. The exploration and study of RQ is important because some studies indicate that the inability of the body to oxidize dietary fat is a risk factor for positive energy balance leading to weight gain (Goris & Westerterp, 2007). Healthy nutritional choices may be expected to increase fat oxidation since fat oxidation appears to be a benefit for overall physical health.

With this understanding of metabolism, the Daniel Fast can be further introduced. A common theme for many diets is the goal to lose a certain amount of weight by restricting the quantity of caloric intake and achieving negative energy balance—consuming fewer calories than are expended. Diets, along with different types of fasting, allows the dieter to choose any food option—they must simply restrict the amount of food they eat. This is based on the assumption that the quantity of calories is more important to health than the quality of those calories (Bloomer et al., 2010).

The assumption that caloric restriction is most important may not be true in all instances. One drawback to caloric restriction is that metabolism can slow down if not enough calories are

consumed. The RMR may be repressed by as much as 20% when an individual begins to follow a diet that restricts energy intake drastically (Kinucan & Kravitz, 2006). The body perceives energy deficiency as a threat and reacts by burning fewer calories in order to preserve energy. This can eventually lead to positive energy balance and weight gain because when food is consumed without restriction again, metabolism has already slowed down and must adjust in order to burn the additional calories. Studies examining energy expenditure in subjects who restrained eating versus subjects who did not restrain eating found that those who restrained food intake also restricted calories significantly which could cause the metabolism to slow down and result in weight gain when dieting stopped (Manore et al., 1991). This cycle, which often results from dieting, can prove discouraging to those who are trying to lose weight and maintain the loss.

Some caloric restriction can be effective and beneficial, but it may not be the most important factor when it comes to eating healthfully. Even though the total amount of energy consumed as calories is an important consideration, studies have also shown that the type of food consumed may be just as important to consider in regard to overall health (Bloomer et al, 2010). For this reason, Dr. Fuhrman, M.D., has sought to look past quick-fix diets to find a more satisfying and scientifically sound weight loss program. He has developed a diet based on the formula $\text{Health} = \text{Nutrients} / \text{Calories}$ (Fuhrman, 2010) which means that when the ratio of nutrients to calories is high, body fat will decrease more quickly. The more nutrient-dense the calories are—the higher the quality of the type of food consumed—the more satisfaction and satiety occurs with fewer calories. His research has even found that cravings for fatty and processed foods will disappear over time, making the pattern of eating more enjoyable and more sustainable (Furhman, 2002).

In accordance with Dr. Furhman's research, the Daniel Fast differs from typical diets by

diverging on this point: the goal is not a certain amount of weight loss via the quantitative restriction of calories. Instead, the Daniel Fast allows *ad libitum* unlimited intake of whole, nonprocessed foods and resembles a vegan diet. The type of food is restricted while the *amount* of food consumed is left to the discretion of the individual. Instead of merely reducing the total amount of energy consumed, the purpose of the Daniel Fast is to restrict the types of foods consumed, thereby increasing the quality of the fuel the body receives in a way that is sustainable as a lifestyle rather than as a temporary diet solution.

Because the Daniel Fast does not restrict caloric intake, it has the potential to avoid the dieting cycle. Thus, it also has the potential to help subjects develop a lifestyle that balances emotional satisfaction from food with energy balance and physical well-being. Previous studies on the Daniel Fast have shown reductions in total caloric intake, protein, total fat, saturated fat, trans fat, and cholesterol, and increases in carbohydrate and fiber (Bloomer et al., 2010). For the average participant in a Daniel Fast, consumption of processed or less nutrient-dense food decreases and the elimination of such foods results in decreased caloric consumption and the improvement of metabolic and anthropometric health factors (Bloomer et al., 2010).

Purpose

The overall study of this Daniel Fast sought to investigate the spiritual, mental, and physical effects of a Daniel Fast on students at SAU. The specific aim of this portion of the study was to investigate the effects of dietary intake changes on the metabolism and anthropometric variables and to compare the changes of participants in a Daniel Fast to a control group making no changes. The following questions were proposed: Does weight loss occur during a Daniel Fast? Does the metabolism of fat increase as a result of the Daniel Fast? It was hypothesized that each subject would experience a moderate decrease in weight along with an increased metabolism of fat at rest during 28 days of fasting in accordance with Daniel Fast guidelines.

Methods and Design

The physical effects of this Daniel Fast were observed by selecting certain participants to be enrolled as subjects a laboratory-based portion of the study. The effects of the fast on the body were measured by observing changes in weight, resting heart rate (RHR), body composition, body mass index (BMI), and metabolism. Due to the nature of this Daniel Fast, done at SAU and implemented for the benefit of the students, this study simply involved a pre/post assessment and did not include a randomized assignment. The participants were not limited to females with known risk factors because the goal was to see how all types of young female students at SAU would respond to a new way of spiritually-based eating. This sample of females represents the potential effects of a lifestyle change similar to the Daniel Fast on other young women in the population.

Subjects and screening.

The subjects for this study were college-age females age 18-22 (n=22) (see *Figure 12*). Thirty-three subjects were recruited and 31 subjects were enrolled. Twenty-two subjects completed the fast and testing procedures. The majority of subjects were either African American or White (see *Figure 13*). Using BMI, 14 subjects were classified as normal body weight (BMI 18.5-24.9 kg/m²), five were classified as overweight (BMI 25-29.9 kg/m²), and three were classified as obese (BMI • 30 kg/m²) (Centers for Disease Control and Prevention, 2011). The weight range was also wide (109.5-195 lbs.) and subjects practiced a variety of exercise and dietary habits prior to the fast. Research on the Daniel Fast suggests that a wide range of subjects can respond to the Daniel Fast in like manner regardless of baseline characteristics (Bloomer et al., 2010). Baseline characteristics for this study are described in *Table 1*.

Potential subjects were screened prior to participation using a standard questionnaire. All subjects were recruited and enrolled in the study during the same month. The inclusion criteria included female between the ages of 18 and 54 years, BMI above or equal to 18.5, willingness to undergo metabolic testing, willingness to choose a spiritual purpose for the fast, willingness to attend weekly group worships, willingness to follow the guidelines of the fast, willingness to keep a daily food log, willingness to journal about their personal journey, a current student or faculty member at SAU, and a regular menstrual cycle. Exclusion factors included smoking within the past 5 years, inability to maintain the prescribed diet of the fast, current major health issues that require physician supervision or support, history of disorders that require special dietary intake (such as eating disorders), pregnancy within the past 12 months or currently breastfeeding, or an investigator or family member of an investigator. Whether potential subjects already adhered to a diet similar or identical to the Daniel Fast was also a consideration. However, it was not an exclusion factor.

A control group was also recruited at SAU. Out of 11 initial control subjects, one subject dropped out and two subjects did not complete post-fast testing. Therefore the control group was made up of eight subjects, about 33% the size of the fasting group. The same exclusion and inclusion criteria, testing procedures, and dietary surveys were given to the control group. They were instructed not to make any dietary, exercise, or lifestyle changes.

Prior to joining the study, all fasting subjects were informed of all procedures, requirements, and potential risks or benefits. They were informed through verbal and written instruction. All subjects were given details about the study in accordance with University Institutional Review Board for Human Research Subjects guidelines (H10-06). Each subject was required to read and sign an informed consent form before being admitted to the research study. Each subject was also provided with an outline of the study with a timeline, specific guidelines

for dietary intake, instructions for how to use a food log to record dietary intake, suggested recipes and meal ideas to use during the fast, and a spiritual purpose worksheet to fill out before beginning the fast. A specific list of foods allowed or disallowed was also distributed to all participants and the contact information of the research team was made available to them in case of ambiguity. These preparatory and administrative processes were modeled after previous studies on the Daniel Fast (Bloomer et al., 2010).

Subjects were recruited using advertisements around the campus of the university. The advertisements were done by Campus Ministries and invited any student to participate in the 28-day Daniel Fast. The advertisements were not specific to the research study due to the nature of the fast being open to all students, male and female. At the information meeting for students, the research study option was announced and female students were allowed to volunteer to be a part of the metabolic testing. The subjects were not promised any incentive for participating in the metabolic research portion of the study.

Study design.

This study was not the first or the most comprehensive investigation of the Daniel Fast. In the process of planning this study, previous research on the Daniel Fast was consulted, including the first known scientific investigation of the Daniel Fast. This study, conducted by Dr. Bloomer (2010), involved a 21-day *ad libitum* fasting period using the same dietary restrictions used in the current study. Most previous research has involved Daniel Fasts of 21 days, but in the current study, subjects would fast for 21 days and then receive final testing during the fourth week of the fast.

Another primary resource used to design this study was Gregory's book *The Daniel Fast* (2011). An original spiritual purpose worksheet was prepared for participants using the ideas and guidelines from Gregory's book. Specific guidelines on how the diet should be restricted were

provided in this book as well (see *Appendix C*). The current study slightly modified these guidelines by not allowing textured vegetable protein (vegetarian meat substitutes) to be eaten during the fast. Completely natural fruit smoothies were also allowed. Aside from these divergences, all of the other details of the fast were in accordance with the guidelines given in Gregory's book, which was advertised to the subjects in case they had an interest in purchasing it for themselves for easy reference. The food list was provided to all subjects for easy access as well, and any time they had a question they were able to contact the research coordinator requesting a prompt answer. A registered nurse and exercise physiologist were also available to field questions during the fast.

Variables.

In accordance with the first known investigation of the Daniel Fast, the independent variable in this study was change in dietary intake alone over the first 21 days of the Daniel Fast (Bloomer et al., 2010). Initial RMR tests were conducted 2 weeks before the fast began. After finding this baseline, subjects were instructed to choose a spiritual purpose for the fast and to record 3 days of pre-fast dietary intake in a specified food log. The second RMR test was performed during the fourth week of the fast after at least 21 days of fasting had been completed. The dependent variables included REE, RQ, weight, body composition, perceived effects, and a dietary survey score. Any change in metabolism, weight, or other variables would be examined with dietary restriction as the main independent variable.

Assessments and measures.

The initial, pre-fast evaluation included the following tests: 1) RMR after an overnight fast, and 2) body composition by the bioelectrical impedance method. The nature of the current diet of each subject was also evaluated using a survey which compared the current diet to the fast and assigned a diet score indicating how close pre-fast intake was to the fasting guidelines.

During all of these tests, attention to detail was emphasized by the research team. Each test was carefully performed before the study began and during the last week of the fast (after 21 complete days of fasting). All tests were performed in the early morning between the hours of 6:00 AM and 10:00 AM after an overnight total fast.

Anthropometric variables.

Body composition was analyzed via bioelectrical impedance analyzers. Bioelectrical impedance determines percentage of body fat (%BF) using a low-voltage current, which alternates through the body. The current is conducted more readily by lean tissue, while fat and bone are less conducive (Zarowitz & Pilla, 1989). This method has been used by researchers, compared to other more invasive and time-consuming measures of body composition, and validated as a safe and efficient method for measuring body composition. Weight was measured using a calibrated medical scale. Body mass index was calculated as weight divided by height and was found using the bioelectrical impedance device.

Resting metabolic rate.

The resting metabolic test provided information about total daily energy expenditure. Following an overnight fast of at least 10 hours, the subject reported to the Human Performance Lab for the measurement of RMR early in the morning. The subject was to lie quietly for 20 minutes in a neutral temperature environment and was told not to listen to music or to fall asleep. Breath-by-breath oxygen and carbon dioxide analysis was performed using the ParvoMedics Metabolic Analyzer®. Average oxygen consumption was calculated and was used to determine the RMR and RQ. The RQ represents the ratio of carbon dioxide output to oxygen consumed and is used to analyze fuel utilization by estimating the percentage of energy metabolism taken from CHO and fat (Powers & Howley, 2012). A measured RQ of 0.70 indicates exclusive metabolism of fat, and an RQ of 1.0 indicates metabolism of solely CHO. A measured RQ of 0.85 indicates

an equal contribution from both fat and CHO as energy substrates.

Dietary records and physical activity.

Prior to this study, the subjects did not maintain any certain diet and may or may not have exercised regularly. Subjects were instructed to maintain whatever exercise regimen they had been using before the fast in order to eliminate exercise as a variable in the study.

Before the fast began, subjects were also given dietary guidelines on which to base their new eating pattern. This eating plan was entirely plant-based with an emphasis on whole foods. The amount of processed foods allowed in the plan was very limited, but a list of acceptable processed foods was provided to the subjects and included unsweetened milk substitutes, tofu, and certain types of pre-made whole grain bread.

The subjects were asked to keep a log of dietary intake for 3 days before the fast and for 6 days during the final week of the fast. The websites LiveStrong.com and MyPlate.gov were used to monitor intake. Subjects were not instructed to see this as a diet or as a method for weight loss. Instead they were encouraged to view the fast as a spiritually-based healthy eating plan. The goal was not weight loss, but balanced intake of fiber, protein, and necessary nutrients without consuming processed foods.

Dietary survey.

All participants in the Daniel Fast were asked to complete a dietary survey using an online survey engine. The survey was created using other dietary survey examples from other studies, but was original in being applied to the Daniel Fast and in the way it was quantified. The questions included inquiries about the amounts of certain foods eaten, time of day for meals, frequency of snacks, amount of sugar consumed, and classification of diet (vegetarian, pescatarian, etc.). Most research subjects completed the survey. These surveys were quantified so that a greater the diet “score” indicated a larger divergence between the current diet and the

guidelines of the Daniel Fast. A post-fast dietary survey was also prepared, distributed, and quantified. The comparison of these dietary scores was used as a tool to look at the change in dietary intake as a result of the fast. A greater change in score indicated a greater change in diet as a result of the fast.

Data collection and statistical analysis.

Data was collected confidentially with numbers assigned to each subject. The testing results were kept in a locked file box, accessible only to the research coordinator and lab assistants. The data was then entered according to subject number into a spreadsheet and analyzed using T-test statistical methods.

Results

Thirty-one subjects were initially enrolled in the research study. All subjects completed the 28-day fast but not all completed the requirements necessary to remain in the research study. Two subjects decided to modify the fast to fit their own preferences and were excluded before the fast began. One subject dropped out of the fast after 2 weeks due to perceived feelings of exertion and weakness during exercise. A fourth subject was not compliant with the fasting guidelines and was excluded from data analysis. And a fifth subject did not show up for her final RMR test. Of the remaining 26 subjects, four were excluded from resting metabolism data analysis due to a malfunction in the resting metabolism machine during post-fast testing. In addition to these exclusions, one subject was excluded from the data analysis due to the nature of her plan—she had an exercise component added to her fasting plan due to her health condition and current state of no exercise at all. Her data became a case study and is discussed at the end of this paper (see *Appendix D*). In summary, 22 subjects completed the fast while remaining eligible for data analysis in the research study.

Subjective results.

Some subjects complained of not being able to feel full or satisfied during the Daniel Fast. Others claimed that they always had enough to eat and were always satisfied. These individual perceptions of satiety can be attributed to individual adaptation to the whole foods diet during the fast. For example, those who ate more fiber in the form of legumes would be more likely to feel satisfied for longer periods of time than would those who ate a less fibrous meal. Despite some subjects feeling dissatisfied, many subjects noted that they enjoyed Daniel Fast food choices and appreciated the *ad libitum* design. Some subjects said they would continue to incorporate some of the food choices into their dietary style after the fast ended.

Subjects said that the most challenging part of the fast was finding appropriate foods when eating out or when food choices on campus were limited. Many of the subjects, as students, lived in the residence hall dormitory where cooking abilities were limited, subjecting them to whatever was being served on campus that day. However, three of the eateries on campus provided “Daniel Fast Items” on a daily basis, so that food was always available in some form. Students who did have access to a kitchen and cooking equipment observed that buying healthy food and ingredients seemed to be more expensive. This presented a challenge for college students with a limited income. However, those who did cook said they enjoyed the experience and learned significantly about experimenting with whole foods.

Subjects also commented that they had not previously known about all of the hidden ingredients in foods. By doing the Daniel Fast, they gained a new appreciation for reading the ingredients before making a decision on what food to eat. Instead of eating blindly, they became more aware of the foods they chose to consume, knowledge they would be able use after the fast was complete.

In accordance with the previous sections on the mind and spirit, these subjects also reported feeling more mentally alert, academically capable, and spiritually engaged. Subjects

perceived feeling more energized with fewer hours of sleep, less drowsy throughout the day, and less easily distracted when trying to study. Regarding physical health, subjects said they “felt lighter” and “felt great,” and several subjects reported more “strength” and “endurance” during their normal exercise routines.

Anthropometric results.

Previous research studies on the Daniel Fast have not shown large differences in weight, BMI, body composition, or RHR (Bloomer, 2010). As hypothesized in this study and in accordance with previous research, only a moderate change in these variables was observed during the fast. These changes included a moderate decrease in average body weight (3.58 lbs, $p=0.00001$). Weight changes varied from as much as 8.0 pounds lost to 2.5 pounds gained. Eight subjects lost greater than 5 pounds and two subjects gained less than 3 pounds. There was also a slight decrease in BMI (0.87, $p=0.001$), a small decrease in %BF (1.19%, $p=0.004$), and an unexpected decrease in RHR by an average of 7.41 beats per minute ($p=0.00015$) (see *Table 2*).

Metabolic results.

The REE decreased as expected during the fast ($p=0.00005$) (see *Tables 3* and *4*). Other pre-fast and final week metabolic data differed from expected results. The change in average RQ was 3.63% in the direction of increased CHO burn. From pre-fast to the final week, the average percentage of fat oxidized at rest (%FAT) decreased, and the average percentage of CHO oxidized at rest (%CHO) increased. However, this change in substrate oxidation was not significant for %FAT ($p=0.095$, NS) or %CHO ($p=0.095$, NS). Relative to individual subject data, 52% of subjects either increased or maintained the same fat burning levels while 48% burned more CHO. These results split the sample almost exactly in half between increased %FAT and increased %CHO (see *Figures 14* and *15*).

Dietary Results.

Pre-fast diet surveys indicated an average change in diet of 60.4% ($p < 0.01$). This change indicates that all subjects changed their diet during the fast to be closer to the ideal Daniel Fast diet. Diet surveys were used as a subjective interpretation of the subject's diet and were a tool for examination of other changes.

Only 12 of the subjects completed food logs both pre-fast and during the final week of the fast. As expected, daily dietary intake from pre-fast to the final week of the fast changed in several areas. Average total calories consumed per day decreased by 9.05% ($p = 0.069$, NS). There was also a decrease in cholesterol and sodium consumption, with a change of 91.7% ($p = 0.0015$) and 53.5% respectively ($p = 0.00014$). Carbohydrate intake (measured as a percentage of macronutrient) intake increased by 7.40% ($p = 0.321$, NS) and intake of protein (PRO) decreased significantly ($p < 0.01$). Intake of fiber per day also increased by 172.2% ($p = 0.0085$) (see *Table 5*).

Control results.

Because the control group was instructed not to make any dietary or lifestyle changes, no changes were expected to be observed in the data collected from these subjects. However, unexpected changes were observed in several anthropometric and metabolic variables (see *Table 6*). The change of %BF of the control increased by 1.64% ($p = 0.340$, NS), and the change of average weight decreased by 0.73% ($p = 0.261$, NS). A 16.16% change in metabolic RQ ($p = 0.0098$) was also observed. The average metabolism moved toward higher %CHO as opposed to higher %FAT ($p = 0.0076$). Four of the control subjects completed a dietary survey which indicated a decreased diet score and movement towards dietary habits more similar to the fasting guidelines ($p = 0.033$).

Discussion

Results from the present study indicate that 21 days of a Daniel Fast 1) reduce cholesterol and sodium intake and increase carbohydrate and fiber intake, 2) promote moderate weight loss and change in body composition, 3) are well-tolerated due to the *ad libitum* nature, 4) may or may not directly affect the metabolism of fat or carbohydrate, and 5) may be useful for encouraging the development of healthy lifestyle habits that are long-lasting and beneficial for physical health. Ultimately, the goal of this discussion will be to explore why subjects were burning more or less fat during the final week of the fast and why subjects did or did not lose weight. Both dietary and anthropometric data will be used to explore possible reasons for the variation in changes observed.

Control group.

Although the purpose of the control group was to establish a standard results for those not making any dietary or lifestyle changes, the control group in this study did have observable changes in anthropometric and metabolic data which led to question the validity of their data as a standard comparison. As stated, the dietary survey score for the control subjects changed significantly ($p=0.033$). Based on their own assessment, they may not have complied with the instructions to not change their diet, therefore discrediting the validity of their data as a control group. Further tests would not be valid standards because the control group was essentially not a control group. Changes in control RQ, weight, or other variables could have been caused by the unmeasured variation in diet or lifestyle. In the future, a more closely monitored control group is necessary for valid comparison to the data of fasting subjects.

Dietary intake.

According to the Center for Nutrition Policy and Promotion (CNPP, 2011), the recommended guidelines for a balanced diet for women of this age are <300 mg cholesterol, <2300 mg sodium, 45-65% CHO, 10-35% PRO, 20-35% fat, and 1800-2000 calories. Surplus or

deficit in each of the macronutrient categories was determined using these recommended guidelines. Six of the 12 subjects who completed the food logs were in the recommended range for CHO consumption—the other half were slightly over the recommended amount. For most subjects, both PRO and fat were within the recommended proportion of diet, with 66.7% of subjects consuming the recommended amounts (16.7% below and 16.7% above). This indicates that during a Daniel Fast, the majority of subjects eat macronutrients within the recommended amounts for a healthy diet.

The CNPP (2011) has set the Adequate Intake (AI) for dietary fiber for women at 25 grams per day, and most subjects exceeded this amount significantly after the fast with the average increasing from 18 grams per day to 28 grams per day ($p=0.0085$). The reason for this change in dietary fiber intake can be attributed to the change in the content of the diet during the Daniel Fast. Dietary fiber is the form of carbohydrates that occurs naturally in plants and, due to its non-digestible nature, helps to provide feelings of fullness and satisfaction after eating. The best sources of dietary fiber include beans, peas, vegetables, whole grains, nuts, and some fruits (CNPP, 2011). All of these foods were included in the whole foods acceptable during the Daniel Fast. Refined flours and processed foods contain significantly lower amounts of naturally occurring dietary fiber and thus, replacing the intake of such foods with more fibrous foods during the Daniel Fast caused a significant increase in the dietary fiber consumed by subjects (CNPP, 2011).

This increase in dietary fiber is significant and may be one of the largest benefits to the Daniel Fast eating plan. According to research and set guidelines, naturally occurring dietary fiber is thought to reduce the risk of cardiovascular disease, obesity, and type 2 diabetes (CNPP, 2011). Thus, consuming higher amounts of fiber during a Daniel Fast could promote physical

health and well-being by increasing the intake of nutrient-dense foods and promoting healthy digestion.

Interestingly, total average calories decreased even though subjects could eat unlimited amount of food. As seen in previous research on the Daniel Fast, this indicates that when eating nutrient-dense foods with more fiber, satiety increases and thus the intake of calories is reduced (Bloomer et al., 2010). Another recent study found that a nutrient-dense diet makes the experience of hunger less unpleasant even though fewer calories are consumed (Fuhrman, 2010). Additionally, this study found that such a diet may result in an eating pattern that is sustainable and can lead to improved health and a healthy weight (Fuhrman, 2010). In accordance with this research, it is likely that subjects consumed a higher volume of nutrient-dense foods that provided satisfaction without providing as many calories even though they were allowed to consume as many calories as they desired.

Changes were also observed in the consumption of less desired nutrients—cholesterol and sodium. Before the fast, most subjects consumed less than the recommended 300 mg cholesterol and 2300 mg sodium per day (CNPP, 2011). However, two subjects were near to 300 mg cholesterol and five subjects were above 2300 mg sodium. During the final week of the fast, intake decreased for all subjects and every subject was below the recommended maximum for both cholesterol and sodium. Because cholesterol is only found in animal foods, the Daniel Fast guidelines eliminate the probability of consuming dietary cholesterol. Additionally, sodium content of foods comes mostly from salt added during food processing, thereby making processed foods a major contributor to high amounts of sodium (CNPP, 2011). Eliminating animal foods as a source of cholesterol and processed foods as a source of sodium is the most likely cause of the decrease in cholesterol and sodium during the Daniel Fast. Because high sodium and high cholesterol can be contributors to lifestyle diseases such as high blood pressure,

diabetes, and heart disease, adopting a dietary lifestyle that maintains healthy levels of both sodium and cholesterol could be beneficial to overall health and even reduce the risk for cardiovascular disease (CNPP, 2011).

All of the findings are supported by research that says vegan diets, such as the Daniel Fast, tend to have less saturated fat, less cholesterol, and more dietary fiber than typical vegetarian diets (Craig, 2009). However, vegan dieters may be at risk for a lack of vitamin B-12, vitamin D, calcium, omega 3 fatty acids, iron, and zinc. Although levels of these nutrients were not monitored in this study, it is important for those eating a vegan diet to consume foods fortified with these nutrients in order to ensure that no area of the diet is lacking (Craig, 2009). Additionally, previous research indicates that those on a Daniel Fast for just 21 days may have a decrease in HDL cholesterol, the “good” cholesterol for the heart, which presents a concern (Bloomer et al., 2010). Researchers suggest that if the Daniel Fast is to be viewed as a heart healthy dietary plan, fasters should be eating foods such as almonds, walnuts, and flaxseed to ensure healthy levels of HDL-cholesterol are maintained (Bloomer et al., 2010).

Overall, the Daniel Fast dietary intake seems to follow the recommended guidelines set forth for Americans by the CNPP (2011): decreasing dietary cholesterol and sodium intake, decreasing the consumption of refined grains, solid fats, and added sugars, and increasing intake of dietary fiber, vegetables, fruits, whole grains, healthy fats, and lean protein. Although not all of these components were measured during the fast, the fasting guidelines efficiently and clearly set forth principles that are in line with the recommendations.

Although the total caloric intake decreased during the fast, when average calories consumed were compared to the energy expenditure, REE was found to be greater than the caloric intake for most subjects. Some subjects consumed up to 670 calories less than their REE based on the food log data. In this case, subjects were more likely to be in negative energy

balance and therefore more likely to lose weight. All of the subjects who completed food logs, however, lost weight whether or not they reported consuming more or fewer calories than REE.

Because metabolic RQ changed, the food logs were analyzed to look for any possible correlations between percentage of macronutrient consumption or total caloric intake and the change in metabolism. However, no direct correlation between the change in metabolic RQ and the change in CHO intake was found ($R^2=0.0183$, $p=0.675$, see **Figure 16**). Some subjects recorded increased consumption of CHO while the metabolism increased fat oxidation. Therefore, it was not necessarily the macronutrient content of the diet that caused the metabolic RQ to shift toward higher %CHO or higher %FAT. Although no direct correlation was found, further research could potentially determine how, if at all, the content of a meal on the day prior to metabolic testing impacts the substrate oxidation on the following morning.

When discussing dietary intake, it is important to note that food logs were completed only during the final week of the fast and did not necessarily give a complete picture for amount of caloric intake during the other weeks of the fast. Caloric intake could have fluctuated based on appetite or food choices during that week specifically and subjects may have consumed different amounts of calories during the first three weeks of the fast. A complete food log for the whole fast completed by all subjects would be ideal for determining exact amounts of micronutrient and macronutrient consumption proportions.

Weight loss.

In relation to measured variables, some positive changes were observed in body weight and body composition during the fast. It was speculated that subjects would lose a moderate amount of weight, and this speculation was supported by the amount of weight loss observed. The observation that fasting subjects did not lose large amounts of weight reemphasizes that the Daniel Fast focuses on lifestyle change rather than weight loss alone.

The weight could have been lost at any point during the 21 days before the final data collection. However, according to a study done on alternating periods of dieting with subsequent weight loss and weight gain, weight loss may be larger in the beginning of the diet and decrease as time progresses throughout the weight loss period (Manore et al., 1991). It is possible that subjects, although not dieting primarily for weight loss, lost more weight at the beginning of the fast and experienced a gradual decrease in change in weight as the fast progressed. This would suggest that the body is seeking energy balance at which neither weight loss or weight gain will occur. This also suggests that subjects lost, gained, or maintained weight based on where their pre-fasting weight was in regards to energy balance.

As dietary intake changed and as dietary score increased, subjects approached a diet closer to Daniel Fast guidelines. As subjects ate a diet more similar to the Daniel Fast principles there was a slight trend for more weight loss, with 14.9% of the variation in weight being explained by the variation in diet ($R^2=0.149$) (See **Figure 17**). In addition to the above discussion on dietary intake, this indicates that the Daniel Fast provides guidelines for a diet that can positively influence weight—not necessarily for weight loss but rather the maintenance of a healthy weight.

The average decreases in weight and BMI were moderate, but changes varied among subjects (see **Figures 18 and 19**). Although average weight loss was 3.58 pounds, weight changes varied from as much as 8.0 pounds lost to 2.5 pounds gained. Changes of less than 5 pounds can potentially be attributed to commonly causes of daily fluctuations in weight. Factors that influence these fluctuations include timing of bowel movements, weight of meals consumed, sodium intake, hormonal changes, and water retention levels. Control subjects also lost a moderate amount of weight, although less than fasting subjects. This too, could be attributed to

normal day-to-day fluctuations in weight and may not necessarily have resulted from dietary changes alone.

Body composition.

Over the years BMI has become one of the most foundational ways to classify healthy weight levels. However, BMI cannot show how fat and muscle are distributed throughout the body (Ainsworth, 2004). For this reason, body composition is also important because it analyzes beyond the number on the scale and measures the components of that number. The variations in weight seen during the Daniel Fast call for an exploration into these components—a look behind the numbers on the scale into the factors that make up those numbers. Looking at these factors is crucial because if weight is lost in the form of lean body mass, it can carry a health risk rather than health benefit (Kingsland, 2005). In the case of this Daniel Fast, there was no strong relationship between the amount of dietary change and decreased %BF ($R^2=0.017$). Those whose pre-fast diet was most unlike the Daniel Fast did not necessarily lose more weight or more body fat.

It was speculated that baseline body composition could potentially have impacted the effects of the Daniel Fast on body composition or weight. Previous research on the body composition of women has found that women who have a higher %BF will lose a greater proportion of body weight from fat than from lean body mass (Broyles, Bouchard, & Bray, 2011). This prediction is consistent over age and ethnic lines and could be applicable for the subjects in this study. It was seen that subjects who lost more weight had slightly higher baseline %BF, but this trend was very slight. Only 4.17% of the variation in %BF was explained by the baseline %BF ($R^2=0.0417$, NS).

Weight loss and body composition changes may have occurred based on the changes in eating style, but the Daniel Fast alone does not ensure that the weight lost is not lean body mass.

Research shows that physical activity added to initial diet intervention is important because it provides the most effective reduction in fat cell size (You, Murphy, Lyles, Demons, Lenchik, & Nicklas, 2006). Additional research has shown that the only way to increase fat burn other than consuming more fat is to increase physical activity (Goris & Westerterp, 2007). Without diet intervention, physical activity would have less of an effect on fat cell size, just as without physical activity the diet intervention has less effect. Therefore, exercise combined with healthy eating is a way to maintain a healthy body composition because it helps to preserve lean body mass during weight loss. Participants in a Daniel Fast should be encouraged to maintain a healthy body weight and body composition by maintaining healthy exercise habits in addition to dietary changes.

Metabolism.

According to previous research, when body weight or body composition changes, the total number of calories necessary to maintain energy balance changes as well (Manore et al., 1991). As seen, there were slight changes in body composition and weight during the Daniel Fast. These changes in body composition and weight influenced total need for calories measured as REE. In this study, the REE decreased as expected ($p < 0.05$), but this was just one component of the metabolic activity. Expenditure of calories measured during RMR testing used can come from one of two sources: fat or carbohydrate. It was originally hypothesized in this study that fat oxidation would increase as a result of the Daniel Fast, but this hypothesis was not supported by the results. The changes in substrate oxidation call for more comprehensive discussion.

During the final week of the fast it was found that %FAT had increased, decreased, or remained unchanged (see *Table 4*). There were no direct correlations or consistent changes in RQ—some subjects shifted towards higher %CHO while others shifted towards higher %FAT. This split may indicate that simply changing dietary habits is not the sole factor in determining

substrate oxidation. Weight loss, decreased %BF, and changes in dietary intake are other potential factors that deserve attention.

In regards to weight loss, no correlation was found between the amount lost and the change in RQ ($R^2=0.003$). The majority of subjects were in one of two groups: one group increased CHO oxidation with a change in weight and the second group increased fat oxidation with a change in weight. Clearly, a shift towards burning CHO or fat could occur simultaneously with the loss of weight. However, an interesting observation was made concerning these two major groups of subjects: the change in RQ tended to be larger for subjects whose %CHO increased. In other words, a shift towards fat oxidation had a lower percent change—less displacement—than a shift towards CHO oxidation. This could indicate that an increase in CHO oxidation happens more readily than an increase in fat oxidation, but further research would be needed to explore this possibility. Despite this observation, no significant relationship can be found between the loss in body weight and the change in substrate oxidation based on the results in the current study (see *Figure 20*).

Because no connection was found between RQ change and loss of body weight, it is important to look at body composition. Could the percentage of body fat or lean body mass of a subject have influenced the metabolism independently from weight loss? Some research studies have hypothesized that subjects with a higher %BF would naturally burn more fat while other studies have proposed that higher %BF may actually decrease fat oxidation, making lean body mass more desirable for increased fat burn (Kriketos et al., 2000). However, one study explored this relationship between %BF and change in substrate oxidation, and found that fat oxidation in women is not related to body fat or lean body mass (Kriketos et al., 2000). In accordance with this research, subjects in the current study with a higher %BF at the beginning of the fast did not necessarily have a greater change in metabolism toward or away from fat oxidation. These

findings, along with past studies, suggest that REE and substrate oxidation may not be primarily related to body composition as previously thought. There must be other factors influencing fat oxidation more heavily than body composition.

The final possible factor measured in this study was the dietary intake during the fast. In discussing these results, it is important to note that dietary data was based on food logs and dietary surveys, both of which allowed for subjectivity in the responses. The percent change in diet was likely to be higher as fat oxidation increased (see **Figure 21**). This relationship was not very strong, but there was a slight trend with 22.4% of the change in RQ being explained by the diet based on the diet survey scores ($R^2=0.224$). This means that although diet was not the only factor, part of the metabolic change was explained by the amount of dietary change.

Researchers suggest that one can turn the body can into a “fat-burning machine” by manipulating the content of the diet (Kiens et al., 2011). During the Daniel Fast, average CHO intake increased which could potentially have affected the percentages of substrate oxidized. A study done on the factors regulating fat oxidation found that using dietary intake to manipulate stores of glycogen—a form of CHO found in muscle—could increase or decrease fat oxidation (Kiens et al., 2011). In this case, lower CHO intake and lower glycogen levels would promote higher fat oxidation. When carbohydrates are controlled, insulin does not need to increase dramatically because there is less sugar in the bloodstream and the body is able to burn the fat consumed rather than depositing it.

According to these previous studies, the current study’s average increase in CHO intake of 7.4% could have either increased glycogen stores or increased the body’s blood sugar, decreasing the ability to oxidize fat. However, as stated, this was not the case for every subject because although CHO intake increased for 66% of subjects who completed a food log, %FAT

and %CHO oxidation changed indirectly. Only 1.8% of the change in RQ was explained by the change in CHO consumption ($R^2=0.0183$) (see **Figure 22**).

Perhaps looking at fat intake can provide insight on the matter of substrate oxidation. As with carbohydrates, the average intake of fat increased during the fast, based on the food logs completed by subjects. However, no correlation was found between the amount of change in fat intake and the change in RQ ($R^2=0.0002$). Because no correlation was found between either macronutrient—neither fat nor carbohydrate—macronutrient consumption too was also not shown to be the primary cause for the metabolic shifts observed.

In addition to weight loss, body composition, and dietary change, one unmeasured factor should also be acknowledged. The level of physical activity and physical fitness of individual subjects could have had an impact on metabolism and substrate oxidation. Previous studies have found both that high physical fitness levels tend to yield higher rates of fat oxidation and that fat oxidation is higher in sedentary individuals with a higher body fat mass (Kriketos, Sharp & Seagle, 2000). Further research suggests that this increased fat oxidation affects the body during both exercise and at rest, meaning that it would affect the resting metabolic rate (Kriketos et al., 2000). Subjects were instructed to maintain the same exercise habits as they had been practicing before the fast. However, these exercise habits were neither quantified nor monitored. Some of the subjects began the fast as “physically active” individuals, while others were quite “sedentary.” It is possible that the rate of fat oxidation changed based on pre-fast fitness level or type of activity, but further research is needed to determine how fitness and activity levels affect subjects participating in a Daniel Fast. This relationship could be examined to find whether or not these factors could have influenced the extent of metabolic change once the dietary changes were implemented.

As discussed, none of the measured factors in the current study seem to explain the variety of metabolic shifts observed—half of subjects burning more fat and half of subjects burning more CHO. Research has found that fat oxidation may actually have negative effects, however, indicating that an increase in %CHO is not necessarily an adverse effect of the Daniel Fast. For example, increased fat oxidation can potentially impair glucose uptake by metabolic feedback, decreasing insulin sensitivity (Kiens et al., 2011). Thus, higher fat oxidation may not always be ideal for the body.

Based on these benefits versus drawbacks, the metabolism as a whole remains an important consideration when looking at the indicators for overall health. Science has established that the body works to achieve energy balance and equilibrium and may be using specific substrates in different amounts in order to achieve this balance. This constant pursuit of equilibrium could be the reason for the variation in metabolic substrate oxidation. What is yet to be determined are the specific variables affecting this equilibrium and the timing of the changes.

Discussion summary.

Previous studies report a wide variation in findings on metabolism related to body composition, dietary intake, and physical activity, and this study is no exception (Kriketos et al., 2000). Although future research is necessary to determine the cause of the metabolic shifts observed, this study on the Daniel Fast presents many avenues with which to proceed in this endeavor. Despite the variation in findings, all subjects reported perceived feelings of well-being indicating that health benefits could be present irrespective of the direction of metabolic shift. Other health factors such as weight loss, decreased %BF, decreased BMI, and reported decreased acne, decreased perceived hunger, etc. were also observed irrespective of the change in metabolism. This indicates that the Daniel Fast does have benefits and that fat oxidation may not be the primary indicator for physical health.

Limitations and Application

Because this study was done by a full-time undergraduate student, some resources were limited. One limitation in this study was the restricted amount of time available in the Human Performance Lab. The lab is heavily used by professors and students, and only set amounts of time were available for testing. In addition, the research coordinator for this study was a novice at performing testing without supervision. All subjects were tested appropriately and safely but the room for error was increased due to this learning curve. Different lab technicians were also involved in the testing and not all used the exact same process to test the subjects. Although it is possible that slight differences in testing processes could have created small changes in data collection, additional technicians were necessary in order to accomplish all of the testing in the limited amount of time. Training of each technician was completed as consistently as possible to prevent inconsistency.

Despite efforts to use resources efficiently and accurately, four procedural inconsistencies occurred. First, two different machines were used to test the resting metabolism of subjects. Ideally, each subject should have been tested before and after the fast using the same machine to ensure more efficient data collection. The discrepancy between the two machines, if any exists, is unknown. Second, some subjects were instructed not to fall asleep or to listen to music during the test while others were not given this guidance. Third, the method for collecting body composition information was bioelectrical impedance, which is not the most effective and accurate way to find this data. Lastly, the largest limitation was a machine malfunction. During the post-fast testing, four subjects were tested on a machine that had a hole in one of the tubes leading to the analyzer. The data from these four tests was excluded from analysis of resting metabolism results. The subjects could not be re-tested due to the final test being done on the last day of the fast.

Due to time constraints and limited lab resources, testing was done as efficiently as possible. However, if this study could be redesigned from the beginning, a more structured environment for testing would be ideal. More lab resources would be needed to ensure every test was completed with precisely the same process and on the same machine for each subject. Additionally, a more closely monitored control group would be necessary for valid comparison to the data of fasting subjects.

In addition to these procedural limitations, the nature of the Daniel Fast creates limitations in the study design. Because subjects are free to partake of unlimited amounts of food, they are on a type of honor system. The subjects were only required to keep track of intake using the baseline 3-day food log and a 6-day log during the fast. Other than this information, there was no way to monitor that they were adhering strictly to the fast. Although the guidelines were thoroughly explained and emphasized to all subjects before and during the fast, the understanding of these guidelines may have varied from subject to subject. Therefore, the actual compliance of subjects to the fast could not be measured and ensured beyond individuals stating that they adhered to the guidelines appropriately. The study design could be modified to include more monitoring of dietary intake and more measures of compliance to ensure subjects were following all guidelines accurately.

Additionally, discovering the precise cause of the metabolic shift is not possible when many variables—measured or unmeasured—exist. Because further research is needed to determine the cause of the metabolic shift, the study design could be modified to reduce the variables potentially affecting the substrate oxidation. First, the design could include multiple tests throughout the fast to determine if weight or metabolism fluctuated during the fast or showed a constant trend. This would allow researchers to examine whether or not metabolism approaches a level of equilibrium at any point during the fast at which it switches to the opposite

substrate. Another modified design could explore the impact of the macronutrient content of specific meals prior to testing by using multiple metabolic tests and by specifying the exact content of the meals. Finally, further research should also take physical activity and physical fitness into account when designing a Daniel Fast study. Metabolism may be affected by the type of exercise subjects choose or by their fitness level prior to beginning the fast. The current study was limited in that it did not measure or quantify these exercise habits and therefore could not examine the impact.

Overall, the current design of the Daniel Fast is not an ideal method for studying the metabolism, weight loss, or change in body composition due to the number of variables involved. It is possible that unmonitored variables could have influenced the changes observed during the fast or that limitations in the study design limited the significance of the results. However, if the focus of future studies can be modified to be more precise and variables can be monitored more efficiently, it is possible to narrow the possibilities and find conclusive evidence regarding the effects of the Daniel Fast,

Conclusion

This investigation sought to discover whether subjects burned more fat and lost moderate weight after at least 21 days of following the dietary restrictions of a spiritually-based Daniel Fast. Results showed changes in weight, body composition, dietary intake, and metabolism but with no highly significant relationships between different variables. Despite limitations, results regarding weight loss did support the hypothesis that moderate weight loss would occur. Results of metabolic testing did not support the prediction that subjects would burn greater amounts of fat, however. These findings identify the need for much more in-depth study to determine the precise variables causing changes in substrate oxidation. However, although the metabolic shifts

were not explained, this study successfully provided a variety of ideas which could aid in designing future studies on the Daniel Fast.

This study also successfully found a method of encouraging young women at SAU to develop enjoyable and sustainable dietary habits. Although the quantity of food consumed was still viewed as important, only the type of food was restricted, allowing each subject to focus on the spiritual experience while also enjoying healthful, whole foods (Trepanowski & Bloomer, 2010). Subjects became more aware of the food they consumed, gained knowledge about healthy food choices, and expressed a desire to continue eating according to the fasting guidelines after the fast was complete. If continued intentionally, such habits could develop into lasting lifestyle choices that have the potential to positively impact both perceived and measured physical health.

Nutrition for Spirit, Mind, and Body: Conclusions

The most important aim of this study was to discover whether or not the Daniel Fast is a successful, meaningful, and beneficial method for promoting wholeness in the spiritual, mental, and physical dimensions of health. By focusing on the development of sustainable lifestyle habits such as spiritual growth and healthful eating, the Daniel Fast encouraged all participants to look beyond dieting for weight loss to a greater, three-dimensional perspective of nutrition. This perspective led many of them to experience not only perceived physical health benefits, but spiritual progress and academic performance improvement as well.

Although not all findings were statistically significant, the number of participants reached in a way that could positively impact their lifestyle choices was significant. The Daniel Fast provided the structure and support needed to succeed. It provided education about healthy nutrition and facilitated the application of the knowledge learned. Most of all, the fast led participants to lean on God's strength to become physically, mentally, and spiritually whole through making healthful nutritional choices day by day. Ultimately, this study successfully

reinforced the connection between spiritual, mental, and physical health, and provided evidence that, together, each of these dimensions make the Daniel Fast a comprehensive, Christ-centered approach to spreading the good news of nutrition for spirit, mind, and body.

APPENDIX A: SPIRITUAL PURPOSE WORKSHEET

SAU Daniel Fast Spiritual Preparation Worksheet

“The spirit of true fasting and prayer is the spirit which yields mind, heart, and will to God.”

Ellen White, *Counsels on Diet and Foods*, p. 189

Step 1: Pray.

From the very start, include God in your fast. This is the most important step as you prepare for your fast. The Daniel Fast is a God-centered fast. Without this spiritual purpose, it is merely a 28-day trial of a healthy diet. In Isaiah 58, God addresses the very important issue of priorities in fasting. Fasting is FOR God! As you prayerfully consider your fast, think about what will be pleasing to Him. Keep at the forefront of your thoughts that fasting is “unto the Lord.” God sees your heart and He wants you to enter into this fast to seek Him, to honor Him, and to draw closer to Him. Open yourself up to Him and talk to Him about your intentions. Submit the fast and yourself to Him. He is eager to spend more time with you.

Step 2: Commit.

Make a firm commitment to yourself and to God. Why is this important? Because it’s likely that there will be times when you want to quit or give in a little. These struggles are a part of

fasting. But in those times of temptation and weakness, a quality decision will help you to stir up your resolve, seek the Holy Spirit for help, and develop self-control and patience.

I commit to spend 28 days in fasting for a spiritual purpose.
With God as my guide, Jesus as my strength, and the Holy Spirit as my helper,
I am going to do this!

Signed _____ Date _____

Step 3: Focus.

Determine a spiritual purpose for your fast. This is the “why” that will provide focus for your time with God and motivation to stay on track (or get back on) if you find yourself tempted during your fast. Ask yourself: *What is important to God? What is important to me?*

“I am fasting and praying towards _____ (spiritual renewal, guidance, healing, forgiveness, revival, resolution of problems, special grace to handle a difficult situation, finances, ministry, family, salvation of others, forming new spiritual habits, etc.).”

Step 4: Plan.

Define a time and place where you can be alone with God on a consistent and daily basis. This daily time with God enables Him to interact with you and His Word to direct you. Ellen White wrote that “In the hand of God [fasting and prayer] are a means of cleansing the heart and promoting a receptive frame of mind. We obtain answers to our prayers because we humble our souls before God.” (*Counsel on Diets and Foods*, p. 187).

If you are not used to spending time with God, ask the Holy Spirit to guide and teach you. Daniel was a very busy man with all his duties and responsibilities, but he still maintained the Jewish practice of morning, midday, and evening prayer. The key lies in planning ahead.

Ask yourself:

- *How much time will I devote each day to prayer? When? Where? How much time will I spend each day in God’s Word? When? Where?*
- *What supplies do I need?* (Bible, journal, pen, etc.)
- *Do I need to put anything away during the fast?* (In biblical accounts, people prepared for fasting by cleaning their houses from top to bottom and removing all yeast from their homes. What might get in the way of my fast? Are there some tempting foods than need to be gotten rid of? Music, books, videos, or other things I don’t want to fill my mind with?)

- *What visual or auditory cue can I put in place so that I will be reminded of the spiritual purpose of my fast?* (post-it note on mirror, alarm on phone, Bible on my pillow, etc.)

My plan for spending time with God during this Daniel Fast:

- What I will do:
- When:
- Where:
- How:

Checklist:

- ☐ I have included God in my fast.
- ☐ I have made a firm commitment to myself and to God.
- ☐ I have determined a spiritual purpose for the fast.
- ☐ I have developed a plan for spending time with God each day.

APPENDIX B: TABLES AND FIGURES

Section 1: Nutrition for the Spirit

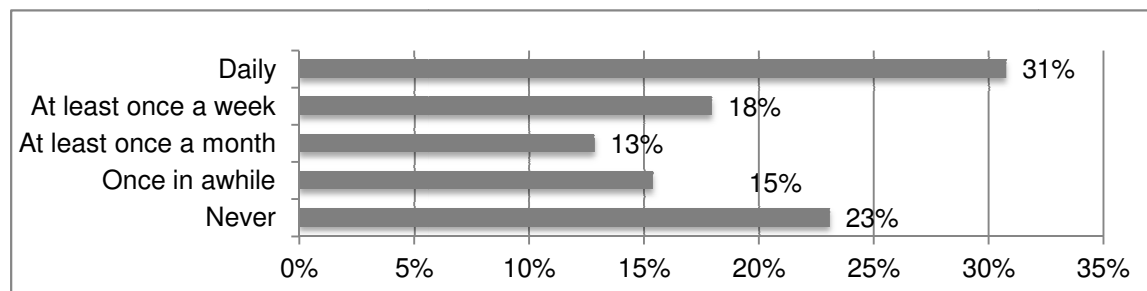


Figure 1.1. Pre-fast expression of faith through music or art. Before the fast, participants were asked to rate the frequency of expressing faith through music or art. Thirty-one percent said *daily* and 18% said *at least once a week*.

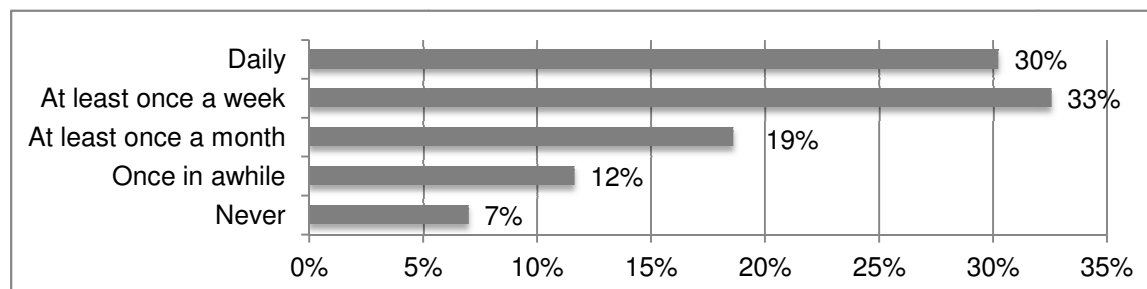


Figure 1.2. Post-fast expression of faith through music or art. Participants rated the frequency again after the fast and the percentage of *at least once a week* responses increased to 33%. The *never* category decreased from 23% to 7% during the fast.

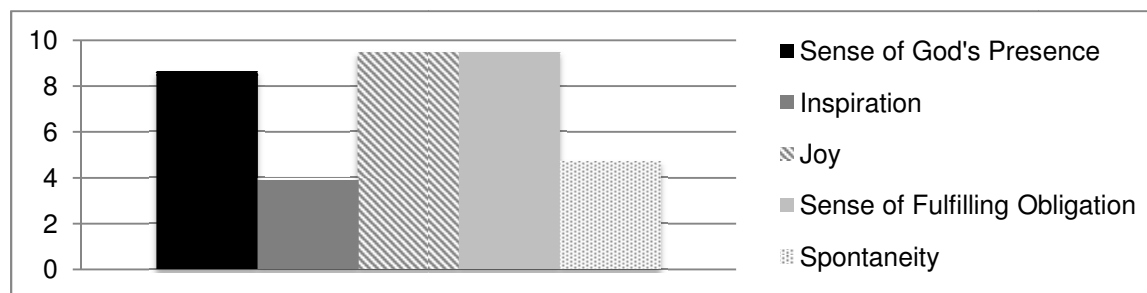


Figure 2.1. Average change in frequency of various feelings during worship services or church. Each of these areas *increased* by this percent change during the fast: sense of God's presence by 8.6%, inspiration by 3.9%, joy and sense of fulfilling obligation by 9.5%, and spontaneity by 4.7%.

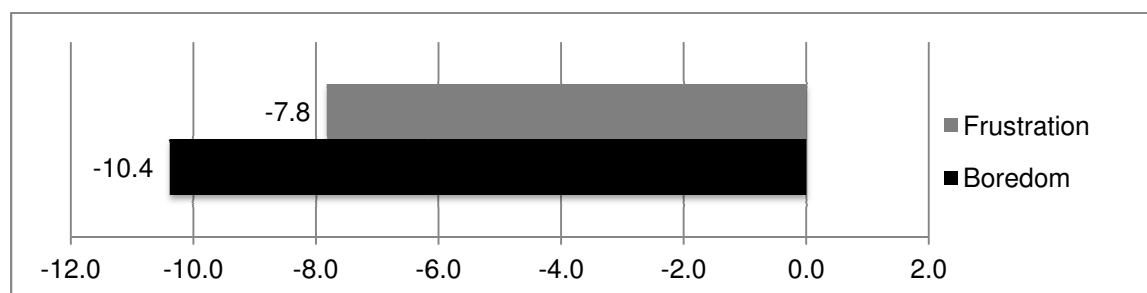


Figure 2.2. Average change in frequency of various feelings during worship services of church. The frequency of experiencing frustration and boredom decreased by 7.8% and 10.4% respectively.

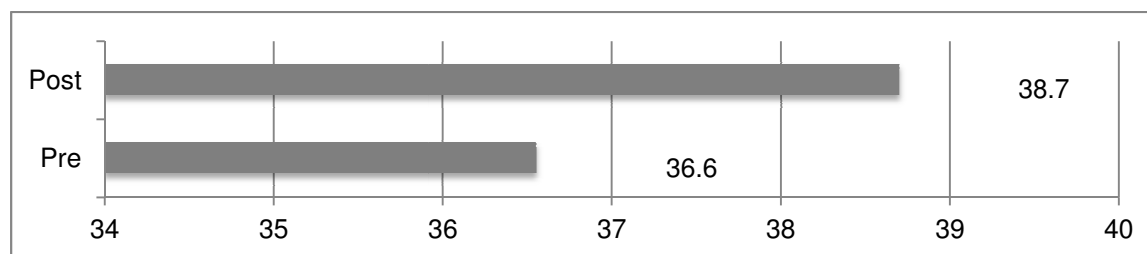


Figure 3. Change in spiritual survey scores. Spiritual progress was indicated by increased spiritual survey scores which measured levels of spiritual practice and subjective perceived closeness with God.

Section 2: Nutrition for the Mind

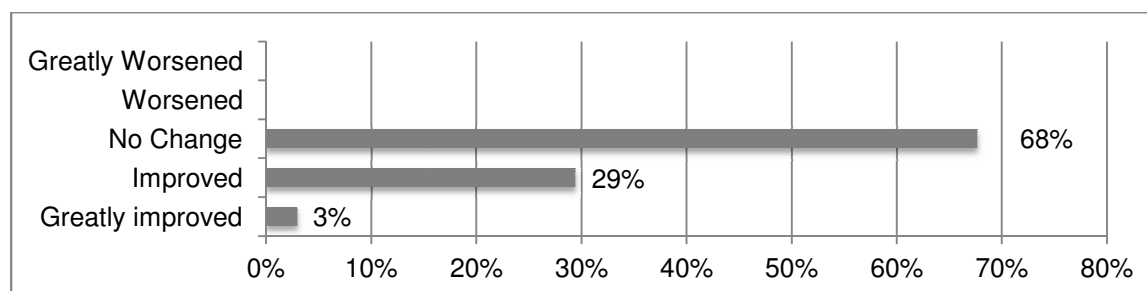


Figure 4. Change in perceived reading speed. 68% of participants said they perceived no change in reading speed during the Daniel Fast, while 32% perceived either improvement or great improvement.

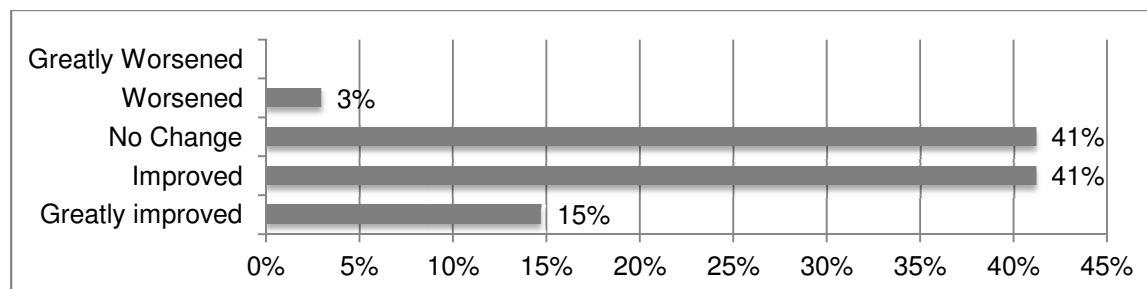


Figure 5. Change in perceived length of attention span. 41% of respondents perceived that their attention span was improved during the Daniel Fast and 15% reported a great improvement. 44% of participants said that it was either unchanged or worsened, indicating that the fast had an affect depending on the individual.

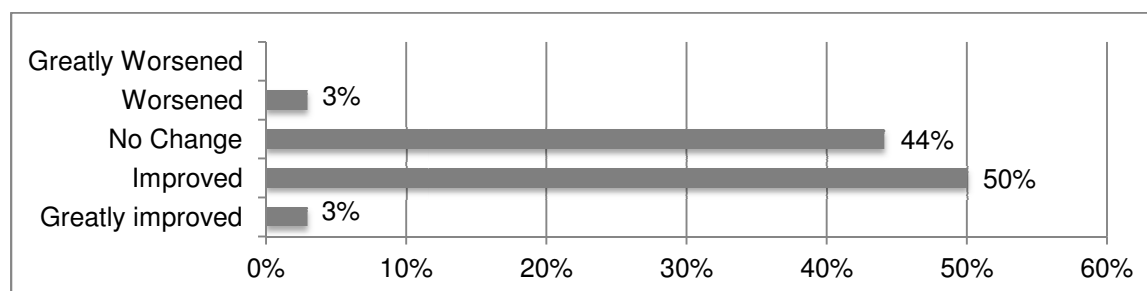


Figure 6. Change in perceived reading comprehension and recollection. 53% of participants reported an improved or greatly improved level of reading comprehension and recollection, while 47% either remained unchanged or worsened during the fast.

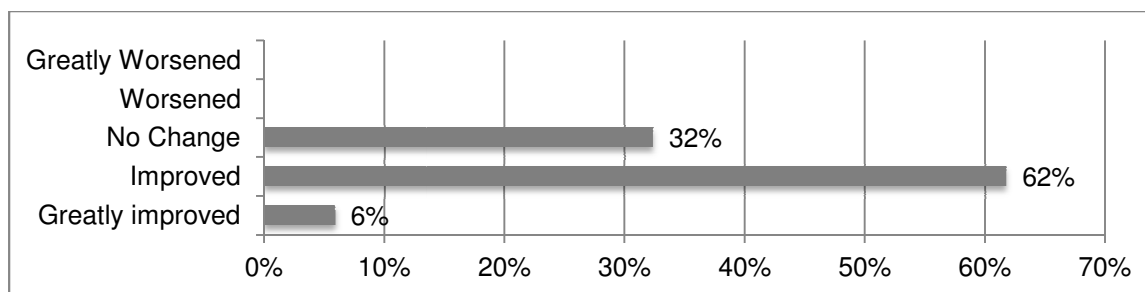


Figure 7. Change in perceived ability to learn and understand new concepts. The majority of participants either improved or greatly improved in ability to learn and understand new concepts based on their perception. 62% perceived improvement and 6% said improvement was “great.” Only 32% did not perceive any change.

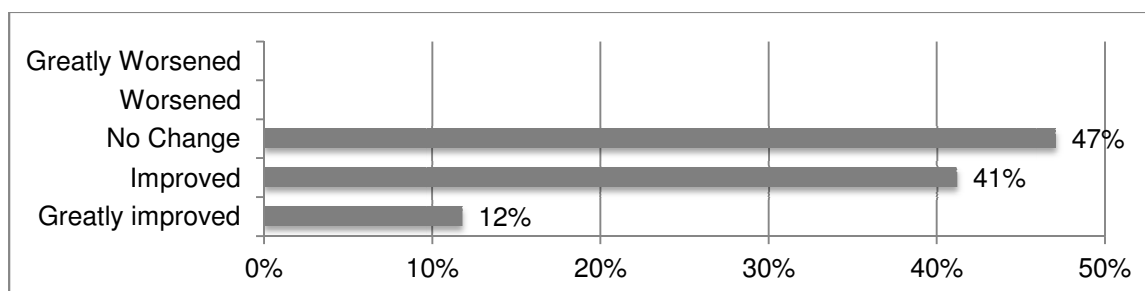


Figure 8. Change in perceived memorizing speed. Participants were almost split half and half regarding memorizing speed: 47% observed no change while 53% either improved or greatly improved.

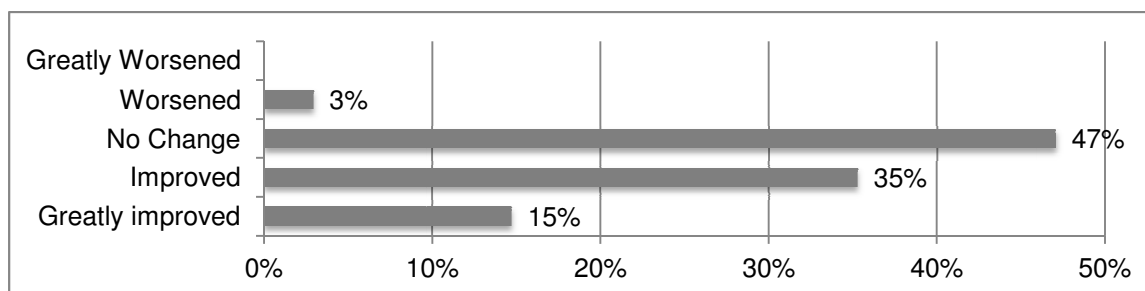


Figure 9. Change in perceived ability to study shortly after eating a meal. About half of participants did not perceive any change in ability to study after eating, but 50% either perceived improvement or great improvement. The change, and the differing amounts of change, could be related to the content of the meals.

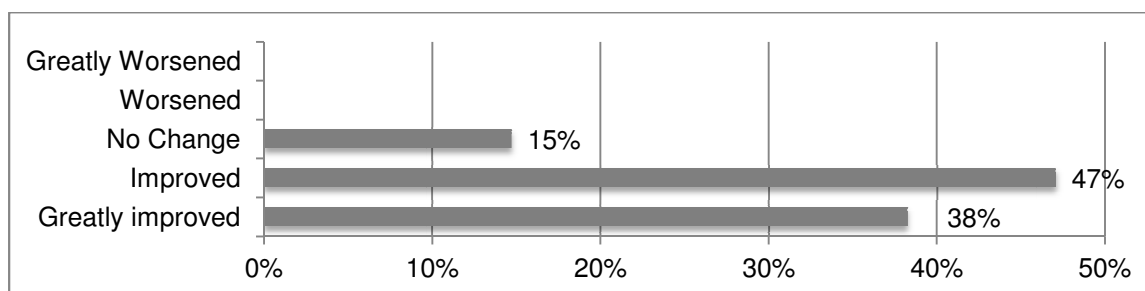


Figure 10. Change in perceived clarity of mind. Only 15% of participants did not perceived any change at all, while 47% reported improvement and 38% *great* improvement.

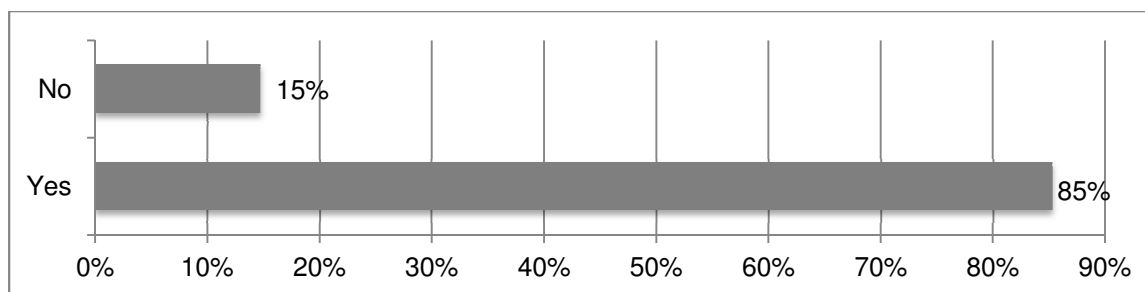


Figure 11. Change in perceived sharpness of mind. When participants were asked whether or not their mind became sharper during the fast, 85% responded *yes* and only 15% responded *no* indicating that regardless of how other questions were answered, the Daniel Fast did improve mental clarity and sharpness in some way for the majority of participants.

Section 3: Nutrition for the Body

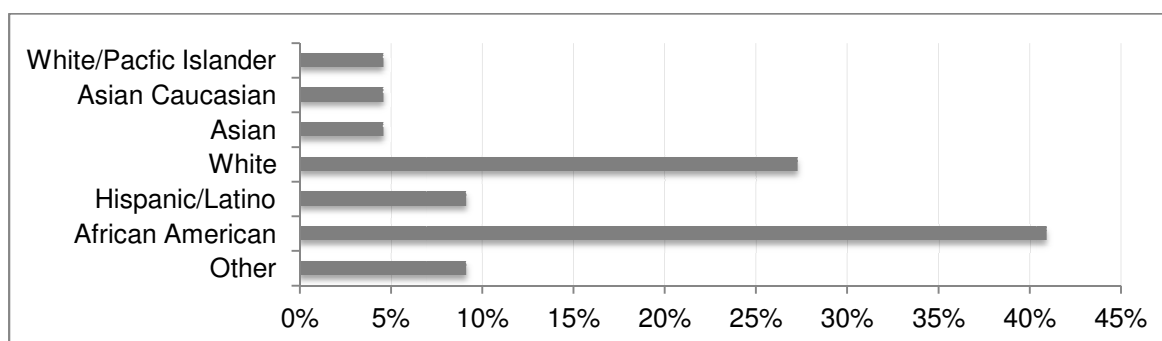


Figure 12. Subject race. As surveyed, subjects in this study indicated the race they identified with most. Of the 22 subjects, the majority were African American and White. The subjects were not stratified into groups based on race.

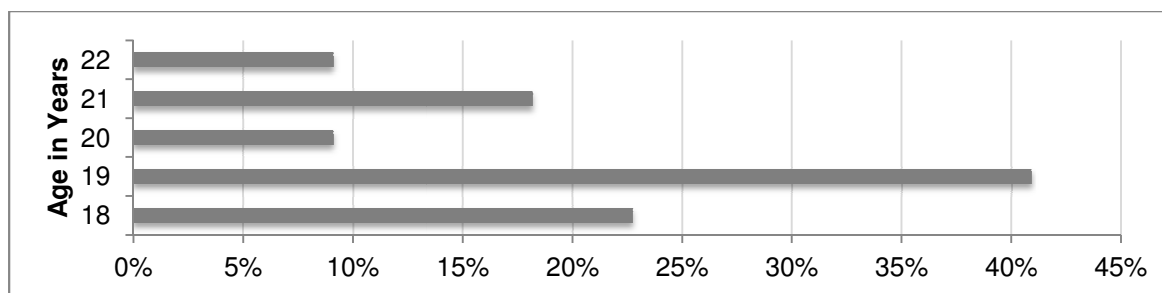


Figure 13. Subject age in years. Out of the subjects in this study, 41% of subjects were age 19. All subjects were between the ages of 18 and 22.

Table 1*Pre-fasting baseline characteristics*

	Weight (lbs)	BMI	Body Fat (%)	REE (kcal)	FAT burn (%)	Diet Score
Mean	147.72	24.79	26.25	1578.4	81.8	23.3
SEM	± 31.49	± 0.82	± 1.43	± 47.9	± 3.4	±1.5
N	22	22	21	21	21	18

Table 1. Baseline characteristics recorded at the time of pre-fast testing. Prior to the fast, weight was measured in pounds. Average BMI was in the “normal” range. The body composition was measured by bioelectrical impedance to find %BF. REE was 1578.38 kilocalories per day and average %FAT was 81.8%. According to the dietary survey taken pre-fast, average score was 23.3, indicating a high deviation from a vegan, whole food dietary lifestyle such as the Daniel Fast. All values are mean ± SEM.

Table 2*Anthropometric data of subjects pre and during final week of fast*

Variable	Pre	Post	% Change
Weight (lbs.)	147.72 ± 31.49	144.14 ± 30.73	-2.43 ± 0.52
BMI (kg.m-2)	24.79 ± 0.82	23.92 ± 0.72	-3.28 ± 0.71
Body Fat (%)	26.25 ± 1.43	25.05 ± 1.34	-4.10 ± 0.02
RHR (bpm)	71 ± 6.7	63 ± 7.5	-10.2 ± 8.86

Table 2. Anthropometric data of subjects before and during the final week of a 28 day Daniel Fast. This table shows the mean values for each variable pre and post-fast ± SEM. The percent change was calculated as a relative value.

Table 3*Metabolic changes*

Variable	Pre	Post	% Change
REE (kcal)	1578.4 ± 47.9	1412.8 ± 38.0	-9.88 ± 0.02
CHO burn (%)	18.2 ± 3.43	29.6 ± 6.72	N/A
FAT burn (%)	81.8 ± 3.43	70.6 ± 6.71	N/A
RQ	0.76 ± 0.01	0.78 ± 0.02	3.63 ± 0.03

Table 3. Metabolic data of subjects before a 28 day Daniel Fast and during the final week of the fast. All values are mean ± SEM. REE decreased by an average percent change of 9.88%. RQ *increased* by 3.63% meaning that the number approached more carbohydrate burn. The distribution of values varied greatly from subject to subject. 52% of subjects had higher %FAT at the end of the fast while 48% had higher %CHO, splitting the sample almost exactly in half.

Table 4*Change in percentage fat burn at rest*

Subject	Pre (%)	Post (%)	Change (%)
	61	27	-34
	54	98	44
	100	45	-55
	90	59	-31
	97	36	-61
	100	100	0
	99	64	-35
	60	100	40
	95	100	5
	100	100	0
	70	89	19
	60	100	40
	100	21	-79
	95	56	-39
	89	100	11
	80	100	20
	66	96	30
	85	25	-60
	76	95	19
	74	48	-26
	67	23	-44
Mean	81.8 ± 3.43	70.6 ± 6.71	-11.2 ± 8.07

Table 4. Change in percentage fat burn at rest. This table shows the raw data for subject fat oxidation. Those with a negative change decreased in %FAT while those with a positive change increased. Eleven of the 21 subjects either increased or remained the same. The mean values show that overall there was a decrease in %FAT, but the raw data shows that only about half of the subjects actually decreased in fat oxidation. All values are mean ± SEM.

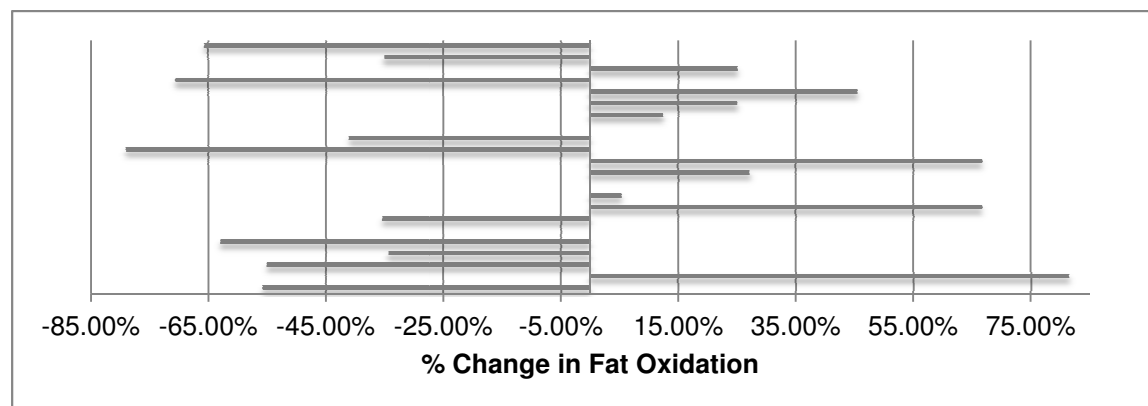


Figure 14. Distribution of changes in percent fat oxidation. The percent change in fat oxidation from pre-fast to the final week of the fast was widely distributed: 52% of subjects increased fat oxidation while 48% of subjects burned less fat near the end of the fast.

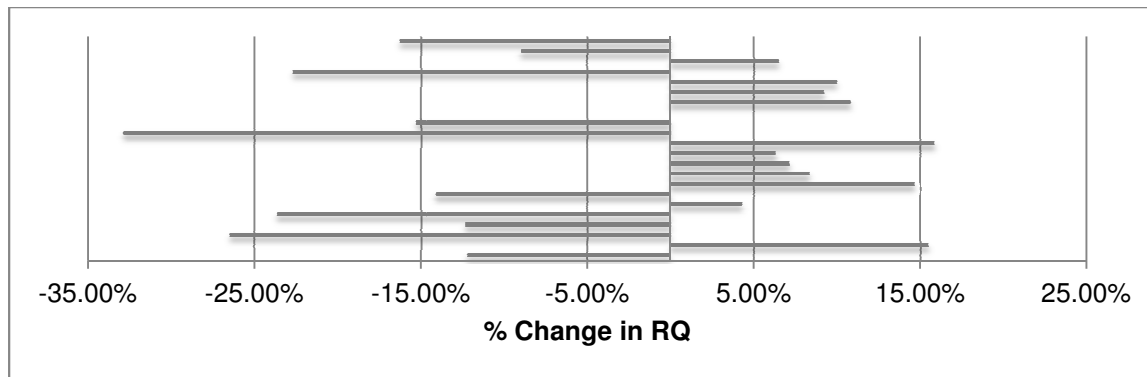


Figure 15. Distribution of changes in respiratory quotient. This figure shows the percent changes in RQ during from pre-fast to the final week of the fast. 52% of subjects had an positive change, indicating an increase or maintenance of %FAT. 48% of subjects had a negative change indicating an increase in % CHO.

Table 5

Dietary intake value comparison

Variable (mean)	Pre Fast	Post Fast	Control
Calories (kcal)	1490	1253	2264
Cholesterol (mg)	103	8	84
Sodium (mg)	2304	1003	3702
Carbohydrate (%)	59.17	61.52	63.00
Fiber (g)	18	28	32
Diet Score	23.3 ± 1.46	8.7 ± 0.61	19.0

Table 5. Dietary intake value comparison. From pre-fast to during the final week of the fast caloric, CHO, and fiber intake increased. Cholesterol and sodium intake decreased. The control group only completed one food log and the comparison to this food log can be seen: calories, cholesterol, sodium, CHO, and fiber were all higher than subjects during the final week of the fast. The diet score for subjects decreased as a result of the fast, and was appropriately lower than that of the control. Diet score values are ± SEM.

Table 6

Control and fast comparison of % changes in variables

Variable	Fast	Control
Weight (lbs.)	-2.43 ± 0.52	-0.73 ± 0.26
BMI	-3.28 ± 0.71	-1.20 ± 0.70
Body Fat (%)	-4.10 ± 0.02	-11.16 ± 0.09
RHR (bpm)	-10.2 ± 8.86	-4.35 ± 0.02
REE (kcal)	-9.88 ± 0.02	-0.05 ± 0.03
RQ	3.63 ± 0.03	-16.16 ± 0.04

Table 6. Control and fast comparison of changes in variables. Both fasting subjects and control group subjects showed changes in these variables indicating that the control group was not the ideal “standard” comparison as a control group should be. All values are mean ± SEM.

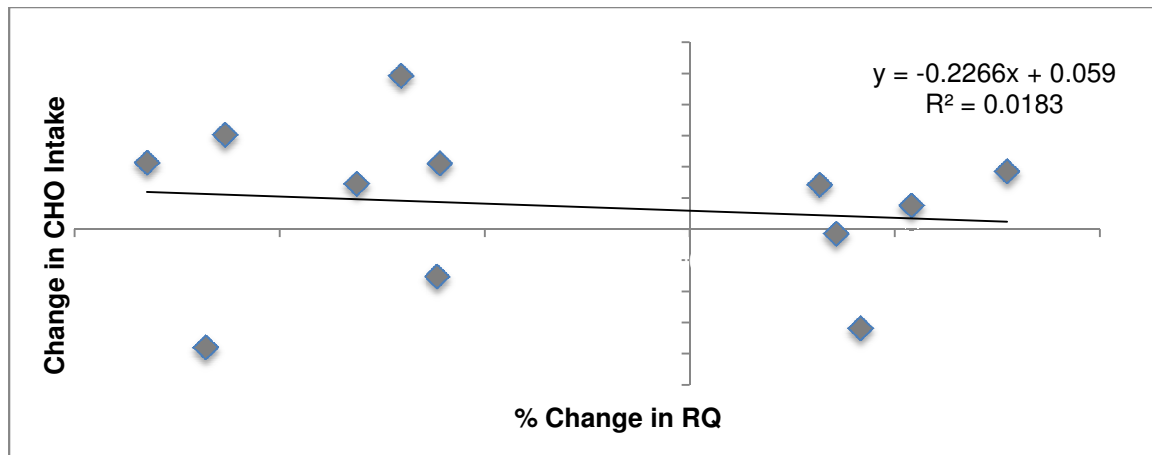


Figure 16. Change in RQ compared with change in CHO intake. As indicated by this graph, only 1.8% of the change in RQ was explained by the change in CHO intake. Three subjects who increased in CHO intake increased fat oxidation, while 5 subjects who increased CHO intake increased CHO oxidation. Two subjects who decreased CHO intake increased CHO oxidation while 2 who decreased CHO intake increased fat oxidation.

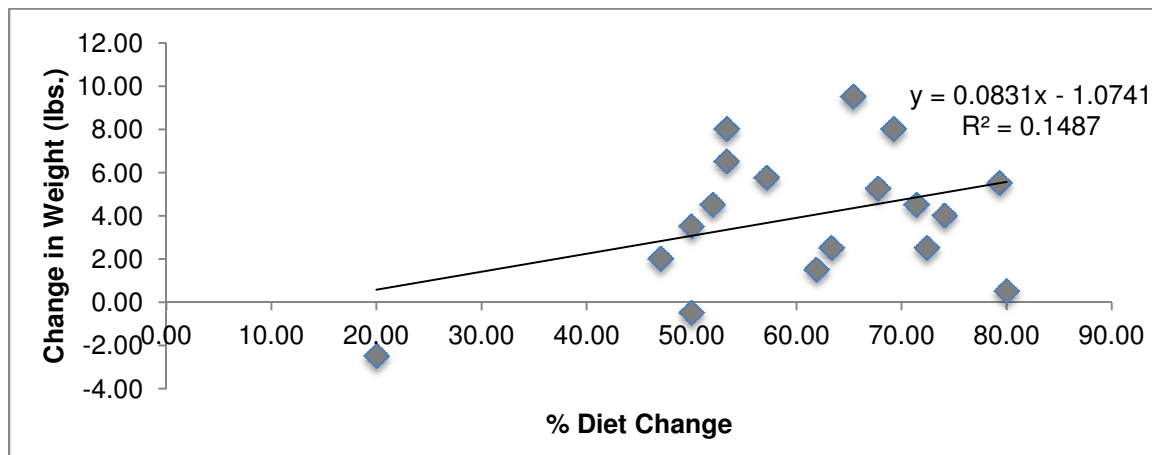


Figure 17. Change in diet compared with loss of weight. As subjects ate a diet more similar to the Daniel Fast guidelines there was a slight trend for more weight loss with 14.9% of the variation in weight being explained by the variation in diet ($R^2=0.149$).

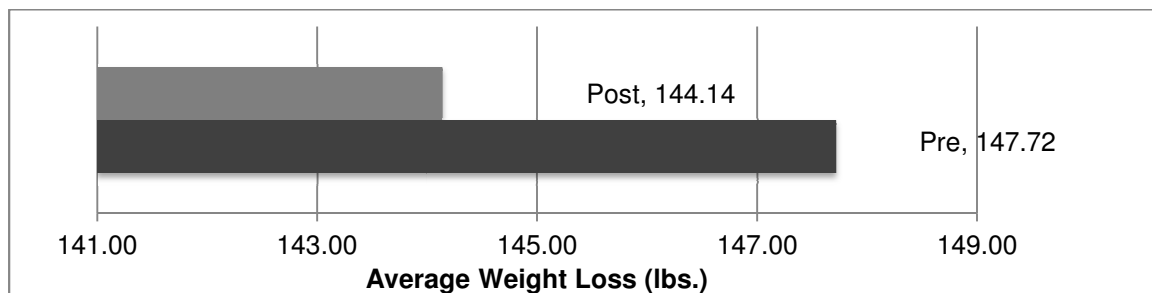


Figure 18. Average body weight pre-fast and during final week of fast. The average loss of body weight was 3.58 lbs.. Only two subjects gained weight during the fast.

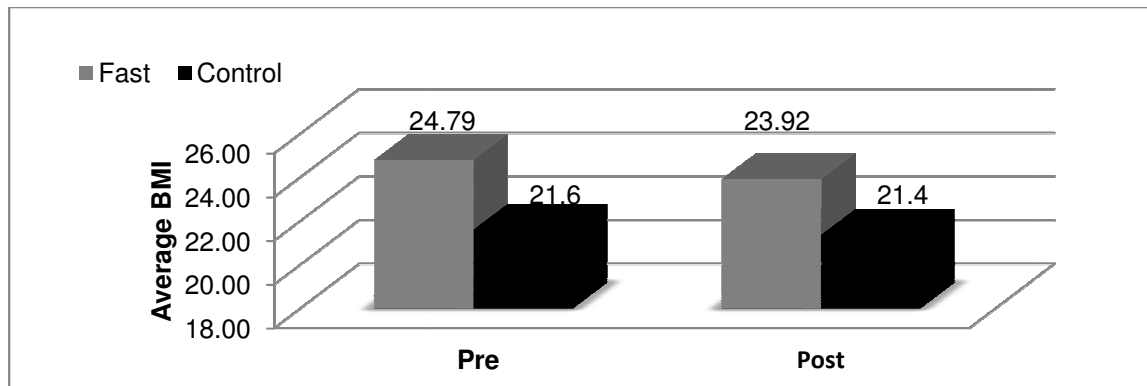


Figure 19. Average BMI pre-fast and during final week of fast. Average BMI decreased moderately during the time of fasting. The control group remained relatively the same.

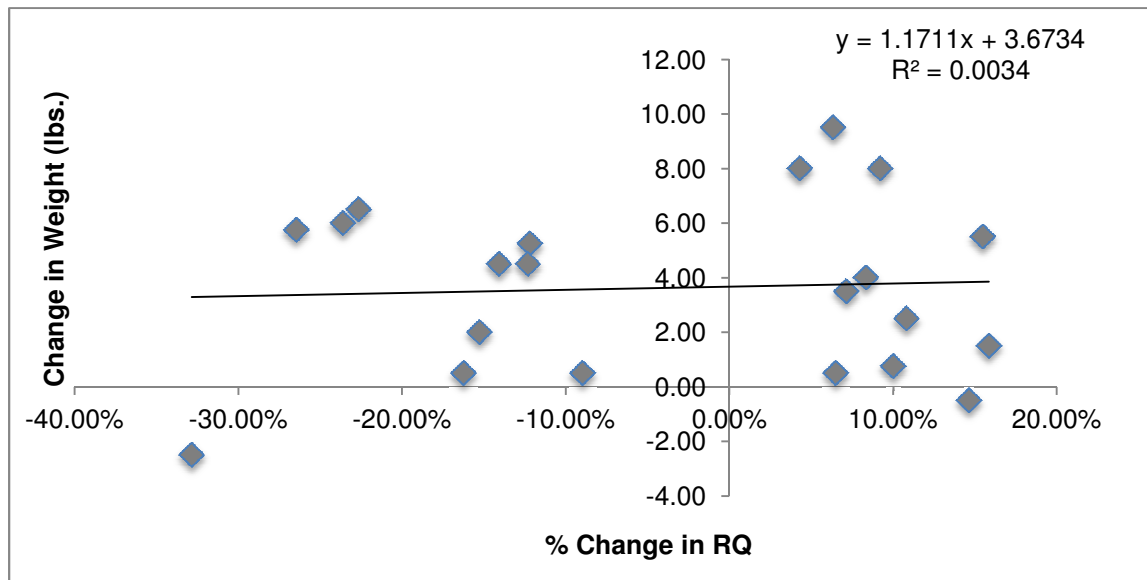


Figure 20. Change in metabolic RQ compared with loss of weight. As RQ decreased, fat burn increased. About half of subjects had an decrease in RQ but this was not necessarily related to the amount of weight lost. Only .34% of the RQ change was explained by the change in weight.

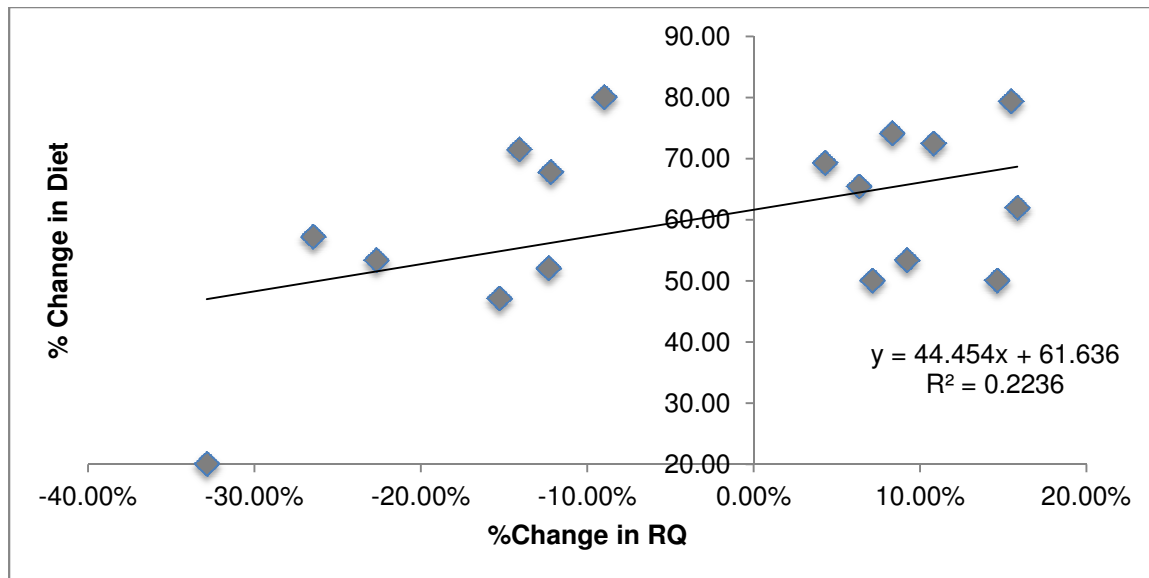


Figure 21. Change in metabolic RQ compared with change in dietary survey score. As RQ decreased the change in diet was likely to be higher. The relationship was not extremely strong but there was a slight trend with 22.4% of the change in metabolic RQ being explained by the change in diet ($R=0.2236$).

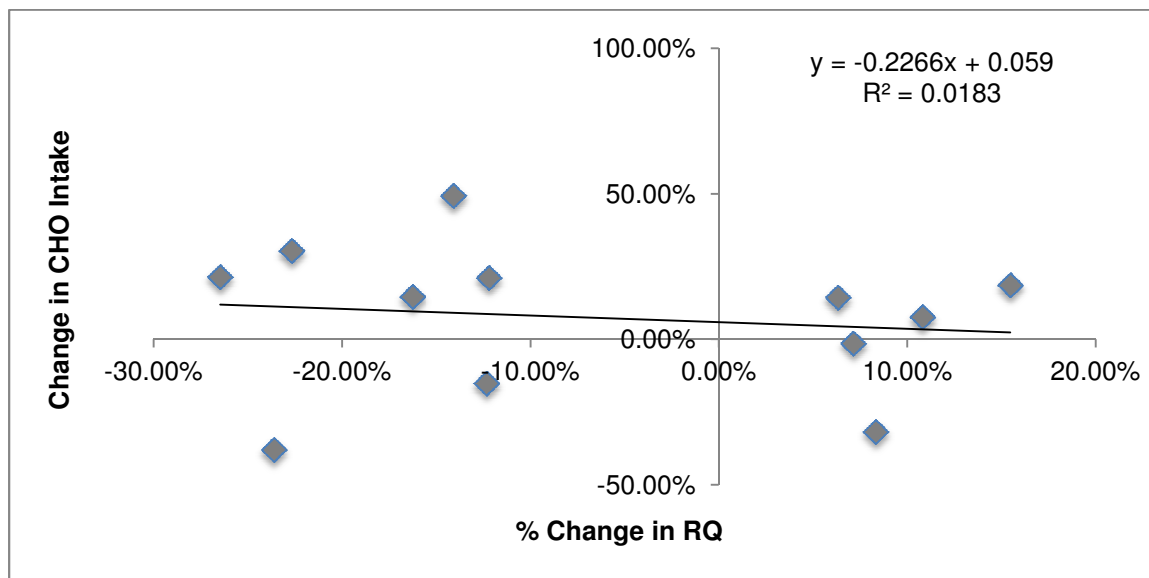


Figure 22. Change in metabolic RQ compared to change in CHO intake. Only 1.8% of the change in metabolic RQ was explained by the change in CHO (which was an average increase of CHO intake).

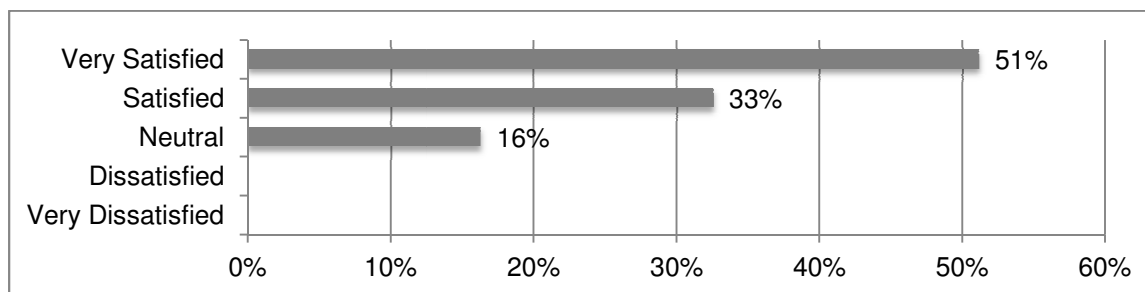
Section 4: Participant Satisfaction

Figure 23.1. Satisfaction with overall Daniel Fast experience. No subjects indicated dissatisfaction.

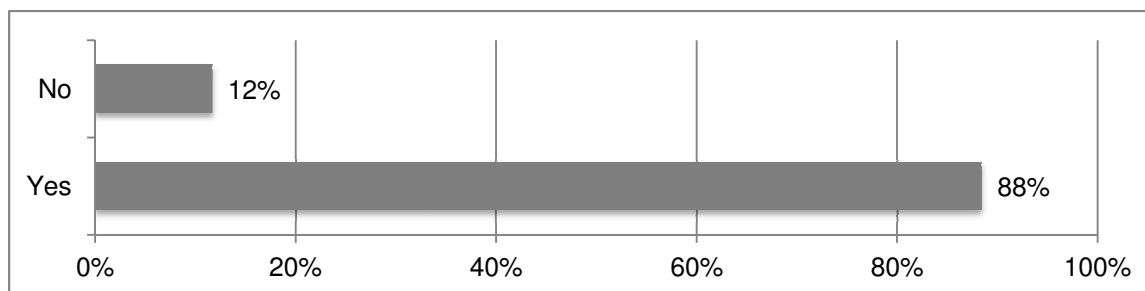


Figure 23.2. Willingness to repeat the Daniel Fast if given the opportunity. When asked if they would like to participate in the Daniel Fast again, 88% of respondents indicated yes.

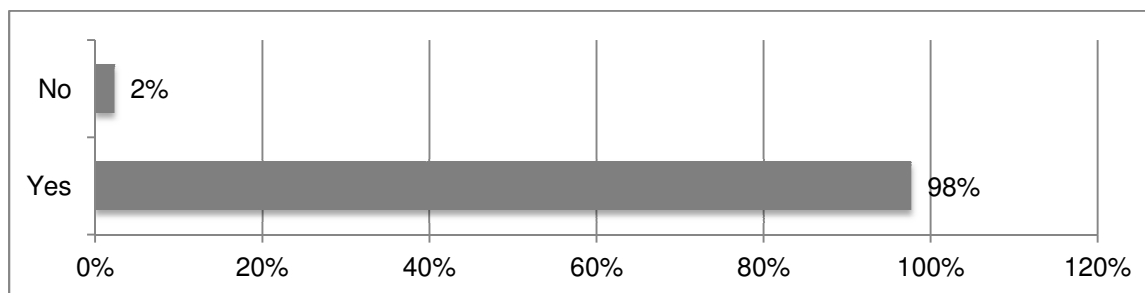


Figure 23.3. Likelihood of recommending the Daniel Fast to another person. Of all respondents, 98% said they would recommend the Daniel Fast to a friend, classmate, family member, or acquaintance based on their own experience.

APPENDIX C: FOOD LIST

This list of foods is taken from Gregory's (2010) book, *The Daniel Fast*, and was provided to all participants before the fast began. The foods allowed during the fast included the following:

“All fruits. These can be fresh, frozen, dried, juiced or canned. Fruits include but are not limited to apples, apricots, bananas, blackberries, blueberries, boysenberries, cantaloupe, cherries, cranberries, dates, figs, grapefruit, grapes, guava, honeydew melon, kiwi, lemons, limes, mangoes, nectarines, oranges, papayas, peaches, pears, pineapples, plums, prunes, raisins, raspberries, strawberries, tangelos, tangerines, and watermelon.

All vegetables. These can be fresh, frozen, dried, juiced or canned. Vegetables include but are not limited to artichokes, asparagus, avocados, beets, broccoli, brussels sprouts, cabbage, carrots, cauliflower, celery, chili peppers, collard greens, corn, cucumbers, eggplant, garlic, gingerroot, green beans, kale, leeks, lettuce, mushrooms, mustard greens, okra, olives, onions, parsley, parsnips, peppers, potatoes, radishes, rutabagas, scallions, shallots, spinach, sprouts, squashes, sweet potatoes, tomatoes, tomato paste, turnips, water chestnuts, watercress, yams, and zucchini. Veggie burgers are an option if you are not allergic to soy.

All whole grains. These include but not limited to barley, brown rice, corn flour, cornmeal, grits, millet, oat bran, oats, popcorn, quinoa, rice cakes, wheat germ, whole wheat, whole wheat pasta, and whole wheat tortillas.

All nuts and seeds. These include but are not limited to almonds, cashews, coconut, flax seeds, pecans, peanuts, pine nuts, poppy seeds, sesame seeds, and walnuts. Nut butters such as peanut butter and tahini (sesame seed paste) may be included.

All legumes. These can be canned or dried. Legumes include but are not limited to black beans, black-eyed peas, cannellini beans, chickpeas, dried beans, kidney beans, lentils, lima beans, navy beans, pinto beans, split peas, and white beans.

All quality oils. These include but are not limited to canola, coconut, grape seed, olive, peanut, and sesame.

Water. Distilled water, filtered water, spring water or other pure waters. spring water, distilled water or other pure waters.

Soy foods. These include tofu (all kinds), TVP (textured vegetable protein), and other soy products.

Condiments and cooking ingredients. Adobo sauce, cilantro, herbs, mustard (unsweetened), salt, seasonings, soyonnaise, spices, TVP, vanilla, and vegetable broth. You can use small amounts of fruit juices as ingredients in dishes (apple juice, lemon juice, lime juice, orange juice, pineapple juice)” (Gregory, 2010, p. 99-100).

Participants were given this list with the understanding that a few modifications had been made. Unsweetened soymilk and whole fruit smoothies were allowed as beverages during the SAU Daniel Fast. However, TVP, soyynnaise, artificial sweeteners, and fruit juices were excluded. In addition to these exclusions, the following foods were restricted during the Daniel Fast as are set forth in *The Daniel Fast* book. Gregory (2010) writes a list of the exclusions:

“Exclude **all meat and animal products** such as beef, lamb, pork, poultry, and fish. Exclude **all dairy products** such as milk, cheese, cream, butter, and eggs. Exclude **all sweeteners** such as sugar, raw sugar, honey, syrups, molasses, and cane juice. Exclude **all leavened bread** such as Ezekiel Bread (most of which contains yeast and honey), pretzels, pita bread, and other baked goods made with leavening agents. Exclude **all refined and processed food products** that contain such ingredients as artificial flavorings, food additives, chemicals, white rice, white flour, or artificial preservatives. Exclude **all deep-fried foods** such as potato chips, French fries, and corn chips. Exclude **all solid fats** such as shortening, margarine, lard, and foods high in fat. Exclude **all nonwater beverages** such as coffee, tea, herbal teas, carbonated beverages, energy drinks, and alcohol” (p. 101).

All foods were restricted in accordance with this list during this Daniel Fast. Participants were encouraged to read all food labels to ensure that foods did not contain restricted ingredients. Any questions regarding this food list were directed to the Daniel Fast leaders.

APPENDIX D: CASE STUDY

At the beginning of the fast, one subject was screened and found herself to be in a discouraging situation. Based on a trip to the University Health Center, she was having pre-diabetic symptoms, was addicted to caffeine, had no exercise routine, and was unsure of where to turn. Because of her situation, a custom plan was created for her. This plan caused her to be excluded from the metabolic research study results, but still provided an interesting case study.

Methods and Design

For the most part, the plan was for this subject to follow all of the same guidelines as other participants. The only difference would be a lengthened plan and an added exercise component. For the first two weeks of the fast, she was to follow the fasting guidelines as the other participants, with no differences. During these 2 weeks, she made no changes in her exercise routine. After these two weeks, she had another RMR test. Then, for the next week, she was to walk ½ mile each day, keeping her heart rate between 110 and 130 beats per minute at around a 6 on a Rate of Perceived Exertion (RPE) scale. Then, for the fourth week of the fast, she was instructed to increase her walking to .75 miles each day, while continuing all fast guidelines. She had her post-fast RMR test three days after the fast ended.

After the fast ended, she was given the choice to either continue fasting and exercising or to stop. Because she said she would like to continue, the guidelines were for her to walk 1 mile a day while remaining close to the fasting dietary intake with a few exceptions every now and then. This plan was to continue from the time the fast ended until the end of the school year and the beginning of finals week, ending in a final RMR test and a trip to the school health center to check for improvement.

In the case study, the subject was not expected to adhere as closely to the fast as subjects in the main research group. This plan was for her own benefit rather than for research purposes. But results were still observed and compliance was still encouraged. Each time she came for a periodic RMR test, she reported her perceived feelings as well. In addition to this, she kept a personal record of her progress in the form of a video blog which contained many of her thoughts on her spiritual journey as well. Both these meetings and the blog were used to assess her progress during the fast.

Results and Discussion

After two weeks of fasting, she had a meeting with her family where she observed an interesting change in her perspective when eating. Before seeing her family she was worried because she normally eats what they eat and the focus is on the food. But this time was different because her focus could not be on the food—she was able to remain true to the fast while also enjoying her family's company. Her family was her primary focus instead of the food.

A few days after this meeting with her family, she had her first RMR test which reported a shift to higher fat burn. She said she felt great physically, more emotionally stable, and felt smarter with clearer thinking, a less foggy mind, and more ability to think logically. She also said that she was needing less sleep in order to feel rested, was often more energetic, felt more

studious, and was experiencing clearer skin with less cystic acne. These benefits were experienced after two weeks of fasting and provided a sharp contrast to her initial experiences during the first week of the fast.

At the beginning of the fast she had experienced severe caffeine withdrawals including constant headaches, occasional tremors, and consistent fatigue. Three days passed before the tremors stopped and five days passed before her headaches subsided. After the withdrawal symptoms faded the first time, she experienced two days of second wave symptoms which subsided more quickly. After the first week, she had no more cravings for caffeine and felt more energized than she had when she was drinking it before the fast. She also reported sleeping better when she did sleep so that she did not feel the need for caffeine to help wake her up.

After the fast, she decided to go back to eating “normally” for about two weeks. She tried to be moderate with the change at first, but her pre-fast habits resurfaced quite quickly. However, she only had caffeine one time after the fast, and it caused her to feel very hyper and jittery. During this time “off” of the fast, she experienced lethargy, unstable moods and behavior, and a difficulty concentrating for during classes and study sessions. Due to these effects of ending the fast, she decided on her own to begin the fast again, with less extreme guidelines than given during the fast on campus. She had not been able to maintain the exercise component during the fast and planned to begin walking regularly at home during the summer.

Because the exercise component was not added in a consistent manner, changes observed can be attributed mainly to dietary manipulation. Based on the diet survey alone, this subject experienced an 86.21% change in diet. Before the fast, her dietary survey score was 29 and after the fast it was 4. Because her score lowered, she became closer and closer to what the Daniel Fast style of eating is. Before the fast, her food log indicated that she ate 2722 calories a day with very high levels of consumed cholesterol and sodium, and a low level of fiber intake (see **Table 7**).

Table 7

Case study comparison of pre-fasting diet with recommendations

	Pre-Fasting	Recommended
Calories (kcal)	2722	1800-2000
Cholesterol (mg)	489	<300
Sodium (mg)	3921	<2300
Carbohydrates (%)	49	45-65
Fat (%)	39	20-35
Protein (%)	13	10-35
Fiber (g)	26	25-40

Table 7. The case study subject was within the recommended guidelines for some dietary factors but not for others. She consumed above recommended calories, cholesterol, sodium, and fat intake.

According to the CNPP (2011), based on weight and level of activity this subject should have been consuming around 1800-2000 calories a day for energy balance. Her diet was relatively balanced with slightly more calories from fat than are recommended. During the fast, her food log was not recorded, but she reported very high compliance and had many people

holding her accountable as she continued. She had tortilla chips one time and a small amount of cheese, both not in amounts significant enough to affect results.

From the beginning of the fast until the end, this subject lost five pounds and her BMI decreased from 46.5 to 45.7. Her %BF decreased, and because she lost weight, her resting energy expenditure also decreased. Interestingly, after only two weeks of fasting, her RMR test showed increased fat burn with an RQ of 0.71, almost 100% fat oxidation. After two weeks completely off of the fast, during the time when she was eating like she had pre-fast, she did not regain significant weight or increase REE significantly. However RQ was measured at 0.81 after two weeks of no fasting. Compared to the pre-fast RQ of 0.82, her metabolism was burning the same percentage of different substrates as it had prior to fasting almost as if it had never been changed (see *Table 8*).

This prompts the question, “Why did she switch to high-fat burn first and then back to moderately high fat-burn?” Further research would be needed to analyze various subjects with multiple tests during the fast to examine the possibility of pre-testing meals affecting the results as well as the potential equilibrium the body approaches during an extended fast. For this subject, it could be that a two-week time period was her “peak” and then from there her body adjusted to the new dietary intake and approached equilibrium once again. But again, further research is needed to examine this possibility.

Table 8
Case study changes in variables

	Pre-Fast	2 Weeks	4 Weeks	2 Weeks Post-Fast
Weight (lbs.)	271	265	266	266
BMI	46.5	45.5	45.7	45.7
RQ	0.82	0.71	0.79	0.81
%BF	45.9	n/a	45.5	n/a
%Fat Burn	61	98	71	62
RHR	72	65	74	74
REE	2727	2342	2341	2101

Table 8. The case study subject had changes from pre-fast to 2 weeks, from 2 weeks of fasting to 4 weeks, and then after the fast had ended. The progression can be seen in these columns.

Case Study Conclusion

This subject is a good example of how the fast affected participants on an individual level. Her desire was to improve her health and to avoid developing further disposition for diabetes. During the weeks of fasting, a variety of her risk factors improved—she ate fewer calories, less cholesterol, less sodium, and stopped drinking caffeine. She experienced both measured and perceived benefits. Most importantly, she experienced a deeper walk with God during the fast and stated at the Agape Feast, “This fast has changed my life.” No follow-up study was done with this subject, but if one had been done, it could have revealed how likely the fasting principles were to be incorporated into her lifestyle after the fast.

APPENDIX E: PERSONAL REFLECTIONS

As a sophomore, I began to wonder what I would study during my Senior Research Project for the Southern Scholars program at Southern Adventist University. The variety of possible topics was overwhelming and the amount of work it would take was daunting. But although I was a little anxious, I just had a feeling it would all fall into place. Little did I know, the journey would be one of the hardest I experienced during my college years. Thankfully, what began with anxiety, uncertainty and ambiguity would develop into a project designed with God's help every step of the way—a ministry and a journey I never would have dreamed possible. My hope is that my experience will encourage all students, especially Southern Scholars, to finish strong and to rely on God, even with the journey is difficult and intimidating.

By the end of my junior year, I had developed a plan for my project on my own. However, during the fall semester of my senior year, this plan for my project was falling apart and I needed a back-up idea. I had set my heart on accomplishing my initial plan and had invested hours of time and effort to make it happen. Unfortunately, as this plan began to take longer than expected and began to lose momentum, I had absolutely nothing to fall back on. Time was of the essence—my goal was a May graduation! I actually began to doubt I would graduate as a Southern Scholar at all.

After three years in the Southern Scholars program, I considered giving it up due to my daunting predicament. But I was so close to finishing and my heart ached to finish strong. I had been trying so hard to do so. My first project plan had not been an unworthy investment of time and energy either. Working in the Human Performance Lab with a research team, we set out to coordinate a research study on the metabolic efficiency of obese women in the Collegedale area. The study involved testing their resting metabolism, body composition, and aerobic fitness levels after a whole foods diet intervention and a 6-week walking program. I was planning to focus mainly on the dietary intervention, while my colleagues and professors looked at the differences between different intensities of exercise. We were seeking to narrow down the plethora of possible causes of metabolic shifts between levels of fat and carbohydrate burn, a fascinating area of research. When it began to look like I may not have my data in time to graduate in May, I began to realize I needed to brainstorm other ideas. But with lack of ideas, I felt helpless and thus considered giving up all together.

Even though I considered giving up, I held on and kept trying because of a perspective deeply rooted in my heart. Before I would be ready to truly finish with a healthy mindset I would need to confront and process this mentality. You see, I had begun to place a lot of my worth in the Scholars program. I was feeling that without having Southern Scholars on my diploma, my degree would have no value at graduation. I felt worthless as an “ordinary” student and my thoughts sounded something like this...*I'm just a Health Science major...and I don't really know exactly what I'm going to do with my life. I chose this route and so it is my fault I'm where I am. Therefore, I HAVE to graduate as a Scholar to make my parents proud and feel like these four*

years were worth anything at all... I literally *could not* comprehend not being a Scholar. I was so very broken inside at the thought of letting it go.

Throughout this struggle, I was coming closer and closer to an experience with God that would change my life and alter this perspective. Up until this point, my status as a member of the Scholars program had been based my desperate need for affirmation. As I was faced with the idea of giving up the program, I realized that this achievement had become a very real idol in my life. My greatest fears were rooted in my membership, and with a project standing in my way of finding my worth, I was desperate to hold on and find *something* for my project. When a friend reminded me that my worth was based in much more than my Scholar status, I suddenly realized that if God asked me to let the program go, I would protest very strongly and would not be able to obey. Thankfully, God mercifully began to open my eyes to this distorted way of thinking and started to show me the ways He could shape me through this challenging time.

My first lesson came from 2 Chronicles 20. King Jehoshaphat's people came to him out of desperation when a great army was coming against them. They were terrified, kind of like I was in the face of hopelessness and desperation. Instead of being strong and calming them down, the king, too, was afraid. And so they all went before the Lord their God and Jehoshaphat said, "We do not know what to do, but our eyes *are on you*." (2 Chronicles 20:12, NIV). Then God told them not to be discouraged because the battle was not theirs but *His*. They would not have to fight the battle because *He would fight for* them and He would be with them, if only they would stand firm and trust Him.

My heart finally gave up fighting as I accepted that I was broken as could be. Like King Jehoshaphat in 2 Chronicles, I had no idea what to do. And so I decidedly told God that my eyes were on Him and this was now His battle to fight. I began to come to terms with the fact that living without Southern Scholar title was possible because my true value came from God, not any accomplishment of my own. I firmly decided that if I finished the program it would be because it was God's will, not mine. I knew that the *only* way I would have victory in this battle would be through His strength and providence alone.

Before the Lord even delivered Jehoshaphat, he and his people began to praise the Lord for what he could and would do. Like them, I praised God for the guidance he would give in the midst of my situation and strived to continue walking with my eyes on Him instead of on my circumstances. I chose to continue trusting that if it was His will, He would guide me to a project. I would no longer strive so that I could one day say, "I did this..." Instead, I chose to surrender so that I would be able to proclaim, "He has done this through me. I could never have done it without Him by my side."

My first thought for another project came to mind as I was reflecting on my course of study. *If only I could do something that combines religion and health*, I thought multiple times. I faintly remembered some students doing the "Daniel Diet" for religion classes, but I had not a clue how that would be possible to coordinate for a research study. Despite my uncertainty, I knew testing students who changed their diet in this way would bring interesting results. Those that know me would not have been surprised by my intrigue—I *love* nutrition!

When I mentioned this “Daniel Diet” to my Exercise Physiology professor, he said that Katie Schuen, the Wellness Director for Campus Ministries, had been working on starting “The Daniel Challenge” on campus. He suggested I ask her about it and I followed his advice. When I spoke with her, she said she had been hoping and praying for someone who would coordinate the research behind the scenes of the Daniel Challenge. I did not realize it at the time, but this first meeting with Katie would quickly grow into something greater than we could have imagined ourselves—something so much bigger than us—something that would surely fail without God.

Throughout this time of indecision, I had been talking with my best friend, Jason, as I was trying so desperately to decide between my initial project and this new possibility with Katie and Campus Ministries. For my Christmas gift, he felt impressed to send me a book by Susan Gregory (2010) entitled *The Daniel Fast*. I read it within the first week of Christmas break and decided that I would do this so-called Daniel Fast myself at the beginning of 2013 to start off my new year with dedication and purpose. I was so excited for my own journey! But I was even more excited that the format of this book would be an excellent way to implement the fast on our campus. Little did I know that God was gently leading me with this idea and that I would soon be coordinating 40 subjects and scheduling their metabolic testing!

I proposed that the Daniel Challenge team have a small portion of the Southern students do only the Daniel Fast for research purposes. To have a solid research foundation, we needed a group to do the Fast only to eliminate some of the variables in the Daniel Challenge plan. Katie met with Lilly Tryon, our faculty sponsor, and, instead of just agreeing to the fast along with the Challenge, they were both convicted not to do the Daniel Challenge at all. In fact, during their meeting, the man who was initiating the idea of the Challenge texted Katie telling her that he felt convicted not to do the Challenge this year. Katie and Mrs. Tryon then reviewed the Daniel Fast proposal and accepted it as the best option for our campus.

God was leading us all to be on the same page without even communicating, and we began to truly feel God leading us towards the Daniel Fast. First, I believe He led Jason to give me the book for Christmas. And then He led Katie, Mrs. Tryon, and I to the same convictions. I began to pray for all details to continue to fall into place if it was truly God’s will for me to adopt the Daniel Fast as my senior project. There were three proposals that needed to be approved in order for us to proceed with the plan. I decided that if all of these went through without trouble, I would know that this was the path I should take.

Katie and I proceeded to draw up a solid proposal for Campus Ministries that outlined a specific plan. This plan was approved quickly. I still had to have the Scholars Faculty Committee approve it as well as write an Institutional Review Board (IRB) proposal and wait for feedback. The possibilities got more exciting every day. The Scholars Faculty Committee approved my change in plans. The IRB proposal took only a few hours to write and was approved within a few days. I then knew without a doubt that God had been working in us and using us.

Sometimes, Katie and I were nervous and anxious about the endeavor. After all, this project was so much bigger than just two full-time students could coordinate! A lot of stressful planning was involved. However, although we knew that *we* could not do it, we knew that God

could. Trusting God to be by our side every step of the way, Katie and I proceeded to coordinate the 28-day Daniel Fast on campus, complete with food service labels for appropriate foods and an Agape Feast for all participants at the end. We watched as students learned about themselves, the goodness of natural foods, and the importance of growing in a relationship with God.

I realized the significance of God's work on the last day of the fast. Many powerful stories were shared during the Agape Feast. As I looked around the room, I could tell that hearts had been moved and lives had been changed. Without a doubt, the destination we had reached that night at the end of the fast made all of the planning, stress, and uncertainty worth the tiring journey. I could not believe that my senior project—once a source of such confusion and anxiety—had become a powerful testament to God's grace and power. My senior project had become more than just a project—it had become a ministry and a real journey with God for myself and many others. My project had become more than another requirement to graduate as a Scholar—it had become a symbol of a very important process taking place in my own life with God.

Throughout the planning, preparing, fasting and testing, Katie and I encouraged each other in faith saying, "This is *God's* project. We can't do this but He can." I *must* say that implementing the Daniel Fast was not my idea, but His, and He provided everything necessary to make it happen. The Daniel Fast t-shirts say, "I completed the Daniel Fast with God by my side" and the story of this project is no different. I completed the Daniel Fast senior project with God by my side and I owe every accomplishment to Him.

What began with me wondering *if* I could combine religion with health science in some way ended with God doing abundantly more than all I had asked or imagined (Ephesians 3:20, NIV). My project was a testament to the truth of the promise, "I can do all things through Christ who strengthens me" (Philippians 4:13, NIV) and the same is true for every Southern Scholar. We can do anything through Christ who gives us strength. Everything we do should be *for* God, whatever the discipline in which we study. My hope and prayer for every Scholar is this: that the words "Southern Scholar" would be more than a title, that we find our value not in our accomplishments but in Christ, and that whatever the focus of our ambitions may be, we strive to be excellent not for our own glory, but for the glory of Jesus Christ our Lord and our King.

I hope that you enjoy reading about how our Daniel Fast affects the mind, body, and spirit. As Scholars pursuing faith-based academic excellence, we can especially appreciate the potential impact on the mind. However, nutrition's impact on the body and spirit cannot be ignored. My hope is that all three dimensions will be seen as invaluable and equal in importance for living the abundant life God intends for us to live. The three dimensions go hand in hand, and the interdependencies are truly fascinating. Blessings as you read about this God-designed project, and how it relates to His amazing creation—us.

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