USES AND PERCEIVED CREDIBILITY OF SOCIAL NETWORKING SITES FOR WEIGHT MANAGEMENT IN COLLEGE STUDENTS

A thesis submitted to the Kent State University College of Education, Health, and Human Services in partial fulfillment of the requirements for the degree of Master of Science

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USES AND PERCEIVED CREDIBILITY OF SOCIAL NETWORKING SITES FOR WEIGHT MANAGEMENT IN COLLEGE STUDENTS (144 pp.)

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This study examined the use of social networking sites (SNS) as tools for weight management in college students (n=1138), as well as the perceived credibility of these sites as information sources. An anonymous, online, self-administered questionnaire was emailed to 10,000 random students, both undergraduate and graduate, to examine their SNS use for weight management information. They also were asked about their perceived credibility of SNS as an information source, the types of weight management-related search keywords used on SNS, their posting and browsing habits, and their perceptions about social support available on SNS. Descriptive statistics were used to analyze demographics and total SNS usage. Fisher’s exact tests were used to examine gender and age differences in SNS usage, and independent t-tests were used to examine gender differences between perceived credibility, search keywords, posting and browsing habits, and social support perceptions.

Two-thirds (n=739) of participants reported using SNS to access weight management information. Female college students were more likely to be Instagram and Pinterest users (p≤0.001), while male college students were more likely to be Twitter users (p≤0.01). There were no gender differences in Facebook usage. The most frequently searched keywords on SNS pertained to healthy recipes and exercise information. Forty-six percent of participants reported that weight management
information on SNS was trustworthy, and there were no gender differences in perceived credibility. There were no gender differences in posting and browsing habits and perceptions on social support.
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CHAPTER I

INTRODUCTION

More than one-third of adults and 17% of youth were classified as obese in 2011-2012 (Ogden, Carroll, Kit & Flegal, 2014). Although these numbers appear to have stabilized in recent years, researchers have predicted that by 2030, 51% of the adult population will be obese (Finkelstein et al., 2012). For a significant portion of the population, overweight and obesity stem directly from an excess consumption of calories and/or an inadequate amount of physical activity. However, this energy imbalance is also often combined with genetic factors, such as metabolism, and environmental factors such as socioeconomic status and family life (Office of the Surgeon General (US), 2001).

The American College Health Association has found that nearly 35% of college students were classified as overweight or obese in 2014 (American College Health Association, 2014). Many students experience the freedom to make their own lifestyle choices for the first time in college. This transition often results in changes in dietary intake, and is one of many factors responsible for weight gain and the development of unhealthy lifestyle habits in college students (Holm-Denoma et al., 2008; Vella-Zarb & Elgar, 2009). Furthermore, the lifestyle habits developed in college can last into adulthood (Hoffman et al., 2006; Morrow et al., 2006; Nelson et al., 2008). Overweight and obese adolescents are more likely to remain overweight and obese into adulthood, and are more likely to develop obesity-associated diseases, such as type 2 diabetes.
hypertension, and coronary artery disease, earlier on in life (Park, Falconer, Viner & Kinra, 2012).

Interestingly, the prevalence of obesity and obesity-related chronic conditions has actually led to a greater public awareness of the role that diet and nutrition play in health status (Losasso et al., 2012). Similarly, health consciousness has increased in the college student population as well, and many college students become interested in dieting to lose weight or prevent weight gain. In a 2008 survey, 42.1% of female college students and 24.1% of male students reported dieting to lose weight (Harring, Montgomery & Hardin, 2010).

Individuals interested in dieting can look to healthcare professionals, such as doctors or registered dietitians, for weight loss advice, but they can also access information on their own through books, television shows, the Internet, and advice from friends and family (Heaton & Levy, 1995). Social networking sites, such as Facebook, Twitter, Instagram and Pinterest, are becoming popular sources for health information, likely because of their increasing popularity in general. In fact, 86% of undergraduate college students are a member of at least one social networking site and 74% have reported accessing health information online (Escoffery et al., 2005; Smith et al., 2011).

Social networking sites, however, may not be the most accurate sources of information. Because they are extremely user-friendly and easily accessible, just about anyone can employ sites such as Facebook and Twitter as platforms to share information, and these sites do not often have the reputable authors and the frequent fact-checking that
is utilized in most traditional media forms. And although people do not necessarily believe that the Internet is the most credible source of information, that does not always stop them from utilizing it as such (Lubans, 1999). This paradox certainly applies to dieting – when looking for ‘quick-fixes’ to lose weight in a short amount of time or without a lot of effort, individuals may not always be on guard for inaccurate information, nor are they necessarily concerned if a diet or weight loss technique is considered unsafe or unreliable (Bellows & Moore, 2013).

In addition to their role in weight management information seeking, social networking sites have also become a prominent medium to facilitate a dialogue regarding the struggles and successes associated with diet and lifestyle changes. Online communities of friends and followers can aid in both encouragement and accountability, both of which are important catalysts for successful change (Leggatt-Cook & Chamberlain, 2012). For individuals interested in losing weight, social networking sites may be an excellent place to find a virtual support system (Hwang et al., 2010). On the other hand, the constant exposure to others’ experiences “may arouse feelings of anxiety and confusion and can lead to unrealistic expectations, false hopes, or even despair, fear, guilt, anger, and inadequacy if others seem to be managing better” (Ziebland & Wyke, 2012).

**Statement of the Problem**

College can be a time where young adults develop lifestyle habits that last into adulthood. This, combined with an increased awareness of the effects of obesity on
chronic disease development and other health issues later on in life, results in college students that are very interested in weight management, information on which is available from a multitude of sources. Because social networking sites are so popular among this demographic, students are likely to be including them as a source for weight management information. However, the roles and uses of social networking sites for weight management are ever-changing, making it difficult for research to keep up. There is not much current research involving the use of social networks for weight management, and of the research that does exist, much of it involves the use of sites and forums created for the explicit purpose of aiding in weight management, rather than examining the information that appears on the most popular sites, such as Facebook, Twitter and Instagram (Eysenbach et al., 2002; Hwang et al., 2013).

Additionally, many of the studies that look at weight management online or on social networks are intervention-based; that is, comparing results between a group that has access to some form of social network and a group that does not (Saperstein, Atkinson & Gold, 2007; Cavallo et al., 2012). These types of studies ignore the results that can come out of online weight management communities built without any outside assistance.

**Purpose Statement**

The purpose of this study is to examine: 1) the use of social networking sites as tools for weight management in college students and 2) their perceived credibility as an information source.
Hypotheses

1. There is a difference between gender and social networking site usage.
2. There is a difference between age and social networking site usage.
3. There is a difference between gender and weight management keywords searched on social networking sites.
4. There is a difference between gender and perceived credibility of social networking sites.
5. There is a difference between gender and browsing/posting habits on social networking sites.
6. There is a difference between gender and perceived level of social support on social networking sites.

Operational Definitions

*College students* – Individual between the ages of 18-26, attending Kent State University to obtain an undergraduate or graduate degree.

*Social networking sites (SNS)* – “Web based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others in the system” (boyd & Ellison, 2007). In this research, SNS will refer explicitly to four of the most popular social networks: Facebook, Twitter, Instagram, and Pinterest.
**Weight Management** – “Set of practices and behaviors that are necessary to keep one’s weight at a healthful level” (Frey, 2004). In this research, weight management can refer to weight loss, weight maintenance, or weight gain.

**Credibility** – Credibility can be based on a variety of factors, such as believability, accuracy, fairness, depth, trustworthiness, bias, completeness, and reliability (Johnson & Kaye, 2014). In this research, credibility of SNS will be examined mainly by participants’ perceptions of trustworthiness, of the social networking sites themselves and when compared to other sources of information.

**Browsing and Posting Habits** – The ways SNS members use a particular site; e.g., browsing existing content, scrolling through photos, posting status updates, sharing posts from others, etc.

**Social Support** – Coping assistance that aids in stressful situations. Stressors (in this case, weight management) are less impactful when other people help someone change the situation itself, alter the meaning it has, and/or change the individual’s affective response to the stressor (Zimet, Dahlem, Zimet & Farley, 1988)
CHAPTER II
LITERATURE REVIEW

Overweight and Obesity

The United States Centers for Disease Control and Prevention (CDC) classifies overweight and obesity in adults based on the body mass index (BMI). Overweight is defined as an adult with a BMI between 25 and 29.9, and obesity is defined as an adult with a BMI of 30 or higher. In addition the BMI, skinfold thickness and waist circumference can also be used to estimate body fat (Centers for Disease Control and Prevention, 2012).

Prevalence in the United States

According to the most recent data from the CDC, more than one-third of adults and 17% of youth (ages 2 to 19) in the United States were obese in 2011-2012. This data, gathered from the National Health and Nutrition Examination Survey (NHANES), was collected by using sex-specific CDC growth charts in children and adolescents and the BMI measurement in adults (Ogden, Carroll, Kit, & Flegal, 2014).

Obesity rates have been on the rise in the United States in recent decades. The CDC’s trend reports, generated from data from the Behavioral Risk Factor Surveillance System, found that in 1990, no state had a prevalence of obesity greater than or equal to 15%. Ten years later, in 2000, 23 states had an obesity prevalence of between 20 and 24%, but no state had a prevalence of greater than or equal to 25%. Further, in 2010, no state had a prevalence of obesity less than 20% and 36 states showed a prevalence of
greater than 25%, with 12 of these states having a prevalence of greater than or equal to 30% (Centers for Disease Control and Prevention, 2010).

As a whole, obesity prevalence rates have risen across the entire United States, but certain regions and individual states seem to have experienced slightly higher increases. States in the South have the highest prevalence of obesity (30.2%), followed by the Midwest (30.1%), the Northeast (26.5%), and the West (24.9%). Presently, there are two states, Mississippi and West Virginia, with a prevalence of obesity of greater than or equal to 35% (Centers for Disease Control and Prevention, 2014).

The prevalence of overweight and obesity also varies by racial/ethnic groups, with non-Hispanic black women having the highest level of extreme obesity (defined as a BMI of $\geq 40$) among all women surveyed by NHANES. In men, it was found that there were no significant differences in the prevalence of obesity across racial and ethnic categories (Hedley et al., 2004). Obesity also has a relationship with socioeconomic status. Among men, obesity prevalence is generally similar at all income levels. In men who live in households with income at or above 350% of the poverty level, 33% are considered obese, compared with 29% of men who live below 130% of the poverty level. Twenty-nine percent of women at or above 350% of the poverty level are obese, with a much higher prevalence of obesity (42%) in women below 130% of the poverty level. Similarly, women with lower levels of education have higher obesity rates, while there is no significant difference among men with varying education levels (Ogden, Lamb, Carroll, & Flegal, 2010).

Morbidity & Mortality
Obesity is a significant risk factor in chronic disease development and other serious health problems. Although definitions for chronic diseases are still evolving, they can be recognized by several distinct characteristics, including “uncertain etiology, multiple risk factors, a long latency period, a prolonged course of illness, noncontagious origin, functional impairment or disability, and incurability” (Remington et al., 2011).

The CDC listed the 10 leading causes of death in the United States in 2013 in the following order: heart disease (611,105 deaths), cancer (584,881 deaths), chronic lower respiratory diseases (149,205), accidents (unintentional injuries (130,557 deaths), stroke (cerebrovascular diseases) (128,978 deaths), Alzheimer’s disease (84,767 deaths), diabetes (75,578 deaths), influenza and pneumonia (56,979 deaths), nephritis, nephritic syndrome and nephrosis (47,112 deaths), and intentional self-harm (suicide) (41,149 deaths) (Centers for Disease Control and Prevention, 2015).

As evidenced by the statistic that seven of the 10 leading causes of death pertain to a chronic condition, it is apparent that chronic illness is extremely common in the United States. In fact, the CDC has reported that in 2012, approximately half (117 million) of U.S. adults have at least one chronic condition, such as type 2 diabetes, coronary heart disease, hypertension, cancer, hepatitis, kidney failure, and chronic obstructive pulmonary disorder. Of these 117 million adults, more than half (approximately 60 million) had multiple chronic conditions (Ward, Schiller & Goodman, 2014). Obesity should be considered a top public health concern, especially when linear time trend forecasts predict that by 2030, 51% of the population will be obese.
(Finkelstein et al., 2012). If the prevalence rates continue to grow, morbidity and mortality will as well.

As obesity prevalence continues to grow in children and adolescents, research has shifted to studying the long-term health effects as these obese youth enter adulthood. One of the most significant reviews of this topic found that “overweight and obesity in childhood and adolescences were associated with increased risk of both premature mortality and adult morbidity, particularly cardiometabolic morbidity” (Reilly & Kelly, 2011). These conclusions were drawn from a pool of articles that predominately used overweight classification as a variable, rather than obesity, showing that adverse effects can present even if a child or adolescent does not progress into the ‘obese’ ranges of body weight. In a review published several years after Reilly & Kelly’s, researchers attempted to establish a deeper relationship, hoping to evaluate whether childhood obesity is a risk factor for adult morbidity and mortality, independent of adult BMI. Independent associations were assessed in all articles chosen for the review, and it was found that childhood overweight is associated with type 2 diabetes, hypertension, coronary heart disease and mortality later in life, unadjusted for adult BMI (Park, Falconer, Viner & Kinra, 2012). These results are troubling, as they indicate the long-term effects that overweight and obesity have on children and adolescents. Most studies agree that in many cases, overweight or obesity is difficult to grow out of, and can lead to serious health problems in adulthood. The statistics are sobering, with one literature review noting that about a third (26-41%) of obese preschool children and about half (42-63%) of obese school-age children grew up to be obese adults (Serdula et al., 1993). As
important as it is to emphasis healthy lifestyles for adults, a focus on prevention and teaching healthy habits needs to begin early on in life to help control problems from developing during aging.

**Financial Burden**

Overweight and obesity place a significant strain on the healthcare system in the United States, for one reason or another. Some of the health problems stemming from obesity are a result of the excess adipose tissue itself, including aches and pains, dyspnea, and sleep disturbances. However, the majority of medical problems result from the metabolic and endocrine changes that may occur when an individual is obese, such as many of the chronic conditions discussed earlier – including type 2 diabetes, cardiovascular disease, and certain cancers (Lehnert, Sonntag, Konnopka, Reidel-Heller & König, 2013). All of these problems and conditions can require frequent hospital and doctor visits, expensive medications, and other costly means of treatment or management. These are considered ‘direct costs,’ and only account for half of what is used to calculate cost of illness (COI). In 2008, obesity accounted for nearly 10 percent of all medical spending, an estimated total of $147 billion (Finkelstein, Trogdon, Cohen & Dietz, 2009).

The other half of the COI calculation involves indirect costs, or lost productivity that results from employees that who are unable to work or perform typical job functions because of their illness. In one study examining direct costs of medical care in the United States, it was found that medical costs for overweight individuals were 9.9% greater than normal weight individuals, and 42.7% greater for obese individuals (Tsai, Williamson & Glick, 2011). Calculating indirect costs is difficult, as decreased workforce productivity
can depend on various factors such as the degree of excess-weight, company policies, and the sedentary nature of the job (Schmier, Jones & Halpern, 2006). In many calculations of indirect costs, four types of productivity losses are assessed: presenteeism, absenteeism, disability, and premature mortality. Presenteeism, which refers to the costs accrued by employees working in times of illness when they are unable to put forth their best work, has been shown to have a positive association with obesity. This association shows that even when moderately or extremely obese workers are able to work, they might be unable to perform at the speed or skill required to do the job (Janssens et al., 2012; Gates et al., 2008). Absenteeism, or time absent from work because of an illness, has a strong positive association with high BMI or obesity, likely due to both the lost productivity from employees not being present at work as well as the increased pay-outs for sick leave. In 2007 alone, the annual costs due to obesity-related absenteeism were estimated at $6.38 billion. When looking at disability, or short- or long-term absence from the labor market, it was found that overweight and obese individuals are at an increased risk for short- and long-term disability, and are more likely to receive disability payments (Trogdon, Finkelstein, Hylands, Delica & Kamal-Bahl, 2008). Finally, premature mortality is an obvious concern when dealing with the chronic, life-threatening conditions that can result from overweight or obesity. In 2007, lost productivity costs stemming from premature mortality was an estimated $30.15 billion in the United States.

The financial burden of overweight and obesity appears to snowball when the conditions begin in childhood or adolescence. While studies looking at the direct costs of illness for childhood and adolescent obesity are somewhat inconclusive, research has
noted that indirect costs are higher, likely because of time parents take off work to care for their obese children. And since obese children are more likely to become obese adults than children of a normal weight, these indirect costs will only continue into adulthood. Another concern when obesity begins early in life is the negative effect it may have on overall educational performance, which some studies have noted. If a child’s academic performance is stunted, they could cause greater productivity losses later on in life (Hammond & Levine, 2010).

Factors that Influence Obesity

**Genetics.** At its core, obesity is caused by the intake of more calories than are expended through physical activity. However, an individual’s genetic background is now thought to play a crucial role in whether a person will actually become obese or not. Researchers began to sense the importance of genetics when examining the relationship between obesity and the environment in which people live. For example, one of the earliest studies on the matter found that the BMI of adopted children was strongly related to that of their biological parents, even when it is someone else entirely who is providing the food. In fact, the study found that there was no relation whatsoever between the children’s weight and the weight of their adoptive parents (Stunkard et al., 1986). Thus, the environment in which one lives is not the only thing responsible for a person’s body weight. Rather, it seems that various genes are expressed based on certain environmental factors.

Further increasing the likelihood of a combined genetic and environmental influence on obesity are twin studies, where researchers have taken advantage of
monozygotic twins’ unique ability to control for genetics and early environmental exposures. In one review of discordant twin studies in Finland, it was found that the growth patterns of both twins were extremely similar until age 18, after which BMI began to vary between siblings. Upon moving out of the shared parental home, the sets of twins acknowledged that various lifestyle changes, such as becoming a student, sedentary work, and marital and societal relationships, appeared to lend themselves to weight gain when compared to their childhood lifestyle regularity. The authors surmised that “adult BMI is a highly heritable trait, but environmental influences have a major role in the eventual development of obesity and associated comorbidities” (Naukkarinen, Rissanen, Kaprio & Pietilainen, 2012).

The recent discovery of various hormones, such as leptin and ghrelin, has received a great deal of attention in recent years for their roles in appetite and metabolism. In obese individuals, leptin levels have been found to be appropriately high for the degree of adiposity; however, they do not appear to reduce appetite in the same manor that they would in an individual of a normal body weight (Considine et al., 1996). Thus, the current theory involves a form of resistance to leptin, similar to insulin resistance. Currently, one abnormal splicing mutation in the leptin receptor gene has been published, so there could be the potential for more research to come out on the link between genetics and various obesity-related hormones (Clement et al., 1998). Similarly, mutations involving sequences of ghrelin, an appetite-stimulating hormone, have been discovered, and could potentially play a larger role in the genetic component of obesity (Ukkola et al., 2001).
Because there are no known survival advantages of obesity, the question has been posed as to why the human genome even allows for the possibility. While obesity seems to be unfavored by natural selection, over the course of history there have been many periods of prolonged famine in which a survival advantage would be given to those humans with genes that “favor the economical use and storage of energy: so-called ‘thrifty’ genes” (Lazar, 2005). These thrifty genes are not exactly necessary for survival anymore, with modern society’s easy access to high calorie foods and propensity towards a sedentary lifestyle. The thrifty gene theory has also given way to a newer idea involving “drifty” genes. Speakman (2008) proposed that body fatness is regulated by a system that includes upper and lower intervention limits. Thus, “the lower intervention limit is set by the risk of starvation, and the upper intervention limit is set by the risk of predation.” Essentially genes have mutated and drifted, and today, because humans are no longer at risk for being hunted and because food is freely available, they have moved towards the drifted upper limits.

Lifestyle. Some research suggests that “as much as 50% of the variability in body weight is governed by genetic factors” (Rössner, 2002). This leaves 50% of variability to be attributed to lifestyle factors, including dietary intake and physical activity, which often play a large role in the overall health of an individual.

Dietary intake. The growing prevalence of overweight and obesity in the United States appears to have coincided with significant changes in food technology over the course of history. Many food scientists point to two notable revolutions in food technology that drastically impacted our food supply. The first, the Agricultural
Revolution in around 12,000 BCE, prompted the domestication of staple grains. This new grain-based diet yielded a large increase in available calories, along with widespread occurrences of protein- and micronutrient-deficiency diseases, “because grains tend to have a lower ratio of nutrients to calories than animal and other plant foods” (Ludwig, 2011). The second big change in food technology was the Industrial Revolution of the 19th century, which ushered refined flour and concentrated sugar products in as mainstays of the American diet.

Because of these advances in food production technologies, the American diet has shifted from one filled with healthy meats, fruits, and vegetables, to one that is grain-based and heavy in processed foods. Heavily processed foods are typically concentrated in calories, but deficient in fiber, micronutrients, and phytochemicals, the “plant substances that may mediate some of the protective effects of vegetables and fruits against diabetes, heart disease, and cancer” (Ludwig, 2011). And although precise mechanisms are not yet known, a diet rich in processed foods may actually promote obesity and chronic disease, possibly because of the high energy density of the foods, larger portion sizes, trans fats, high glycemic load, or overall lack of nutrients coming from current American diet staples. Several of these factors will be discussed in more detail below.

The typical American family is extremely busy, and as such, home-cooked meals are not as common as they once were. The reliance on restaurant food, whether from a fast food chain or a sit-down establishment, has increased dramatically over the years. In fact, it is becoming common for even meals eaten in the home to be take-out or delivery
(Jekanowski, 1999). In one study using food consumption surveys from the USDA, it was found that between 1977-1978 and 1994-1996, consumption of food prepared away from home increased from 18% to 32% of total calories. Additionally, this prepared food was higher in total fat and saturated fat, and lower in fiber, calcium and iron per calorie than food made at home (Guthrie, Lin & Frazao, 2002). More recent data found that food consumed outside of the home accounted for 47% of the average food budget in the 1990s, versus 34% of the budget in 1970 (Clauson, 1999).

Portion sizes in the United States have also grown considerably, when compared to what they were in previous decades. Researchers in one study compared portion sizes of various fast food items and processed foods from the grocery store to the USDA and FDA standard portions. It was found that the majority of portion sizes studied greatly exceeded what was recommended by the USDA and FDA. For example, the chocolate chip cookie studied was 700% greater than the recommended size, and cooked pasta exceeded the USFA standards by 480% (Young & Nestle, 2002). The longer portion sizes stay distorted like this, the more accustomed people get to them, and it no longer seems strange or abnormal to consume such a large amount of calories and other macronutrients in one sitting. Because of this, one of the first steps in any nutrition intervention should be proper education about portion and serving sizes.

Larger portion sizes are not the only thing contributing to excess energy consumption throughout the day, however. Rather than consuming just three large meals per day, individuals are snacking regularly in between meals, and this can lead to significant increases in energy intake in both children and adults. For example, snacking
contributed to 24% of the total energy consumed by 6 to 11 year olds in 1996, up from 18% in 1977. In adolescents between the ages of 12 to 18, snacking made up 25% of total energy in 1996, versus 21% in 1977 (Jahns, Siega-Riz, & Popkin, 2001). More recent data showed that the percentage of snacking calories further increased to 27% in all children in 2003-2005. In 2006, most snacking calories were coming from desserts, followed by salty snacks and sweetened beverages (Piernas & Popkin, 2010).

**Physical activity.** Physical activity is another factor that can play a key role in an individual’s risk for becoming overweight or obese. Worldwide, physical inactivity is the fourth leading risk factor for mortality (World Health Organization, 2010). It also contributes to the serious financial burden of chronic disease that was discussed earlier, with the annual direct cost of physical inactivity in the United States estimated at $76.6 billion in 2000 (Rosamond et al., 2008). In terms of weight loss, however, it is important to note that exercise alone may not be enough to yield significant results. A 2009 position statement from the American College of Sports Medicine cautioned that physical activity alone is of limited benefit in inducing weight loss. In order to lose one pound per week, for example, an individual would need to walk 35 miles per week, something that few have the time or motivation for. Rather, the same amount of weight loss could be achieved with an intake reduction of 500 calories per day (Wadden, Webb, Moran & Bailer, 2012).

However, despite not being as effective in reducing body mass by itself, physical activity should remain a crucial aspect of the recommendations given to prevent chronic disease development and degeneration. This is because research has shown that physical
activity reduces blood pressure and cholesterol levels, along with increasing insulin
sensitivity, which can reduce the risk for type 2 diabetes (Rehn, Winnett, Wisløff &
Rognmo, 2013). Additionally, in a recent twin study on sibling pairs with differing levels
of physical activity, the twins that were more inactive had greater amounts of high-risk
fat, including 50% higher visceral fat areas, 54% higher intramuscular fat areas, and
magnetic resonance imaging-assessed liver fat scores that were 170% higher (Leskinen et
al., 2009). While looking at individuals with chronic obstructive pulmonary disorder, it
was found that physical activity was the strongest predictor of all-cause mortality, even
when compared with known predictors, such as high-sensitivity C-reactive protein
(Waschki et al., 2011). It appears that physical activity can have an impact on a
significant number of disease-related biomarkers, as well as overall risk for chronic
illness. Furthermore, physical inactivity, regardless of BMI or body weight, appears to
independently impact morbidity and mortality. In one review, researchers found that “the
risk for all-cause and cardiovascular mortality was lower in individuals with high BMI
and good aerobic fitness, compared with those with normal BMI and poor fitness”
(Fogelholm, 2010). In a study of individuals with two or more chronic health conditions,
it was found that those who reported less than 30 minutes of physical activity per week
had an increased risk of mortality independent of other confounders, including age,
gender and smoking (Martinson, O’Connor & Pronk, 2001).

The proper mode, frequency, duration and intensity of physical activity in order to
achieve results is something that is regularly up for debate. However, it was not until
2008 that the very first federal guidelines for physical activity were released in the
Physical Activity Guidelines Advisory Committee Report. Recommendations from the United States Department of Health and Human Services were:

(1) Adults should avoid inactivity (i.e., some physical activity is better than none);
(2) substantial health benefits are obtained from accumulating, in bouts of $\geq 10$ minutes, 150 minutes per week of moderate-intensity or 75 minutes per week of vigorous-intensity aerobic activity, or an equivalent combination of both; (3) additional and more extensive health benefits are obtained by increasing aerobic physical activity to 300 minutes per week at moderate intensity or 150 minutes per week at vigorous intensity or an equivalent combination of both; and (4) muscle-strengthening activities of moderate to high intensity should be performed $\geq 2$ days per week (Strath et al., 2013).

However, in a 2011 study published in *The Lancet*, Wen et al. found that just 15 minutes of physical activity per day provided a reduction in all-cause and all-cancer mortality, as well as extended the lifespan an average of 3 years.

Though more research needs to be done to further solidify the recommendations for physical activity, it is important to keep in mind that the best health benefits come from diet and exercise modifications in combination. Regardless, physical activity is an important tool useful in the interest of chronic disease prevention.

**Chronic Conditions and Obesity**

**Heart disease.** Coronary heart disease (CHD), also referred to as coronary artery disease, is defined as the narrowing of the blood vessels that supply blood and oxygen to the heart (Chen, 2014). Until about a decade ago, the link between obesity and heart
disease was thought of as indirect; that is, “through covariates related to both obesity and coronary heart disease risk, including hypertension; dislipidemia, particularly reductions in HDL cholesterol; and impaired glucose tolerance or non-insulin-dependent diabetes mellitus” (Eckel, 1997). However, studies have since shown that the relationship is much more direct than what was once thought. Several large longitudinal studies have found that obesity both relates to and independently predicts coronary atherosclerosis, with other studies finding similar positive relationships between intra-abdominal visceral adipose tissue and markers of atherosclerosis, such as coronary artery calcium (Choi et al., 2010; Ohashi et al., 2009).

The likely catalyst of the formation of atherosclerosis in obese individuals is related to chronic low-grade inflammation and oxidative stress, both of which appear to play a role in the manifestation of many other chronic diseases, such as diabetes. There appears to be a strong correlation between proinflammatory biomarkers like C-reactive protein, interleukin 6, and tumor necrosis factor alpha, and atherosclerosis. It appears that these activated inflammatory cells infiltrate the arterial walls and promote oxidation, which then leads to plaque growth, erosion, and rupture (Hulsmans, De Keyzer & Holvoet, 2011). In most cases, this plaque formation is developed over a prolonged period of time, and as such, atherosclerosis is usually asymptomatic until it leads to a severe cardiovascular event, such as a heart attack or a stroke (Alie, Eldib, Fayad & Mani, 2014). By electing to make healthy lifestyle decisions, individuals can prevent the hardening of the arteries that can lead to other catastrophic health events.
**Type 2 diabetes mellitus.** Type 2 diabetes mellitus, formerly referred to as non-insulin-dependent diabetes or adult-onset diabetes, is the most common type of diabetes, affecting around 90-95% of individuals with diabetes (American Diabetes Association, 2014). Individuals with type 2 diabetes do not have the autoimmune destruction of the pancreatic islet β-cells that renders individuals with type 1 diabetes unable to produce insulin. Rather, these individuals have built up a form of resistance to insulin, resulting in their bodies being unable to deal with high levels of glucose in the blood.

Most individuals with type 2 diabetes are overweight or obese, which likely plays a key role in the disease manifestation. Some of the earliest studies examining the relationship between diabetes and obesity found that not only was excess body fat associated with an increased likelihood to develop the disease, but the regional distribution of that body fat was of significance. In a 1983 study, Hartz et al. found that in 15,532 women “upper body segment girth measurements (neck, bust, and waist) had strong positive associations with diabetes [while] the lower body segment girth measurement (hips) had an equally strong but inverse association with diabetes.” These relationships were later expounded upon, with research showing that each standard deviation increase in subcutaneous adipose tissue mass results in a decrease in the odds of insulin resistance by 48%. Furthermore, each standard deviation increase in visceral adipose tissue mass increases the odds of insulin resistance by 80% (McLaughlin, Lamendola, Liu & Abbasi, 2011). Further research has shown that even individuals who are not considered to be obese based on total body weight, yet still carry excess adipose
tissue in the abdominal and chest areas can experience insulin resistance (American Diabetes Association, 2014; Kahn, Hull & Utzschneider, 2006).

Though the exact mechanism linking obesity to insulin resistance and diabetes has not yet been identified, many theories stem from elevated levels of fatty acids that are present in obese individuals. According to one review, obese individuals release non-esterified fatty acids (NEFA) and glycerol, hormones and proinflammatory cytokines at higher rates than normal, which appear to have an effect on insulin sensitivity. Researchers seem to be predominately interested in the role of the non-esterified fatty acid release, as studies have shown that “insulin resistance develops within hours of an acute increase in plasma NEFA levels in humans” (Kahn, Hull & Utzschneider, 2006). Likewise, when NEFA levels are acutely decreased, insulin-mediated glucose uptake and glucose tolerance are both improved.

Another review suggests that the excess fatty acids from the visceral adipose tissue are draining into the liver portal vein. Insulin resistance results, either from “impaired insulin signaling through cell autonomous mechanisms, or through the induction of inflammation and the subsequent production of inflammatory cytokines by macrophages, which impair insulin action” (Hardy, Czech & Corvera, 2012).

Despite being unsure of the exact link between obesity and diabetes, it goes unquestioned that maintaining a healthy lifestyle, with adequate diet and regular exercise, is one of the best defenses in preventing the development of the disease. Further, individuals who are on the cusp of a diabetes diagnosis and are able to make significant
lifestyle changes can see reductions in the incidence of diabetes (Diabetes Prevention Program Research Group, 2009).

**Hypertension.** Weight gain has a unique relationship with blood pressure. In most cases, an increase in blood pressure is closely related to the magnitude of weight gain, with even moderate gains associated with an increased risk of hypertension (Davy & Hall, 2004).

Several theories have been proposed to explain why obese individuals are at an increased risk of hypertension. One such theory involves the sympathetic nervous system, which has shown to be overactive in obese humans, as well as in animal studies. Research has shown that a chronic hyperactive sympathetic nervous system can raise arterial pressure by causing peripheral vasoconstriction, as well as by increasing renal tubular sodium reabsorption (Vaz et al., 1997).

Leptin, an adipocyte-derived hormone that helps to regulate appetite and energy expenditure, is another piece of the obesity puzzle that researchers are working to understand better. Leptin could help further the link between the sympathetic nervous system to hypertension. Research in mice has shown that obesity “is associated with resistance to the feeding and weight-reducing actions of leptin, but preservation of the renal sympathoactivation to the hormone” (Rahmouni, Correia, Haynes & Mark, 2005). Thus, obesity could exacerbate hypertension by lessening leptin’s metabolic benefits and heighten the properties that promote arterial pressure.

Another well-developed theory involving obesity and hypertension involves the renin-angiotensin system (RAS) that regulates blood pressure and fluid balance. In
particular, several studies have noted correlations between plasma angiotensinogen, blood pressure, and BMI. In one study of mice, angiotensinogen was overexpressed in the adipose tissue, causing an increase in blood pressure (Sharma, 2004).

Like heart disease, hypertension can often go unnoticed in individuals until it leads to an adverse event. Thus, it is essential to keep blood pressure and weight under control in order to prevent any serious complications.

**Obesity in the College Student Population**

Nearly 35% of college students were overweight or obese in 2014 (American College Health Association, 2014). When students go straight from high school to a college or university, it is often the first time they are truly on their own, having to rely on themselves to plan meals, schedule exercise, gain adequate sleep, and more. Although popular culture often alludes to the “Freshman 15,” or the phenomenon of gaining 15 pounds during the first year of college, these claims may be exaggerated. Most studies examining the “Freshman 15” have established that the average weight gain over the course of freshman year is typically 4.6 to 7.4 pounds (Delinsky & Wilson, 2008; Graham & Jones, 2002; Mihalopoulous, Auinger & Klein, 2008). However, it is of note that even if the average weight gain is smaller than the popular phrase, weight gain in and of itself is not uncommon. Research has shown that a majority of freshmen, anywhere from 51% to 72% depending on the study, do gain weight during this time period (Smith-Jackson & Reel, 2012). In one study examining freshman weight gain between genders, it was found that 80% of all students surveyed reported gaining weight over the freshman academic year. Males gained an average of 8.0 pounds and females gained an average of
7.6 pounds, a difference that was not considered significant at p<0.05 (Economos, Hildebrandt & Hyatt, 2008). In one study examining body composition as measured by a bioelectrical impedance analysis, it was found that weight, BMI, percent body fat, fat mass, and waist significance were all significantly higher when measured at the end of sophomore year vs. the beginning of freshman year, with an increase of females being classified as overweight (Gropper et al., 2011).

The concern for this weight gain, although not as drastic as it is purported to be, is that over the course of the 4 years that a student traditionally spends in college, weight gain could continue, gaining between 9.6 and 27 pounds by graduation (Hoffman et al., 2006; Morrow et al., 2006). This amount of weight could cause a student to become obese based on the BMI classifications, and could place them at risk for many obesity-related disorders. It is of students’ best interests to keep weight gain to a minimum and establish healthy lifestyle habits during college years, as this period can be an important one for establishing long-term health behavior patterns (Nelson, Story, Larson, Neumark-Sztainer & Lytle, 2008).

Because the “Freshman 15” is so ingrained as an almost inevitable tenet of college life, many college students find themselves actively interested in losing weight or preventing weight gain. In a 2008 survey, 42.1% of female college students and 24.1% of male students reported dieting to lose weight (Harring, Montgomery & Hardin, 2010).

**Factors Contributing to Weight Gain**

Many studies attribute most of the weight gain during college years to changes in the food environment of students along with the freedom and independence to make their
own decisions about what to eat (Racette, Deusinger, Strube, Highstein, & Deusigner, 2005). In the research of Levitsky, Halbmaier & Mrdjenovic (2004) that examined freshman-year weight gain in students at Cornell University, it was found that the consumption of evening snacks and the consumption of high-fat food items accounted for the most significant percentage of variance in weight gain. Additionally, ‘all-you-care-to-eat’ dining halls and easier access to ‘junk’ foods played a role in weight gain.

Besides buffets, other dining options on campus typically include fast-food courts and snack stores, where it can be difficult to find healthy meals (Cluskey & Grobe, 2009). Yet, when students move off-campus and are able to begin grocery shopping and preparing their meals themselves, they experience other challenges. One focus group study of college students reported that many were “surprised at the high cost and time required to fix healthful meals” off campus (Cluskey & Grobe, 2009).

Because many of the restaurants on and off campus are not known to offer the healthiest selections, students often end up consuming more calories from saturated and trans fat than what is recommended. In one study of 764 college students, more than half reported eating fried or fast foods at least 3 times during the previous week (Racette et al., 2005), and the National College Health Behavior Risk Survey of 1995 found that 21.8% students consumed at least 3 high fat foods during the previous day (Centers for Disease Control and Prevention, 1997). Along with eating more unhealthy foods, students are likely not consuming adequate amounts of healthier foods, such as fruits and vegetables. One study found that 58% of college-aged participants ate vegetables less than once per day and 64% ate whole or canned fruit less than once per day (Silliman,
Rodas-Fortier & Neyman, 2004), which is far less than the 2 cups of fruit and 2.5 cups of vegetables recommended by the USDA (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Around half of the participants in the same study rated the healthiness of their eating habits as “poor” or “fair,” citing a lack of time, money and motivation, as well as the need for convenience, when making meal choices. In one study of 473 college students, it was found that 64% were working in addition to taking classes, and these added commitments often led to “an increased demand for easy-to-prepare meal solutions such as fast-food restaurant meals” (Schroeter, House & Lorence, 2007). Going along with the lack of free time many college students experience is the inability to make time to exercise, with one study reporting that 41% of students saying they exercise less frequently since attending college. The same study found that 38% of female students and 32% of male students reported exercising 0-2 times per week (Silliman et al., 2004).

Weight gain in college students cannot only be attributed to food, however. Alcohol consumption is common and popular in the college student population, with one study finding that 44% of students surveyed reported binge drinking, defined in the article as consuming five or more drinks in a row at least once in the past two weeks (Wechsler, Davenport, Dowdall, Moeykens & Castillo, 1994). Alcohol is the second most energy dense macronutrient, with 7 kcals per gram, so it could have a significant impact on overall calorie consumption. In fact, one study of college students found that the average male consumed an additional 1449 calories per week from alcohol and the average female consumed an additional 878 per week (Duffrin, Heidal, Malinauskas,
McLeod & Carraway-Stage, 2009). In one focus group study, many participants acknowledged that “alcohol played an important part in their social lives. Males and females spoke of calories in alcohol and in ‘drunk eating,’ a term used for eating fattening food in excess when intoxicated” (Greaney et al., 2009). As such, the calories from the alcohol itself combined with the potential for consuming fried and other unhealthy food items while drinking should be considered when examining risk factors for weight gain in the college student population.

Psychological factors also play a role in weight changes during college, with students experiencing such stressors as moving away from home, forming a new network of friends and acquaintances, and new academic challenges (Serlachius, Hamer & Wardle, 2007). One study examining various stressors in college freshmen found that 22.3% of females reported 5 or more causes of stress at the beginning of the study, compared to 11.6% of males. In female students, an increased academic workload was correlated with a weight gain of 2.9 pounds (Economos et al., 2008). This relationship between academic stress and weight gain has been studied before, with an earlier study noting that academic stress can lead to decreased exercise, poor nutrition, and even increased drug use among undergraduates (Weidner, Kohlmann, Dotzauer & Burns, 1996).

**Nutrition Education and Interventions**

The Academy of Nutrition and Dietetics, the world’s largest organization of food and nutrition professionals, recognizes that the prevalence of overweight and obesity is one of the most significant health concerns the United States faces today. In a 2009
position statement on weight management, the Academy noted that food and nutrition professionals, such as registered dietitians, can play a key role in promoting the skills necessary for successful weight management. Goals for weight management can include “prevention of weight gain in an individual who has been seeing a steady increase in his or her weight; varying degrees of improvements in physical and emotional health; small maintainable weight losses or more extensive weight losses through modified eating and exercise behaviors; and improvements in eating, exercise, and other behaviors” (Seagle, Strain, Makris & Reeves, 2009).

However, it is important to remember that in many cases, numbers on a scale should not be the primary focus of a weight management intervention. Behavior modification is crucial to produce results that are effective and can be maintained for life. Although BMI is the most common scale by which overweight and obesity is measured, it is often ineffective and unreasonable to make a goal out of reaching the normal weight range. Rather, goals should be small and attainable. In fact, even small weight reductions can have a large impact on overall health, with many researchers agreeing that even a weight loss of 10% is effective in reducing risks associated with excessive body weight (NHLBI Obesity Education Initiative Expert Panel, 1998).

**Components of Successful Interventions**

The very basis of weight loss, weight gain, and weight maintenance is energy balance. In order to maintain current body weight, energy intake must equal energy output. In order to lose body weight, energy intake must be less than energy output. And in weight gain, energy intake exceeds energy output. In order to lose a healthy amount of
weight per week, which most experts agree is 1-2 pounds, a reduction in energy of 500 to 1,000 kcal/day is needed. This reduction can come from strict calorie reduction, or from manipulations of macronutrients. Most studies recommend a combination of reduced-energy and low-fat diet to achieve weight loss, as fat is the most energy-dense macronutrient with 9 kcal/gram (Seagle et al., 2009). Other diets have appeared to be effective in the short-term, but end up causing plateaus or weight regain over time. For example, very-low-carbohydrate diets work by depleting glycogen stores and promoting the body to produce ketones to fuel the brain. In recent trials, very-low-carbohydrate diets yielded greater weight loss in 6 months when compared to the energy-restricted, low-fat diets but the losses evened out over the course of 12 months (Gardner et al., 2007; Nordmann et al., 2006). Weight loss trends and popular diets will be discussed at length in the next section.

As mentioned earlier, physical activity may not be enough to prompt weight loss by itself. However, it plays a crucial role in preventing weight regain. Likely, this is because high levels of physical activity allow for a post-reduced individual to sustain a lowered-energy balance level without overly restricting food intake (Hill, Wyatt, Reed & Peters, 2003). The 2005 Dietary Guidelines for Americans recommends the following for exercise:

“30 minutes of moderate-intensity physical activity on most days of the week to reduce the risk of chronic disease; 60 minutes of moderate- to vigorous-intensity activity on most days of the week to manage body weight and prevent weight
gain; and 60-90 minutes of daily moderate-intensity to prevent weight regain after weight loss” (Seagle et al., 2009).

In a recent review of interventions that utilized either diet or exercise alone or combined behavioral weight management programs, combined programs produced greater weight loss results after 12 months when compared to diet alone, despite showing no significant difference at 3 and 6 months (Hartmann-Boyce, Johns, Jebb & Aveyard, 2014). Because of the apparent need to utilize a multifaceted approach to lose and maintain weight, actual behavior changes are important in creating habits. Cognitive behavioral therapy is essentially an umbrella term for any behavioral modification that can help teach individuals about the mechanisms and rationales behind weight loss techniques, rather than just what the techniques are. Cognitive behavioral therapy “has several distinguishing characteristics: it is goal-directed (measurable outcomes), process-oriented (helps people decide how to change), and advocates small rather than large changes.”

Cognitive behavioral therapy can include many techniques, including self-monitoring, stress management, stimulus control, problem solving, contingency management, cognitive restructuring, and social support (Seagle et al., 2009).

**Dieting**

The weight loss industry was estimated to be worth $60.5 billion in 2013, with countless products and services available to individuals with a desire to lose or maintain their weight (LaRosa, 2014). The fact that dieters are so willing to spend so much money to aid in their weight loss goals has prompted the development and promotion of countless diets of varying legitimacy and efficacy. In the 1980s and 1990s, the trendy
diets were the ones that eliminated or restricted a certain macronutrient, such as carbohydrates or fat. Today, nutrition experts preach that there really is no need to eliminate or restrict any food item. Rather, it is best to consume everything in moderation and to place the emphasis on whole grains, low-fat dairy products, and plenty of fruits and vegetables (Freeland-Graves & Nitzke, 2013). To examine the way the weight loss industry has evolved over the past several decades, the next section will detail popular diets from the past and present.

**Very-Low-Calorie Diets**

The definition of a very-low-calorie diet (VLCD) is debatable, although many researchers agree that VLCDs typically provide <800 kcal/day in order to promote rapid weight loss. However, 800 calories per day means something very different depending on an individual’s age, weight, height, and other factors. Thus, another way to define VLCDs is any diet that provides <50% of an individual’s predicted resting energy expenditure (REE) (Atkinson, 1989). Though VLCDs have appeared in published work since the 1930s, they hit peak popularity in the United States in the 1980s, especially after Oprah Winfrey announced losing 67 pounds from a liquid diet in 1988. Despite Winfrey rebuking the success of such diets after regaining all of her lost weight in 1990, VLCDs are still relatively common in the United States: more than 200,000 Americans used them as weight loss tools in 2004 (Tsai & Wadden, 2006).

Today, most VLCDs are used as parts of medically supervised intervention programs, where participants are monitored closely by health professionals for around 12 weeks during the most intense part of the program. Individuals then take another 12 to
14 weeks to focus on lifestyle modification, where conventional foods are reintroduced and weight is stabilized. When used in these carefully controlled settings, and in individuals with BMIs of \( \geq 30 \), VLCDs are considered safe and effective (Tsai & Wadden, 2006). However, they are not without their side effects and symptoms, some more drastic than others. For example, many early studies of the safety of VLCDs noticed a large percentage of participants with cholelithiasis, although today this is less common of a risk as current iterations typically include a moderate amount of fat in the diet and try to limit the rate of weight loss to 1.5 kilograms/week (Weinsier, Wilson & Lee, 1995). Similarly, although there have been 60 reported deaths from the use of a VLDC in the United States, none have been reported since the 1980s when the diets were modified to include higher-quality proteins such as milk, egg and soy, rather than low-quality hydrolyzed collagen.

In a recent review comparing VLCDs to low-calorie diets (LCDs) (classified by the authors as providing 800 to 1800 kcal/day), it was found that following a VLCD resulted in a significantly greater short-term weight loss. However, at follow-up assessments ranging from 1 to 5 years, VLCDs and LCDs yielded comparable changes in weight. The authors attributed this to the greater weight regain among participants on VLCDs (Tsai & Wadden, 2006). In this review, no adverse events were noted. VLCDs can be a safe and effective way to lose weight in a short period of time, if done under the proper medical supervision. However, they need to be coupled with an intervention that promotes lifestyle changes to avoid the weight regain that is so common with these diets.

**Low Carbohydrate Diets**
The first iteration of a low carbohydrate diet (LC) was in the 1860s, when William Banting described losing nearly 50 pounds in a year without ever feeling hungry. But LCs were not a significant feature of the dieting industry until Dr. Robert Atkins published the most notable manuals on low-carbohydrate eating, *Dr. Atkins’ Diet Revolution* in 1972, followed by *Dr. Atkins’ New Diet Revolution* in 1999 (Astrup, Meinert Larsen & Harper, 2004). Most LCs restrict the consumption of carbohydrates to between 20 and 60 grams per day, or typically less than 20% of daily caloric intake. Protein and fat consumption are then increased to make up for the calories that would ordinarily come from carbohydrate (Last & Wilson, 2006).

There are several purported mechanisms behind LCs, most having to do with the way the body metabolizes carbohydrates. The Atkins diet in particular attributes weight loss to an increased energy expenditure associated with a high-fat high-protein diet, but there is no evidence to suggest that this is accurate (Astrup et al., 2004). Another mechanism points to the high glycemic load of refined sugars and starches that would be restricted in LCs. The high glycemic load “increases the difficulty of weight control because the high intake of refined starches and sugars causes rapid swings in blood insulin and glucose levels; these, in turn stimulate hunger between meals and lead to more snacking” (Willett, 2004). Additionally, when individuals do not consume enough dietary carbohydrates, the body is forced to deplete its glycogen stores, prompting the body to use protein and fat as energy sources. Researchers note that the loss of glycogen stores and associated bound water might lead to a weight loss that is primarily from fluid rather than fat (Astrup et al., 2004). If glycogen stores are depleted for a long period of
time and the body goes into ketotic acidosis, circulating ketones might have an appetite-suppressing effect, as in the anorexia of starvation.

Most studies that use LCs as a weight loss tool note that although the diets are successful in promoting weight loss, it appears to be attributed more to the caloric reduction that tends to occur when carbohydrates are limited, rather than as a result of the act of restricting carbohydrates (Astrup et al., 2004; Bravata et al., 2003; Last & Wilson, 2006). In one review, studies that included a calorie restriction in combination with a longer duration prompted greater weight loss than those that were short-term (Bravata et al., 2003). Critics of LCs raise concerns about the significant increase in consumption of fat, saturated fat in particular, in these types of diets but this increase does not seem to have much of a short-term effect on lipid levels. The low fiber content of LCs has been shown to cause constipation, and could potentially increase risk for cancer and diverticular disease later on. Like the lipid levels though, these risks have yet to been studied long-term. Low carbohydrate diets remain popular today, and research shows that they can be an effective tool for weight loss if overall energy intake is reduced. However, the long-term health effects of carbohydrate restriction are still being studied, so it is important to remember that LCs may not work for everyone and, like VLCDs, they should be done with monitoring and support of healthcare professionals.

**Low Fat Diets**

Low fat diets have been controversial in their efficacy, with some researchers going so far as to say that “diets high in fat do not appear to be the primary cause of the prevalence of excess body fat in our society, and reductions in [dietary] fat will not be the
solution” (Willett, 1998). However, many studies have shown that they are, in fact, able to be used to reduce body weight, especially when combined with restrictions in energy. In one such study, fat was restricted to 15% of total energy in a 6.0 MJ (~1433 kcal) diet. Participants had a reported average weight loss of 7.9 kilograms in 12 weeks, as well as reductions in total cholesterol, triglycerides and C-reactive protein (Heilbronn, Noakes & Clifton, 2001). However, a randomized trial of low-carbohydrate diets vs. low-fat diets saw that low-carbohydrate diets produced greater decreases in weight and greater improvements in body composition, HDL cholesterol levels, triglyceride levels, and CRP levels, showing that while low-fat diets may yield these improvements, low-carbohydrate diets may produce more dramatic results (Bazzano et al., 2014).

Furthermore, it does not appear that a low-fat diet is one that can continue to produce results over a long period of time. One review of ad libitum low-fat diet studies showed an average of 3.2 kilograms more weight loss in the intervention groups over the control groups in trials ranging from 2 to 12 months. However, that weight loss tended to plateau after 3-6 months (Astrup, Grunwald, Melanson, Saris & Hill, 2000).

When the low-fat diet craze was hitting its peak in the mid 1990s, the food industry responded by creating a host of low-fat food items for consumers, many of which are still available for purchase today. In many of these products, the animal fat was removed, but hydrogenated vegetable oils or sugar were added in order to maintain the palatable taste and texture that customers were used to (Torrens, 2013). Interestingly, in one study, individuals who consumed low-fat products regularly also consumed more total energy during the day than those who did not eat low-fat products. Further, a higher
consumption of low-fat foods was associated with increases in total protein, carbohydrate and sugar consumption throughout the day as well (Mullie, Godderis & Clarys, 2012). As such, it is possible that low-fat foods may not be as beneficial for weight reduction as they once were believed to be.

Mediterranean & DASH Diets

To combat Americans’ reliance on fast foods and processed foods, the 2010 Dietary Guidelines for Americans included a special focus on how to build healthy eating patterns with information on two specific eating patterns, Dietary Approaches to Stop Hypertension (DASH) and the Mediterranean diet (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). These eating patterns do not recommend restricting anything outright and encourage eating a variety of healthy and filling foods.

The DASH diet places an emphasis on fruits and vegetables, low-fat milk and milk products, whole grains, poultry, seafood and nuts. It recommends reducing consumption of high sodium foods, red and processed meats, sweets, and sugar-sweetened beverages. A more current reiteration of the DASH diet recommends less stringent restrictions on fat, allowing for unsaturated fatty acids, such as olive oil. The Mediterranean diet is named for eating patterns based on many countries that border the Mediterranean Sea, so there is no precise definition for the diet. However, most Mediterranean-style diets encourage fruits and vegetables, nuts, olive oil, and whole grains. Small amounts of meats and full-fat milk and milk products are included, and
wine is often consumed with meals in moderation (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010).

According to one systematic review and meta-analysis of the Mediterranean diet, which looked at adherence to the diet and adverse clinical outcomes, the Mediterranean diet was associated with a significant reduction of overall mortality, cardiovascular incidence or mortality, cancer incidence or mortality, and neurodegenerative diseases (Sofi, Abbate, Genisini & Casini, 2010). In a review comparing outcomes from a Mediterranean diet intervention to a low-fat diet intervention, it was found that the Mediterranean diet led to greater improvements in body weight, blood pressure, fasting blood glucose, and cholesterol, among other biomarkers of health (Nordmann et al., 2011). The DASH diet is strongly recommended to reduce blood pressure, but according to a recent systematic review and meta-analysis, it appears that the diet can also result in a 13% reduction in the 10-year Framingham risk score for cardiovascular disease (Siervo et al., 2015).

**Paleolithic Diets**

The Paleolithic diet, which can also be referred to as the caveman diet or the hunter-gatherer diet, or the Paleo diet for short, is a relatively new popular diet. Proponents of the diet recommend eating the way the humans did 2.5 million years ago, subsiding on “wild-animal source and uncultivated-plant source foods, such as lean meat, fish, vegetables, fruits, roots, eggs, and nuts” (Klonoff, 2009). The Paleo diet also excludes grains, legumes, dairy products, salt, refined sugar, and processed oils.
Because the Paleo diet is so new, research is just beginning to come out about its benefits or lack thereof. A 2007 study by Lindeberg and colleagues compared the Paleo diet vs. a Mediterranean-like diet with whole grains, low-fat dairy, fruits, fish, oils and margarines in patients with ischemic heart disease and either glucose intolerance or type 2 diabetes. After 12 weeks, both sets of patients had lost similar amounts of weight, but the Paleo group had a more reduced waist circumference and more improved glucose tolerance. A similar 2009 study by Jönsson et al. examined the Paleo diet vs. a diabetic diet that consisted of “evenly distributed meals with increased intake of vegetables, root vegetables, dietary fiber, whole-grain bread and other whole-grain cereal products, fruits and berries, and decreased intake of total fat with more unsaturated fat.” After over two years of the trial, it was found that the subjects on the Paleo diet revealed lower average HbA1c scores, triglycerides, diastolic blood pressure, weight, and waist circumference. In this study, subjects on the Paleo diet consumed less total energy even though no recommendations to restrict intake were given, possibly because the Paleo diet is satiating enough that individuals are able to consume less food (Jönsson et al., 2009).

Interestingly, a recent study found results that were less positive. In healthy men and women who were told to eat an ad libitum Paleo diet for 10 weeks, participants lost weight but saw significant increases in non-HDL cholesterol, LDL cholesterol, total cholesterol to HDL ratio, and total cholesterol (Smith, Trexler, Sommer, Starkoff & Devor, 2014). As more research involving the Paleo diet comes out, it will be interesting to see if the positive effects of the diet can be managed without any negative side effects such as increased lipid levels.
**Gluten-Free Diets**

The gluten-free diet is another diet that is only continuing to grow in popularity, with the gluten-free product market estimated to have reached $8.8 billion in sales in 2014, an increase of 63% since 2012 (Mintel Group, 2014). This growth is especially extraordinary given that only around 1% of individuals worldwide are reported to have Celiac disease, the disease in which the only cure is a complete dietary elimination of gluten (Catassi & Fasano, 2008). Despite the fact that a gluten-free diet is truly necessary for only a small percentage of the population and should really only be followed if prescribed by a healthcare professional, many are interested in following one because they perceive it to be effective for weight loss (Gaesser & Angadi, 2012). As of right now, there is no established link between a gluten-free diet and weight loss in individuals without Celiac disease or gluten sensitivity. Furthermore, in individuals with the disease, many often end up gaining weight after following a gluten-free diet, especially if they were overweight before starting the diet (Cheng, Brar, Lee & Green, 2010; Dickey & Kearny, 2006). In individuals with Celiac disease, this weight gain has been attributed to an increased ability to absorb nutrients following the healing of the intestinal lining that occurs while following the proper diet. Because the use of gluten-free diets for weight loss in individuals without Celiac disease is so new, it has yet to be determined if weight gain would also occur (Gaesser & Angadi, 2012). What is known is that many gluten-free products actually have more calories or fat than their gluten-containing counterparts (Marcason, 2011). Additionally, depending on how an individual interprets their gluten-
free diet, they could end up consuming a diet low in carbohydrate, iron, folate, niacin, zinc and fiber (American Dietetic Association, 2009).

Right now, experts do not recommend a gluten-free diet for individuals without Celiac disease wishing to lose weight, although more research needs to be done on the potential for such a diet to promote a decrease in body weight without the possibility for nutrient deficiencies. Additionally, more research needs to be done to examine whether there is any harm in eliminating gluten from the diet in cases where it is not medically indicated to do so. For example, current research believes that “by creating a healthy composition of colon bacteria, whole-grain wheat products may protect the gut from some cancers, inflammatory conditions, and cardiovascular disease.” Further, gliadin, one of the primary proteins in gluten, may strengthen the immune system and aid in blood pressure control (Gaesser & Angadi, 2012). In the next few years, research should help establish the safety and efficacy of a gluten-free diet for weight management.

**High Protein Diets**

Protein is often thought of as one of the key components for successful weight loss because “amino acids act on the metabolic targets involved in satiety, energy, expenditure, and the sparing of fat-free mass” (Westerterp-Plantenga, Lemmens & Westerterp, 2011). Essentially, high protein diets are filling enough that people are able to consume less total energy in order to effectively manage their weight.

However, the average American diet is already very high in protein, with the 2005-2006 NHANES reporting that the average man was eating 101.9 grams per day, and the average woman consuming 70.1 grams per day (U.S. Department of Agriculture,
Agricultural Research Service, 2008). This is higher than what is recommended by the CDC: Recommended Dietary Allowances for individuals aged 19-70+ is 46 grams for women and 56 grams for men (Centers for Disease Control and Prevention, 2012). This works out to be around 0.8 grams of protein per kilogram of body weight per day.

Even athletes, whose protein needs are usually thought to be higher than the general population’s, appear to be consuming more protein than what is really necessary or effective. The International Society of Sports Nutrition recommends that exercising individuals should consume between 1.4 and 2.0 grams/kilogram body weight/day, depending on various factors, such as mode and intensity of exercise and quality of protein (Campbell et al., 2007). However, in one survey of male collegiate athletes, more than 1 out of 5 athletes believed that their protein needs were greater than 4 grams/kilogram body weight/day, although food records found that the athletes were not actually consuming as much as what was perceived to be needed. This same study found that the athletes’ measured carbohydrate intake was significantly less than the lowest recommended level. Combining low-carbohydrate intake with high protein and fat in athletes increases the risk for “glycogen depletion and performance impairment during training/competition, especially with repeated bouts of intense endurance exercise over a relatively short time period” (Fox, McDaniel, Breitbach, & Weiss, 2011). Not only can excessive protein consumption by athletes result in inadequate consumption of other macronutrients, but it also might not be truly necessary for performance. One study found no difference in muscle protein synthesis rates in athletes who consumed 2.8 grams
protein/kilogram body weight/day and athletes who only consumed 1.8 grams/kilogram body weight/day (Tarnopolsky et al., 1992).

Even in non-athletes, consuming an excess of protein at the expense of carbohydrate can have a negative impact on overall health. Eating too much protein from animal sources can increase the risk of coronary heart disease, diabetes, strokes, and several cancers. Further, it can increase the risk of kidney and liver disorders in individuals whose bodies are not effectively able to deal with the excess amounts of protein in their systems (American Heart Association, 2014).

Protein supplements are more popular than ever among both athletes and non-athletes, with the nutritional supplement industry earning $32 billion in 2012 and projected to double that by 2021 (Lariviere, 2013). This boom in popularity and sales is most often attributed to the belief that supplements yield results and benefits above and beyond what normal food can provide (Reinert, Rohrmann, Becker, & Linseisen, 2007). In actuality, supplement usage is often unnecessary and can be harmful. The FDA regulates dietary supplements, but not with the same set of standards as conventional food (Maughan, 2013). As such, supplements can be plagued with quality assurance and contamination issues. A recent review of commercially available protein supplements found that 31% of the products tested failed quality assurance tests. One product contained significantly less protein than what the label claimed, and two other products were found to be contaminated with lead (ConsumerLab.com, 2013).

Just as too much protein from food can cause serious strain on the kidneys and liver, protein supplements could reasonably be expected to cause similar problems if an
excessive amount is consumed. However, a recent study of creatine supplementation in addition to a high-protein diet found no differences in kidney function compared to the control group (Lugaresi et al., 2013). Obtaining protein from food sources is always best because of the added vitamins and minerals that go along with it, but in the case of this study, it seems that a reasonable level of supplementation will not cause any serious damage on bodily organs.

**Outlets for Nutrition Information**

There are countless sources available for people to access if they are interested in nutrition information, although they have varying degrees of legitimacy. The next several sections will examine the many sources of nutrition information, as well as what current research says about their reputations for providing unbiased and accurate information to the public.

**Healthcare Professionals**

Registered dietitians (RDs) are the food and nutrition experts that have completed a bachelor’s degree with coursework in food and nutrition sciences, biochemistry, physiology, microbiology and more. Around half of the RDs in the United States hold advanced degrees, as well (Seagle et al., 2009). Thus, they are some of the best-equipped healthcare professionals that are able to help patients and clients disseminate the volumes of nutrition information available and provide the best tips for weight loss or weight maintenance. However, in many cases patients only end up talking with physicians and registered nurses, who although are extremely knowledgeable and competent in their
areas of practice, may not have the nutrition knowledge base necessary to deliver appropriate answers to patients’ questions.

In a 2008 study surveying resident physicians, 77% felt that nutrition assessment should play a role in routine primary care visits. Further, 94% of participants felt that they had an obligation to discuss nutrition with patients. However, only 14% felt that they were adequately trained to provide nutrition counseling (Vetter, Herring, Sood, Shah & Kalet, 2008). These results may seem surprising but they are not unexpected, especially when looking at studies examining the depth of nutrition information that is taught in U.S. medical schools. In 1985, the National Academy of Sciences National Research Council Committee on Nutrition in Medical Education published a report stating that 25 hours of nutrition education during medical school was adequate in providing medical students the background needed to give general nutrition advice and answer general nutrition-related questions. In a recent survey of medical schools across the United States, it was found that only 27% of schools surveyed provided the 25 hours recommended by the National Academy of Sciences, with nearly 30% stating they required just 12 or fewer hours. Most schools offered nutrition education in the first two years of the program, with very little reiteration (just an average of 4.2 additional hours) in the third and fourth years, causing concerns over how well nutrition knowledge is retained after graduation (Adams, Kohlmeier & Zeisel, 2010). Despite these studies that place some doubt on physicians’ ability to effectively educate patients on nutrition-related topics, 61% of the public considers doctors to be a “very credible” source of nutrition information (American Dietetic Association, 2008).
Registered nurses have the potential to have a great impact on patients’ nutritional status because they are often the first healthcare professionals to recognize problems with feeding and other nutrition-related complications (Kayser-Jones, 1997). As such, it is important that nurses have a basic nutrition knowledge foundation in order to address such problems before they lead to something worse. Unfortunately, this is not always the case. In a study of 106 nurses in Israel, it was found that the participants answered an average of 51.9% questions correct on the nutrition knowledge questionnaire that was given. In a series of Likert-scale questions, the nurses surveyed responded that they strongly disagreed with the statement “Nurses possess a great deal of nutrition knowledge,” yet they also disagreed that “nutrition counseling is not the responsibility of the nurse” (Boaz et al., 2013). These statements reveal that nurses recognize the role that they play in the nutrition care of patients, yet they know they do not possess adequate nutrition knowledge. Fortunately, the nurses were willing to consult other disciplines when necessary – 58% reported consulting a dietitian for patients that they did not think were receiving appropriate nutrition care.

Outside of hospitals and doctors’ offices, other professionals are often considered potential sources for nutrition information by the general public. Athletic trainers and athletic coaches deal with a multitude of people interested in health and wellness, so nutrition topics are often discussed. In fact, in one survey, collegiate athletes responded that they indeed felt comfortable seeking nutritional advice from strength and conditioning specialists and athletic trainers (Torres-McGehee et al., 2012). Unfortunately, these individuals might not have the background and training necessary to
provide informed nutrition advice. The same study tested the sports nutrition knowledge through the use of a questionnaire sent out to a sample of athletic trainers, strength and conditioning specialists, and coaches. It was found that 71.4% of athletic trainers and 83.1% of strength and conditioning specialists displayed adequate nutrition knowledge, while just 35.9% of coaches displayed this level of nutrition knowledge. Based on these results, it appears that athletic trainers and strength conditioning specialists have enough of a nutrition background to be able to successfully disseminate information to interested parties, but coaches might need to point their athletes in the right direction for credible information, rather than trying to give advice themselves.

Individuals not playing a sport at the professional or collegiate level might instead have a gym membership in order to exercise. In many cases, the personal trainers found at most national chain gyms are not licensed to partake in nutrition counseling, though they often do. One study examined the nutrition knowledge of personal trainers in Florida using a sports nutrition knowledge questionnaire, and though most of the trainers reported that they felt “somewhat prepared” to offer nutrition counseling, the average nutrition knowledge score was a 59.7% (Weissman, Magnus, Niyonsenga & Sattlethight, 2013). These results are troubling, and individuals should be wary when trusting nutrition advice from anyone who has not received proper schooling or training on the subject matter.

Mass Media Sources

Although it did not always used to be this way, newspapers, television shows, and magazines are now regularly publishing and discussing nutrition news and information.
According to the Harvard School of Public Health and the International Food Information Council Foundation, this can be attributed to the fact that “public interest in nutrition and food safety has increased dramatically, and food stories – because they are inherently so personal – make for compelling news” (Fineberg & Rowe, 1998). Despite younger individuals being more likely to prefer digital sources for their nutrition information (as will be discussed in the next section), older adults still get their nutrition information from media sources such as newspapers, magazines, television shows, and radio programs (Heuberger & Ivanitskaya, 2011). In fact, The American Dietetic Association’s (now The Academy of Nutrition and Dietetics) *Nutrition and You: Trends 2011* survey found that the majority (67%) of respondents ages 25 and older listed television in an open-ended question asking where they see or hear the most information. Furthermore, magazines (41%) were actually tied with the Internet (40%) for second place as participants’ leading information sources (American Dietetic Association, 2011).

Unfortunately, it does not appear that this increase in coverage and the lasting popularity of these sources has made much difference in the general population’s understanding of nutrition topics. Nutrition news in the media is often contradictory in message and can omit important information from the actual research studies, such as the methodology and other context information (Pellechia, 1997). These contradictions can lead to what one researcher defines as “nutrition confusion” and “nutrition backlash.” Essentially, when contradictory and misleading news is published, it can prompt the public to experience confusion at the multitude of information available, and then have negative beliefs regarding nutrition recommendations and research (Nagler, 2014).
Further, inaccurate or misleading information can come even from public figures that are seemingly knowledgeable and trustworthy. One of the most noteworthy and recent examples of this is with Dr. Mehmet Oz, whose syndicated *The Dr. Oz Show* discusses current medical and personal health topics. In June of 2014, Dr. Oz was brought in front of the Congressional Subcommittee on Consumer Protection, Product Safety and Insurance to defend the way his show has promoted “miracle” weight loss products, including green coffee beans and Garcinia cambogia, that are altogether lacking in support from the majority of the scientific community (Christensen & Wilson, 2014). Dr. Oz serves as an important reminder that having a popular platform or even medical credentials does not always translate into being a reputable source for all types of health information.

**Internet**

Estimates show that more than two billion people use the Internet worldwide (International Telecommunications Union, 2013). With increasing reliance on the Internet to obtain information about just about anything, health and medical information is not excluded. According to the Pew Research Center’s Internet & American Life Project, 72% of internet users have looked online for health information, including searches pertaining to serious conditions, general information searches, and information on minor health problems, of one kind or another within the past year (Fox & Duggan, 2013). Of these online health seekers, 77% used a search engine, such as Google or Yahoo, to access information. Thirteen percent chose sites that specialize in health information, such as WebMD. Rather than searching for strict facts, a large aspect of
health information online involves reading testimonies of others with similar health problems or concerns. Twenty-six percent of adults surveyed by the Pew Research Center recalled reading or watching someone else’s experience about their personal health or medical issues, and 16% used the Internet specifically to search for others with similar issues or concerns.

As mentioned briefly in the previous section, the Internet is readily increasing in prominence as a source for health and nutrition information. By using responses from the American Dietetic Association’s *Nutrition and You: Trends* survey over the years, it becomes clear just how rapidly the Internet has grown in popularity. 1995 was the first year in which the Internet appeared as a response for the ADA’s open-ended question about where participants see or hear the most nutrition information. Three percent of participants cited it as a source in 1995, followed by 2% in 1997, 6% in 2000, and 13% in 2002. In 2008, 24% of participants cited the Internet as a source, and nearly half (40%) reported it as a source in 2011 (American Dietetic Association, 2011). It can be expected that these numbers will only continue to increase over the next several years.

Although the Internet is now being adopted by people of all ages, its users still tend to skew younger. Ninety-seven percent of 18-29 year olds use the internet, compared to 88% of 50-64 year olds and just 57% of individuals ages 65 and above (Pew Research Center, 2014). Similarly, in a recent study comparing the preferred sources of nutrition information between younger and older adults, it was found that the majority of younger adults named registered dietitians and the Internet as their most preferred sources (Heuberger & Ivanitskaya, 2011).
On the Internet, it can be hard to discern credible information from information that may not be as accurate. Heuberger & Ivanitskaya’s 2011 study had participants review three websites about nutritional supplements before taking a questionnaire to establish their ability to evaluate the quality of the sites. The questionnaire involved “identifying a website designed to sell goods and services, selecting the most trustworthy website, and determining if it was appropriate to recommend nutritional supplements from two of the least trustworthy websites.” Just 13.5% of the participants who responded that the Internet was their preferred source for nutrition information were able to achieve a perfect score on the website evaluation questionnaire. This is concerning because even those who believe themselves to be proficient enough in Internet research to consider it their preferred source are unable to distinguish certain credibility.

Some of the best research on Internet credibility comes from focus group testing, with Internet users able to explain more about what they look for when appraising a website’s credibility. In one focus group asking specifically about health information online, many factors emerged as lending themselves to credibility (Eysenbach & Köhler, 2002). For example, website design and layout was key. Participants felt that a professional layout with an interface that was user-friendly and uncluttered appeared to be trustworthy. Participants also wanted to know information about the person or group running the site. They looked for credentials or the name of an organization, and felt it was helpful when websites included a picture of the site owner or owners. Participants also felt it was useful to be able to contact the creators of the website either through email or comment boxes, and the creators should take the time to respond in as timely of a
manner as possible. In terms of content, information should look like it has been updated recently, with participants stating that they look to see specifically what date a website has been last updated or modified. Participants looked for content to “sound scientific” but not use too much professional terminology. They liked to see links to other sources, as it increased transparency and aided in trustworthiness (Eysenbach & Köhler, 2002).

Although the attributes listed above appear to lend themselves to credibility when made available on health-related websites, they unfortunately are not always present in actuality. A 2013 survey examined the quality and accuracy of 48 websites that contained the search term “healthy diet.” Of them, just 5 websites listed references for the information given and just over half (54%) gave the date in which the information was last updated (Hirasawa et al., 2013).

Social Networking Sites

Social networking sites (SNS), or social media, can be defined in many ways as the platforms continue to evolve. One group of researchers defined social networking sites as “web based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others in the system” (boyd & Ellison, 2007). Seventy-four percent of online adults in the United States use social networking sites as of January 2014. The majority of users are young adults, with 89% of Internet users that also use social networking sites falling between the ages of 18-29, but more and more adults over the age of 50 are joining these sites as well (Brenner & Smith, 2013). According to the Pew Research Center’s most
recent data, the most popular social networking sites is Facebook, with 71% of online adults stating that they are members. Twenty-eight percent of online adults use Pinterest, 23% use Twitter, and 26% use Instagram (Duggan, Ellison, Lampe, Leinhart & Madden, 2015). These sites exhibit high levels of user engagement, with many members visiting the sites at least once a day and often multiple times. Contributing to these high levels of engagement is the ease at which social networking are accessible with smartphones, tablets, and other portable devices. Forty percent of cell phone owners use social networking sites on their phone, lending to easy access even without a computer. Young, highly educated people are more likely to use SNS on mobile devices (Duggan & Smith, 2013).

According to the National Research Corporation, one in five Americans use social networking sites as a source for health information in 2011, and it is likely that these numbers have continued to grow. Facebook, YouTube and Twitter were the top three SNS used for healthcare information in this survey, and overall, respondents rated the information available on these sites as rather credible. Thirty-two percent of respondents felt that their level of trust in social medial was “very high” or “high,” while only 7.5% responded with “very low” (National Research Corporation, 2011).

In addition to just being utilized as a type of search engine for health information, social networking sites have also been used to facilitate and deliver information between healthcare professionals and patients, as well as between peers with similar health concerns and problems. A variety of apps available to download are also useful in tracking various data or progress, such as weight loss, exercise, dietary intake, and more.
Twenty-one percent of those who track some form of health indicator have utilized apps or other technology to do so (Rainie, 2013).

Although there appear to be many positive uses of social networking sites in health-related information seeking and interventions, content is very difficult to regulate and moderate, making it very easy for inaccurate information to be promoted as truth. This is quite different from traditional media sources, which have many ‘gatekeepers’ – namely, journalists and editors – who “decide what stories will be covered and reported” as well as presumably check information for accuracy (Salcito, 2009). On social networks, there are very few gatekeepers, and as such, credibility of all information is left for the consumers themselves to verify.

Because SNS users are exposed to so much information at any given time, they often rely on a host of factors to make judgments about other accounts’ accuracy and credibility. One such factor is the recency of updates, examined by Westerman, Spence & Van Der Heide (2014). These researchers created three mock Twitter pages for the American Heart Association, each with varying update recency – the most recent post was either one minute ago, one hour ago, or one day ago. It was found that update recency does impact participants’ perceptions of source credibility through its positive association with cognitive elaboration, defined as the “active participation in information processing” (Defleur & Ball-Rokeach, 1989).

Another study examining factors that influence the perceived credibility of social networking accounts found that credibility perceptions could be impacted by the number of followers that a user has. Furthermore, credibility can be perceived based on the ratio
between the number of followers a user has and the number of other accounts that the
user follows. An account is more likely to be perceived credible if they follow less
people than follow them; for example, if an account has 10,000 followers but only
follows 1,000 other accounts, they are deemed more credible than if those numbers were
reversed. Reputation was also found to be an important factor, and participants in the
study evaluated this by examining a user’s bio. Ideally, the bio would disclose the
credentials of the account, or it would reveal a Verified Account checkmark icon, which
is used to establish the authenticity of the account on sites such as Twitter, Facebook, and
Instagram (Morris, Counts, Roseway, Hoff & Schwarz, 2012). Also interesting is that
first impressions on appearance can have a large impact on credibility. Graphic design,
“including layout, typography, font size, color schemes, and photo quality” all play a role
in whether a user will trust a website or account (Seckler, Heinz, Forde, Tuch & Opwis,
2015; Wang & Emurian, 2005).

Popular social networks. The four social networking sites selected for this
research were chosen based on their popularity. Among adults ages 18 and older, the five
most popular social networks in 2014 were Facebook, LinkedIn, Pinterest, Instagram, and
Twitter (Duggan et al., 2015). LinkedIn was excluded from mention in this research
because its purpose as a professional networking site does not see its users interacting and
posting in ways that are similar to the other four. The following sections will describe
the uses and hallmark characteristics of Facebook, Twitter, Instagram, and Pinterest.

Facebook. Facebook was launched in 2004 for Harvard students and remained
available to only college students until 2006, when it became open to anyone with an
active email address (Phillips, 2007). Of the social networking sites that remain popular, Facebook was started first and is still considered the most popular social network, although its overall growth has slowed as other, newer sites continue to grow in popularity (Duggan et al., 2015). Facebook users begin by creating a profile, which they can fill with photos of themselves, their school and work histories, and relationship status, as well as their favorite books, movies, hobbies and more. After creating a profile, Facebook users can search for people that they may know through various circles, including schools, hometowns, and employers. Users can then post status updates, photos, videos, and links on its newsfeed, where individuals can scroll and see everything that has been posted by their friends. To acknowledge or interact with something that a friend has posted, users can “like” or comment on the item. Additionally, Facebook users can “like” pages or join groups on topics that interest them, and then they will receive updates and notifications from these pages and groups in addition to the ones from their friends (Buck, 2012a). Similar to Twitter’s Retweet function that is discussed below, users can share posts, pictures and videos from other Facebook users, either with or without their own added comments. Likewise, Facebook introduced the hashtag to its site in 2013 after the content organization and search tool began and gained popularity on Twitter (Warren, 2013).

**Twitter.** Twitter was founded in 2006 as a microblogging social network, where users could type short bursts of information, observations, and more, all with 140 characters or less (Carlson, 2011). According to Twitter.com, there are 288 million monthly active users sending 500 million Tweets per day. Twitter allows for users to
easily follow both friends they know in real life and public figures, such as celebrities, politicians, and athletes. Each Twitter user has a profile page, where their own personal Tweets are displayed, and a user’s Feed shows a stream of Tweets from all the accounts the user follows. The Retweet function gives users the option of re-sharing Tweets from other users that they find interesting. One of the hallmark functions of Twitter is the hashtag, which users add to their tweets to participate in the overall conversation about a certain topic and to allow other users to find the Tweet (Smith, 2012). Because Twitter does not allow for its users to create or join groups the way that Facebook does, the hashtag is one of the best ways to find Tweets and accounts that pertain to individual interests.

**Instagram.** Instagram began in 2010 and was acquired by Facebook in 2012. The function of Instagram is much more pared down than Facebook and Twitter, in that Instagram is a photo-sharing app primarily. Instagram allows users to upload photos to the app and apply filters and borders, and make other edits, to change the appearance of the photo. Users can then add captions, and share the photo with their followers. Interestingly, Instagram is almost exclusively a mobile platform, meaning users must have a smartphone in order to upload photos. Because Instagram was designed with the mobile experience in mind, the feed is very minimalist, and users can just scroll through photo after photo of the friends and public figures they follow. Recently Instagram allowed users the option to upload short videos that can be applied with the same filters and edits as photos. Instagram also utilizes the hashtag function, which is extremely popular. Because there is no character limit on Instagram captions like there is for
Twitter, users can add as many hashtags as they want to their photos in order to allow them be seen by anyone interested in similar photos or topics (Buck, 2012b).

**Pinterest.** Like Instagram, Pinterest began in 2010. Pinterest’s key demographic is female, with 42% of online women using the site, compared to just 13% of online men (Duggan et al., 2015). Pinterest is often described as a virtual bulletin board, where users can “pin” or post photos and links to various boards that they create. Unlike the first three social networking sites, users do not create anything on Pinterest the way that they would write Tweets on Twitter or share photos on Instagram. Rather, all content on Pinterest comes from other sources on the web. Pinterest is essentially a way to categorize and organize content found elsewhere. Users can add their own “pins,” from other websites, or they can browse one of Pinterest’s many defined categories, such as Food & Drink, Hair & Beauty, or Health & Fitness. Users can also search for existing pins by typing keywords into a search bar that will access pins with matching keywords from any category. Users can then re-pin content from other boards onto their own boards. Pinterest users can follow boards from friends they know in real life, as well as boards from popular bloggers, celebrities, or strangers with similar tastes (Lammle, 2011).
CHAPTER III

METHODOLOGY

Research Design

This was a descriptive, non-experimental study analyzing the use of social networking sites (SNS) as weight management tools in college students at Kent State University (KSU).

Subjects

A convenience sample of both undergraduate and graduate students at a public midwestern state university was used in this research. Participants were recruited based on current enrollment for the Spring 2015 semester. Inclusion criteria specified that participants must be between the ages 18 and 26 and a member of at least one of four designated social networks (Facebook, Twitter, Instagram or Pinterest). No subject identifiers were obtained.

Survey

The survey, included in Appendix B, consisted of four main parts. Part I included five general demographic questions, such as age (with participants being excluded if they were older than age 26), gender, ethnicity, major, and class rank. Part I also included two questions about usage of the four social networks studied. One question asked for the number of times each site was checked during the day, and the other question asked how much time was spent on the site every time it was checked.
Part II asked all participants whether they had ever used social networking sites to access weight management information. Those who responded “Yes” to this question continued on to the remainder of the survey. Participants were asked 11 questions about their perceptions on the credibility of social networking sites as an information source, based on a 5-point Likert scale where a response of (1) meant strongly disagree and a response of (5) meant strongly agree. Next, participants were asked to rate the importance of various attributes that aided in establishing trust of a social network account, such as the number of followers or quality of photos. These questions were also based on a 5-point Likert scale, where (1) was not at all important and (5) was extremely important.

Part III examined weight management-related browsing and posting habits of participants, through 9 questions based on a 5-point Likert Scale where (1) meant that the respondents reported never performing the habit and (5) meant that respondents reported performing the habit very often. Participants were next asked about their perceptions of the social support available on social networking sites through 7 questions on a 5-point Likert scale, where (1) meant strongly disagree and (5) meant strongly agree.

Part IV asked participants their current weight and height, which was used to calculate BMI. Participants were also asked about their current weight management goals: lose weight, stay the same weight, gain weight, or not trying to do anything about weight. Finally, participants were asked about some of the weight management-related keywords used in searches on social networking sites. For ease of analysis, the 17 keywords were separated into the following categories:
**Diets:** low calorie diets, high protein diets, low fat diets, low carbohydrate diets, Paleo diets, gluten-free diets, Mediterranean diets, vegetarian/vegan diets, liquid diets, cleanses

**Healthy Recipes:** healthy recipes

**Supplements:** supplements, vitamins and minerals, nutritional foods

**Exercise:** exercise or fitness plans

**Weight management programs:** weight management programs

**Surgery:** bariatric or weight loss surgery

Participants reported how frequently they searched for these keywords based on a 5-point Likert scale where (1) meant that they *never* searched the keyword and (5) meant that they searched the keyword *very often*. Participants were also given the option of writing in any search keyword that was not already listed as an option.

**Procedures**

Approval was obtained from the KSU Institutional Review Board, and a request was submitted to the University Registrar for 10,000 email addresses of students (both undergraduate and graduate) currently enrolled in the Spring 2015 semester on KSU’s main campus. After the list of email addresses was obtained, it was inputted into Qualtrics, which was used to administer the questionnaire. The sample was sent an email with a cover letter explaining the study and anonymity of the study. The email included a unique link to the online Qualtrics survey, along with an electronic consent form. The survey was determined to take around 10-15 minutes to complete. Participants were given two weeks to take the survey, and were sent one reminder email halfway
through the survey period. Participants who completed the survey were given the option to be entered into a drawing for one of three $25.00 Amazon gift cards. Contact information for the gift card drawing was collected through an entirely separate Qualtrics survey in order to maintain anonymity of the participants.

**Data Analysis**

Several sections of the survey, including SNS usage, SNS search keywords, perceived credibility, browsing and posting habits, and social support perceptions, required some additional grouping of participants and responses in order to be presented in a concise manner. Below are explanations of the way each of these sections were grouped and analyzed before statistical tests were completed.

**SNS Usage**

SNS usage was examined by classifying participants as either “users” or “non-users” of all four sites. Users were defined as participants who selected that they check a site “less than once per day,” “1-5 times per day,” “6-10 times per day,” “11-15 times per day,” “16-20 times per day,” or “more than 20 times per day,” and non-users were defined as participants who reported that they do not use the site in question. In order to compare SNS usage by gender, transgender participants (n=4) were excluded due to low response rates. To compare SNS usage by age, participants were classified into two groups, “younger” students and “older” students. Younger students were anyone between the ages of 18 and 22, to represent the ages of traditional college students who begin school immediately after high school and finish their undergraduate degree in four
years. Older students were anyone between the ages of 23 and 26, which was more likely to include non-traditional undergraduate students or graduate students.

**SNS Search Keywords**

Participants who reported using SNS for weight management were asked about how frequently they search for various keywords on social networking sites, based on a 5-point Likert scale where (1) indicated that they *never* search for the keyword and (5) indicated that they search for the keyword *very often*. Mean responses were calculated for each keyword and compared by gender, with transgender students excluded due to low response rate (n=2).

**Perceived Credibility**

Credibility questions for students who reported using SNS for weight management were based on a 5-point Likert scale where (1) meant *strongly disagree* and (5) meant *strongly agree*. Mean responses were calculated for each question and compared by gender, with transgender students excluded due to low response rate (n=2). The last four questions in this section asked about the perceived credibility of each site (“I consider the information I find on x site to be credible”) contained a 6th response option, of “*I do not use this site.*” Participants that selected this 6th option were excluded from analysis, so the mean was calculated based on a scale of 1 to 5 to remain consistent with all other questions in this section.

Participants were also asked to rate the importance of several attributes of social networking accounts that could be used in assessing trust. Perceived importance was based on a 5-point Likert scale where (1) was *not at all important* and (5) was *extremely*
important. Mean responses were also calculated for these and compared by gender, with transgender students excluded due to low response rate (n=2).

**Browsing & Posting Habits**

Participants who reported using SNS for weight management were asked questions about browsing and posting habits were based on a 5-point Likert scale where (1) meant participants performed the habit *never* and (5) meant participants performed the habit *very often*. Mean responses were calculated and compared by gender, with transgender students excluded due to low response rate (n=2).

**Social Support Perceptions**

Questions in this section were based on a 5-point Likert scale where (1) meant *strongly disagree* and (5) meant *strongly agree*. Participants who reported using SNS for weight management were the only ones who answered this set of questions. Mean responses were calculated and compared by gender, with transgender students excluded due to low response rate (n=2).

**Statistical Analysis**

Statistical analysis was completed using the Statistical Package for the Social Sciences (SPSS) version 21. Means, standard deviations, frequencies, and percentages were used for analysis of demographics, social network site usage, search keywords, perceived credibility, browsing and posting habits, and perceptions on social support. Fisher’s exact tests were used to compare gender and age differences in social networking site usage. Independent t-tests were used to compare the means of Likert
scale responses and gender for search keywords, perceived credibility, browsing and posting habits, and perceptions on social support. A significance of \( p<0.05 \) was set.
CHAPTER IV

JOURNAL ARTICLE

Introduction

College can be a formative time in young adults’ lives, where lifestyle habits develop and last into adulthood (Nelson et al., 2008). College students often experience changes in dietary intake and exercise habits, and when combined with new stressors and other factors such as alcohol consumption, can lead to weight gain in this population (Holm-Denoma et al., 2008; Vella-Zarb & Elgar, 2009). Nearly 35% of college students were classified as overweight or obese in 2014 (American College Health Association, 2014).

With increased knowledge of the negative effects of obesity and the prevalence of obesity-related conditions has come a greater public awareness of the role that diet and nutrition play in overall health (Losasso et al., 2012). As such, interest in weight management has grown among college students, along with the rest of the population. In fact, 42.1% of female college students and 24.1% of male college students have reported dieting to lose weight (Harring, Montgomery & Hardin, 2010).

Weight management information can come from a multitude of sources, including healthcare professions and traditional mass media sources. However, as use of the Internet and social networking sites has grown astronomically, more and more individuals are using these digital sources for health information (Escoffery et al., 2005).
The use of social networking sites is especially high among college students, with 86% of undergraduate and 82% of graduate students reportedly a member of at least one social network. Thus, it seems very likely that this population has utilized social networking sites as sources for weight management information (Smith et al., 2011).

There has been very little research done on the use of social networking sites for weight management information in any population, including college students. Research needs to be done to examine the extent to which social networking sites are used for this purpose, as well as the perceptions of social networking sites as a credible and trustworthy source for weight management information. Thus, the purpose of this study was to examine: 1) the use of social networking sites as tools for weight management in college students and 2) their perceived credibility as an information source.

**Methodology**

This descriptive, non-experimental study was approved by the Kent State University Institutional Review Board. Participants were recruited via their university email address, which was obtained from the University Registrar. 10,000 random undergraduate and graduate students received an invitation to the online questionnaire, and were given the chance to win one of three Amazon gift cards as an incentive.

The survey consisted of four main parts. Part I included five general demographic questions, such as age (with participants being excluded if they were older than age 26), gender, ethnicity, major, and class rank. Part I also included two questions about usage of the four social networks studied. One question asked for the number of times each site
was checked during the day, and the other question asked how much time was spent on the site every time it was checked.

Part II asked all participants whether they had ever used social networking sites to access weight management information. Those who responded “Yes” to this question continued on to the remainder of the survey. Participants were asked 11 questions about their perceptions on the credibility of social networking sites as an information source, based on a 5-point Likert scale where a response of (1) meant strongly disagree and a response of (5) meant strongly agree. Next, participants were asked to rate the importance of various attributes that aided in establishing trust of a social network account, such as the number of followers or quality of photos. These questions were also based on a 5-point Likert scale, where (1) was not at all important and (5) was extremely important.

Part III examined weight management-related browsing and posting habits of participants, through 9 questions based on a 5-point Likert Scale where (1) meant that the respondents reported never performing the habit and (5) meant that respondents reported performing the habit very often. Participants were next asked about their perceptions of the social support available on social networking sites through 7 questions on a 5-point Likert scale, where (1) meant strongly disagree and (5) meant strongly agree.

Part IV asked participants their current weight and height, which was used to calculate BMI. Participants were also asked about their current weight management goals: lose weight, stay the same weight, gain weight, or not trying to do anything about weight. Finally, participants were asked about some of the weight management-related
keywords that they used in searches on social networking sites. For ease of analysis, the 17 keywords were separated into the following categories:

**Diets:** low calorie diets, high protein diets, low fat diets, low carbohydrate diets, Paleo diets, gluten-free diets, Mediterranean diets, vegetarian/vegan diets, liquid diets, cleanses

**Healthy Recipes:** healthy recipes

**Supplements:** supplements, vitamins and minerals, nutritional foods

**Exercise:** exercise or fitness plans

**Weight management programs:** weight management programs

**Surgery:** bariatric or weight loss surgery

Participants reported how frequently they searched for these keywords based on a 5-point Likert scale where (1) meant that they *never* searched for the item and (5) meant that they searched for the item *very often*. Participants were also given the option of writing in any search item that was not already listed as an option.

Statistical analysis was completed using the Statistical Package for the Social Sciences (SPSS) version 21. Means, standard deviations, frequencies, and percentages were used for analysis of demographics, social network site usage, search keywords, perceived credibility, browsing and posting habits, and perceptions on social support. Fisher’s exact tests were used to compare gender and age differences in social networking site usage. Independent t-tests were used to compare the means of Likert scale responses and gender for search keywords, perceived credibility, browsing and posting habits, and perceptions on social support. Transgender students were excluded
from gender analyses due to low response rate (4 participants identified as transgender, and only 2 reported using SNS for weight management). A significance of p<0.05 was set.

Results

10,000 random undergraduate and graduate students received an invitation to be a participant in the study. 1,405 students began the survey, resulting in a response rate of 14.1%. After participants were asked to input their age, 267 (19.0%) were eliminated from the survey for not meeting the inclusion criteria of being between ages 18 and 26. This left 1,138 participants to continue on through the remainder of the survey. As will be discussed later, the entire sample answered demographic questions and questions about their social networking site usage. Then, the remainder of the survey was directed just towards the individuals who use social networking sites for weight management.

Demographics of Entire Sample

The demographic breakdown of the sample is highlighted in Table 1. Seventy-five percent of participants were female (N=856) and the mean age was 20.7±2.1. Additionally, a majority of the participants were Caucasian (84.3%), followed by Asian (6.4%) and African American (4.2%). Eighty-six percent of survey participants were undergraduate students, and the remaining 13.6% were graduate students. The average BMI of participants was 24.6±5.71, and over half (58.3%, N=539) reported a BMI in the normal range of 18-24.9. Twenty-two percent of participants reported a BMI in the overweight range of 25-29.9.
Table 1

*General Characteristics of College Students Surveyed about Social Networking Usage*

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>%</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>15.2</td>
<td>173</td>
</tr>
<tr>
<td>19</td>
<td>21.1</td>
<td>240</td>
</tr>
<tr>
<td>20</td>
<td>18.0</td>
<td>205</td>
</tr>
<tr>
<td>21</td>
<td>13.7</td>
<td>156</td>
</tr>
<tr>
<td>22</td>
<td>12.0</td>
<td>137</td>
</tr>
<tr>
<td>23</td>
<td>7.6</td>
<td>87</td>
</tr>
<tr>
<td>24</td>
<td>5.3</td>
<td>60</td>
</tr>
<tr>
<td>25</td>
<td>4.1</td>
<td>47</td>
</tr>
<tr>
<td>26</td>
<td>2.9</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>1138</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>%</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>24.4</td>
<td>277</td>
</tr>
<tr>
<td>Female</td>
<td>75.3</td>
<td>856</td>
</tr>
<tr>
<td>Transgender</td>
<td>0.4</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>1137</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>%</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caucasian</td>
<td>84.3</td>
<td>959</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1.6</td>
<td>18</td>
</tr>
<tr>
<td>African American</td>
<td>4.2</td>
<td>48</td>
</tr>
<tr>
<td>Asian</td>
<td>6.4</td>
<td>73</td>
</tr>
<tr>
<td>Native American</td>
<td>0.1</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>1.7</td>
<td>19</td>
</tr>
<tr>
<td>Prefer not to answer</td>
<td>1.7</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>1137</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class Rank</th>
<th>%</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>25.0</td>
<td>284</td>
</tr>
<tr>
<td>Sophomore</td>
<td>22.3</td>
<td>253</td>
</tr>
<tr>
<td>Junior</td>
<td>17.8</td>
<td>202</td>
</tr>
<tr>
<td>Senior</td>
<td>21.3</td>
<td>242</td>
</tr>
<tr>
<td>Graduate Student</td>
<td>13.6</td>
<td>155</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>1136</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Body Mass Index</th>
<th>%</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;18</td>
<td>4.9</td>
<td>45</td>
</tr>
<tr>
<td>18-24.9</td>
<td>58.3</td>
<td>539</td>
</tr>
<tr>
<td>25-29.9</td>
<td>21.9</td>
<td>202</td>
</tr>
<tr>
<td>30-34.9</td>
<td>8.8</td>
<td>81</td>
</tr>
<tr>
<td>35-39.9</td>
<td>4.0</td>
<td>37</td>
</tr>
<tr>
<td>&gt;40</td>
<td>2.2</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>924*</td>
</tr>
</tbody>
</table>

* = 203 responses eliminated due to missing or unrealistic data
General Social Network Usage

Nearly all participants used at least one social networking site, and only 1.3% (n=15) reported that they did not any of the four sites listed. As shown in Figure 1, the two most used sites were Facebook, which was used by 93.5% (n=1035) of participants, and Instagram, which was used by 80.3% (n=897).

Frequency of SNS usage is displayed in Figure 2. Many students checked social networking sites multiple times throughout the day. Forty percent (n=453) of participants reported checking Facebook 1-5 times per day, and 39.6% (n=447) checked it 6 times or more per day. Eighteen percent of participants checked Twitter 1-5 times and 31.7% checked it 6 times or more per day. Nearly half (43.9%, n=492) of participants reported checking Instagram 6 or more times per day. Pinterest was used least frequently, with 39.7% (n=441) reporting that they checked it less than once per day.

The majority of participants (74.2%, n=819) reported that they spent 15 minutes or less on Facebook each time that they check it. Similarly, 58.0% spent 15 minutes or less on Twitter each time and 64.6% spent 15 minutes or less on Instagram each time, as well. Fifty-seven percent of participants reported that they spend 30 minutes or less on Pinterest every time they check it.
Figure 1. Use of Social Networking Sites by College Students

Figure 2. Daily Frequency of Social Networking Site Usage by Site in College Student SNS-Users
Comparison Between Gender and Social Networking Site Usage

Table 2 compares gender differences in SNS usage, and a Fisher’s exact test found significant associations between gender and Twitter, Instagram, and Pinterest. In this sample, college males were more likely to be Twitter users ($p \leq 0.01$), and college females were more likely to be Instagram ($p \leq 0.001$) and Pinterest users ($p \leq 0.001$). There was no significant gender difference ($p=0.512$) in likelihood of using Facebook.

Table 2

*Gender Differences in Social Networking Site Usage in College Students* $^a$

<table>
<thead>
<tr>
<th>Site</th>
<th>Gender</th>
<th>User % (n)</th>
<th>Non-User % (n)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>Male</td>
<td>93.8 (256)</td>
<td>6.2 (17)</td>
<td>0.512</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>93.5 (797)</td>
<td>6.5 (55)</td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td>Male</td>
<td>77.3 (208)</td>
<td>22.7 (61)</td>
<td>0.005</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>69.1 (584)</td>
<td>30.9 (261)</td>
<td></td>
</tr>
<tr>
<td>Instagram</td>
<td>Male</td>
<td>73.0 (197)</td>
<td>27.0 (73)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>82.6 (700)</td>
<td>17.4 (147)</td>
<td></td>
</tr>
<tr>
<td>Pinterest</td>
<td>Male</td>
<td>40.1 (105)</td>
<td>59.9 (157)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>79.3 (670)</td>
<td>20.7 (175)</td>
<td></td>
</tr>
</tbody>
</table>

$^a$ = participants may have given multiple responses, depending on how many sites they are members of
Comparison Between Age and Social Networking Site Usage

A comparison between the age of participants and social networking site usage is shown in Table 3. Participants were separated into two age groups, 18-22 (n=911) and 23-26 (n=227). It was found that the college students between the ages of 18 and 22 were significantly more likely to use Twitter (p=0.001) and Instagram (p≤0.001) when compared with the 23-26 year olds. No significance was found between the age groups and Facebook (p=0.154) and Pinterest (p=0.270).

Table 3

*Age Differences in Social Networking Site Usage in College Students*

<table>
<thead>
<tr>
<th>Site</th>
<th>Age</th>
<th>User % (n)</th>
<th>Non-User % (n)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td>18-22</td>
<td>94.0 (848)</td>
<td>6.0 (54)</td>
<td>0.154</td>
</tr>
<tr>
<td></td>
<td>23-26</td>
<td>91.9 (203)</td>
<td>8.1 (18)</td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td>18-22</td>
<td>73.1 (652)</td>
<td>26.9 (240)</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>23-26</td>
<td>62.1 (136)</td>
<td>37.9 (83)</td>
<td></td>
</tr>
<tr>
<td>Instagram</td>
<td>18-22</td>
<td>82.4 (736)</td>
<td>17.6 (157)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td>23-26</td>
<td>71.0 (157)</td>
<td>29.0 (64)</td>
<td></td>
</tr>
<tr>
<td>Pinterest</td>
<td>18-22</td>
<td>70.4 (624)</td>
<td>29.6 (262)</td>
<td>0.270</td>
</tr>
<tr>
<td></td>
<td>23-26</td>
<td>68.0 (149)</td>
<td>32.0 (70)</td>
<td></td>
</tr>
</tbody>
</table>

* = participants may have given multiple responses, depending on how many sites they are members of
Use of Social Networking Sites for Weight Management

All participants were asked whether or not they have used social networking sites to search for weight management information. Participants who responded “Yes” were then asked about the specific weight management-related keywords they search on social networking sites, their perceived credibility of social networking sites as information sources, their social networking posting and browsing habits, and their perceptions of the social support available on social networking sites. Independent t-tests were used to compare all results by gender, and significance was found only in the weight-management related keywords. Thus, all other sections were analyzed based on total number of responses.

Use and weight management goals. Approximately two-thirds (66.7%, n=739) of participants reported using social networking sites to search for weight management information. Of this group, male students accounted for 11.9% (n=88) and female students accounted for 88.1% (n=651). Of this subsample, the participants reported their current weight management goals as follows: lose weight (61.0%), stay the same weight (20.4%), gain weight (6.1%), and not trying to do anything about weight (12.4%).

Weight management search keywords. Participants were asked to answer how often they search for various weight management keywords on social networking sites through the use of a 5-point Likert scale, where a response of (1) indicated that they never search for the keyword and (5) indicated that they search for the keyword very often. As shown in Table 4, males were significantly more likely than females to search for supplements on social networking sites (p≤0.001). Females were significantly more
likely than males to search for healthy recipes (p≤0.001) and exercise information (p≤0.01).

Table 4

*Frequency of Weight Management-Related Keyword Searches in Male and Female College Students that have Accessed Weight Management Information on Social Networking Sites (Mean ± SD)*

<table>
<thead>
<tr>
<th>Category</th>
<th>Male (n=79)</th>
<th>Female (n=578)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diets</td>
<td>2.00 ± 0.83</td>
<td>1.85 ± 0.74</td>
<td>0.127</td>
</tr>
<tr>
<td>Healthy Recipes</td>
<td>2.77 ± 1.41</td>
<td>3.64 ± 1.23</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Supplements</td>
<td>2.95 ± 1.14</td>
<td>2.25 ± 1.05</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Exercise</td>
<td>3.15 ± 1.18</td>
<td>3.53 ± 1.12</td>
<td>0.008</td>
</tr>
<tr>
<td>Weight Management Programs</td>
<td>1.80 ± 1.15</td>
<td>1.81 ± 1.17</td>
<td>0.941</td>
</tr>
<tr>
<td>Weight Loss Surgery</td>
<td>1.34 ± 0.77</td>
<td>1.21 ± 0.68</td>
<td>0.154</td>
</tr>
</tbody>
</table>

* = scores based on a Likert scale where (1) meant never searched and (5) meant very often searched
Perceived credibility of social networking sites. Table 5 highlights perceived credibility of social networking sites as a source for weight management information. Questions were based on a 5-point Likert scale, where (1) meant strongly disagree and (5) meant strongly agree. Nearly all (92.6%, n=667) of participants reported that they considered themselves to be a good judge of whether information is accurate or not. Forty-six percent agreed or strongly agreed that the weight management information found on social networking sites was trustworthy. Over half of participants (57.7%, n=421) agreed or strongly agreed that weight management information on social networking sites was just as accurate as the information from mass media sources, such as television and magazines. Sixty percent (n=440) agreed or strongly agreed that weight management information on social networking sites was just as accurate as the information on the Internet. Only 15.1% of participants agreed or strongly agreed that weight management information on social networking sites was just as accurate as information from a healthcare professional.

Just 9.7% of participants agreed or strongly agreed that the information found on Facebook was credible, compared with 12.0% for Twitter, and 20.3% for Instagram. Pinterest was considered to be the social networking site with the most credible information, with 51.5% of participants agreeing or strongly agreeing with this statement.
Table 5

*Perceived Credibility of Social Networking Sites in College Students*\(^{a}\) that have Accessed *Weight Management Information on Social Networking Sites*

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean ± SD(^b)</th>
<th>Agree/Strongly Agree % (n)</th>
<th>Neutral % (n)</th>
<th>Disagree/Strongly Disagree % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The weight management information and advice I read on social networking sites is trustworthy</td>
<td>3.34 ± 0.78</td>
<td>45.9 (334)</td>
<td>40.2 (293)</td>
<td>13.9 (101)</td>
</tr>
<tr>
<td>Weight management information on social networking sites is just as accurate as what I would hear from a healthcare professional (ex: doctor, nurse, registered dietitian)</td>
<td>2.48 ± 0.92</td>
<td>15.1 (110)</td>
<td>28.8 (210)</td>
<td>56.0 (408)</td>
</tr>
<tr>
<td>Weight management information on social networking sites is just as accurate as what I would get from mass media sources, such as television, books, or magazines</td>
<td>3.45 ± 0.89</td>
<td>57.7 (421)</td>
<td>24.4 (178)</td>
<td>17.9 (131)</td>
</tr>
<tr>
<td>Weight management information on social networking sites is just as accurate as what I would get from the Internet</td>
<td>3.54 ± 0.84</td>
<td>60.4 (440)</td>
<td>26.1 (190)</td>
<td>13.5 (98)</td>
</tr>
<tr>
<td>Weight management information on social networking sites is just as accurate as what I would hear from family or friends</td>
<td>3.24 ± 0.87</td>
<td>44.7 (326)</td>
<td>32.9 (240)</td>
<td>22.5 (164)</td>
</tr>
<tr>
<td>There is little risk involved in following weight management information on social networking sites</td>
<td>2.71 ± 1.02</td>
<td>25.9 (189)</td>
<td>25.9 (189)</td>
<td>48.2 (352)</td>
</tr>
</tbody>
</table>
I consider myself to be a good judge of what information is accurate and what information is not. The average score is $4.16 \pm 0.63$.

I consider the information I find on Facebook to be credible. The average score is $2.53 \pm 0.80$.

I consider the information I find on Twitter to be credible. The average score is $2.51 \pm 0.87$.

I consider the information I find on Instagram to be credible. The average score is $2.75 \pm 0.89$.

I consider the information I find on Pinterest to be credible. The average score is $3.42 \pm 0.90$.

social network account trust assessment. Table 6 shows attributes that participants consider important when assessing other social network users and accounts. Questions were based on a 5-point Likert scale, where (1) meant *not at all important* and (5) meant *extremely important*. Participants rated the credentials of a user or account as important ($\bar{x} = 4.17 \pm 0.95$). Additionally, participants agreed that the quality of photos, as well as the quantity and recency of posts/updates, could influence their likelihood of trusting information from a certain account. The number of followers was considered to be the least important factor in SNS accountability ($\bar{x} = 2.83 \pm 1.22$).
Table 6

*Attributes that Influence College Students\(^a\) Trust on Social Networking Sites*

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Mean ± SD(^b)</th>
<th>Extremely Important/ Very Important % (n)</th>
<th>Neither Important Nor Unimportant % (n)</th>
<th>Very Unimportant/ Not At All Important % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of followers</td>
<td>2.83 ± 1.22</td>
<td>35.7 (252)</td>
<td>31.8 (224)</td>
<td>32.5 (229)</td>
</tr>
<tr>
<td>Credentials</td>
<td>4.17 ± 0.95</td>
<td>85.1 (559)</td>
<td>8.4 (59)</td>
<td>6.5 (46)</td>
</tr>
<tr>
<td>Quality of photos</td>
<td>3.19 ± 1.08</td>
<td>43.6 (308)</td>
<td>36.0 (254)</td>
<td>20.4 (144)</td>
</tr>
<tr>
<td>Quantity of updates/posts</td>
<td>3.15 ± 1.15</td>
<td>44.6 (315)</td>
<td>30.7 (217)</td>
<td>24.8 (175)</td>
</tr>
<tr>
<td>Recency of updates/posts</td>
<td>3.45 ± 1.11</td>
<td>59.5 (420)</td>
<td>22.8 (161)</td>
<td>17.7 (125)</td>
</tr>
<tr>
<td>Acquaintance in real life</td>
<td>3.24 ± 1.18</td>
<td>44.2 (313)</td>
<td>32.6 (231)</td>
<td>23.2 (164)</td>
</tr>
<tr>
<td>Acquaintance online</td>
<td>2.74 ± 1.08</td>
<td>23.2 (164)</td>
<td>41.9 (297)</td>
<td>34.9 (247)</td>
</tr>
</tbody>
</table>

\(^{a}=\) no gender differences found  
\(^{b}=\) scores based on a Likert scale where (1) meant *not at all important* and (5) meant *extremely important*

**Weight management-related posting and browsing habits.** Table 7 shows the frequency with which participants perform several weight management-related browsing and posting habits on social networking sites based on a 5-point Likert scale, where a response of (1) meant that participants reported *never* performing a certain habit, and a response of (5) meant that the participants reported performing the habit *very often*.

Results showed that nearly half of participants (49.6%, \(n=343\)) reported that they often browse existing weight management posts rather than post their own content. Over half of participants (52.2%, \(n=361\)) responded that they often “like” or “favorite” posts from other people that they agree with or find interesting. Thirty-nine percent (\(n=266\))
also reported sharing, reposting, or retweeting content from other people that they agree with or find interesting. Just 2.9% of participants reported that they share their weight management struggles and successes with their followers, and 2.7% reported posting “before” and “after” photos to document their progress on social networking sites.

Table 7

*Online Browsing and Posting Habits of College Students* that have Accessed Weight Management Information on Social Networking Sites

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean ± SD</th>
<th>Very Often/Quite Often</th>
<th>Sometimes</th>
<th>Rarely/Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>I browse nutrition or weight management posts without posting content of my own</td>
<td>3.52 ± 1.12</td>
<td>45.9 (334)</td>
<td>40.2 (293)</td>
<td>13.9 (101)</td>
</tr>
<tr>
<td>I post updates that share my weight management struggles and successes with my followers</td>
<td>1.41 ± 0.79</td>
<td>15.1 (110)</td>
<td>28.8 (210)</td>
<td>56.0 (408)</td>
</tr>
<tr>
<td>I post “before” and “after” photos of myself in order to share my weight management progress with my followers</td>
<td>1.30 ± 0.74</td>
<td>57.7 (421)</td>
<td>24.4 (178)</td>
<td>17.9 (131)</td>
</tr>
<tr>
<td>I use nutrition or weight management-related hashtags on my posts so they will be found by other people interested in similar topics</td>
<td>1.44 ± 0.87</td>
<td>60.4 (440)</td>
<td>26.1 (190)</td>
<td>13.5 (98)</td>
</tr>
<tr>
<td>I ask questions or get clarification about weight management or other nutrition information</td>
<td>2.03 ± 1.15</td>
<td>44.7 (326)</td>
<td>32.9 (240)</td>
<td>22.5 (164)</td>
</tr>
</tbody>
</table>
I share advice about which weight management approaches have worked for me and which have not

I “like” or “favorite” posts from other people that I agree with or find interesting

I share, repost, or retweet posts from other people that I agree with or find interesting

I comment on posts from other people that I agree with or find interesting

<table>
<thead>
<tr>
<th>Activity</th>
<th>Mean ± SD</th>
<th>Median (n)</th>
<th>Median (n)</th>
<th>Median (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I share advice about which weight management approaches have worked for me and which have not</td>
<td>1.90 ± 1.10</td>
<td>25.9 (189)</td>
<td>25.9 (189)</td>
<td>48.2 (352)</td>
</tr>
<tr>
<td>I “like” or “favorite” posts from other people that I agree with or find interesting</td>
<td>3.52 ± 1.13</td>
<td>92.6 (667)</td>
<td>5.0 (36)</td>
<td>2.4 (17)</td>
</tr>
<tr>
<td>I share, repost, or retweet posts from other people that I agree with or find interesting</td>
<td>2.99 ± 1.33</td>
<td>9.7 (68)</td>
<td>41.0 (287)</td>
<td>49.3 (345)</td>
</tr>
<tr>
<td>I comment on posts from other people that I agree with or find interesting</td>
<td>2.45 ± 1.22</td>
<td>12.0 (68)</td>
<td>38.0 (216)</td>
<td>50.0 (284)</td>
</tr>
</tbody>
</table>

*a* = no gender differences found  

*b* = scores based on a Likert scale where (1) meant the habit was *never* performed and (5) meant the habit was performed *very often*

**Perceived social support on social networking sites.** Perceptions of SNS as a supportive community to facilitate healthy and lasting weight changes are shown in Table 8. These questions were based a 5-point Likert scale, where a response of (1) meant *strongly disagree* and a response of (5) meant *strongly agree*. Almost two-thirds (64.8%, n=443) of respondents agreed or strongly agreed that social networking sites are a great place to receive encouragement and support for their weight management goals; however, just 36.1% responded that they feel a strong sense of community with their followers and the people they follow on social networking sites.

Nearly half (46.1%, n=309) of participants agreed that the weight management information and advice they see on social networking sites is attainable and realistic for them to follow. Fifty-four percent reported that they find themselves comparing their own progress and goals to those of their online friends and followers, and 42.5% reported...
feeling discouraged about their own progress if it appears that others on their social networks are achieving faster results.

Table 8

Perceptions of Social Support on Social Networking Sites by College Students\(^a\) that have Accessed Weight Management Information on Social Networking Sites

<table>
<thead>
<tr>
<th>Item</th>
<th>Mean ± SD(^b)</th>
<th>Agree/ Strongly Agree % (n)</th>
<th>Neutral % (n)</th>
<th>Disagree/ Strongly Disagree % (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social networking sites are a great way to receive encouragement as I work towards my weight goals and other health objectives</td>
<td>3.69 ± 0.85</td>
<td>64.8 (443)</td>
<td>26.5 (181)</td>
<td>8.8 (60)</td>
</tr>
<tr>
<td>I feel a strong sense of community with my followers and the people I follow on social networking sites</td>
<td>3.08 ± 0.98</td>
<td>36.1 (247)</td>
<td>37.5 (257)</td>
<td>26.4 (181)</td>
</tr>
<tr>
<td>It would be difficult to manage my weight without the support of my followers and the people I follow on social networking sites</td>
<td>2.05 ± 0.95</td>
<td>8.0 (55)</td>
<td>21.9 (150)</td>
<td>70.0 (479)</td>
</tr>
<tr>
<td>Posting about my personal progress on social networking sites is a good way to stay on track to achieve my goals</td>
<td>2.85 ± 1.05</td>
<td>28.9 (198)</td>
<td>37.2 (255)</td>
<td>33.9 (232)</td>
</tr>
<tr>
<td>The weight management information and advice I see on social networking sites is attainable and realistic for me to follow</td>
<td>3.32 ± 0.82</td>
<td>46.1 (309)</td>
<td>39.2 (263)</td>
<td>14.8 (99)</td>
</tr>
</tbody>
</table>
I often find myself comparing my progress and my goals to those of the people I follow on social networking sites

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SE</th>
<th>N</th>
<th>Mean</th>
<th>SE</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>I often find myself</td>
<td>3.32</td>
<td>1.10</td>
<td>364</td>
<td>54.2</td>
<td>2.83</td>
<td>134</td>
</tr>
<tr>
<td>I get discouraged about my own progress if it appears that my friends or other followers are achieving results faster than I am</td>
<td>3.03</td>
<td>1.17</td>
<td>286</td>
<td>42.5</td>
<td>1.95</td>
<td>146</td>
</tr>
</tbody>
</table>

\(^a\) = no gender differences found
\(^b\) = scores based on a Likert scale where (1) meant strongly disagree and (5) meant strongly agree

Discussion

The purpose of this study to examine the use of social networking sites (SNS) as tools for weight management, as well as the perceived credibility of SNS as a source of information. Study results indicated: 1) there were significant differences between gender and age and use of social networking sites; thus, Hypotheses 1 and 2 were accepted; 2) there was a significant difference between gender and the types of weight management-related items searched for on social networking sites; thus, Hypothesis 3 was accepted; and 3) there were no significant differences between gender and perceived credibility, browsing and posting habits, and perceived level of social support; thus, Hypotheses 4, 5, and 6 were rejected.

Social Networking Site Usage

The Pew Research Center’s Internet & American Life Project has been researching the growth and popularity of the Internet, and eventually social networking sites, since 1999. Their research in 2011 found that 86% of undergraduate and 82% of graduate college students are members of at least one social networking site (Smith et al.,
2011). The present study found that 98.7% of the college students surveyed use at least one social networking site, although usage between the four sites studied (Facebook, Twitter, Instagram, and Pinterest) varied. This research found that Facebook was used by 93.5% of the sample, followed by Instagram (80.3%), Twitter (71.0%) and Pinterest (70.1%).

Compared with older studies, the present study found that students are more likely to check SNS regularly throughout the day, and more time is spent on the sites overall. Ellison, Steinfield & Lampe reported that college students checked Facebook for 10-30 minutes per day in 2007, and Pempek et al., reported that students check the site “a few times” throughout the day and spend an average of closer to 30 minutes total per day in 2009. Comparatively, the present study found that the majority of students checked Facebook anywhere from 1-10 times per day, and spent 15 minutes or less on the site each time. This could mean that students are spending as much as 150 minutes on Facebook alone per day. This is a substantial increase in time spent on SNS for just 6-8 years of difference between the older studies and this current one, and can possibly be attributed to the proliferation of smartphone usage. In 2007, the very first iPhone was announced, and smartphone popularity has grown rapidly ever since, with 79% of young adults between the ages of 18 and 24 reporting that they owned a smartphone in 2013 (Smith, 2013). All four of the social networking sites examined in this study offer a smartphone app, which allow for students to have easy access to the sites at any time throughout the day.

**Comparisons Between Gender and Age and SNS Usage**

The current research found several significant differences between gender and use of social networking sites. There was found to be no difference between gender and likelihood of using Facebook, although the Pew Research Center’s Internet and American Life Project has reported that women were more likely to be Facebook users compared to men in 2014, though this was not specific to a college student population (Duggan et al., 2015). The college males in the present study were more likely to use Twitter, and college females were more likely to use Instagram and Pinterest. These results echo what was found by Duggan et al. (2015).

In order to compare age and social networking site usage, participants were separated into two age groups: 18-22 and 23-26. This division was selected to correspond with the notion that traditional college students (those who begin college immediately after high school) typically complete a four-year degree between the ages of 18 and 22. As such, anyone who is between the ages of 23 and 26 is more likely to be either an untraditional undergraduate student or a graduate student. Results showed that there was no significant difference in age group and usage of Facebook and Pinterest, but the younger group of students (18-22 year olds) were more likely to use Twitter and Instagram than their older counterparts (23-26 year olds). Facebook’s universal use among the age groups can possibly be attributed to the fact that it is the oldest of the four sites (Phillips, 2007). Facebook was made available for anyone with an email address to sign up for the site in 2006, when the current 23-26 year olds would have been 14-17 years old. Teenagers are often some of the earliest adapters to social networking sites, so it is likely that the older college students joined Facebook as teenagers, but were less
likely to become members of the newer sites, such as Twitter and Instagram (Boness, 2012). Interestingly, this theory could not hold true for Pinterest, which was founded in 2010. However, existing research on Pinterest has reported the site’s popularity across all age groups. Duggan et al. (2015) found that of Internet users that use Pinterest, 27% were 18-29 years old, 24% were 30-49, 14% were 50-64, and 9% were 65 and older. This relatively even breakdown between age groups (when compared to those of other social networking sites) suggests that Pinterest’s hallmark function of allowing users to upload, save, and organize content from all over the web appears to appeal to Internet users of all ages.

**Use of Social Networking Sites for Weight Management**

Two-thirds of the college students surveyed in the present study reported using social networking sites to access weight management information. This statistic falls in line with several other studies of online health information seeking, where researchers have reported around 70-75% of Internet users have reported using the web to access health information (Escoffery et al., 2005; Fox & Duggan, 2013). However, the majority of the existing pool of research involving online health information seeking is based on use of the Internet, rather than social networking sites (Fox & Doggan, 2013; Saperstein et. al, 2007; Singh & Brown, 2014). Furthermore, research on Internet use for nutrition information tends to focus on specific populations, such as pregnant women, or on specific conditions, such as osteoporosis or eating disorders (Huberty et al., 2013; Joshi et al., 2011; Syed-Abdul et al., 2013). The present study confirms that individuals are using
social networking sites along with general Internet searches to access health information, and that weight management is a topic of interest in these searches.

Unsurprisingly, female college students in this study were more likely to report using social networking sites for weight management information, as well as more likely to report that they were currently trying to lose weight. Women have long thought to be more susceptible to the pressures to be thin, and often report higher levels of body dissatisfaction and dieting attempts, and these trends have been reported in many previous studies (Furnham et al., 2002; Lev-Ari, Baumgarten-Katz, & Zohar, 2014; Pingitore et al., 1997; Tiggeman & Rothblum, 1988).

**Weight Management Search Keywords**

Participants in this study reported searching for healthy recipes and exercise information on social networking sites often. Interestingly, trendy diets, including the Paleo diet, gluten-free diet, and cleanses, were searched far less often. This differs from the results of several older studies that have reported the prevalence of the use of fad diets in the college student population (Brevard & Ricketts, 1996; Malinauskas et al., 2006). Thus, this current research could show a promising shift towards interest in healthy lifestyle changes, rather than quick-fix solutions and popular diets that may not be safe or effective, and is something that should be studied in more detail in the future. On the other hand, general terms like ‘healthy recipes’ could encompass just about anything, and it is entirely possible that what many think is healthy might not be. Regardless, understanding the types of information that are being searched for can help healthcare professionals shape their counseling techniques and approaches. For example, registered
dietitians and other nutrition professionals can help to educate their clients on what makes a recipe healthy, and the factors to examine when comparing recipes online. One of the most effective forms of counseling involves a technique known as ‘motivational interviewing,’ which among other tenets, recommends that the counselor meet the client where they are (Hettema, Steele & Miller, 2005). Taking general nutrition concepts such as ‘healthy recipes’ that are very clearly being utilized and turning them into tools for education would be an excellent way to reach clients in a useful fashion.

Female college students were more likely than males to search for healthy recipes and exercise information, whereas males were more likely to search for information on supplements. Searches for healthy recipes and exercise correspond with the scientific consensus that women are more health conscious than men, and would be more likely to be interested in improving their health through diet and exercise (Harring et al., 2010). In contrast, most published research indicates that men “exhibit a greater desire for larger, more muscular bodies, and may use various behavior strategies (e.g., excessive protein supplement use and excessive exercise to increase lean muscle mass) to achieve these sex-specific aesthetic ideals” (Forbush, Wildes, & Hunt, 2014). This use of protein supplementation has been examined frequently, and most researchers have concluded that males are more likely to use protein supplements than females (Bell et al., 2004; Lieberman et al., 2014).

**Perceived Credibility of Social Networking Sites**

Nearly all participants in the current study believed themselves to be good judges of whether information is accurate or not, and just under half of participants felt that the
weight management information on social networking sites was trustworthy. This level of trust has been discussed in previous literature, with one study acknowledging that the peer-driven content on social networking sites has aided in the notion that “one’s peers are an important source of information, with 47% of respondents in one survey reporting that the information they receive from ‘a person like me’ to be extremely or very credible, on par with their trust of industry experts” (Scanfield, Scanfield & Larson, 2010). Research has acknowledged the benefits of peer input in addition to the clinical advice of experts (Hartzler & Pratt, 2011). While clinicians have the knowledge base to offer scientifically sound advice, peers can offer insight into their own personal methods for dealing with an illness or other conditions, such as obesity (Boothroyd & Fisher, 2010). In other words, they can aid in the social support, encouragement, and accountability that are extremely helpful in weight management, to be discussed later. Unfortunately, because individuals without a strong nutrition background can intentionally or unintentionally spread nutrition misinformation, peer sources of information and support should be examined critically for their information accuracy (Esquivel et al., 2006; Wansink, 2006). Thus, as nutrition professionals, it is important to both recognize the use of peer sources as beneficial in some aspects of weight management, but to also teach patients and clients the skills and confidence needed to assess information accuracy.

When compared to other sources of information, the majority of participants agreed that social networking sites were on par with traditional media sources and the Internet in terms of credibility. This slightly differs from previous studies. Though not
specifically looking at weight management information, a study on political information from various sources found that participants perceived information on social networking sites to be significantly less credible than traditional media sources and other online sources. (Johnson & Kaye, 2014). The authors of this study attributed the low credibility scores of SNS to the fact that just 4.5% of their participants reported using SNS for political information. Because the current investigation found that the majority of participants do use SNS for weight management information, this could explain why SNS was perceived to have similar levels of credibility as traditional media sources.

Interestingly, although overall trust in social networking sites was high, few participants felt that site-specific information was credible. Less than 10% of participants reported agreeing or strongly agreeing that the information found on Facebook was credible, and just 12% agreed or strongly agreed that the information on Twitter was credible. A slightly larger percentage of participants (20%) felt the information on Instagram was credible, and the information found on Pinterest was perceived to be most credible, with over 50% of participants agreeing or strongly agreeing. There have been no studies to date to possibly explain why individuals perceive Pinterest to be more credible than other social networks, but it is possible that because Pinterest is really just a way to collect links and information from other sites, it is easier for users to go back to the original source and verify information.

Research has found that “credibility is a judgment made by the user based on a host of factors” (Johnson & Kaye, 2014). When participants of the current study were asked to rate the importance of several of these factors in deciding whether to trust the
content of a social networking account, credentials of an account and recency of updates were the two attributes found to be most important. These attributes were also found to be important in establishing trust in previous research by Morris et al. (2012) and Westerman et al. (2014). Additionally, nearly half of participants felt that quality of photos and the quantity of updates are were important, and about a third felt that the number of followers was an important factor in their trust assessment.

The use of factors such as these to establish trust can help bridge the gap between the seemingly contradictory results about credibility discussed above. Although small numbers of participants in the current study agreed or strongly agreed that information on Facebook, Twitter, and Instagram was credible, they still considered social networking sites as a whole to be trustworthy sources of weight management information. McCoy (2010) found that young adults are more likely to consider themselves to be technologically proficient than older adults. Perhaps college students feel strongly enough in their ability to examine individual accounts for various attributes of trustworthiness that they are able to pick out the credible accounts and ignore the not-so-credible ones.

**Weight Management-Related Posting and Browsing Habits**

In examining the frequency with which participants perform certain habits online, it was found that, in terms of weight management, they are more likely to take on a passive role on social networking sites, rather than an active one. In other words, the college students surveyed in this investigation were more likely to browse existing weight management information, and “like” or share information found from other sources.
They were less likely to post about their own personal goals and progress. This highlights the new role that social networking sites have in information seeking, with several studies reporting that individuals are using social networks in the way they would a search engine, such as Google (Morris et al., 2010; Park et al., 2009; Sin & Kim, 2013). The use of social networking sites for encouragement and accountability in weight management will be discussed below, but the results from the present study have found that in addition to this social support aspect, social networking sites have become viable places to browse and search for information.

**Perceptions on Social Support**

The degree to which social support is available on social networking sites has been discussed frequently in previous literature. The general consensus is that social networking sites can be an excellent source for support, especially in health-related communication (Farmer et al., 2009; Greene et al., 2011; Sarasohn-Kahn, 2008). The present study found that two-thirds of participants agreed or strongly agreed that social networking sites are a great place to receive encouragement and support for their weight management goals. Existing research has found that one of the most beneficial aspects of online weight loss communities is that the interactions between users promote accountability, which is often seen in traditional and effective weight control programs (Hwang et al., 2009; Turner-McGrievy & Tate, 2013; Womble et al., 2004). Although in most cases, these interactions are considered a benefit, research has found that this type of constant exposure to others’ experiences “may arouse feelings of anxiety and confusion and can lead to unrealistic expectations, false hopes, or even despair, fear,
guilt, anger, and inadequacy if others seem to be managing better” (Ziebland & Wyke, 2012). Over half of the college students in the present study reported that they find themselves comparing their progress and goals to those of the other people they follow on social networking sites. Forty-two percent reported getting discouraged about their own progress if it appears that their other friends or followers are achieving results at a faster pace. Thus, it is important to keep in mind that while many individuals find that social networking sites can aid in adherence to lifestyle changes, others still report some negative effects to their usage.

Applications

According to the results of this study, two-thirds of college students reported using social networking sites for weight management information. Furthermore, these students reported overall that this information was trustworthy. In actuality, nutrition myths run rampant online and the spread of misinformation is common (Kouris-Blazos, Setter, Wahlqvist, 2001; Nguyen et al., 2012). Because it is unlikely that college students will let the potential for misinformation stop them from using these sites for information, healthcare professionals should consider an online presence on the popular social networks in order to reach the masses and disseminate factual nutrition information to combat the inaccuracies that arise. By the same token, healthcare professionals need to make absolute certain that the information that they post or share is ethical and reputable, as the college students in this study reported that they do look for the credentials of online accounts before trusting the information. Dietitians and other health educators that are knowledgeable about social networking sites and their uses can help to educate their
clients on ways to assess nutrition information for its accuracy, as well as show them where to go to find trustworthy information online.

The results of this study highlight social networking sites as popular sources for weight management information among the college student population, which indicates that these sites can be utilized as tools to promote a healthy lifestyle. Because of the frequency with which college students are checking social networking sites daily, a Facebook group or Twitter feed promoting healthy lifestyle changes or physical activity could easily become something that is accessed routinely. On a larger scale, nutrition and wellness campaigns that target the college student population should adopt social networking sites as part of their platforms in order to reach students through the communication channels that are actually being used.

**Limitations**

Though the current study found that participants felt weight management information on social networking sites was trustworthy and credible overall, it is possible that the results were influenced by the fact that these participants already reported using social networking sites for this purpose. Previous research has found that “credibility is strongly related to how often individuals use a particular medium” (Johnson & Kaye, 2000). As such, future research should examine the differences in perceived credibility between groups that report using social networking sites for weight management and groups that do not.

Another limitation is the much higher percentage of female respondents to this survey. This was expected, as it has found that college females are more likely to
respond to Web surveys than male students (Underwood, Kim & Matier, 2000). Furthermore, because the subject matter pertains to weight management and females have been shown to express more of an interest in this topic than males, they may have been more likely to respond to the survey. Future research should attempt to control for similar-sized gender groups.

Finally, this study examined just four social networking sites, selected based on their popularity and use of similar functions, such as a search bar and profile pages, where accounts can display attributes like credentials, number of followers, and more. Other social networking sites, such as Snapchat and Tumblr, were considered for inclusion in this study, but ultimately were rejected. Snapchat’s popularity continues to rise among young adults, but the app has some limitations that make it difficult to be compared with the four SNS in this study. Because of Snapchat’s hallmark function of allowing for messages to be deleted just a few seconds after users open them, the present iteration of Snapchat has no search function and old Snapchats cannot be displayed in any way unless users take a screenshot and save them as photos. This means that users are unable to actively seek information on the site. Furthermore, Snapchat offers no real profile page in which to be used to assess account credibility. Tumblr does offer more of the functions described above, but it is considered, in essence, to be more of a blogging platform than a social network. Additionally, Tumblr’s user base is much smaller, with just 13% of young adults reporting that they use the site (Desilver, 2013). Future studies should expand the research to more social networks to truly get a better picture of all the ways they are being used as weight management tools.
Conclusion

Research has been struggling to keep up with the ever-changing atmosphere of new media, such as social networking sites. This present study gives new insight into the ways college students are using social networking sites for weight management, including the types of keywords that are being searched and the types of browsing and posting behaviors that are being utilized. This study also helps to examine perceived credibility of social networking sites, which is something of importance as researchers are still examining the best ways to measure perceptions on credibility. The conceivable applications for this study are vast, and these results could be used to educate college students and healthcare professionals alike. Social networking sites are still so new that their full potential has yet to be seen, but this current study has uncovered several ways their features can be applied to aid in weight management.
APPENDICES
APPENDIX A

CONSENT FORM
Appendix A

Consent Form

The Use of Social Networking Sites for Weight Management Information

Thank you for your interest in completing this questionnaire! Before taking part in this study, please read the consent form below and click on the "I Agree" button at the bottom of the page if you understand the statements and freely consent to participate in the study.

Consent Form

This study involves a web-based questionnaire designed to examine how college students use social networking sites (such as Facebook, Twitter, Instagram & Pinterest) to access weight management information (information on weight loss, weight gain, or weight maintenance), as well as how credible information found on these sites is perceived to be. This study is being conducted by Professor Eun-Jeong Ha, an associate professor of Nutrition & Dietetics, and Alyssa Pupino, a graduate student in Nutrition & Dietetics. It has been approved by the Kent State University Institutional Review Board. No deception is involved, and the study involves no more than minimal risk to participants (i.e., the level of risk encountered in daily life).

Participation in the study typically takes around 15 minutes and is strictly anonymous. Participants begin by answering a series of demographic questions and questions about their social network usage. Next, questions will ask about the credibility of information found on social networking sites, and the degree to which participants partake in sharing and posting information online. Several questions will also examine social networks as a source of support and community. Finally, questions will ask participants about their own personal weight goals.

All responses are treated as confidential, and in no case will responses from individual participants be identified. Rather, all data will be pooled and published in aggregate form only. Participants should be aware, however, that the experiment is not being run from a "secure" https server of the kind typically used to handle credit card transactions, so there is a small possibility that responses could be viewed by unauthorized third parties (e.g., computer hackers).

No adverse reactions have been reported thus far during the completion of this questionnaire. Participants will be given the option of entering a raffle for three $25 Amazon e-gift cards. Contact information obtained for the gift card raffle will not in any way be linked to responses from the questionnaire. Participation is voluntary, refusal to take part in the study involves no penalty or loss of benefits to which participants are otherwise entitled, and participants may withdraw from the study at any time without penalty or loss of benefits to which they are otherwise entitled.

If participants have further questions about this study or their rights, or if they wish to lodge a complaint or concern, they may contact the principal investigator, Professor Eun-Jeong Ha, at (330) 672-2701; or the Kent State University Institutional Review Board, at (330) 672-2704.

If you are 18 years of age or older, understand the statements above, and freely consent to participate in the study, click on the "I Agree" button to begin the survey.
General Demographics Questions

1. What is your age?
   - Younger than 18 → go to end of survey
   - 18
   - 19
   - 20
   - 21
   - 22
   - 23
   - 24
   - 25
   - 26
   - Older than 26 → go to end of survey

2. What is your gender?
   - Male
   - Female
   - Transgender

3. What is your ethnicity?
   - Caucasian
   - Hispanic
   - African American
   - Asian
   - Native American
   - Other (please fill in) ______________________
   - Prefer not to answer

4. What is your major? __________

5. What is your class rank?
   - Freshman
   - Sophomore
   - Junior
   - Senior
   - Graduate student
The following set of questions will ask you about your usage of several social networking sites: Facebook, Twitter, Instagram and Pinterest.

6. How many times per day do you check the following social networks (on your laptop, smartphone, or other device)?

<table>
<thead>
<tr>
<th>Social Network</th>
<th>Less than once per day</th>
<th>1-5 times per day</th>
<th>6-10 times per day</th>
<th>11-15 times per day</th>
<th>16-20 times per day</th>
<th>More than 20 times per day</th>
<th>I do not use this site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instagram</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinterest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. On average, how much time do you spend on the following social networking sites every time you check them?

<table>
<thead>
<tr>
<th>Social Network</th>
<th>Less than 5 minutes</th>
<th>5-15 minutes</th>
<th>15-30 minutes</th>
<th>30 minutes-1 hour</th>
<th>Greater than 1 hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facebook</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Twitter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instagram</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pinterest</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Have you ever used one or more social networking sites to search for weight management information? This can include information on specific diets, healthy recipes, supplements, exercise plans, or other general nutrition tips.
   - Yes $\rightarrow$ go to 9a-20a
   - No $\rightarrow$ go to 9b-19b

**Trust and Credibility Set 1 (for those who answer YES in #8)**

9a. The weight management information and advice I read on social networking sites is trustworthy.
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

10a. Weight management information on social networking sites is just as accurate as what I would hear from a healthcare professional (ex: doctor, nurse, registered dietitian)
   Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree
11a. Weight management information on social networking sites is just as accurate as what I would get from mass media sources, such as television, books, or magazines.

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

12a. Weight management information on social networking sites is just as accurate as what I would get from the Internet (ex: what I would find with a Google search)

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

13a. Weight management information on social networking sites is just as accurate as what I would hear from friends or family.

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

14a. There is little risk involved in following nutrition information on social networking sites.

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

15a. I consider myself to be a good judge of what information is accurate and what information isn’t.

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree

16a. I consider the information I find on Facebook to be credible

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree  Do Not Use

17a. I consider the information I find on Twitter to be credible

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree  Do Not Use

18a. I consider the information I find on Instagram to be credible

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree  Do Not Use

19a. I consider the information I find on Pinterest to be credible

Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree  Do Not Use
20a.

Think about the following attributes of a social networking account. How important are they in deciding whether or not to trust weight management information from the account?

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Not at all Important</th>
<th>Very Unimportant</th>
<th>Neither Important nor Unimportant</th>
<th>Very Important</th>
<th>Extremely Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of followers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credentials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality of photos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity of updates or posts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recency of updates or posts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquaintance in real life</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acquaintance online (ex: you follow each other or have interacted before)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Trust and Credibility Set 2 (for those who answered NO in #8)

9b. The information and advice I read on social networking sites is trustworthy.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

10b. Information on social networking sites is just as accurate as what I would get from mass media sources, such as television, books, or magazines.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

11b. Information on social networking sites is just as accurate as what I would get from the Internet (ex: what I would find with a Google search)
   Strongly Disagree Disagree Neutral Agree Strongly Agree

12b. Information on social networking sites is just as accurate as what I would hear from friends or family.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

13b. There is little risk involved in following information on social networking sites.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

14b. I consider myself to be a good judge of what information is accurate and what information isn’t.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

15b. I consider information I find on Facebook to be credible
16b. I consider information I find on Twitter to be credible
Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree  Do Not Use

17b. I consider information I find on Instagram to be credible
Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree  Do Not Use

18b. I consider information I find on Pinterest to be credible
Strongly Disagree  Disagree  Neutral  Agree  Strongly Agree  Do Not Use

19b.

Think about the following attributes of a social networking account. How important are they in deciding whether or not to trust weight management information from the account?

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Not at all Important</th>
<th>Very Important</th>
<th>Neither Important nor Unimportant</th>
<th>Very Important</th>
<th>Extremely Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of followers</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Credentials</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Quality of photos</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Quantity of updates or posts</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Reacency of updates or posts</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Acquaintance in real life</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Acquaintance online (ex you follow each other or have interacted before)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

After these credibility questions, participants who answered Yes in Question 8 will continue on to the remainder of the survey. Participants who answered No will skip to Question 29, where they will answer the entire section except for Question 39 (to be answered only by those who responded Yes to Question 8).
### SNS Posting Habits

This set of questions asks about your weight management-related posting habits on social networking sites. Please note how often you do the following things on social networking sites.

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Quite Often</th>
<th>Very Often</th>
</tr>
</thead>
<tbody>
<tr>
<td>I browse nutrition or weight management posts without posting content of my own</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I post updates that share my weight management struggles and successes with my followers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I post &quot;before&quot; and &quot;after&quot; photos of myself in order to share my weight management progress with my followers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I use nutrition or weight management-related hashtags on my posts so they will be found by other people interested in similar topics</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I ask questions or get clarification about weight management or other nutrition information</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I share advice about which weight management approaches have worked for me and which have not</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I &quot;like&quot; or &quot;favorite&quot; posts from other people that I agree with or find interesting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I share, repost, or reweet posts from other people that I agree with or find interesting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I comment on posts from other people that I agree with or find interesting</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### SNS Use for Social Support

22. Social networking sites are a great way to receive encouragement and support as I work towards my weight goals and other health objectives.

Strongly Disagree    Disagree    Neutral    Agree    Strongly Agree
23. I feel a strong sense of community with my followers and the people I follow on social networking sites.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

24. It would be difficult to manage my weight without the support of my followers and the people I follow on social networking sites.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

25. Posting about my personal progress on social networking sites is a good way to stay on track to achieve my goals.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

26. The information and advice I see on SNS is attainable and realistic for me to follow.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

27. I often find myself comparing my progress and my goals to those of the people I follow on social networking sites.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

28. I get discouraged about my own progress if it appears that my friends or other followers are achieving results faster than I am.
   Strongly Disagree Disagree Neutral Agree Strongly Agree

**General Weight Loss Questions**

29. What is your current body weight in pounds?
   ______ lb

30. What is your current height in feet and inches?
   ___feet ___inches

31. Are you currently trying to:
   - lose weight \(\rightarrow\) go to #32
   - stay the same weight
   - gain weight \(\rightarrow\) go to #34
   - I am not trying to do anything about my weight

32. In the past year, have you lost weight?
   - Yes
   - No

33. How much weight have you lost in the past year?
   ______ lb
34. In the past year, have you gained weight?
   - Yes
   - No

35. How much weight have you gained in the past year?

36. What is your goal body weight in pounds?
   _____ lb

37. In what timeframe are you hoping to achieve this goal?
   - [drop down menu for numbers] [drop down menu for “days, weeks, months, years”]

38. 
   During the past year, how often have you done each of the following things in order to lose weight, gain weight, or keep from gaining weight?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>On a Regular Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed my eating</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ate more fruits and vegetables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ate less high-fat foods</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ate less sweets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watched my portion sizes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drank less sugar-sweetened beverages (such as regular soda pop, fruit juice, gourmet coffee drinks, sweet tea, and energy drinks)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   (Neumark-Sztainer, 2010).
39.

In the past year, how often have you searched for the following on any social networking site?

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Quite Often</th>
<th>Very Often</th>
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<tr>
<td>Low calorie diets</td>
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<td>High protein diets</td>
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<td>Low fat diets</td>
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<td>Low carbohydrate diets</td>
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<td>Paleo diets</td>
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<td>Gluten-free diets</td>
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<td>Mediterranean diets</td>
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<tr>
<td>Vegetarian or vegan diets</td>
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<td>Liquid diets</td>
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<td>Cleanses</td>
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<td>Healthy recipes</td>
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<td>Supplements, such as whey protein</td>
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<td>Vitamins and minerals</td>
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<td>Nutritional foods, such as Quest Bars</td>
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<td>Exercise or fitness plans</td>
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<td>Weight management programs, such as Weight Watchers</td>
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<td>Bariatric or weight loss surgery</td>
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</tbody>
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REFERENCES
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healthy diet. *International Journal of Food Sciences and Nutrition, 64*(8), 1007-1013.


