

**An Examination of Mental and Physical Health in College**

By

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## Abstract

The transitional years of college that a traditional student faces are full of change and adaptation; these years of emerging adulthood require learning how to balance new responsibilities. Although this new independence can be liberating, this transitional time has been found to be a stressful period of life (Kaddison & DiGeronimo, 2004). The purpose of this study is to examine longitudinal changes in percent body fat and experience of depressive symptomology throughout emerging adulthood. Research indicates that mental health can directly affect physical health (Faith, Butryn, Wadden, Fabricatore, Nguyen, & Heymsfield, 2011). The participants for this study consisted of 535 (n=190 males, and n=345 females). The data indicated that although emerging adults in this sample showed symptoms of depression throughout college, their level of depression symptomology was more in line with sub-threshold depression rather than being diagnosed with depression. In regards to body fat, an average of 3.39 percent body fat was gained over the four years of college. When depression symptomology was used to predict changes in body fat significant results were not found. However, females' depression symptomology was a significant predictor of initial (freshman year) percent body fat. Therefore, with mental and physical health being so important in emerging adulthood research needs to continue to focus on these variables.

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## **Chapter 1**

### **Introduction**

Approximately 47% of emerging adults (age 18-25) in America are enrolled in some type of post-secondary education (U.S. Department of Commerce, 2011). Between 2000 and 2010, the percentage of emerging adults enrolled in college increased by thirty seven percent; more specifically, in that same time period the percentage of college students who were in the emerging adult age group (18-25) rose twelve percent—to 30.7 million (U.S. Department of Education, 2012). As evidenced by the large numbers of emerging adults enrolled in college, research focused on emerging adulthood needs to include college students. The transitional years of college that a traditional student faces are full of change and adaptation; these years of emerging adulthood require learning how to balance new responsibilities. It is a time period that requires emerging adults to branch out on their own and establish new patterns, away from their parents. Although this new independence can be liberating, this transitional time has been found to be a stressful period of life (Kaddison & DiGeronimo, 2004).

The stress that students feel during the transition to college has been connected to financial problems, academic pressures, psychological concerns, and overall negative adjustment patterns (Ratanasiripong, Sverduk, Hayashino, & Prince, 2010). These stressors have a direct relationship to the maladaptive coping strategies college students utilize during this period of strain, such as, self-injurious behavior, and binge eating (Ratanasiripong et al., 2010). With almost 95% of college students feeling overwhelmed by the pressure from academia, some of these stressors may be a contributing factor to the high rates of depression symptoms and/or the physiological changes found among this population (American College Health Association, 2009). Almost half of all college students have reported experiencing feelings of depression

during their freshmen year (Furr, Westefeld, McConnell, & Jenkins, 2001). Students also report that these depressive symptoms make it difficult for them to function in academia (Taliaferro, Rienzo, Pigg, Miller, & Dodd, 2008). As a result, experiencing depressive symptoms can affect grades and the ability to stay in college. One explanation of why this specific population has such high depressive symptoms is the ways in which they utilize coping skills (Brougham, Mendoza, & Miller, 2009).

Adaptive coping skills allow for individuals to calm themselves through positive methods and have been shown to even increase academic functioning (Brougham, Mendoza, & Miller, 2009). Conversely, college students tend to utilize maladaptive coping skills in periods of stress. One maladaptive coping skill that has been extensively studied is eating disorders in emerging adulthood (Hudd et al., 2000). Eating disorders have short and long term consequences. Because emerging adults tend to utilize maladaptive coping skills, it is not surprising that only a small percentage of emerging adults take advantage of counseling services. Even when students are experiencing depressive symptoms their engagement in counseling is low. It is estimated that about 70% of these students reach out for counseling services; yet only 8% are going to more than one counseling session (Eisenberg, Golberstein, & Gollust, 2007). When students do utilize regular counseling services they report positive results (Tucker, Sloan, Vance, & Brownson, 2008), indicating that there is a large disconnect between the services needed and the services being used. Addressing this issue may require developing a broader understanding of depression, and depressive symptomology, among college students. This may help identify patterns and may shed light on when students are the most in need of psychological services. This also may assist college counselors in targeting important time points and help students with depression symptoms develop healthy coping strategies (Pierceall and Keim, 2007). This is

critical since these depressive symptoms have the potential to affect other areas of students' lives, such as their physical health (Carnelley, Pietromonaco, & Jaffe, 1994). The term physical health tends to be an all-encompassing term that includes immune response, body fat, bone density etc... This factor is important to study because of the maladaptive coping skills that are being utilized in this population. For example, physical health is significantly changed when a student is struggling with regulating his/her food intake. One strong indicator of physical health is body composition, which has been shown to change among students during the college years (Morgan et al., 2012).

This critical period of emerging adulthood has several key aspects going on simultaneously; students are embarking upon a time of new independence and depression symptoms and body fat percentage are significantly increasing. All of these changes are leading researchers to focus on the significance of studying emerging adults and the changes that are happening both mentally and physically.

### **Significance**

Increases in depression symptoms and negative changes in percent body fat during emerging adulthood are both well documented (Garlow et al., 2008; Kisch, Leino, & Silverman, 2005). We know that about fifty percent of college students report having feelings of depression (Furr et al., 2001). Depression symptoms can decrease a person's ability to function, by delaying tasks or not accomplishing day-to-day activities (American College Health Association, 2009). Although depression symptoms can have detrimental effects, only a small percentage of students take full advantage of counseling services available on college campuses (Eisenberg, Golberstein, & Gollust, 2007). When students are able to successfully employ healthy coping



strategies, overall adjustment to college has been shown to be easier (Dyson, & Renk, 2006). It is evident that the majority of students in need of counseling services are not seeking help during a time when maladaptive coping strategies are significantly prevalent (Hirsch and Ellis, 1996). These destructive coping strategies can lead to negative health effects in students during a demanding time period. One unhealthy coping strategy in college surrounds food, which is directly linked to the negative effects on anthropometric measures.

There is clear evidence that a significant number of college students experience depressive symptoms at some point during college. Potentially paralleling this are the significant changes in body composition. Even with this research, we are still unclear about the relationship that exists between these two critical variables. The current literature depicts small aspects of either the increase of emerging adults' depression symptoms or changes in body composition but rarely does research encompass both. Because lifelong habits are formed in emerging adulthood (Nelson, et al., 2008) and significant changes in depression symptoms and body composition occur during this time, a study is needed that examines the relationship between these items. More specifically, to gain a clear picture of the relationship between depression symptoms and percent body fat a longitudinal study across the college years would greatly increase the current body of literature. A longitudinal study that encapsulates the relationship between depression symptoms and percent body fat would significantly add to the literature and better facilitate college counselors in reaching students at critical times when depression symptoms are highest.

### **Purpose of the study**

The purpose of this study is to examine longitudinal changes in body fat and experience of depressive symptomology throughout emerging adulthood. The relationship that lies between

physical and mental health is one that is complex and has yet to be fully exposed. Research indicates that mental health can directly affect physical health (Faith, Butryn, Wadden, Fabricatore, Nguyen, & Heymsfield, 2011). For example, emerging adults who perceive themselves as being depressed are more likely to partake in risky behaviors, therefore putting themselves in physical harm (Angst, 1996). Additionally, emerging adults who struggle with obesity are more likely to perceive themselves as being depressed. To better understand this relationship in a longitudinal fashion, the current study is focusing on students' depression symptoms and changes in body fat over college. The ultimate goal of this study is to provide college counselors with an understanding of the longitudinal relationship between depression and body composition. This will ultimately allow professionals working with emerging adults to focus resources around peaks of depression; therefore students will be able to receive services at stressful time periods in emerging adulthood. Lastly, this study hopes to have a residual effect on body composition, such that as students are able to receive services for depression their physical health will be maintained or improve over emerging adulthood.

### **Research questions**

Q1: How does percent body fat change during college?

Q2: How do depressive symptoms change during college?

Q3: Are there significant gender differences in the way in which depressive symptoms predict percent body fat during college?

### **Definition of terms**

**Emerging adulthood.** The term emerging adulthood was first introduced by Arnett (2000). Arnett saw a need for a new term that defined and encompassed the changing life stage associated with transitioning from adolescence to adulthood. This term was established because certain aspects of adulthood were being delayed. These delays included financial independence, marriage, and childbearing. The term emerging adulthood is now used for individuals within the 18-25 age range.

**Percent body fat.** The chemical composition of the human body includes water, protein, fat, and minerals with smaller amounts of vitamins and carbohydrates. Of these components, water on a percentage weight basis is the largest, representing about 55% to 65% of weight. Protein, consisting mostly of muscle and organ mass, accounts for about 14% to 18%, and minerals about 5% to 6%. The remaining component fat accounts for about 15% to 30% of body weight. These percentages differ between males and females. Additionally, some components are more readily influenced by lifestyle changes such as diet and physical activity, than others. In this study, changes in body fat were assessed. Excess amounts of body fat increase the risk for health problems such as type 2 diabetes mellitus, heart disease, some cancers, and metabolic syndrome.

## **Chapter 2**

### **Literature Review**

#### **Introduction**

The transition from adolescence to adulthood is one of the most important transitions a person makes in their lifetime. This transition is so vital because of the lasting affects it has on later adulthood. This specific time in life is so imperative for development and later life that it has now been categorized as a separate life phase, emerging adulthood (Arnett, 2000). During this time of emerging adulthood, a large amount of responsibility and changes are occurring. Most of these new responsibilities emerge in the college years. Approximately 30.5 million students who are 18-25 years old now attend college each year (U.S.Department of Commerce, 2011). This transition is linked to many of the issues and challenges adolescents experience as they move into emerging adulthood. Specifically, this transition means that millions of emerging adults every year are faced with new challenges both mentally and physically. These challenges include: moving out of the security of their parents' home, developing new habits, and being more independent (Mulder & Clark, 2002).

College is a vital time in most young adults' life; not only is college where students go to develop their career goals, but it is also a time of growing individuality (Mulder & Clark, 2002). This individuality allows for young adults to set standards for themselves. The standards that college students may begin to set for themselves include significant life habits that impact their physical and mental health. Moreover, this emerging adulthood time period, between the ages of 18-25, is also very significant because it is when adults begin to formulate their perceptions of the world and themselves (Nelson, et al., 2008). Research has demonstrated that this can be a

quite difficult task for emerging adults; all of the difficulties that emerging adults face in this time period is still unclear. For this specific population there are rapid changes in both physical and mental health (Morgan et al., 2009). Some of the mental health changes might be best reflected by the growing rates of depression symptoms among this population. It is estimated that there are rates of depression symptoms on some college campuses near fifty percent (Furr, Westefeld, McConnell, & Jenkins, 2001). This high rate of depression symptoms are evidence that counselors need to gain more knowledge in the area of depression within emerging adulthood. Additionally, researchers have wondered about the relationship between this staggering statistic and other life changing areas among emerging adults.

Mental health is a life changing area for emerging adults, so too is the change that occurs in their physical health. Changes in body composition during the college years have been well-studied, especially during the freshman year. More recently, other studies have expanded the period of study into the third and fourth years of college, and report increases in body fat among both male and female college students (Morgan et al., 2012; Gropper et al., 2012; Hull, Morrow, Dinger, Han, & Fields, 2007). Reasons for the increased body fat are not as clear, but potential factors include: physical inactivity, residency, types of food eaten, and change in schedule (Levitsky, Halbmaier, & Mrdjenovic, 2004). However it has been suggested that these variables may not totally address all the dynamics involved in this physical change (Levitsky, Halbmaier, & Mrdjenovic, 2004). The consequences of increased body fat include higher risk for some diseases such type 2 diabetes and metabolic syndrome, but also can affect students' mental health (Blaine, 2008).

These changes within physical and mental health can have lifelong effects on habits formed in emerging adulthood, which are important to investigate during college. Thus, it is

important to have a greater understanding of these variables. This may provide a foundation to help counselors working with emerging adults stop negative life patterns and lead healthier lives. Adults in the midst of emerging adulthood tend to gain weight (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008). Although emerging adults are at their prime in terms of immune response, muscle growth, and bone density (Weng, 2006), this weight gain at such a critical time could potentially derail this naturally healthy time period. Additionally, those who are struggling with obesity are twice as likely to be diagnosed with depression (Roberts, Deleger, Strawbridge, & Kaplan, 2003). Again, there is research that begins to identify the relationship between physical and mental health, but we still do not fully understand the link between rates of depression symptoms in college and changes in body fat during emerging adulthood. If counselors were able to better grasp the direction of significance within these variables, more support could be provided to emerging adults. This new understanding could potentially help researchers to see whether or not mental health affects physical health or vice versa in emerging adulthood.

Although body fat percentage has been shown to increase over the college years, one area that is less understood is the link between mental health and this physical change. With body fat changing in college and such a large percentage of college students self-reporting high rates of depressive symptoms through college (Furr, Westefeld, McConnell, & Jenkins, 2001), it is vital that these two variables be critically examined simultaneously. Because of this critical time in emerging adulthood and the many changes that are taking place, this research study examined the relationship between students' depression symptoms and changes in their body fat over college. In reaching students at critical time points in college, depression symptoms could potentially drop, thus leading to numerous positive benefits such as lower self-perceived

depression rates and a healthier body composition. To better understand this population and the issues within emerging adulthood, several variables need to be properly expanded upon. The following sections of this study address more detail concerning emerging adulthood, the significance of that time period, coping strategies used within emerging adulthood, changes within mental and physical health during emerging adulthood, and what current research says concerning the relationship between mental and physical health in emerging adulthood.

### **Emerging adulthood**

The self-depreciating health and lifestyle of children and adults has been described as a major health problem, one that impacts health rates and overall life satisfaction (Ebbeling, Pawlak, & Ludwig, 2002). However, less is known about emerging adults. To properly study the population of emerging adults, it is vital to first understand this specific life phase. The term emerging adult is one that has developed because of a change in our culture. When Erikson (1950) first developed life stages he organized the teen years from the beginning of puberty to late teens, he documented a person moving from a teenager to early adulthood (18-40 years of age). This life stage was based upon the average person getting a full-time job, marrying, and starting a family, around age twenty. However, since Erikson introduced the theory of life stages our society as a whole has undergone significant transitions. Our society as a whole has continued to postpone marriage, childbearing, entering into the work force, and even being financially independent (Arnett, 2000). For example, in the United States the average age of first marriage is now almost thirty (Arnett, 2007). Within the industrial society in which we live, most in the age group of 18-25 are not yet financially stable and have yet to marry (Cote, 2006). This transitional time is no longer a brief period, it is a significant life stage that allows for autonomy to be developed and a deeper understanding of the world to be increased (Douglass,

2007). Therefore, this stage in life, when young adults are slowly emerging into roles and responsibilities, has distinct features from the normality of adulthood. Within emerging adulthood, expectations and boundaries are being set about the social environment and people within it (Orr, 2009). Therefore a great deal of these expectations concerning the world and how each emerging adults see themselves within that context is formed in the environment of post-secondary education.

Currently, approximately 31 million American, emerging adults attend some type of post-secondary education and most who are in this life stage of transition are exploring various ways to live and learn (U.S. Department of Commerce, 2011). It is within this critical life stage that habits are formed and life patterns begin to be developed (Nelson, et al., 2008). These habits that are formed in emerging adulthood focus around a variety of life's basic needs. Emerging adults are no longer under the primary care of their parents; therefore they are managing things like food, activities, and finances. Without the support system that these emerging adults are used to, normative behaviors are altered (Cluskey & Grobe, 2009). In addition, not only are emerging adults learning to live without the support system of their parents, most are having to make new friends (Cluskey & Grobe, 2009; Nelson, 2005). Being challenged to form a new peer group can be stressful, and cause a person to reestablish their perception of the world and how they fit into that world.

Within the first year of college many life changes are taking place for emerging adults: moving away from parents, increase financial responsibility, and a greater sense of personal choices. These choices such as physical activity and diet in college predispose emerging adults to significant health concerns later in life; with more active emerging adults who are conscious of their diet having less health concerns later in life (Racette, Deusinger, Strube, Highstein, &



Deusinger, 2005). With these choices come more changes for emerging adults. Some of these changes include living arrangements. Living arrangement for college students tend to change from year to year and have been found to be correlated to changes in body fat (Hull et al., 2007). These changes go beyond their physical health that was mentioned earlier and also include a change in emerging adults' mental health, an increase in depression symptoms (Michael, Huelsman, Gerard, Gilligan, & Gustafson, 2006; Wethington, 2005).

As discussed earlier, emerging adults are challenged with several changes within this short, yet significant time period. Although we know that depression symptoms are high for emerging adults, there are more aspects of emerging adults that need to be understood. During emerging adulthood this group is challenged to redefine themselves in terms of how they see themselves in the world (Michael, et al., 2006). Due to the significant changes happening in emerging adults' lives, their first year of college has been marked as a critical period in life. Changes that happen in emerging adulthood include the redefinition of peer groups, support systems, and relocation. Therefore, it is logical that researchers have predominately focused on the first year of college. It is within the first year of college that these rapid life changes that affect mental and physical health can be clearly seen.

One of the challenges when considering the physical and mental health changes among this population is the lack of research looking at these issues across the emerging adult time span. The majority of research on emerging adults has focused primarily on the first year of college (Vella-Zarb & Elgar, 2009). Although these initial findings for emerging adults surrounding mental and physical changes helps to lay the ground work for the field, more specific, longitudinal data are needed to understand the relationship between mental and physical health in emerging adults. Current research on emerging adults indicates that within the first

year of college there is indeed an increase in depression symptoms (Furr et al., 2001) and a negative change for their percent body fat (Morgan et al., 2012). Other research within this area indicates that negative changes in percent body fat continue to happen throughout the first few years of college (Hoffman, Policastro, Quick, & Lee, 2006; Hull et al., 2007; Gropper et al., 2012). Although we understand that there is a relationship between these two variables, we do not fully understand how these two aspects of emerging adulthood relate to each other over the entirety of emerging adulthood. Longitudinal data surrounding these two variables would allow for researchers and counselors to pinpoint when exactly emerging adults are having negative changes in their mental and physical health. With longitudinal data focused on emerging adults' patterns of change in their physical and mental health, counselors would be able to set interventions in place at critical time periods in college. If interventions are set in place to help these emerging adults build healthy patterns of behavior and ways to cope with life's stressful events then long term health benefits could emerge. Therefore, to be able to gain more knowledge about emerging adults and how their habits and life transitions are formed, the best place to observe and collect data would be from a secondary educational setting. One area that can specifically be examined when analyzing changes in emerging adulthood is through mental and physical changes that emerge through the life stage of gaining more independence and knowledge. In the next section, the mental health of emerging adults will be discussed along with resources that are normally found on a college campus.

### **Mental health in emerging adulthood**

There is a great amount of research that has been conducted surrounding the mental health concerns of emerging adults. One reason why such importance has been placed on mental health in emerging adulthood is the significance of this life stage. College students are able to

focus a great deal of time and energy on their growth into the person they desire to become (Hunt and Eisenberg, 2010). This sensitive population has shown to have an increase in their need for mental health services during emerging adulthood (Kitzrow, 2003). In a national survey done in 2008, 95% of directors from college counseling centers reported a significant increase in services being used by students (Gallagher, 2008). This directly reflects the changes in services provided at college counseling centers. In the past, most college students utilized their college counseling center for planning and developmental services; today counseling centers are used more for serious diagnosis (Gallagher, Sysko, & Zhang, 2001). Approximately 43% of college students who utilize their counseling center are diagnosed with a severe psychological problem (Gallagher, 2004). Yet only 24% of emerging adults who are diagnosed with depression seek services in college (American College Health Association, 2009). This is concerning for two reasons; first a large percentage of students in need are not receiving services, and second, those who are experiencing depression and not receiving services are more likely to have stronger symptoms and relapse over their lifetime (Ryan, 2003).

One of the most significant mental health changes we have seen among emerging adults is the increase in the numbers reporting depression or those with sub-threshold depressive symptomology (Fergusson, Horwood, Ridder, & Beautrais, 2005). It has been reported that nearly 53% of emerging adults self-identify with experiencing depression symptoms at some point in their college experience (Furr, Westefeld, McConnell, & Jenkins, 2001). Depression symptoms in college can lead to a lack of motivation, a decrease in academic scores, and a higher risk of violent behavior (Arehart-Treichel, 2002). Over the last ten years there has been an increase of approximately 5% of students who rate their mental health as needing professional services, indicating that the worry we have with depression in emerging adults is a prominent concern

(National Research Council & Institute of Medicine, 2009). The ramifications that mental health concerns can have on emerging adults are significant. Students with a high rate of depression symptoms are more likely to have a decrease in grade point average (Ding, Lehrer, Rosenquist, & Audrain-McGovern, 2009) and engage in risky behaviors (American College Health Association, 2012). These risky behaviors include emerging adults placing themselves in unnecessarily jeopardy both physically and mentally (Angst, 1996). These include risky sexual behaviors, self-mutilation, and bingeing behaviors surrounding food (Dawson, Grant, Stinson, & Chou, 2004). Also, emerging adults who self-diagnose with being depressed are among the 6% of emerging adults who seriously consider suicide (American College Health Association, 2012). This is of particular concern because suicide is the third leading cause of death among emerging adults (National Center for Health Statistics, 2004). One reason why depression symptoms may be high is that emerging adults in college are reporting feeling more overwhelmed than ever before (Sher, Wood, & Gotham, 1996). This feeling of psychological distress has been shown to peak during freshman year of college and then slowly decline in preceding years; yet for some students a decrease in psychological distress never occurs (Sher, Wood, & Gotham, 1996). Although this research indicates that a peak in distress occurs during freshman year, we are still unsure what exactly 'distress' means and whether or not other psychological diagnoses also peak during freshman year of college (Hunt, 2010). The distress that students experience does not always lead to them being diagnosed with depression or perceive themselves as being depressed.

### **Sub-threshold of Depression**

Another area of mental health that needs to be distinguished is a sub-threshold of depression. Although greater reliability has been found in diagnosing clients there are still areas in which a more precise look is needed to provide accurate services to those in need (Pincus,

Davis, & McQueen, 1999). For example, there are clients who fall on a sub-threshold of depression. To be on a sub-threshold of depression, an emerging adult would not qualify for a depression diagnoses under the requirements of the DSM-V (Pincus, Davis, & McQueen, 1999), yet they would still have symptoms of depression that affect their day to day life (Fergusson, Horwood, Ridder, & Beautrais, 2005). Why sub-threshold depression is so important is that it is significant and positively correlated to a future diagnosis of depression and other diagnosis (Fergusson, et al., 2005). More specifically, emerging adults who fall into the sub-threshold of depression have a high probability of meeting a full depression diagnosis in adulthood (Pine, Cohen, Cohen, & Brook, 1999).

Although a more serious diagnosis is probable in the future, those with sub-threshold diagnosis are rarely studied in the field. Not only is this population left out of research surrounding depression but they are also significantly less likely to seek professional counseling services. When services are sought after most tending to seek services through their primary care doctor or not seek services at all (Pincus, Davis, & McQueen, 1999). Since we know that it is within emerging adulthood that most mental health diagnosis are made (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005) and those with sub-threshold diagnosis are not seeking services, emerging adulthood should be the prime focus for studies that include sub-threshold diagnosis. In the population of emerging adults, there are a significant number of college students who fall in the sub-threshold of depression (Fergusson, Horwood, Ridder, & Beautrais, 2005). While these emerging adults may not have severe symptoms now, they are likely to experience a full diagnosis of depression later in life (Pine, Cohen, Cohen, & Brook, 1999). By addressing sub-threshold diagnosis early in life, later life symptoms can be less severe (Pine et al., 1999). Therefore, studies that are analyzing emerging adults need to include

measures that take account depression symptoms and include those who qualify for a sub-threshold depression diagnosis in their final analysis.

### **Challenges/importance of looking at mental health in emerging adulthood**

Most studies that have focused on the link between mental and physical health have empirical limitations within the research. First, these studies tend to examine mental health at specific time points rather than examining how mental health may vary at different life stages (Faith et al., 2011). Secondly, these studies are limited by their cross sectional nature, only collecting mental health data at one time point (Faith et al., 2011). Lastly, in the body of research regarding emerging adulthood, usually the first year of college is the only focal point for collecting data. These limitations are surprising in light of the reported need for mental health services throughout college (Furr et al., 2008, Taliaferro et al., 2001). Depression in college can have a lasting effect on an adult's ability to acclimate to new situations and people in later life (Pine, et al., 1999), and although mental health has been shown to shift in emerging adults' first year of college this is not the only time in college that mental health is changing (Hunt & Eisenberg, 2010). The mental health of college students and more specifically how they perceive their own mental health, is important to understand throughout college, not just one time period.

In order to address the gaps mentioned above there is a need for longitudinal research regarding depression symptoms in emerging adulthood. More specifically, a study that focuses exclusively on the sensitive life stage of emerging adulthood would allow for a greater understanding of when mental health changes occur. Additionally, if self-perceived rates of mental health were collected, the data would be able to identify the rate of change throughout emerging adulthood. This inclusion of data would allow for a greater understanding in a

specific, life defining time period. However even with the inclusion of longitudinal mental health data on a specific, transitional period in life there would still be a gap in the study. To have a complete understand of the relationship in mental and physical health we need to understand what physical health changes happen in college, and be able to collect physical health data in a precise, and longitudinal manner.

### **Physical changes in emerging adulthood**

Along with an increase in self perceived depression rates in emerging adults, there are significant physical health changes as well. As weight and levels of obesity in emerging adults increase, their physical health has become a significant public health problem (Truesdale, Stevens, Lewis, Schreiner, Loria, & Cai, 2006). Over the past thirty years the prevalence of overweight and obesity among adults has increased (Ogden, Carroll, Kit, & Flegal, 2014). Both overweight and obesity are associated with increased health problems, yet increased body fat while maintaining a body mass index within the healthy range also is associated with increased health problems. Approximately twenty percent of college students are overweight (Huang, Harris, Lee, Nazir, Born, & Kaur, 2003). Additionally, the average female emerging adult has a Body Mass Index (BMI) of 23.7 and the average male has a BMI of 25.5 (Morrell, Lofgren, Burke, & Reilly, 2012). Although these average BMI's of emerging adults are considered normal, they are very close to the overweight category (Morrell et al., 2012). An increase in body fat has been linked to diseases such as type 2 diabetes, heart disease, and metabolic syndrome, but also with negative psychological factors such as depression (Blaine, 2008). Dozens of studies have been conducted examining changes in weight and body composition among college students, especially during the freshman year. For example, within the first twelve weeks of college emerging adults gained about 4.4 pounds (Levitsky, Halbmaier, &

Mrdjenovic, 2004). Through emerging adults' freshman year in college, students gain on average 5.29 pounds (Edmonds, et al., 2008). More specifically, from the beginning to the end of students' sophomore year of college the average weight gain was 9.25 pounds (Lloyd-Richardson, Bailey, Fava, & Wing, 2009). Changes in weight and body composition by the end of the junior year of college show that gains during the junior and freshman years were higher than those during the sophomore year (Gropper et al 2012). Additionally, by the end of the junior year, weight gain among the two thirds of college students who gained weight averaged 9.4 lbs. and body fat increased by 4% (Gropper et al 2012). Additionally, Gropper et al., (2012) found that after four years of college students were more likely to be obese compared to when they began college. Lastly, Gropper et al., (2012) found significant differences between males and females in regards to changes in percent body fat and weight, with males having a more significant increase in body fat compared to females. As part of the same study, Morgan and coworkers (2012) identified that on average, college students gain about 0.06% of body fat every three months they are in college. Other research within this area indicates that negative changes in percent body fat continue to happen throughout the first few years of college (Hoffman, Policastro, Quick, & Lee, 2006).

Although this research identifies specific time points at which students are increasing their weight and body fat we are unclear as to why this increase happens so drastically. Although an increase in weight and height are normal for males and females from 18-20 years, the changes that have been documented are significantly greater than those on the growth charts from the CDC (Gropper et al., 2012). These longitudinal studies are the first to include all four years of college while examining changes in body fat, and they conclude that more research is needed to identify support for college students to be healthy.



## **Body Composition Assessment**

The chemical composition of the human body includes water, protein, fat, and minerals with smaller amounts of vitamins and carbohydrates. Of these components, fat normally accounts for about 15% to 30% of body weight. Measurement of body composition along with weight provides added health information. To determine health anthropometrically, weight and height are measured to calculate body mass index (BMI). BMI is then compared with recommended values published by the center for disease control. Yet, having a BMI within a healthy range does not necessarily indicate health. Normal weight obesity, which is characterized by a BMI in the normal range, but excess amounts of body fat, is associated with increased of metabolic syndrome, type2 diabetes, and heart disease among other conditions. Thus, measurement of body fat along with weight provides valuable health information, and more accurately depicts changes related to health concerns (Teixeira, Sardinha, Going, & Lohman, 2001).

Several methods are available to analyze body composition including Dual Energy X-Ray Absorptiometry (DEXA), bioelectrical impedance analysis, densitometry, skinfolds, among others. Each method has advantages and disadvantages with some being more accurate than others (Heydari, Freund, & Boutcher, 2012; Ellis, 2001).

## **The relationship between mental and physical health**

The life stage of emerging adulthood has many transitions; these transitions affect both mental and physical health. Although it is important to be able to see the changes in these two individual variables, it is also vital to gain knowledge on the relationship between these two fluctuating pieces of emerging adulthood. Research in the field has shown that there is conflicting evidence on the direction of the relationship between mental and physical health.

Research indicates that physical health such as level of obesity is directly linked to adults' mental health, with higher levels of obesity significantly correlated to higher levels of depression (Hopkins & Bland, 1982). This relationship is thought to occur for several reasons. One may be due to the negative stigma associated with obesity. Those struggling with physical health concerns such as obesity tend to score lower on self-perceived happiness and overall mental health surveys (Blaine, 2008). However, when this relationship is observed in longitudinal data, the results fluctuate in their significance, which leads researchers to wonder about whether physical health affects depression or vice versa (Barefoot, Heitmann, Helms, Williams, Surwit, & Siegler, 1998). Longitudinal investigations confirm that there is indeed a significant relationship between mental and physical health (Richard et al., 2003). When emerging adults are depressed, their depression is significantly related to them being obese in later adulthood (Richard et al., 2003). Along with an increase in severe psychological diagnosis, including depression, there has been an increase in the percentage of eating disorders seen on campuses (Gallagher, 2004). College counseling centers have reported an increase in eating disorders of nearly 60 percent in the last twenty years (Levine & Cureton, 1998). This increase in eating disorders has caused researchers to further investigate the link between mental and physical health. Research has found that depression and obesity are likely to co-occur, suggesting that a more serious focus is needed surrounding the link between mental and physical health (Faith, Butryn, Wadden, Fabricatore, Nguyen, & Heymsfield, 2011). This is also evidence for mental health having the potential to influence all aspects of a person's life, including their physical health. However, these physical effects are not evident for all adults. In some studies only women were found to have a significant relationship with their level of depression in emerging adulthood and their level of obesity in later adulthood (Richard et al., 2003). Additionally, the

evidence for mental health having a significant effect on physical health has been limited due to research in the field having few longitudinal studies and limited indicators of physical health (Richard et al., 2003). To combat these problems, a study is needed that addresses both the need for continuous data in emerging adulthood and an accurate, and reliable way to measure physical health.

The studies that have focused on mental and physical health have utilized a variety of methods to collect data. In regards to mental health, most studies have utilized self-report questionnaires (Furr et al., 2001). However, most of the fluctuation in data collection surrounds the physical health variable. The collection of physical health ranges from self-report to measurements conducted by researchers, and because of these differences limits the way in which researchers and counselors can use the data. For example, in studies that rely on self-report data, less correlation was found between physical and mental health. Additionally, this self-report data has traditionally been weight. Self-report of weight is associated with inaccuracies and the measurement of weight alone does not necessarily indicate health (Daniels, Khoury, & Morrison, 1997). Therefore, lack of a relationship found between physical and mental health could in fact be due to an absence of correlation or it may be due to inaccurate ways of collecting physical health data.

## **Chapter 3**

### **Methodology**

After a comprehensive review of the literature it is clear that significant changes occur in the years of emerging adulthood. While emerging adults are experiencing an increase in depression rates they are also gaining weight. Yet, even in a field where both of these variables have been examined, research has yet to focus on the longitudinal relationship between mental and physical health in college. Therefore, this study examined the relationship between mental and physical health and how as counselors we can provide resources at critical highpoints in college. More specifically, this study analyzed the critical time period within the college years in emerging adulthood by examining changes in depression symptoms and how they are related to changes in body composition.

#### **The current study**

This study examined the link between physical and mental health in hopes to provide counselors with specific time points that emerging adults need more services. More specifically, this study analyzed the critical time period within the college years in emerging adulthood by examining changes in depression rates and how they are related to changes in body composition. The data that was analyzed was collected at the beginning of the academic year in 2007 and ended in 2012. Each semester body analysis was taken and a survey was completed by students. The study followed two cohorts of students throughout college. The self-perceived depression survey that was utilized for the current study is the modified CES-Depression inventory. This inventory was used to help better understand the link between changes in percent body fat percentages and depression. The CES-D was originally made to

evaluate current level of depression in the general population (Radloff, 1977). Areas such as depressive mood, feelings of worthlessness, feelings of helplessness, loss of appetite, and sleep problems are all asked about in the survey (Radloff, 1977). Reliability for this survey was established by examining scores of depression before and after clinical treatment and comparing the general populations' scores before and after life altering events (Radloff, 1977). The reliability of the original survey was found to be significant. For the general population the internal reliability was found to be  $\alpha=.85$  and even higher for the patient sample, with a reliability of  $\alpha=.90$  (Radloff, 1977).

To be able to accurately assess the depressive symptoms in the emerging adults a sample of a modified version of the full CES-D was used in this research study. The abbreviated version of the CES-D does not include questions that are biased towards men or women and has an overall high reliability and validity. Therefore the survey assesses how participants felt over the last week by measuring the level of depressive symptoms in a short, yet accurate fashion. Students were asked to think back over the last week and select the time period that best reflected their symptoms. Students selected one of the following options: rarely (less than one day), some (1 or 2 days), occasionally (3-4 days), or most days (5-7 days). Items included statements surrounding having a poor appetite, sleep, effort in life, feelings of sadness, and feelings of loneliness. The scales' internal consistency is high ( $\alpha=.81$ ) and its results are highly correlated to the original CES-D ( $r_s>.83$ ) (Carpenter et al., 1998). This means that the test is not normally swayed in one direction or the other just because of someone's mood on one particular day. The questions in the survey focus on a variety of aspects of depression symptoms, and are asked to be answered on a four point likert scale, with none of the questions reversed scored and all weighing equally. For example,

changes in sleep and appetite were asked about, along with changes in life satisfaction. Since the questionnaire for this specific scale within the survey has already been composed it is important to follow the creator's format and content, so this aspect of my survey can have proper reliability.

## **Sample and procedure**

### **Subjects**

This study used archival data that was collected as part of a larger study among emerging adult college students. Data collection began for cohort 1 during the fall semester of 2007 and for cohort 2 during fall semester of 2008. During these times, freshmen were recruited to participate in the study. After the Institutional Review Board (IRB) granted approval to the study recruitment began. The researchers involved in the study recruited students from freshman classes at a large southeastern university. Recruitment was primarily done through fliers, class announcements, and e-mails. To encourage students to participate a stipend of approximately \$75 was given to students for every year they completed in the study. To participate in the study a student had to be a freshman in college and within the ages of 17-19. For students who were below age of consent, parental consent was received for them to participate in the study. This age restriction ensured that students participating would be within the emerging adult phase for the entirety of the study. Students were excluded from participating in the study if they were married, pregnant, had children, or had been diagnosed with an eating disorder. In total 535 students were recruited (n=190 males, and n=345 females).

### **Time Periods**

Data were collected from the participants at ten different time points in college. During their freshman year of both cohorts (2007 and 2008), data were collected in August/September (time 1), December (time 2), and April/May (time 3). During their sophomore year of college data were again collected in August/September (time 4), December (time 5), and April/May (time 6) for cohort 1, but for cohort 2 were only collected in August/September and in April/May. Only data for cohort 1 were collected during the junior and senior years. In the students' junior year of college data were collected in August/September (time 7) and April/May (time 8). In the students' senior year of college data were also collected in August/September (time 9) and April/May (time 10).

Each time data was collected students filled out a self-report survey. Anthropometric indices that were collected included measurements of weight, height and body composition. For purposes of this study, body weight data, percent body fat data, depression symptom scores, and demographic information were utilized.

#### Anthropometric Measures

Weight and height were measured using a digital scale with an attached height rod (Healthometer, Plestar, LLC, Model 500KL, Bridgeview, IL). Participant's height was measured to the nearest quarter-inch. Weight was measured to the nearest 0.2 lbs. The accuracy of the scale was verified with external weights. Subjects were asked to wear similar clothing and removed shoes, hats, belts, outer garments, and emptied their pockets before being weighed. Body composition was measured using bioelectrical impedance analysis (BodyStat; BioVantSystems, Detroit, MI). The inclusion of body composition is valuable since measuring weight or body mass index alone does not allow one to distinguish between gains and losses of

muscle and fat (Garn, Leonard, & Hawthorne, 1986). Because bioelectrical impedance analysis is affected by hydration status and recent food ingestion, subjects were asked not to drink or eat for several hours and to have not exercised for at least 12 hours pre-assessment. Assessment required subjects to lay supine while small electrodes were placed on their hands and feet. The instrument generates an electrical current which is directed through the body. The instrument measures the impedance to the flow of an electrical signal throughout a participant's body. The faster the signals travel through a participant's body the more muscle is present. Fat cells hold less water compared to muscle and other body components, and therefore they slow down the electrical signal (Kyle, et al., 2004). Fat cells (versus muscle) impede the electrical signal to a greater extent; the bioelectrical impedance analyzer measures this impedance (Kyle, et al., 2004). The procedure took about 10 minutes. Body composition measurements varied by less than 0.5% with repeated measurements on the same subject. Bioelectrical impedance accuracy compares well to that of underwater analysis, which is one of the most accurate analyses available (Benton and Swan, 2007).

### **Demographic information**

For the demographic information students were asked to self-report information at each time point. Questions asked in the original study covered race, sex, living arrangements, age, state of residency, and range of parents' income. Some demographic information was collected at each time point such as living arrangements. Other information such as range of parents' yearly income was collected at the beginning of the study, this question allowed for students to choose which range of wealth they thought their parents qualified for (<10,000, 10-30,000, 30-



50,000, 50-70,000, 70-90,000, 90-110,000, 110-130,000, 130-150,000, >150,000, or student where given an option to indicate that they were not aware of their parents' yearly income).

### **Center for Epidemiologic Studies Depression Scale**

To measure depression symptoms in community based populations, the Center for Epidemiologic Studies Depression Scale was developed at the National Institute for Mental Health (Radloff, 1977). The items in the Center for Epidemiologic Studies Depression Scale (CES-D) were collected from a variety of reliable depression scales (Radloff, 1986). Most methods of assessing for self-reported depression symptoms have primarily focused upon adults (Radloff, 1991). This has left the emerging adult age group overlooked in terms of developmentally appropriate scales to assess for depressive symptoms. One scale that has been shown to be reliable for measuring depression symptomology in emerging adulthood age group is the CES-D (Poulin, Hand, & Boudreau, 2004). The CES-D includes items that specifically ask about appetite, emotion, motivation, perception of self, and thoughts of death with each question having equal weight when scored (Radloff, 1977). The measure ranges in possible scores from 20 to 60, with score of 20 showing no clinical significance for depression, up to a score of 60 indicating a possible diagnosis of major depressive symptoms (Radloff, 1977). To measure depression symptoms in this study, participants completed a version of the CES-D.

An abbreviated version of the CES-D was used for this study. The abbreviated scale was developed in response to participants indicating the original scale was too long and was biased towards women showing more depressive symptoms. The scale has been normalized for this population by examining results from diverse groups. For example, the scale was given to undergraduate students, community dwellers within the United States, people recovering from a

physical illness, and community dwellers within Canada and then assessed for reliability and how questions should be normalized (Carleton et al., 2013). It has been found that an accurate assessment for depression symptoms can be gathered by using a modified version of the CES-D scale (Carleton et al., 2013). The original CES-D scale asks participants questions that have been found to be skewed for females (Carleton et al., 2013). These skewed questions focus on the emotional state of participants. To have a questionnaire that has equal reliability for males and females the abbreviated edition of the CES-D does not include questions regarding the emotional state of participants in a general format. In the abbreviated questionnaire, emotional state is asked about for specific time periods in emerging adults' life.).

To be able to accurately assess the depressive symptoms in emerging adults an abbreviated version of the full CES-D (Santor and Coyne, 1997) was used in this research study. The abbreviated version of the CES-D does not include questions that are bias towards men or women and has a good overall internal consistency reliability ( $\alpha=.88$ ) (Santor and Coyne, 1997). Therefore the study still assesses how participants felt over the last week by measuring the level of depressive symptoms in a short, yet accurate fashion. Students were asked to think back over the last week and select the time period that best reflects their symptoms. Students selected one of the following options: rarely (less than one day), some (1 or 2 days), occasionally (3-4 days), or most days (5-7 days). Items included statements surrounding having a poor appetite, sleep, effort in life, feelings of sadness, and feelings of loneliness. The revised scales' internal consistency is high ( $\alpha=.81$ ) and are highly correlated to the original CES-D ( $r_s>.83$ ) (Carpenter et al., 1998). The questions in the survey focus on a variety of aspects within depression, and are asked to be answered on a four point likert scale, with none of the questions reversed scored and all weighing equally. For example, increases in sleep and appetite are asked about, along with

having thoughts of punishing yourself, interest in sex, how the participant has been feeling for the past two weeks, and his/her interest in life.

## **Data Analysis**

The current study utilized data from the original longitudinal project conducted at Auburn University between 2007 and 2012. The focus for this current study was to longitudinally analyze two specific variables within the study, while controlling for relevant demographic variables.

The first research question, how does percent body fat change during college, was answered through descriptive statistics and preliminary analysis. Average means and standard deviations were calculated through descriptive statistics in Statistical Package for the Social Sciences (SPSS). Through mix ANOVA analysis trends within the data were observed allowing averages for males' and females' percent body fat to be looked at separately.

The second research question, how does depression symptomology scores change during college, was answered through descriptive statistics. Average means and standard deviations were calculated through descriptive statistics in SPSS. Through mix ANOVA analysis trends within the data were observed allowing averages for males' and females' percent body fat to be looked at separately.

To answer the third and final research question, are there significant gender differences in the way in which depressive symptoms predict body fat during college, growth modeling was used. Growth modeling is a way for researchers to map a multilevel model of change onto a traditional covariant structure model (Singer and Willet, 2003). This method therefore allows for research questions to be answered that surround change in time and not the stability of rank order

of individuals. The fit indices that were used for the study are the Root Mean Square Error of Approximate (RMSEA) and the Tucker-Lewis Index (TLI). These indices have been found to indicate adequate fit for growth models (Wheaton et al., 1977). An RMSEA of less than .10 and a TLI greater than .90 were used as the current studies cut off points. These cut off points have been established in the literature to represent sound results (Wheaton et al., 1977). To be able to answer the final research question first, a model was fit with depression symptomology predicting body fat, without gender. This then allowed for fit indices to be examined and for a series of nested models to be utilized. These nested models allowed for the most appropriate, and best fitting, model to be found. Depression symptoms and body fat data from ten time points were utilized. First, the data was examined through descriptive statistics to determine whether or not heterogeneity in the intercepts and rate of change were present. Once this was done through a visual examination of the data individual growth parameters were allowed to differ across individuals. With large amounts of data and time points—such as the current data—a program that is able to use the mean of each variable to create a prototypical participant is vital, therefore M-plus was utilized to analyze the data.

## **Chapter 4**

### **Results**

#### **Introduction**

The purpose of this study was to examine longitudinal changes in percent body fat and depressive symptomology throughout college, and therefore the majority of emerging adulthood. Descriptive statistical analysis, exploratory factor analyses (EFA), and longitudinal growth modeling, were conducted to assess the students' depression symptomology and students' body fat percentage over four years of college, as indicated by the research questions established for the current study. Additionally, the researcher conducted analysis to answer the question of how depression symptomology affects percent body fat over college, and how gender affects this relationship. The results of the data analysis are presented in this chapter.

#### **Depression symptomology scale**

To be able to accurately assess the depressive symptoms in emerging adults an abbreviated version of the full CES-D (Santor and Coyne, 1997) was used in this research study. This scale is seven questions long in the current study had a  $\alpha=.77$ , thus allowing researchers to utilize the scale to interpret scores to gain knowledge surrounding depression symptomology.

#### **Research Questions**

Q1: How does percent body fat change during college?

Q2: How do depressive symptoms change during college?

Q3: Are there significant gender differences in the way in which depressive symptoms predict percent body fat during college?

#### **Participants**

In total, 535 students were recruited (n=240 males, and n=295 females) with an average age of 18 (SD = 0.4). Cohort one included 240 freshman, of which 85 (35%) were males and 155 (65%) were females. Of this group, 81.9% were Caucasian, 11.4% were African American, 2.7% were Hispanic, 2% were Asian and 2% were other. The racial/ethnic composition did not significantly differ from that of the incoming class of 2007 at Auburn University, which had 4191 student of which 53% were female and 47% were male and was primarily made up of Caucasian student (81.7%), then African-American (11.3%), Hispanic (2.9%), Asian (1.9%), and Native American (0.8 (chi-square test,  $p > .05$ ). The majority of the incoming students also had residency in Alabama (57%) followed by Georgia (18.3%), Florida (6.1%) and Tennessee (3.8%). The majority of participants (74 %) reported coming from a family whose income was greater than \$90,000 per year (Auburn University, 2007). Demographic data can be found in Table 1.

Cohort 2 included 295 participants, of which 105 (36%) were males and 190 (64%) were females. Of this group, 88.8% were Caucasian, 3.7% were African American, 3.7% were Hispanic, 3.4% were Asian and <1% were other. The racial/ethnic composition did not significantly differ from that of the incoming class of 2008 at Auburn University, which had 24,530 student of which 49% were female and 51% were male and was primarily made up of Caucasian student (82.6%), then African-American (8.2%), then Alien or Unknown (4.8) Hispanic (1.9%), Asian (1.8%), and Native American (<1%) (Chi-square test,  $p > .05$ ). The majority of the incoming students also had residency in Alabama (62.3%) followed by Georgia (17.2%), Florida (6.1%) and Tennessee (5.3%). The majority of participants (70 %) reported coming from a family whose income was greater than \$90,000 per year (Auburn University, 2008). Demographic data can be found in Table 1.

Table 1. Sample Characteristics of Participants

Sample Characteristics	Percentage in sample
Female	64% (345)
Male	36% (190)
Non-Hispanic White	84%(458)
Black or African American	7%(40)
Hispanic or Latino	3%(18)
Asian	2.5%(14)
Other	3%(5)
Residency within Alabama	36% (190)

A total of 535 participants (345 females and 190 males) began the study with 240 from cohort 1 and 295 from cohort 2. Cohort 1 was followed for 4 years and by the end of the senior year, over half, 131 (42 males and 89 females) of the 240 (85 males and 155 females) returned. Cohort 2 was only followed for the first two years, and at the end of the sophomore year over half, 178 (63 males and 115 females) of the 295 (105 males and 190 females) returned. Out of those who did not return to the study 44% were no longer enrolled at Auburn University. It should be noted that those who were still participating in the study did not significantly differ from those who were no longer in the study or Auburn University's 2007 and 2008 freshmen class. Lastly, the retention rate of emerging adults within the current study was 58%; this is higher than other longitudinal studies which have focused on similar measurements. For

example Racette, Deusinger, Strube, Highstein, & Deusinger, (2005) followed students for two years to measure body compositional changes and had a retention rate of 38%.

Q1: How does percent body fat change during college?

A significant increase across the change in percent body fat was observed from time one to time ten. Within-subjects ANOVAs were fit to the data to dictate the nature of the data's trend. The data were found to have a significant linear trend ( $F= 62.66 p \leq .01$ ). At time one the average percent body fat was 19.21, by the middle of college at time five the average percent body fat was 20.86. Then finally at time ten the average percent body fat was the highest at 22.60. There was a significant increase in percent body fat from time one to time five ( $p \leq .01$ ), from time five to six there was not a significant increase ( $p > .10$ ), but then time six to time ten had another significant increase ( $p \leq .01$ ). An average of 3.39 percent body fat was gained over participants' four years of college (from time one to time ten). On average, female college students had a percent body fat of approximately 22.3% (Edmonds, et al., 2008) so the current data is in line with national averages.

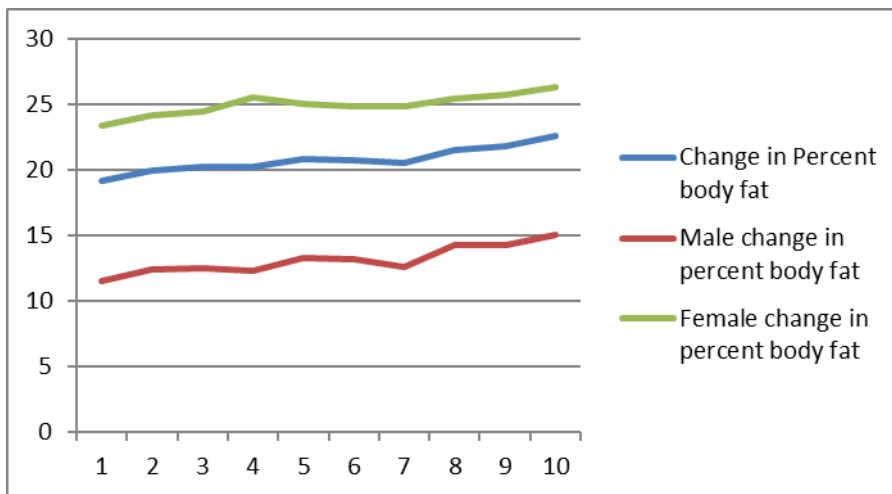
Because percent body fat has different health implications depending upon sex (Pribis, Burtneck, McKenzie, & Thayer, 2010) females' and males' changes in body fat were fit in separate models. Additionally, mixed ANOVA analysis was fit to the data to test for gender differences within percent body fat. It was found that males and females significantly differ in percent body fat across college and there was not an interaction effect between males and females ( $F=678.91 p \leq .01$ ). For males, at time one the average percent body fat was 11.53, by the middle of college at time five the average percent body fat was 13.30. Then by the end of college at time ten the average percent body fat was 15.10. An average of 3.57 percent body fat was gained for males over four years of college. For females at time one the average percent



body fat was 23.43, during the middle of college females were near their highest percent body fat (25.57). Females' percent body fat decreases to 24.83 by time six but then increases again to its highest at 26.33 by time ten. An average of 2.90 percent body fat was gained for females over four years of college. For males and females the lowest average percent body fat was found at time one and the highest percent body fat was found at time ten. These trends can also be found in Graph 2.

There were students who had body fat percentages that were much lower/higher than the average. For example, one outlier in the study had a body fat percentage of 52 percent at the beginning of college and increased to a body fat percentage of 56 percent by ten time. Additionally, several students had percent body fats below 10 percent. Even with those students who had lower percent body fat they had an increase in percent body fat throughout college, with time ten having the highest percent body fat for almost all students.

Graph 2. Trends in average changes in percent body for participants



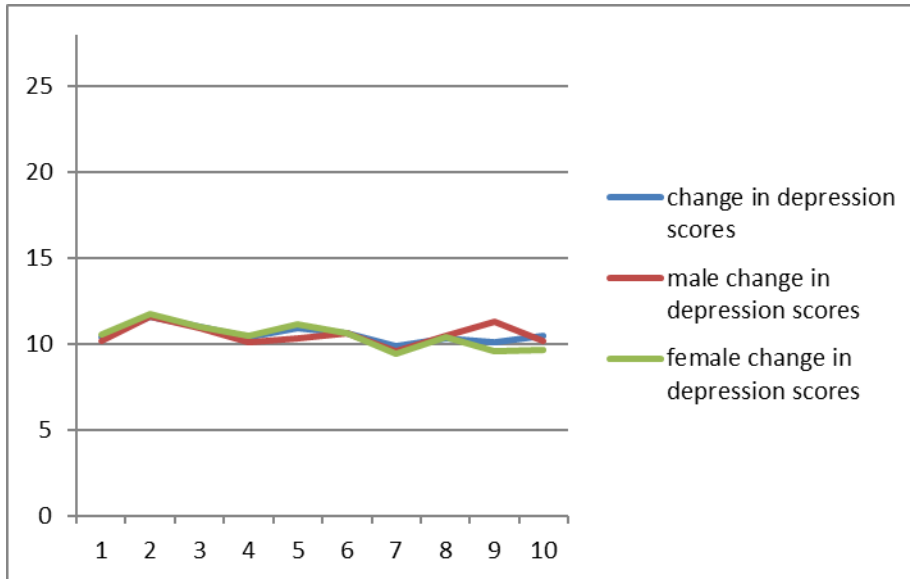
Q2: How do depressive symptoms change during college?

At time one the average score of depression symptomology was 10.40, at time two the average score of depression symptomology was at the highest level of 11.58. This score

decreases after students' first year of college and finally at time ten the average score of depression symptomology was 10.45. Additionally, males and females were analyzed separately with depression symptomology scores. Depression symptomology was found to have a significant linear trend ( $F= 7.13 p \leq .05$ ). Mixed ANOVA analysis was fit to the data to test for gender differences within depression symptomology. Males and females did not differ in depression symptomology across college and their interaction was not significant so the male and female trends were not different ( $F=1.95 p > .10$ ). For males, at time one the average score of depression symptomology was 10.16, at time two the average score of depression symptomology reached its peak at 11.57, by time seven the average score of depression symptomology had reached its lowest score of 9.61, and finally at time ten the average score of depression symptomology was 10.18. For males the lowest average score of depression symptomology (9.61) was found to be at time 7—which was September of males' junior year of college. The highest average score of depression symptomology (11.57) was found to be at time 2—which was December of males' freshmen year in college.

For females, at time one the average score of depression symptomology was 10.53, at time two the average score of depression symptomology reached its highest score at 11.72, at time seven the average score of depression symptomology was at its lowest at a 9.46, and finally at time ten the average score of depression symptomology was 9.64. Similar to males, females' lowest, average score of depression symptomology (9.46) was found to be at time 7—which was September of females' junior year of college. The highest average score of depression symptomology (11.72) was found to be at time 2—which was December of females' freshmen year in college. All descriptive statistics can also be found in Tables 3 and 4. It should be noted that like percent body fat there were outliers for the depression scale as well.

Graph 1. Trends in average changes in depression scores for participants



**Are there significant gender differences in the way in which beginning level of depressive symptoms predict percent body fat during college?**

To answer the final research question – Are there significant gender differences in the way in which beginning level of depressive symptoms predict percent body fat during college?—growth modeling was first utilized to fit the appropriate models. Multivariate models were fit with MPlus (Version 6; Muthén & Muthén, 1998-2010) that allows for the inclusion of participants with missing data by using full information maximum likelihood (FIML) estimation (Muthén & Muthén, 2003). FIML sorts observations into missing data patterns and each parameter is estimated using all available data for that parameter. Mplus was used to fit the data and analyze the results. To be able to answer the final research question a full unconstrained model of all ten data points of percent body fat change was fit to the data. This model showed that depression symptoms at the beginning of college did not predict percent body fat ( $\chi^2/df > 2$ , RMSEA = 0.25,  $p = < .01$ ; TLI = 0.68). After this was concluded then a model was fit by utilizing gender. Two growth models were fit in order to determine the impact of gender and depression symptomology

on percent body fat over the ten time points. The variable ‘female’ (which was coded 1 for female and 0 for male) and depression symptomology were added to the model. They were then each constrained to be zero in order to determine whether they were significant predictors of percent body fat across the ten time points. First, depression symptomology was added to the model. Depression symptomology was found to be a significant predictor through setting the effects of depression symptomology equal to zero and conducting a delta chi-square test, ( $\Delta\chi^2 = 1435, \Delta df = 2$ ) Because 1435 is greater than 10.83 (upper-tail critical values of chi-square distribution with 2 degrees of freedom) the null hypothesis could be rejected. Next, gender was added to the model. Results of the analysis of adding gender showed that both depression symptomology and gender were significant predictors of change in percent body fat because the delta chi-square test revealed that they were not equal to zero, as the delta chi-square (406) was larger than the critical value (73.40). Therefore the null hypothesis that the paths were equal to zero was rejected, leaving the model that includes both depression symptomology and gender as the best fitting model.

The final model fit the data adequately ( $\chi^2/df < 2$ , RMSEA = 0.069,  $p < .01$ ; TLI = 0.97), indicated by a  $\chi^2/df$  ratio of less than 2, root mean square error of approximate (RMSEA) less than 0.10, and a Tucker–Lewis Index (TLI) greater than 0.90 (Wheaton et al., 1977). When analyzing beginning levels of depression symptomology the model indicates that on average, males had around 12% body fat ( $\beta_{int} = 12.46, p < .001$ ) at the beginning of freshman year and increased an average of 0.08% body fat each month ( $\beta_{slope} = 0.08, p < .05$ ) over the next four years of college. These  $p$  values indicate that the intercepts and slopes are greater than zero and were not found by chance, they are significant in telling us that where students started and their trajectory throughout college. Additionally, on average, males’ depression symptomology score

did not predict their beginning percent body fat ( $\beta_{Int\_BFat}=-0.07, p=.57$ ) nor did it predict their rate of percent body fat gain during college ( $\beta_{Slope\_BFat}=0.00, p=.74$ ). On average, females had around 21% body fat ( $\beta_{Int}= 21.70, p<.001$ ) at the beginning of freshman year. On average, females who were more depressed at the beginning of college had significantly higher percent body fat at the beginning of college ( $\beta_{Int\_BFat}=0.20, p\leq.05$ ). However, those who were more depressed at the beginning of college demonstrated similar changes in percent body fat as those who were less depressed ( $\beta_{Slope\_BFat}=0.00, p=.35$ ). There was a slight amount of variance found in regards to the intercept of body fat, it was found that 1.2% of females' and males' starting percent body fat was explained by their depression symptomology. This effect size shows that to fully understand the trajectory of percent body fat there are more variables that need to be analyzed in the future research. Significant variance was not found for males in regards to the intercept or slope of change in percent body fat ( $R^2$  Intercept of Bodyfat=0.00 Slope of Bodyfat=0.00) Similar to males females' data showed that variance was not found in regards to the slope of body fat (Slope of Bodyfat=0.00).

To understand how other variables could potentially help further explain the relationship between depression symptomology and change in percent body fat across college the remaining variance was tested. For both male and female students there is still significant variance (98%) left ( $p<.001$ ), therefore other variables could be added in the future to explain the relationship between depression symptomology and change in percent body fat across college.

### **Summary of Results**

The main interest of the present study was surrounding the relationship between depression symptomology and percent body fat changes over the four years of college for emerging adults. Descriptive statistics and longitudinal growth modeling were utilized to answer

the researcher's questions surrounding changes in depression symptomology, percent body fat, and the relationship that exist between these two variables. Based on these analyses it was found that males had a significant increase in body fat over the four years of college that was statistically and significantly different than the increase in percent body fat that females experienced. A significant change in depression symptomology was not found for males or females.

In regards to the relationship between depression symptomology and percent body fat, it was found that males' starting depression symptomology score was not significantly related to their starting percent body fat. Similarly, males' starting depression symptomology score did not predict their change in percent body fat. Conversely, females' starting depression symptomology score was significantly related to their starting percent body fat. Females', similar to males, starting depression symptomology score did not predict their change in percent body fat. These results therefore answer the main and final research question of the relationship between depression symptomology and depression and whether or not gender differences could be accounted for by these variables.

## **Chapter 5**

### **Discussion**

Almost fifty percent of emerging adults enter into some type of post-secondary education (U.S. Department of Commerce, 2011). Within this transition there are many changes in life variables, including—for most emerging adults—living conditions, expectations, peer groups, food options, and financial requirements. In addition to emerging adults experiencing these changes they also experiences changes within their mental and physical health. Just in the last decade there has been an increase in emerging adults reaching out for profession, mental health services (National Research Council & Institute of Medicine, 2009). Furthermore, with the increased need in mental health services on college campuses there has also been an increase in physical health concerns in emerging adulthood.

The average depression symptomology scores for emerging adults in the study ranged from 10.40 at time one (fall of freshmen year) to 10.45 at time ten (spring of senior year). The average starting depression symptomology score was not statistically different than the average ending score. This indicates that on average, emerging adults in this sample are not increasing in their symptoms of depression throughout college. Despite literature indicating that there is more of a need for mental health services need now compared to ten years ago, symptoms of depression over college remained stable within this sample. The scores for depression symptomology for the sample in this study also demonstrated that the average emerging adult in this sample would not meet the criteria to be diagnosed with depression (Carleton et al., 2013). This finding was somewhat expected and is supported by past research that has found low numbers of depression among college students (Roberts, et al., 2003). Likewise, in a longitudinal study, students were followed before, during and after college and were found to

have a significant increase in depressive symptoms before college but not during college (Hankin, Abramson, Moffitt, Silva, McGee, & Angell, 1998). In the same longitudinal study—similar to the current study—gender differences were not found when examining depressive symptoms (Hankin et al., 1998). To examine gender differences, in the current study the scores for the depression symptomology scale were examined by gender. The average male scores and the average female scores for depression symptomology were not statistically different in this study. Therefore, this data indicated that although emerging adults in this sample do show symptoms of depression throughout college their level of depression symptomology is more in line with sub-threshold depression rather than being diagnosed with depression.

The other variable of interest was body fat. Similar to what the literature depicts for body fat, this study found that the average emerging adult had an increase in percent body fat over their four years of college. An average of 3.39 percent body fat was gained over participants' four years of college with both males and females exhibiting the lowest average percent body fat at time one and the highest percent body fat at time ten. However, even with these similarities there were differences among the trajectory of the paths males and females. On average, males had a steeper increase in percent body fat compared to females throughout college. These increases in body fat were not however found to correlate with increases in depression symptomology, despite other studies suggesting a relationship (Richard et al., 2003). Even when emerging adults had high depression symptomology scores those scores did not correspond to changes in percent body fat.

To further investigate the relationship between depression symptomology and body fat, the data for males' and females' were separated and analyzed. For females, depression symptomology was found to be a significant predictor of starting values of percent body fat. The



average female in this study had a BMI within the normal range for females (18.5 to 24.9) and a normal depression symptomology score (10.53). Even though these data are within the normal range it is important to look at the potential mechanisms behind why a higher level of depression symptomology might be linked to higher body fat. One possible explanation for these findings surrounds the stressors that college student experience such as living conditions, sleep changes, and roommates (Hicks, & Heastie, 2008). Female college students have been found to get less quantity and quality of sleep when compared to their male peers (Tsai, & Li, 2004). Sleep quantity has been found to be significantly correlated to levels of obesity, with those who are getting poor sleep having more health problems (Gangwisch, Malaspina, Boden-Albala, & Heymsfield, 2005). With incoming college students potentially having shifts in their schedules and having to deal with variables that can negatively influence sleep such as new roommates and studying these variables could be explaining this relationship. More specifically, the gender differences that have been found between sleep quality and quantity are also in line with this explanation. As a student progresses through college they may be able to learn to deal with these sleep challenges, thus helping to explain why the current study did not find a longitudinal relationship between depression symptomology and physical health. Therefore, utilizing stressors in college such as sleep quality and quantity variables along with mental and physical health could benefit future research.

Although females' depression symptomology was found to be a significant predictor of starting values of percent body fat their beginning depression symptomology scores did not predict their change in percent body fat over time in college. In fact, males' beginning depression symptomology scores were also found to not be a predictor of their percent body fat. Some research does link mental health to physical health the longitudinal research that has been done

within this subject marks that there is not data to confirm that depression levels do not predict a rise in obesity levels (Faith et al., 2011). The longitudinal research does indicate that obesity levels predict depression levels, therefore future researchers might consider analyzing this relationship (Faith et al., 2011).

### **Implications for counselors**

One of the goals of the current study was to allow professionals working with emerging adults to focus resources around peaks of depression; therefore students will be able to receive services at stressful time periods in emerging adulthood. However, due to the nature of the depression trend found throughout college there does not seem to be a critical time period for students. However, as a result of the current study there are several implications that can help guide counselors working with emerging adults. If counselors were to simply examine the current literature surrounding mental and physical health they might conclude that clients entering into college might have an increase in depression symptoms (Kitzrow, 2003). However, the current study was able to analyze this variable and showed that on average—for this specific sample—an increase in depression symptoms does not occur throughout college. However, emerging adults still have depression symptoms and could therefore benefit from aspects of counseling such as learning coping skills and relaxation techniques. Relaxation techniques have been found to be an effective tool for counselors to utilize with clients who have goals surrounding depression symptomology; relaxation techniques have also been found to be effective for long term treatment (Borkovec & Costello, 1993). Further, these results show that emerging adults may greatly benefit from utilizing coping skills. An increase in physical activity has been found to effectively treat depression symptomology (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005; Harris, Cronkite, Moos, 2006). This suggested increase in physical activity is

two-fold. First, physical activity has been shown to decrease when emerging adults enter college (Butler, Black, Blue, & Gretebeck, 2004). An increase in physical activity can negate the increase in percent body fat experienced by the average emerging adult throughout college (Butler, et al., 2004; Gropper, Newell article 2013). Secondly, an increase in physical activity can allow for emerging adults to learn or develop positive coping skills during a life phase that is marked by increased stress (Harris, Cronkite, Moos, 2006). Exercise has been documented to reduce hyper-arousal symptoms thus allowing students' ability to cope with stressful stimuli (Taylor, Thordarson, Maxfield, Fedoroff, Lovell, & Ogrodniczuk, 2003). Counselors can help emerging adults get connected with resources in their community or university and encourage clients to embark on new habits while entering into college.

### **Strengths and Limitations**

There are several strengths in this study. The first is the relatively large sample size. Additionally, these emerging adults were followed over four years of college. Also, two cohorts were followed, which allowed researchers to examine whether or not findings would be consistent. Additionally, strong statistical methodology, longitudinal growth modeling was used to analyze the data. In using such advanced methods the researchers were able to use multivariate models that allowed for the inclusion of participants with missing data by using full information maximum likelihood (FIML) estimation (Muthén & Muthén, 2003). This ultimately allowed researchers to take advantage of the highest percent of data possible. Lastly, this study is able to provide information regarding the relationship between mental and physical health over college, something that is lacking in the literature.

Although there are many strengths within the study, there are also limitations. First, the data were collected at one large, public institution in the Southern region of the United States.

Therefore results of the study have limited generalizability and are only applicable to emerging adults attending similar universities. Also, the students in the study all volunteered, thus creating biases in who participated and therefore potentially the results. Additionally, the depression symptomology scale required participants to be forth coming about their depression symptoms. Emerging adults might have found the process of exposing their true depression symptoms embarrassing, fearing judgment or shame (Clark, & Desharnais, 1998). Lastly, the majority of the sample was non-Hispanic White (81.7%), and 68% were female. Future studies are needed to extend the literature about males and other ethnic and/or culture groups.

### **Future research**

Although this research study helped to shed light on important questions surrounding mental and physical health, there are additions that could be made to the current body of research surrounding this subject. The mental health of emerging adults is one that is important to succeed in academics, making friends, and overall happiness (Arehart-Treichel, 2002; Ding, Lehrer, Rosenquist, & Audrain-McGovern, 2009). Additionally, physical health is also a vital piece of emerging adulthood. With emerging adults' high rates of obesity, their physical health has the potential to negatively affected (Truesdale, et al., 2006). Therefore, with mental and physical health being so important in emerging adulthood, research needs to continue to focus on these variables. To improve on this line of research future research within the subject of depression symptomology and percent body fat should consider including retrospective questions regarding depression symptomology. Due to the lack of significant change in depression symptomology in the current study and research indicating that adolescents experience a significant increase in depressive symptomology through the ages 15-18 (Hankin et al., 1998), a retrospective question regarding depression symptomology might help shed light on the full

relationship between mental and physical health during these formative years. Another potential way for future studies within this subject to improve on the current research is to gain a better understanding as to what variables influence changes in depression symptoms and percent body fat throughout college. One way in which the current study could have improved and ultimately helped to accomplish this goal was to include physical observational data. Physical observational data could come in the form of an exercise measuring device placed on each participant and worn throughout a week or for sleep cycles to be observed. These additional areas of focus could potentially help shed light on other variables that have a relationship with depression symptomology and percent body fat changes in college students.

## **Summary**

The health of emerging adults has drastically changed over the last twenty years (Truesdale et al., 2006). Obesity and rates of physical illnesses have significantly increased among this population. These changes that emerging adults face are not limited to physical health, mental health seems to have also declined (Furr et al., 2002). The current study demonstrated emerging adults' body fat increases while depression symptomology remained primarily stable throughout college. Yet, while depression rates did not predict changes in body fat, college counselors could proactively work with emerging adults to increase coping skills. The gender differences that were found suggest that males and females experience the effects of depression symptoms differently. By targeting males and females separately, counselors can increase the effectiveness of coping skills. Because females' depression symptoms affect their starting percent body fat they could potentially be positively affected by an introduction to positive coping skills in their first semester of college. An overall increase in healthy coping skills could potentially allow for emerging adults to stabilize their body fat over college. Lastly,

emerging adults should be made aware of how the habits they are forming in college could negatively impact the way in which they cope with life stressors.

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Table 1. Sample Characteristics of Participants

Sample Characteristics	Percentage in sample
Female	64% (345)
Male	36% (190)
Non-Hispanic White	84%(458)
Black or African American	7%(40)
Hispanic or Latino	3%(18)
Asian	2.5%(14)
Other	3%(5)
Residency within Alabama	62%(336)

Table 2. Descriptive statistics for participants' percent body fat

	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8	Time 9	Time 10	Change
Average	19.21	19.96	20.24	20.22	20.86	20.70	20.54	21.50	21.83	22.60	3.39
Males	11.53	12.40	12.50	12.30	13.30	13.20	12.57	14.29	14.30	15.10	3.57
Females	23.43	24.14	24.51	25.57	25.10	24.83	24.86	25.44	25.73	26.33	2.90

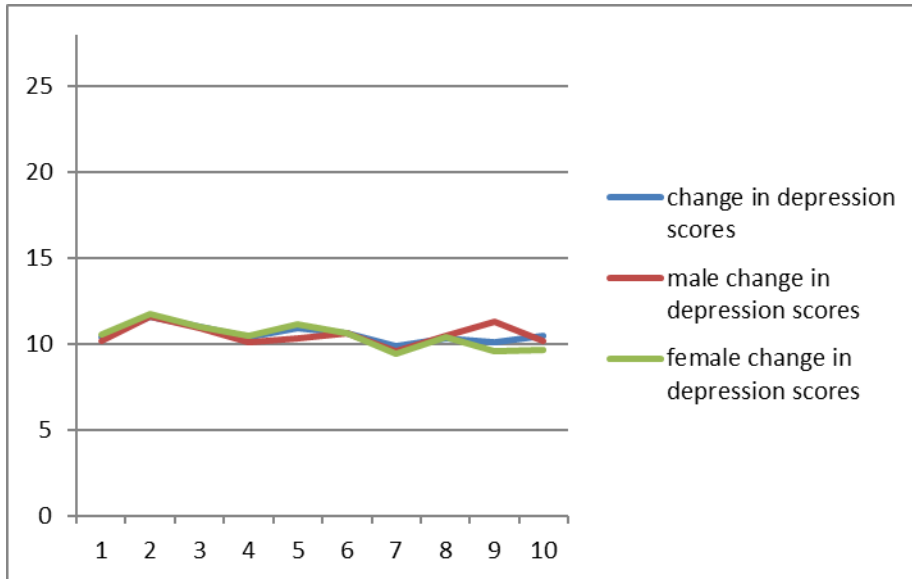
Table 3. Descriptive Statistics for depression symptomology scores

	Time 1	Time 2	Time 3	Time 4	Time 5	Time 6	Time 7	Time 8	Time 9	Time 10	Change
Average	10.40	11.58	11.00	10.40	10.94	10.63	9.86	10.36	10.10	10.45	.05
Males	10.16	11.57	10.90	10.10	10.34	10.64	9.61	10.50	11.30	10.18	.02
Females	10.53	11.72	11.02	10.48	11.14	10.63	9.46	10.42	9.56	9.64	-.89

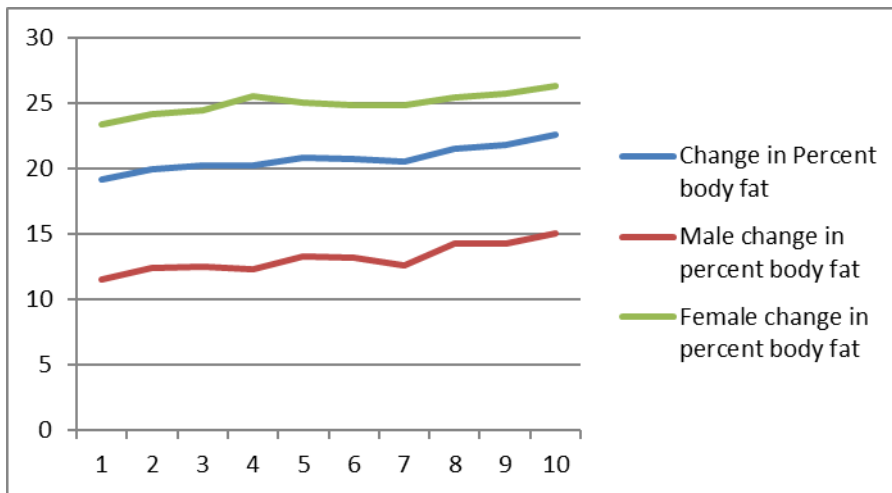
Table 4. A table showing the delta chi-square tests for the growth models.

Model	Constraint	$\chi^2$	df	$\Delta\chi^2$	$\Delta df$	Crit $\chi^2$
1. Full model	none	4.03	2			
2. Reduced	depression@0	1435	2	1435	2	10.83
3. Model including gender	none	32.83	5	406	2	73.40

Graph 1. Trends in average changes in depression scores for participants



Graph 2. Trends in average changes in percent body for participants



Appendix 1.

*Abbreviated version of the Center for Epidemiological Studies Depression Scale (Radloff, 1985)*  
 Think back over the last week (7 days). For each item, how often have you felt like the description?  
 Circle the number that best indicates your answer.

- 1 = Rarely or none (Less than 1 day)  
 2 = Some or a little (1 - 2 days)  
 3 = Occasionally or moderately (3 - 4 days)  
 4 = Most of the time (5 - 7 days)

	Rarely (Less than 1 day)	Some (1-2 days)	Occasionally (3-4 days)	Most Days (5-7 days)
1. I did not feel like eating; my appetite was poor.....	1	2	3	4
2. I felt that everything I did was an effort.....	1	2	3	4
3. I thought my life had been a failure .....	1	2	3	4
4. My sleep was restless .....	1	2	3	4
5. I felt lonely .....	1	2	3	4
6. I felt sad.....	1	2	3	4
7. I could not get "going" .....	1	2	3	4



Appendix 2. Approval from the Institutional Review Board at Auburn University

**AUBURN UNIVERSITY INSTITUTIONAL REVIEW BOARD for RESEARCH INVOLVING HUMAN SUBJECTS  
REQUEST FOR EXEMPT CATEGORY RESEARCH**

For information or help completing this form, contact: **THE OFFICE OF RESEARCH COMPLIANCE**, 115 Ramsay Hall  
Phone: 334-844-5966 e-mail: IRBAdmin@auburn.edu Web Address: http://www.auburn.edu/research/vpr/ohs/index.htm

Revised 2/1/2014 Submit completed form to IRBsubmit@auburn.edu or 115 Ramsay Hall, Auburn University 36849.

Form must be populated using Adobe Acrobat / Pro II or greater standalone program (do not fill out in browser). Hand written forms will not be accepted.

Project activities may not begin until you have received approval from the Auburn University IRB.

**1. PROJECT PERSONNEL & TRAINING**

PRINCIPAL INVESTIGATOR (PI):

Name Juliana Radomski Title \_\_\_\_\_ Dept./School Counseling Education  
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FACULTY ADVISOR (if applicable):

Name Jamie Carney Title Ph.D., Professor Dept./School Counselor Education  
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KEY PERSONNEL: List Key Personnel (other than PI and FA). Additional personnel may be listed in an attachment.

Name	Title	Institution	Responsibilities
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

The Auburn University Institutional Review Board has approved this document for use from 11/22/14 to 11/21/17  
Protocol # 14-SIT-EX1411

KEY PERSONNEL TRAINING: Have all Key Personnel completed CITI Human Research Training (including elective modules related to this research) within the last 3 years?  YES  NO

TRAINING CERTIFICATES: Please attach CITI completion certificates for all Key Personnel.

**2. PROJECT INFORMATION**

Title: Relationship between depression symptomology and percent body fat

Source of Funding:  Investigator  Internal  External

List External Agency & Grant Number: NONE

List any contractors, sub-contractors, or other entities associate with this project.  
NONE

List any other IRBs associated with this project (including those involved with reviewing, deferring, or determinations).  
The Freshmen 15 Study approval number 07-153EP 0707 is the original study

FOR ORC OFFICE USE ONLY			
DATE RECEIVED IN ORC:	<u>11/5/14</u>	by <u>BK</u>	APPROVAL # <u>14-517</u>
DATE OF IRB REVIEW:	_____	by _____	APPROVAL CATEGORY: _____
DATE OF ORC REVIEW:	_____	by _____	INTERVAL FOR CONTINUING REVIEW: _____
DATE OF APPROVAL:	_____	by _____	
COMMENTS:	_____		