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Potential Risk Factors for Diabetes in Undergraduate Students

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Potential Risk Factors for Diabetes in Undergraduate Students

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by

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Abstract

Type 2 Diabetes (T2D) is the inability to effectively utilize insulin, known as insulin resistance, which is essential for the body's absorption of glucose and the subsequent generation of energy. Although it is most prevalent in adulthood, T2D can emerge at any age. Unlike Type 1 Diabetes (T1D), certain steps can be taken toward the prevention and management of T2D. According to the American Diabetes Association (ADA), diet, physical activity, weight, smoking, blood pressure, blood glucose level, and family history of diabetes are all risk factors. This archival study examined how these possible precursors combined with history of reported exposure to adverse events can lead to the eventual development of diabetes in undergraduate students. Both an Adverse Childhood Experiences (ACE) questionnaire and a survey regarding these diabetes risk factors and de-identified demographic information (i.e. gender, family history of diabetes) were distributed to 78 students enrolled in undergraduate psychology courses. It was hypothesized that there would be a significant association between history of trauma (ACE score) and diet and physical activity, and a significant difference between history of trauma (ACE score) and frequency of smoking and drinking, body mass index (BMI), and family history of diabetes. Findings were grouped and analyzed in order to assess participants' vulnerability and to predict their likelihood of ultimately developing diabetes. The hypotheses were not supported, though post-hoc analyses found that family history of diabetes may actually promote more frequent physical activity and healthier dietary habits. Implications for the education of young adults about diabetes risk prevention are discussed.

Keywords: glucose, insulin, intervention, prevention, risk, trauma, type 2 diabetes

Potential Risk Factors for Diabetes in Undergraduate Students

Several variables influence one's risk for developing diabetes. Lifestyle choices seem to play a significant role in the health of individuals, as well as in the prevention of Type II Diabetes (T2D) emergence, including type of diet, amount of physical activity, cigarette smoking, alcohol drinking, and stress and depression (Hu, Manson, Stampfer, Colditz, Liu, Solomon, & Willett, 2001). Indeed, sedentary lifestyle and unhealthy choices have been identified as potentially significant risks for eventual health complications, including T2D emergence (Wilmot, & Idris, 2014). Mental health, in addition to physical health, contributes to the lifestyle choices individuals make; emotional instability caused by depression and distress may influence an individual to develop poor eating habits, including overeating and undereating (Uscher, 2011), and it may lead to reduced physical activity or even physical inactivity (Elfrey, & Ziegelstein, 2009), as depression impairs physical and mental functions ("Prevent Complications," 2016). A history of trauma exposure can result in post-traumatic stress disorder, inducing such negative emotional states. Mental illnesses, specifically depressive disorders, may prompt brain changes that prevent healthy lifestyle decisions (Adams, 2015), and are associated with an increased prevalence of chronic diseases, including diabetes; depressive disorders precipitate chronic diseases, and chronic diseases exacerbate depressive symptoms (Chapman, Perry, & Strine, 2005).

Diabetes Risk Factors

Diabetes is a disease which occurs when glucose from ingested food is improperly metabolized, converted to energy, and stored due to the pancreas's insufficient production of the hormone insulin or to the body's inadequate response to insulin, resulting in high levels of blood glucose, as defined by the Centers for Disease Control and Prevention (2015). T2D is characterized by insulin resistance, leading to the inefficient processing of glucose. T2D typically emerges in late adulthood, but can also develop during adolescence and early adulthood (Wilmot, & Idris, 2014).

Although T2D is more prevalent than Type I Diabetes (T1D), it is manageable when the appropriate interventional measures are taken, including regular exercise and controlled diet (Harris, Petrella, & Leadbetter, 2003). There are many determinants that factor into an individual’s risk for developing T2D. These determinants can be influenced and structured, such as daily lifestyle choices and environmental factors, or they can be inevitable and unmanageable, like genetics, or a combination of both.

Although T2D has a stronger link to a family history than T1D, the genetic basis alone is not enough; identical twins have identical genes, however, the prevalence in monozygotic twins is approximately 70%, whereas in dizygotic twins it is 20–30% (Lyssenko, & Laakso, 2013). Genes play a strong role, allowing diabetes to run in families. However, the risk of T2D development depends on a combination of both genetic susceptibility and environmental factors; children learn from their surroundings and their guardians, and thus adopt their dietary and exercise habits, shaping their daily lifestyles. When suboptimal habits are emulated, the likelihood of diabetes being passed along to them is heightened. Families tend to share similar habits, so obesity commonly runs in families as well. Interestingly, one study found that obesity is more heavily influenced by genes than by childhood family environment (Sorensen, & Stunkard, 1993).

The American Diabetes Association (ADA) (“Lower Your Risk,” 2017), the Centers for Disease Control and Prevention (CDC) (“Basics About Diabetes,” 2017), and the International

Diabetes Federation (IDF) ("Risk Factors," 2015) list family history of diabetes, diet, weight, physical activity, smoking, blood pressure, and blood glucose level as the main risk factors.

Behaviors and Diabetes Risk

Lifestyle behaviors, such as diet and level of physical activity, are modifiable risk factors that are equated more with avoiding T2D development altogether than with lowering the risk of development (Hindhede, & Aagaard-Hansen, 2015). General lifestyle behaviors are shaped by many aspects of society including community, school, personality, family, friends, and the media ("School Health Guidelines," 2011). A cohort study found that individuals with a low conscientiousness personality are at an elevated risk for T2D, as they engage in careless behavior, such as poor weight management, physical inactivity, and low medication adherence, and have a lack of self-control and planning (Jokela, Elovainio, Nyberg, Tabak, Hintsa, Batty, & Kivimaki, 2014). Social relationships influence health behaviors and habits. Early life course experiences shape upcoming health outcomes in adulthood. Social ties constitute a major biological risk factor, as distress can emerge and health can fail in the absence of social ties (Umberson, Crosnoe, & Reczek, 2010).

Unhealthy dietary patterns serve as a determinant for T2D risk. More specifically, high intakes of dough, high-fat dairy, red meats, grains, and animal and hydrogenated fats are associated with an increased risk for T2D. Contrarily, there is no significant association between healthy dietary pattern and T2D risk (Zaroudi, Charati, Mehrabi, Ghorbani, Norouzkhani, Shirashiani, & Oveis, 2016).

Maintaining a healthy weight through physical activity plays an important role in the prevention of diabetes. Low physical activity, coupled with being overweight or obese, is especially associated with a greater risk of T2D development. In one study (Cloostermans, Wendel-Vos, Doornbos, Howard, Craig, Kivimaki, & Bemelmans, 2015), there was a 7.4-fold increased risk for T2D in obese individuals with low physical activity, compared to individuals with normal weight and high physical activity.

Decision Making and Diabetes Risk

There are cognitive constructs behind the daily lifestyle decisions people make, such as whether or not to be more physically active. These constructs include making time for it in their schedule (scheduling efficacy), following task-specific directions (task efficacy), and being active even when feeling unenergetic (coping efficacy). These constructs are all influential in one's decision to engage in physical activity, the amount they engage in, and how much they prioritize it in their everyday lives (Taylor, Raine, Plotkinoff, Vallance, Sharma, & Spence, 2016). There are also cognitive constructs behind diet, and the daily choices that point it in a healthier direction. Blood glucose levels are influenced not only by lifestyle, specifically dietary choices and physical activity, but is also significantly predicted by stress; stress produces hormones, such as glucagon and cortisol, that release glucose into the bloodstream, thus increasing blood glucose concentration, also known as hyperglycemia (Halford, Cuddihy, & Mortimer, 1990). Although it is known that a healthy, nutritious, and well-balanced diet along with engagement in physical activity can not only lower risk, but can help avoid disease altogether, people still rely more on their physicians to improve their health problems rather than making an effort toward fixing it themselves (Hindhede et al., 2015).

On the other hand, there are many other causes of and contributions to the escalation and reduction of T2D risk, apart from daily lifestyle decisions, such as simply being unaware of diabetes risk or asymptomatic. More often than not, people are uninformed that they are on the road toward diabetes, and even prediabetes (Geiss, James, Gregg, Albright, Williamson, &

Cowie, 2010). Due to this unawareness, individuals do not engage in any useful behaviors that would help reduce their risk. Those who are knowledgeable that they are at risk are more likely to engage in moderate physical activity, as well as manage their weight (Gopalan, Lorincz, Wirtalla, Marcus, & Long, 2015). Notwithstanding, one can know that he or she is at risk and still be noncompliant with his or her medication regimen, as there is a tendency to discontinue treatment by medication if one is asymptomatic (Rao, Kamath, Shetty, & Kamath, 2014).

Emotions and Diabetes Risk

In addition to the contribution of physiological and behavioral factors, there are emotional risk factors that facilitate T2D development as well. Mental disorders, particularly depressive disorders, are strongly associated with the occurrence of chronic diseases including diabetes and obesity (Chapman et al., 2005). Mental health is a crucial factor in the emergence of T2D; severe depression and anxiety greatly elevate the risk of diabetes development in individuals diagnosed with prediabetes (Deschenes, Burns, Graham, & Schmitz, 2016).

Negative emotions, including stress, nervousness, anxiety, depression, restlessness, and hopelessness, are commonly reported by individuals at risk for diabetes; stress is the most commonly reported negative emotion. Moreover, risk behaviors, such as increased soda consumption and decreased amount of time dedicated to exercise, result from experiencing these negative emotions (Choi, Rush, & Henry, 2013). The presence and sustainment of emotional distress is associated with a higher incidence of diabetes development in young and healthy individuals (Twig, Gerstein, Fruchter, Shina, Afek, Derazne, & Tirosh, 2016). Those with elevated diabetes-specific emotional distress are at risk for prolonged poor glycemic control and higher HbA1c levels (Strandberg, Graue, Wentzel-Larsen, Peyrot, Thordarson, & Rokne, 2015).

When the body experiences stress, the autonomic nervous system is signaled by the hypothalamus to produce cortisol and epinephrine, also known as the "stress hormones." Upon their release, more glucose is produced in the liver to provide energy to allow for fight or flight responses. Stress management can help maintain blood sugar level, as this extra blood sugar, or hyperglycemia, impairs glucose secretion and absorption, which is one of the main causes of diabetes (Toschi, Camastra, Sironi, Masoni, Gasteldelli, Mari, & Natali, 2002).

People with depression are more likely to develop diabetes (Musselman, Betan, Larsen, & Philips, 2003). Depression and distress generate sensations of fatigue, which ultimately lessens the amount of physical activity an individual engages in (Park, Park, Quinn, & Fritschi, 2015). Physical inactivity increases the risk for T2D development in both males and females (Pan, 2015). Studies have shown that individuals with diabetes have about a 24% elevated risk of developing depression than those without diabetes. Further, depressive disorders and symptoms are twice as prevalent in diabetics (Nouwen, Winkley, Twisk, Lloyd, Peyrot, Ismail, & Pouwer, 2010).

Stress Management Choices and Diabetes Risk

Common negative stress coping strategies include cigarette smoking and alcohol consumption, amongst several others (Romito, & Locke, 2014). Smoking and drinking are much more prevalent in individuals with stress, depression, anxiety, and other mental health conditions; negative psychological states elicit tobacco and alcohol use in order to relieve stress (Drobes, 2002). Smoking increases the body's abdominal fat accumulation, as well as the production of stress hormones. This increases blood pressure and heightens the concentration of glucose in the blood, resulting in insulin resistance, the leading cause of T2D (Brown, 2010). Ultimately, smoking causes T2D, and active smokers have a higher risk for T2D development than nonsmokers, light smokers, and former smokers (Willi, Bodenmann, Ghali, Faris, & Cornuz, 2007). According to Radzeviciene and Ostrauskas (2009), smoking increases T2D risk, especially smoking duration, in years; individuals who have been smokers for 10 or more pack-years had double the risk than non-smokers. However, the number of cigarettes or packs smoked per day has no significant impact on risk. Low to moderate alcohol consumption and cigarette smoking are linked with a low T2D risk (Shi, Shu, Li, Cai, Liu, Zheng, & Villegas, 2013), therefore, high consumption and frequency increases risk due to biological changes that can cause obesity.

Poor mental health conditions can be a burden, and individuals each have their own approaches for arriving at ways in which they can alleviate the negative symptoms of the disorder. One common approach to handling depression and chronic stress is overeating “comfort foods,” or binge eating, which can potentially result in obesity (Hoerster, Jakupcak, Hanson, Mcfall, Reiber, Hall, & Nelson, 2015). The psychological burden of T2D diagnosis can result in binge eating disorders due to the combination of increased body weight, body dissatisfaction, previous diet, and a history of depression (Wilmot, & Idris, 2014). Binge eating essentially consists of high intakes of sugary foods and carbohydrates, and is generally an unhealthy diet which can result in an increase in weight and BMI, and hyperglycemia; hyperglycemia is a hallmark sign of T2D and is one of the main causes of it (Wagner, Armah, Smith, Pike, Tu, Campbell, & Gletsu-Miller, 2016). Binge eating and other behavioral choices made by an individual influence their biological risk factors, such as blood pressure, blood glucose, hemoglobin concentration, and triglyceride levels (Wagner et al., 2016).

Obesity and Diabetes Risk

Being overweight or obese is a leading risk factor for T2D as it can hinder insulin production and utilization, and also result in hypertension and other cardiovascular complications (Kahn, & Flier, 2000). Higher weight and BMI are associated with T2D, especially when seen throughout childhood and adolescence, as per Sabin et al.'s study (2015). In this study, participants between 3–18 years old were randomly selected from the Cardiovascular Risk in Young Finns Study, and data including their height, weight, age, gender, and fasting insulin levels were collected. Later, in adulthood, the same participants were given a survey assessing their possible T2D development. Sabin et al. concluded that obesity in childhood and BMI in adolescence are useful indicators for T2D emergence in adulthood (2015). Notwithstanding, gender is not a significant predictor of obesity (Davis, 2016). Additionally, greater BMI and larger waist-hip circumference are associated with prediabetes (Urena-Bogarin, Martinez-Ramirez, Torres-Sanchez, Hernandez-Herrera, Cortes-Sanabria, & Cueto-Manzano, 2014). Contrarily, both normal and high BMI can lead to diabetes, in terms of whether or not there is insulin resistance and impaired insulin secretion (Tatsumi, Morimoto, Miyamatsu, Noda, Ohno, & Deura, 2015). Unhealthy diet is associated with depression and diabetes, whereas healthy diet is associated with lower odds of depressive symptoms (Dipnall, Pasco, Meyer, Berk, Williams, Dodd, & Jacka, 2015).

PTSD and Health Maintenance

Exposure to traumatic events can induce chronic mental and emotional stress, such as depression, distress, and anxiety, which could be consequential to one's heart health; individuals who suffer from clinical depression are at greater risk for subsequent heart disease. The correlation between depression and cardiovascular disease is comparable to the correlation between smoking and cardiovascular disease (Levy, 2014). Furthermore, chronic stress can lead to both physical and psychological health issues. Extreme amounts of chronic stress can take a severe emotional toll on an individual, as well as adversely affect their immune, cardiovascular, endocrine, and central nervous systems. Moreover, prolonged stress has shown to contribute to the development of major illnesses, including cardiovascular disease and obesity (Schneiderman, Ironson, & Siegel, 2005). This could elevate one's level of risk of T2D development.

Post-traumatic stress disorder (PTSD) is a mental condition that develops at any age following the experience of a psychologically shocking, scary, dangerous, and traumatic event. According to the DSM V of the American Psychiatric Association (APA), the diagnostic criteria for PTSD include either direct or indirect exposure to or the witnessing of death, threatened death, actual or threatened serious injury, or actual or threated sexual violence ("DSM-5 Criteria for PTSD," 2013). However, not every traumatized individual develops chronic or acute PTSD, and not every individual with PTSD has encountered a dangerous event, according to the National Institute of Mental Health (NIH) ("Post-Traumatic Stress Disorder," 2016).

PTSD can influence poor health behaviors that can result in cardiovascular disease. Furthermore, individuals with PTSD have higher rates of physical inactivity, smoking, and medication noncompliance primarily explained by comorbid PTSD-induced depression (Zen, Whooley, Zhao, & Cohen, 2012). PTSD has a direct impact on particular physiological mechanisms, including impeding glucose metabolism, the leading cause of T2D (Vaccarino, Goldberg, Magruder, Forsberg, Friedman, Litz, & Smith, 2014), creating poorer cholesterol levels, greater body mass index (BMI), and higher weight (Trief, Ouimette, Wade, Shanahan, & Weinstock, 2006). Two studies, one conducted by Lukaschek, Baumert, Kruse, Emeny, Lacruz, Huth, and Ladwig (2013) and the other by Roberts, Agnew-Blais, Spiegelman, Kubzansky, Mason, Galea, and Koenen (2015), both investigated the association between PTSD and T2D and discovered that the more severe the symptoms of posttraumatic stress, the stronger the relationship with T2D. In Lukaschek et al.'s study, participants between the ages of 32–81 years were recruited from the KORA F4 in South Germany. Oral glucose tolerance tests (OGTT) were performed, and PTSD screenings were conducted to measure participants' severity of PTSD; they were categorized into partial PTSD, full PTSD, no traumatic event, and traumatic event but no PTSD. The study found that PTSD may induce symptoms of chronic stress and may alter physiological mechanisms, such as high blood pressure, ultimately resulting in T2D development (2013). In Roberts et al.'s study, females between 24–42 years old from the Nurses' Health Study II were mailed questionnaires regarding their trauma exposure. They were classified into five groups based on the amount of trauma experienced and PTSD symptoms reported, and were asked to provide the age at which they experienced what they considered to be the worst trauma. In addition to Lukaschek et al.'s findings, Roberts et al. concluded that a history of PTSD is a strong precursor for T2D development (2015).

Negative cognition and mood are symptoms of PTSD, according to the DSM V (2013), and may cause the same impact as depression on those with T2D. PTSD symptoms, accompanied by depressive symptoms, are related to poorer health status in severely traumatized individuals due to the direct relationship with lessened exercise (Rutter, Weatherill, Krill, Orazem, & Taft, 2013).

Interventions to Reduce Diabetes Risk

Certain interventions prove successful in the reduction of T2D risk. Well-balanced meals and physical activity are the most valuable and controllable lifestyle components that are essential for ideal health, especially for diabetes management (Appuhamy, Kebreab, Simon, Yada, Milligan, & France, 2014). Improving physical and dietary lifestyles can reduce weight, BMI, waist circumference, cholesterol levels, and triglyceride levels. Incorporating whole grains, fruits, vegetables, lean proteins, low-fat dairy, and moderate amounts of fat and sugar into your diet can provide significant health benefits for individuals with diabetes, and even for those without it, as recommended by the American Diabetes Association (2017). Improvements in diet and physical activity create improvements in wellness and productivity, which are not only important behaviors that contribute to diabetes prevention, but also for those with diabetes and obesity diagnoses as well (Block, Azar, Romanelli, Block, Palaniappan, Dolginsky, & Block, 2016).

Specific dietary strategies reduce the risk of T2D development. When dietary adherence is high, it can result in weight loss. Weight loss, accompanied by a low carbohydrate diet, may optimize improvement in diabetes risk factors such as insulin resistance and hyperglycemia (Gow, Garnett, Baur, & Lister, 2016). One study, conducted by Block et al. (2016), found that individually tailored goal settings are effective interventions for promoting adjustments in dietary and exercise habits. In this study, prediabetic patients from a healthcare delivery system were provided with customized goals in order to promote alterations in their diet and engagement in physical activity. This intervention significantly heightened their level of physical activity, as well as their fruit and vegetable consumption by about three times per week. It also decreased their refined carbohydrates intake by about four times per week (Block et al., 2016).

Health maintenance contributes to T2D risk; adhering to healthy lifestyle modifications can lower risk of death in individuals with T2D (Hu et al., 2001). More specifically, not smoking, moderate alcohol consumption, vigorous exercise, and healthy eating are primary lifestyle choices that are beneficial to the health of individuals with and without diabetes (Patel, Gadiraju, Gaziano, & Djousse, 2016). Poor health maintenance can result in the unstable conditions of obesity and inadequate metabolic health, putting an individual at a significantly higher risk for future T2D emergence. Greater relative risks for diabetes are indeed more prevalent in obese individuals, however, weight reduction is effective in lowering risk (Lee, Yang, Ha, Lee, Kwon, Park, & Yoon, 2015).

Exercising regularly can significantly reduce the risk of developing T2D, and even prevent or delay the development, by controlling blood glucose, weight, and blood pressure (Colberg, Sigal, Fernhall, Regensteiner, Blissmer, Rubin, Chasan-Taber, Albright, & Braun, 2010). Engaging in swimming, cycling, brisk walking, dancing, and other forms of physical activity for about 150 minutes a week can reduce the risk of T2D development and several other chronic diseases (Blair, & Morris, 2009). Remaining active about 5 days a week and making healthy food choices can delay and possibly prevent T2D development. Further, moderate weight loss if overweight or obese, combined with exercise, can also reduce one's risk for developing T2D by up to 58% (Colberg et al., 2010). Personalized daily and weekly physical and dietary objectives and reminders are successful interventions for diabetes risk (Block, Azar, Romanelli, Block, Hopkins, Carpenter, & Block, 2015). One study, conducted by Block et al., was centered on an intervention program that sent weekly physical and dietary goals via email, phone calls, and an app to prediabetic patients between the ages of 31–70 years. It was concluded that both physical and dietary improvements can lower fasting glucose levels, weight, BMI, cholesterol, and triglyceride levels (Block et al., 2015). Exercising regularly can produce many health benefits in individuals. High intensity interval training (HIIT) is especially beneficial for overall cardiovascular health. Although studies have not shown any impacts of HIIT on blood pressure, BMI, or waist-hip circumference, HIIT has proven to improve blood flow and maximum oxygen consumption (Higgins, Baker, Evans, Adams, & Cobbold, 2015). By losing a minimum of 7% of their body weight, one can greatly augment their health, as recommended by the ADA (2017).

In addition to diet, physical activity, and weight management, mental health and psychological well-being also contribute to T2D risk. Diabetes distress and mental stress affect health; emotional issues including depression and anxiety contribute to poor glycemic control (Mazze, Lucido, & Shamoon, 1984). T2D can be a burdensome condition, thus positive psychological well-being, specifically life satisfaction and emotional vitality, may assist in the reduction of risk of T2D diagnosis; one study's findings indicated that life satisfaction and emotional vitality were associated with up to a 15% decrease in the odds of diabetes diagnosis (Boehm, Trudel-Fitzgerald, Kivimaki, & Kubzansky, 2015). The stress-buffering functions of positive affect are predictive of a lower risk of mortality in individuals with T2D. Not only does overall "enjoyed life" and hopefulness significantly lower the risk in diabetics, but in those with no chronic illness as well (Moskowitz, Epel, & Acree, 2008).

Emerging Adults

Emerging adulthood is defined by Jeffrey Arnett as the developmental period between 18 and 25 years of age in which adolescents adopt a more independent role and explore various life directions (2001). Further, it is described as the age of possibilities, identity exploration, instability, self-focus, and feeling "in-between." Emerging adults have a variety of potential futures, and are discovering and deciding who they are, what they want out of life, where they want to go, and who they want to be with. Emerging adulthood is full of profound change, and it generates a feeling of "in-between" since the period of adolescence has concluded, and it so closely precedes the adulthood period and its corresponding responsibilities and commitments ("Emerging adults: The in-between age," 2006).

Emerging adulthood is characterized by personal freedom; as emerging adults complete high school and commence their college careers, they typically move out of their parents' homes. All of the exploration, experience, and decision-making that occurs in emerging adulthood establishes the foundations for their lifestyles during young adulthood (Arnett, 2001). Behaviors, particularly health related-behaviors, among emerging adults vary by college status (Simons-Morton, Haynie, O'Brien, Lipsky, Bible, & Liu, 2016). In one study, participants attending 4-year universities, 2-year colleges, and no college completed annual surveys during their final year of high school and their first year of college in order to assess their health behaviors. The study found that, relative to 4-year college students, college non-attendees reported more frequent driving while intoxicated (DWI), soda consumption, and oversleeping while those in 2-year or community college reported less binge drinking, but more frequent soda consumption and marginally more depressive symptoms (Simons-Morton et al., 2016).

Popular reality entertainment television programs, commercials, and advertisements heavily influence viewers' perceived motivations and efficacy, particularly on food preference and exercise. According to Nabi and Thomas' (2013) study, health-oriented programs can induce positive health behaviors in emerging adults, as they generate confidence and motivation to eat more healthily and exercise more frequently. In this study, female undergraduates were randomly assigned to watch either a health-oriented reality program, a non-health-oriented reality program, or a health-themed sitcom containing commercials advertising both healthy and unhealthy foods. Results showed that those who watched the health-oriented reality program were more likely to eat a healthy snack afterward, hence the conclusion that reality programming is effective in promoting positive health behaviors (Nabi, & Thomas, 2013). The taste of food directly pilots the dietary choices emerging adults make. More specifically, palates that are high in fat, sugar, and salt are more preferable and associated with higher consumption. Therefore, emerging adults tend to have poor diet qualities and consume less fruit and vegetables (Kourouniotis, Keast, Riddell, Lacy, Thorpe, & Cicerale, 2016).

The current cigarette smoking status of emerging adults depends on their family history of smoking. According to one study (Chassin, Presson, Sherman, & Mulvenon, 1994), those with a family history of cigarette smoking are more committed and addicted smokers, as they smoke more cigarettes daily and annually. They have a positive overall perception of the psychological consequences of smoking, such as the beneficial sensations of pleasurable relaxation. Further, there is a relationship between the initiation of cigarette smoking and subsequent alcohol consumption. A study administered by Myers, Doran, Edland, Schweizer, and Wall (2013) found that emerging adults who commenced smoking in college reported more frequent heavy drinking episodes, partially due to environmental factors such as peer smokers.

Focus of the Current Study

Not enough has been researched regarding emerging adults and their respective risks of T2D based on their lifestyles and trauma exposure. What steps could be taken with emerging adults which could prevent the development of T2D? This study investigated the relationship between diabetes risk and lifestyle risk factors, family history of diabetes, and history of trauma exposure. The study also investigated the lifestyle habits and trauma backgrounds of undergraduate males and females in order to predict how this association may place them at either higher or lower risk for T2D in the future.

Hypotheses

1. There will be a significant difference between the within-group categories of the following reported risk factors and their and corresponding trauma history score:
    a) Body Mass Index (BMI) (normal weight vs. obese)
    b) Frequency of cigarette smoking (smokers vs. non-smokers)
    c) Level of alcohol consumption (drinkers vs. non-drinkers)
2. There will be a negative correlation between the following reported risk factors and their corresponding trauma history score:
    a) Level of physical activity (1–5)
    b) Level of diet health (1–5)
3. Those with a family history of diabetes will report a greater number of diabetes risk factors as per the risk survey than those without a family history of diabetes.

Method

Participants

The convenience sample comprised of a total of 78 participants, all of whom were undergraduate students enrolled in psychology courses, who were invited to participate in the study. Ages ranged between 18-21 (*N* = 35), 22-25 (*N* = 17), and 25+ (*N* = 2) years old (see Table 1). In this study, participants enrolled in both a trauma psychology course (*N* = 34) and an introductory psychology course (*N* = 44) completed their surveys and ACE questionnaires as part of their class instruction after reading, accepting, and signing the informed consent. All students in both courses were able to decline participating in the study without it impacting on their grade in the class. Of the entire sample pool (*N* = 78), 54 of the participants, 10 males and 44 females, agreed to participate in the study (see Table 1). There was a 100% participation rate in the trauma psychology course (5 males, 29 females) and a 45% participation rate in the introductory psychology course (5 males, 15 females). The low participation rate has raised suspicion of a problematic administration or intimidation by the administrator. For both courses combined, 20% (*N* = 11) scored high (4–10) on the ACE questionnaire, indicating multiple negative or traumatic experiences, whereas 80% (*N* = 43) scored low (0–3), signifying little to no negative or traumatic experiences.

Materials

An informed consent was written following the standard template, adjusting to the specifics of the current study (see Appendix A). A survey was distributed to those who gave their consent in order to assess the covariates of self-reported gender, age, height, weight, type of diet, level of physical activity, current smoking status, current drinking status, and family history of diabetes (see Appendix B). The survey was formulated based on the risk survey provided on the American Diabetes Association's (ADA) website. Subsequently, the standard ACE questionnaire was handed out to measure adverse childhood experiences and to assess their overall level of possible traumatic exposure (see Appendix C).

Since height and weight were provided in ranges on the survey, the midpoints of each were used in order to calculate BMI values. For weight, 129 lbs. was used for < 130 lbs., a midpoint of 149.5 lbs. was used for the range 130–169 lbs., midpoint 189.5 lbs. for the range 170–209 lbs., midpoint 229.5 lbs. for the range 210–249 lbs., and 250 lbs. for ≥ 250 lbs. For height, 3'11" was used for < 4'0", midpoint 4'5" was used for the range 4'0"–4'11", midpoint 5'5" for the range 5'0"–5'11", midpoint 6'5" for the range 6'0"–6'11", and 7'0" for ≥ 7'0".

In an effort to keep all identities anonymous, every participant wrote a different code on the corner of their survey and ACE questionnaire in order to correlate their risk factors with their adverse events history. Participants enrolled in the trauma psychology course made up their own codes, and those in the introductory psychology course were randomly assigned numbers.

Procedure

To begin, all participants in both the trauma and introductory psychology courses were given an informed consent to understand the terms of the research conducted for their class, to be assured that their compliance or refusal to participate would not influence their class grade, and ultimately to either accept or deny their participation via their printed name and signature. Those who agreed were given both the survey and ACE questionnaire to complete, in that order, during class time by a research assistant for the class. Neither the experimenter nor the class instructors were involved with the administration and collection of the consents, surveys, and ACEs from the participants in both classrooms. The research assistant was asked to collect the risk surveys and ACE questionnaires together and the informed consents separately, and to then place the responses in a sealed envelope with no identifying information included.

The archival de-identified data used in this study was originally collected as part of class instruction. Findings of the study were reported to the participants in both the trauma psychology and introductory psychology courses during class time a few weeks later, and students were offered the opportunity to view copies of their responses. Students were also provided names of people (Tiffany Santiago and Thomas Demaria) they could contact in the event that they had questions or concerns that resulted from their participation in the class assignment.

Results

Subject Characteristics

Since height and weight were presented as ranges on the risk survey, only approximate BMI values could be calculated. BMI variables were made into two nominal categories; normal weight and obese. The minimum approximate BMI value was 21.5, which is considered normal weight, and the maximum approximate BMI value was 38.2, which is considered obese, (*M* = 24.9, *SD* = 3.79). BMI was only determined for 44 of the 54 participants since the height was not indicated along with the weight on 10 of the risk surveys. More than half of the sample (84%) fell under the category of normal weight (*N* = 37), while few (16%) fell under the category of obese (*N* = 7). No participants fell under the category of overweight (see Table 10).

Current smoking status and current drinking status were each made into two nominal categories; non-smokers and smokers, and non-drinkers and drinkers. Of all 54 participants, 7% (*N* = 4) indicated on the risk survey that they were cigarette smokers, and 66% (*N* = 35) indicated that they were alcohol drinkers (see Table 2). One risk survey marked “yes” for current alcohol drinking status, but the frequency was not indicated. The median diet scale rating reported on the risk survey was 3 (average health), and the median physical activity scale rating was 3 (sometimes active) (see Table 3).

Family history of diabetes was also made into two nominal categories; family history of diabetes and no family history of diabetes. Of the entire sample (*N* = 54), 33% (*N* = 18) reported having a family history of diabetes, and 7% (*N* = 4) were unsure about their family history of diabetes (see Table 5). Of those who reported having a family history of diabetes (*N* = 18), 83% (*N* = 15) scored less than 4 on the ACE questionnaire, and 17% (*N* = 3) scored 4 or above on the ACE questionnaire. Of those who reported not having a family history of diabetes (*N* = 32), 78% (*N* = 25) scored less than 4 on the ACE questionnaire, and 22% (*N* = 7) scored 4 or above on the ACE questionnaire (see Table 4). Trauma history indicated by the ACE score was kept as a continuous variable.

Descriptive statistics demonstrated that out of the possible 10 points that could be scored on the ACE questionnaire, the minimum score was 0 and the maximum score was 7, ($M = 2.02$, $SD = 1.91$). Of the entire sample ($N = 54$), 80% ($N = 43$) scored less than 4, and 20% ($N = 11$) scored 4 or greater.

Hypothesis 1

To determine the difference in self-reported trauma history (continuous variable) between BMI categories (normal weight vs. obese), a two-tailed independent samples t-test value was computed, with equal variances assumed since no outliers were present to skew the data, for a between-groups comparison. For this test, BMI values were categorized as normal weight (18.5–24.9) and obese (≥ 30). The category for overweight (25.0–29.9) was not included since none of the participants' BMI values were rendered overweight. There was no significant difference in self-reported trauma history indicated by the ACE questionnaire score between normal BMI and obese BMI, $t(42) = .034$, $p = .973$.

To distinguish the difference in self-reported trauma history (continuous variable) between both smoking categories (smokers vs. non-smokers) and drinking categories (drinkers vs. non-drinkers), two-tailed independent samples t-tests, with equal variances assumed since there was no skewness due to outliers, were performed for a between-groups comparison. For these tests, the three levels of both smoking and drinking (occasionally, semi-frequently, frequently) were coded collectively as "yes" for the categories of smokers and drinkers. There was no significant difference in self-reported trauma history based on the ACE questionnaire score between cigarette smokers and non-smokers, $t(52) = -1.577$, $p = .121$ (see Figure 1), nor between alcohol drinkers and non-drinkers, $t(52) = -.103$, $p = .918$ (see Figure 2).

Hypothesis 2

Diet and physical activity scale ratings (1–5) were kept as continuous variables. Two-tailed Spearman correlation tests were computed in order to determine the correlations between both level of health of diet (1–5) and trauma history (continuous variable), and level of physical activity (1–5) and trauma history (continuous variable). Although there was no significant relationship between self-rated level of diet and self-reported trauma history as per the ACE questionnaire score, $r_S(54) = -.232$, $p = .091$, there was a trend toward an inverse relationship as $p < .100$. Similarly, there was no significant relationship between self-rated level of physical activity and self-reported trauma history as per the ACE questionnaire score, $r_S(54) = .088$, $p = .529$.

Hypothesis 3

To detect the differences in severity of self-reported trauma history between categories of family history of diabetes (yes vs. no), two-tailed independent samples t-tests were carried out, with equal variances assumed since there were no outliers to cause skewness. Those who indicated on the risk survey that they were unsure about their family history of diabetes ($N = 4$) were not included in the between-groups comparisons. There was no significant difference in self-reported trauma history based on the ACE questionnaire score between those with a family history of diabetes and those without a family history of diabetes, $t(48) = .287$, $p = .775$.

Post-Hoc Comparisons

In order to compare the relativity of health of diet between those with and without a family history of diabetes, the following percentages were examined. The percentage of individuals who rated their diet as healthy or extremely healthy (4–5 out of 5) on the risk survey was greater for those with a family history of diabetes (39%) than for those without a family history of diabetes (28%). The percentage was highest for average diet (3 out of 5) for individuals both with (56%) and without (63%) a family history of diabetes. The lowest percentage was observed for unhealthy diet (1–2 out of 5) for individuals both with (5%) and without (9%) a family history of diabetes (see Table 6).

The highest percentage of individuals, both with (50%) and without (37%) a family history of diabetes, rated their physical activity as semi-frequently or frequently active (4–5 out of 5) on the risk survey. For sometimes active (3 out of 5), there was a lower percentage for those with a family history of diabetes (28%) than for those without a family history of diabetes (44%). Conversely, a slightly greater percentage was observed for inactive or a little active (1–2 out of 5) for those with a family history of diabetes (22%) than for those without (19%) a family history of diabetes (see Table 6).

The most frequent ACE score, out of the possible 10 total points, was 0 ($N = 16$). The second most frequent ACE scores were 1 ($N = 11$) and 2 ($N = 11$). More than half of the sample received an ACE score between 0–3 (N = 43), while part of the sample scored 4 or above ($N = 11$). No individuals from the sample scored 5, 8, 9, or 10 out of 10 on the ACE questionnaire (see Table 7). Of all 54 participants, the most commonly marked ACE question was number 6 ($N = 22$), which asked "Were your parents ever separated or divorced?," while the least marked was number 5 ($N = 1$), which asked "Do you often feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you, or that your parents were too drunk or high to take care of you or take you to the doctor if you needed it?." (see Table 8).

A total of 11 participants had a cumulative score of 4 or above on the ACE questionnaire. Of these 11, 64% ($N = 7$) had an ACE score of 4 out of 10, 27% ($N = 3$) had a score of 6, and 9% ($N = 1$) had a score of 7. In addition, the average diet rating was 3.27 out of 5, and the average physical activity rating was 3.36 out of 5, both with a median score of 3. The self-reported current smoking status was almost entirely “no” (91%), with just one with a status of “yes.” More than half of the 11 participants reported “yes” for their current drinking status (64%), with four statuses of “no.” A majority of this subsample did not have a family history of diabetes; 27% (*N* = 3) reported having a family history of diabetes, while 9% (*N* = 1) reported being unsure of their family history of diabetes (see Table 9).

Discussion

The present study examined the potential T2D risk in female and male undergraduate students by assessing their lifestyles and behaviors (diet, physical activity, smoking status, drinking status), previous trauma exposure, and family history of diabetes through the use of survey questions. Diabetes is a chronic disease that has become an epidemic, T2D more so than T1D. According to the American Diabetes Association, diabetes is the seventh leading cause of death in the United States, and around 9.3% of the American population is diabetic as of 2012. Equivalently, one in eight adults is diagnosed with diabetes (Gardner, 2013). The most influential and effective treatments of diabetes include a nutritious diet and moderate weekly physical activity.

Analysis of Hypotheses

No statistically significant relationships were observed from the Pearson correlational analyses nor from the between-groups comparisons. There was no significant association between the ACE score and the diabetes risk factors endorsed as per the risk survey, as hypothesized. Only 20% of the sample indicated having some previous trauma exposure, scoring 4 or more points on the ACE questionnaire. Findings generally showed that there were no significant differences between BMI and trauma history, smoking and trauma history, drinking and trauma history, and family history of diabetes and trauma history.

Hypothesis 1 was not supported. There were no significant differences, positive or negative, between BMI, smoking, and drinking, based on the risk survey, with trauma history level, based on the ACE questionnaire score. This may be caused by the sample characteristics since almost the entire sample had a normal BMI, and more than half of the sample did not smoke (see Figure 1) or drink (see Figure 2).

Hypothesis 2 was not supported either. There was no correlation, positive or negative, between level of physical activity and diet health, as per the risk survey, with the total number of adverse experiences, as per the ACE questionnaire score. However, a trend toward an inverse relationship was observed between self-rated diet and self-reported trauma history, indicating the possibility that a healthier diet was encouraged by a history of trauma exposure. According to the diet and physical activity rating scales, participants were mainly healthy and active; most of the sample rated their diet and physical activity as average (3 out of 5), but no participants rated their physical activity as inactive (1 out of 5), or their diet as unhealthy (1 out of 5).

Hypothesis 3 was also unsupported. There was no significant association between a family history of diabetes and the total number of adverse experiences endorsed on the ACE questionnaire. Less than half of the sample reported having a family history of diabetes (see Figure 4).

Post-Hoc Analyses

The post-hoc comparisons yielded some interesting findings. The frequencies suggest that awareness of a family history of diabetes may augment both dietary health and level of physical activity. Although the most commonly endorsed diet scale rating was average health (3 out of 5), the frequency of healthy and extremely healthy diet (4–5 out of 5) for those with a family history of diabetes was greater than for those without a family history of diabetes, which may suggest that awareness aids in the promotion of healthier dietary habits. The same goes for physical activity; a physical activity scale rating of semi-frequently or frequently active (4–5 out of 5) had the greatest frequency of all scale ratings marked by individuals with a family history of diabetes, also suggesting that awareness may encourage an individual to engage in more exercise since they are aware of the risks posed by diabetes and the preventional measures they can take.

On the ACE questionnaire, the most repeatedly endorsed question was number 6, showing that a lot of the individuals in the sample have parents who ever separated or divorced. Numbers 1 and 8 were also frequently marked, demonstrating that the individuals were sworn at, humiliated, insulted, put down, or felt afraid that they would be physically hurt by a parent or other adult, or that they live or lived with someone who is or was an alcoholic or who used street drugs. Question number 5 was the least commonly endorsed, thus it was very uncommon amongst the sample to have experienced not having enough to eat, having to wear dirty clothes, not having anyone for protection, have parents who were too drunk or high to take care of them or take them to the doctor. Numbers 7 and 10 were the second least endorsed questions, indicating that not many individuals had a household member who went to prison, or witnessed their mother or step other often get pushed, grabbed, slapped, have something thrown at her, kicked, bitten, punched, hit with a hard object, repeatedly hit over a short period of time, or threatened with a gun or knife. Based on the frequencies of "yes" marks for each question, the sample of undergraduates were relatively mentally healthy and really did not experience any adverse events.

Of the 11 participants who scored 4 or greater on the ACE questionnaire, only 3 reported having a family history of diabetes. One of these 3 participants reported being a non-smoker and a non-drinker, one reported being an occasional smoker and occasional drinker, and one reported being a non-smoker and an occasional drinker. These 3 participants rated both their dietary health and their level of physical activity no lower than average (3 out of 5). Although this shows no suggestions of family history of diabetes leading to non-smoker and non-drinker statuses, the smoking and drinking may be a result of adverse experiences expressed by their relatively higher ACE. Their diet and physical activity ratings of average or better may be a result of their awareness of having a family history of diabetes, making them more knowledgeable of the risks associated with diabetes and how their lifestyles are strong forms of intervention.

Limitations of the Study

One limitation of the study was that it was based on survey questions; people tend to overestimate their height and underestimate their weight when responding to surveys (Davis, 2016). Since diet and physical activity were self-rated by the participants on the scales, it is possible that they could have been too modest or too generous with their ratings, deeming them slightly possibly inaccurate.

The sample size (N = 54), along with the portion of males and females, was another limitation of the study. Over half of the participants enrolled in the introductory psychology course (55%) declined their participation in the study (N = 24), reducing the original sample pool from 78 to 54. Since the sample was predominantly female, the data were biased, and no correlations or disparities between genders could be observed. In addition, undergraduate students at Long Island University could have either been athletes, both males and females, or just health conscious, thus possibly being the reason why most of the physical activity ratings were high (semi-frequently and frequently active), and a majority of the BMI values were of normal weight.

A third limitation was that the risk survey provided ranges for age, weight, and height. Thus, midpoint values for weight and height ranges were used to calculate estimated BMI values for each participant, rather than actual weights and heights, rendering them ambiguous and inaccurate. Further, estimated BMI values could not be determined for 10 of the 54 participants since they only indicated their weight, not their height.

Another limitation was the history of adverse events as reported on the ACE questionnaire; only 11 of the 54 participants in the sample scored high (4–10) on the ACE questionnaire, so trauma history was not severe or prevalent enough to serve as a predictor for this sample. Additionally, a majority of the sample reported not having a family history of diabetes, thus, no significant results were obtained.

Implications for Further Research

Implications for further research or clinical practice primarily include assessing a larger sample size in order to obtain more valid and significant results. Secondly, a sample with a more proportionate amount of males and females would allow for gender comparison analyses. To exemplify with previous findings, cigarette smoking and alcohol consumption are more prevalent in males (Pan, 2015), males are at a higher risk for high blood glucose (Davis, 2016), and BMI is more predictive of prediabetes development in females (Serlachius et al., 2016).

Another implication is to incorporate a broader age range within the sample to compare and contrast the risks in young adults versus senior adults, as T2D is more prevalent in adulthood; a higher risk of T2D development is associated with older age (Urena-Bogarin et al., 2014). Were this study to be conducted again, the participants would be asked to provide their age and most accurate weight and height on the risk survey rather than select an appropriate range; more exact weights and heights would allow for the calculation of more approximate BMI values per individual. Participants would also be asked to indicate whether or not they are athletes, since athletes are more biased than non-athletes toward the physical activity rating scale.

Another inclusion to the risk survey would regard the participants' ethnic backgrounds in order to reinforce the assessment of their predicted risk; Native Americans have the highest rate of incidence of diagnosed diabetes among all other ethnic groups in the United States, as reported by the American Diabetes Association.

Another implication for a future study is to incorporate a group with no history of trauma exposure and a group with severe trauma exposure, in order to perform a between-groups analysis and observe the variations in their reported risk factors.

Clinical implications include the consideration of a family history of diabetes in the assessment of a patient's lifestyle, as this factor may negatively or positively impact their level of physical activity and their dietary health. It is worth exploring whether or not a patient is aware of their family history of diabetes, as well as of their parents' and family's physical health, in terms of preventative medicine. This clinical speculation of doctor-patient relationships is about teaching patients how to accommodate their lifestyles for the benefit of their health.

References

Adams, A. (2015, October). How mental health alters decision making. Retrieved from http://news.stanford.edu/features/2015/decisions/disease-state.html

American Psychiatric Association (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed.).

Appuhamy, J. A., Kebreab, E., Simon, M., Yada, R., Milligan, L. P., & France, J. (2014). Effects of diet and exercise interventions on diabetes risk factors in adults without diabetes: meta-analyses of controlled trials. *Diabetology & Metabolic Syndrome, 6*(1), 127. doi:10.1186/1758-5996-6-127

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*, *55*(5), 469. Retrieved from http://dx.doi.org/10.1037/0003-066X.55.5.469

Basics About Diabetes. 2017. Retrieved from https://www.cdc.gov/diabetes/basics/diabetes.html

Blair, S. N., & Morris, J. N. (2009). Healthy Hearts—and the Universal Benefits of Being Physically Active: Physical Activity and Health. *Annals of Epidemiology, 19*(4), 253-256. doi:10.1016/j.annepidem.2009.01.019

Block, G., Azar, K. M., Romanelli, R. J., Block, T. J., Hopkins, D., Carpenter, H. A., . . . Block, C. H. (2015). Diabetes prevention and weight loss with a fully automated behavioral intervention by email, web, and mobile phone: A randomized controlled trial among persons with prediabetes. *Journal of Medical Internet Research*, *17*(10), 1-14. doi:10.2196/jmir.4897

Block, G., Azar, K. M., Romanelli, R. J., Block, T. J., Palaniappan, L. P., Dolginsky, M., & Block, C. H. (2016). Improving diet, activity and wellness in adults at risk of diabetes:

randomized controlled trial. *Nutrition & Diabetes, 6*(9), E231. doi:10.1038/nutd.2016.42

Boehm, J. K., Trudel-Fitzgerald, C., Kivimaki, M., Kubzansky, L. D. (2015). The prospective association between positive psychological well-being and diabetes. *Health Psychology, 34*(10), 1012-1021.

Brown, D. E. (2010). The Effects of Nicotine on Blood Glucose Levels. Retrieved from http://www.livestrong.com/article/230910-the-effects-of-nicotine-on-blood-glucose-levels/

Chapman, D. P., Perry, G. S., Strine, T.W. (2005). The vital link between chronic disease and depressive disorders. *Preventing Chronic Disease*, *2*(1), A14.

Chassin, L., Presson, C. C., Sherman, S. J., & Mulvenon, S. (1994). Family history of smoking and young adult smoking behavior. *Psychology of Addictive Behaviors*, *8*(2), 102-110. doi:10.1037//0893-164x.8.2.102

Choi, S. E., Rush, E. B., & Henry, S. L. (2013). Negative emotions and risk for Type 2 Diabetes among Korean immigrants. *The Diabetes Educator, 39*(5), 679-688. doi:10.1177/0145721713492566

Cloostermans, L., Wendel-Vos, W., Doornbos, G., Howard, B., Craig, C. L., Kivimäki, M., . . . Bemelmans, W. J. (2015). Independent and combined effects of physical activity and body mass index on the development of Type 2 Diabetes – a meta-analysis of 9 prospective cohort studies. *International Journal of Behavioral Nutrition and Physical Activity, 12*(1). doi:10.1186/s12966-015-0304-3

Colberg, S. R., Sigal, R. J., Fernhall, B., Regensteiner, J. G., Blissmer, B. J., Rubin, R. R., . . . Braun, B. (2010). Exercise and Type 2 Diabetes: The American College of Sports Medicine and the American Diabetes Association: joint position statement. *Diabetes*

Care, 33(12), E147-E167. doi:10.2337/dc10-9990

Davis, W. S. (2016). Association between psychological trauma from assault in childhood and metabolic syndrome. Retrieved from http://scholarworks.waldenu.edu/cgi/viewcontent .cgi?article=2255&context=dissertati ons

Deschênes, S. S., Burns, R. J., Graham, E., & Schmitz, N. (2016, October). Prediabetes, depressive and anxiety symptoms, and risk of type 2 diabetes: A community-based cohort study. *Journal of Psychosomatic Research, 89*, 85-90. doi:10.1016/j.jpsychores.2016.08.011

Dipnall, J. F., Pasco, J. A., Meyer, D., Berk, M., Williams, L. J., Dodd, S., & Jacka, F. N. (2015). The association between dietary patterns, diabetes and depression. *Journal of Affective Disorders*, *174*, 215-224. doi:10.1016/j.jad.2014.11.030

Drobes, D. J. (2002, November). Concurrent alcohol and tobacco dependence: Mechanisms and treatment. Retrieved from https://pubs.niaaa.nih.gov/publications/arh26-2/136-142.htm

DSM-5 Criteria for PTSD. 2017. Retrieved from http://www.brainlinemilitary.org/content/2014/06/dsm-v-tr-criteria-for-ptsd.html

Elfrey, M. K., Ziegelstein, R. C. (2009). The "inactivity trap." *General Hospital Psychiatry, 31*(4), 303-305. doi:10.1016/j.genhosppsych.2009.05.001

Emerging adults: The in-between age. (2006). Retrieved from http://www.apa.org/monitor/jun06/emerging.aspx

Gardner, A. (2013, February). 1 in 8 Americans Diagnosed With Type 2 Diabetes: Poll. Retrieved from http://health.usnews.com/health-news/news/articles/2013/02/20/1-in-8-americans-diagnosed-with-type-2-diabetes-poll

Geiss, L. S., James, C., Gregg, E. W., Albright, A., Williamson, D. F., & Cowie, C. C. (2010). Diabetes risk reduction behaviors among U.S. adults with prediabetes. *American Journal of Preventive Medicine, 38*(4), 403-409. doi:10.1016/j.amepre.2009.12.029

Gopalan, A., Lorincz, I. S., Wirtalla, C., Marcus, S. C., & Long, J. A. (2015). Awareness of prediabetes and engagement in diabetes risk–reducing behaviors. *American Journal of Preventive Medicine, 49*(4), 512-519. doi:10.1016/j.amepre.2015.03.007

Gow, M., Garnett, S., Baur, L., & Lister, N. (2016). The effectiveness of different diet strategies to reduce Type 2 Diabetes risk in youth. *Nutrients, 8*(8), 486. doi:10.3390/nu8080486

Halford, W. K., Cuddihy, S., & Mortimer, R. H. (1990). Psychological stress and blood glucose regulation in Type I diabetic patients. *Health Psychology, 9*(5), 516-528. doi:10.1037/0278-6133.9.5.516

Harris, S. B., Petrella, R. J., Leadbetter, W. (2003). Lifestyle interventions for type 2 diabetes. Relevance for clinical practice. *Canadian Family Physician, 49*, 1618-1625.

Higgins, T. P., Baker, M. D., Evans, S., Adams, R. A., & Cobbold, C. (2015). Heterogeneous responses of personalised high intensity interval training on Type 2 Diabetes mellitus and cardiovascular disease risk in young healthy adults. *Clinical Hemorheology and Microcirculation, 59*(4), 365-377. doi:10.3233/ch-141857

Hindhede, A. L., & Aagaard-Hansen, J. (2015). Risk, the prediabetes diagnosis and preventive strategies: Critical insights from a qualitative study. *Critical Public Health, 25*(5), 569-581. doi:10.1080/09581596.2014.921283

Hoerster, K. D., Jakupcak, M., Hanson, R., Mcfall, M., Reiber, G., Hall, K. S., & Nelson, K. M. (2015). PTSD and depression symptoms are associated with binge eating among US Iraq and Afghanistan veterans. *Eating Behaviors*, *17*, 115-118. doi:10.1016/j.eatbeh.2015.01.005

Hu, F. B., Manson, J. E., Stampfer, M. J., Colditz, G., Liu, S., Solomon, C. G., & Willett, W. C. (2001). Diet, lifestyle, and the risk of Type 2 Diabetes Mellitus in women. *The New England Journal of Medicine*, *345*, 790-797. doi:10.1056/NEJMoa010492

Jokela, M., Elovainio, M., Nyberg, S. T., Tabák, A. G., Hintsa, T., Batty, G. D., & Kivimäki, M. (2014). Personality and risk of diabetes in adults: Pooled analysis of 5 cohort studies. *Health Psychology*, *33*(12), 1618-1621. doi:10.1037/hea0000003

Kahn, B. B., & Flier, J. S. (2000). Obesity and insulin resistance. *Journal of Clinical Investigation*, *106*(4), 473-481. doi:10.1172/jci10842

Kourouniotis, S., Keast, R., Riddell, L., Lacy, K., Thorpe, M., & Cicerale, S. (2016). The importance of taste on dietary choice, behaviour and intake in a group of young adults. *Appetite*, *103*, 1-7. doi:10.1016/j.appet.2016.03.015

Lee, S., Yang, H. K., Ha, H., Lee, J., Kwon, H., Park, Y., . . . Yoon, K. (2015). Changes in metabolic health status over time and risk of developing Type 2 Diabetes. *Medicine*, *94*(40), E1705. doi:10.1097/md.0000000000001705

Levy, R. (2014). Distress, depression, anxiety and cardiovascular disease: A call to action. *Journal of Clinical and Preventive Cardiology*, *3*(4), 107-134.

Lower Your Risk. 2017. Retrieved from http://www.diabetes.org/are-you-at-risk/lower-your-risk/?loc=atrisk-slabnav

Lukaschek, K., Baumert, J., Kruse, J., Emeny, R. T., Lacruz, M. E., Huth, C., . . . Ladwig, K. (2013). Relationship between posttraumatic stress disorder and Type 2 Diabetes in a population-based cross-sectional study with 2970 participants. *Journal of Psychosomatic Research, 74*(4), 340-345. doi:10.1016/j.jpsychores.2012.12.011

Lyssenko, V., & Laakso, M. (2013). Genetic Screening for the Risk of Type 2 Diabetes: Worthless or valuable? *Diabetes Care, 36*(Supplement 2), S120-S126. doi:10.2337/dcs13-2009

Mazze, R. S., Lucido, D., & Shamoon, H. (1984). Psychological and Social Correlates of Glycemic Control. *Diabetes Care, 7*(4), 360-366. doi:10.2337/diacare.7.4.360

Moskowitz, J. T., Epel, E. S., & Acree, M. (2008). Positive affect uniquely predicts lower risk of mortality in people with diabetes. *Health Psychology, 27*(1, Suppl), S73-S82. doi:10.1037/0278-6133.27.1.s73

Musselman, D. L., Betan, E., Larsen, H., & Phillips, L. S. (2003). Relationship of depression to diabetes types 1 and 2: epidemiology, biology, and treatment. *Biological Psychiatry, 54*(3), 317-329. doi:10.1016/s0006-3223(03)00569-9

Myers, M. G., Doran, N. M., Edland, S. D., Schweizer, C. A., & Wall, T. L. (2013). Cigarette smoking initiation during college predicts future alcohol involvement: A matched-samples study. *Journal of Studies on Alcohol and Drugs, 74*(6), 909-915. doi:10. 15288/jsad.2013.74.909

Nabi, R. L., & Thomas, J. (2013). The effects of reality-based television programming on diet and exercise motivation and self-efficacy in young adults. *Health Communication, 28*(7), 699-708. doi:10.1080/10410236.2012.711510

Nouwen, A., Winkley, K., Twisk, J., Lloyd, C. E., Peyrot, M., Ismail, K., & Pouwer, F. (2010). Type 2 diabetes mellitus as a risk factor for the onset of depression: a systematic review and meta-analysis. *Diabetologia, 53*(12), 2480-2486. doi:10.1007/s00125-010-1874-x

Pan, X. (2015). Gender dissimilarity in Type 2 Diabetes risk factors: A Chinese study. *International Journal of Behavioral Medicine, 22*(5), 614-624. doi:10.1007/s12529-015-9474-2

Park, H., Park, C., Quinn, L., & Fritschi, C. (2015). Glucose control and fatigue in Type 2 Diabetes: The mediating roles of diabetes symptoms and distress. *Journal of Advanced Nursing*, *71*(7), 1650-1660. doi:10.1111/jan.12632

Patel, Y. R., Gadiraju, T. V., Gaziano, J. M., & Djoussé, L. (2016). Adherence to healthy lifestyle factors and risk of death in men with diabetes mellitus: The Physicians' Health Study. *Clinical Nutrition*. doi:10.1016/j.clnu.2016.11.003

Post-Traumatic Stress Disorder. 2016. Retrieved from https://www.nimh.nih.gov/health/topics/post-traumatic-stress-disorder-ptsd/index.shtml

Prevent Complications. (2016). Retrieved from https://www.cdc.gov/diabetes/managing/problems.html

Radzevičienė, L., & Ostrauskas, R. (2009). Smoking habits and the risk of Type 2 Diabetes: A case-control study. *Diabetes & Metabolism, 35*(3), 192-197. doi:10.1016/j.diabet.2008.11.001

Rao, C. R., Kamath, V. G., Shetty, A., & Kamath, A. (2014). Treatment Compliance Among Patients with Hypertension and Type 2 Diabetes Mellitus in a Coastal Population of Southern India. *International Journal of Preventive Medicine, 5*(8), 992-998.

Risk Factors. 2015. Retrieved from http://www.idf.org/about-diabetes/risk-factors

Roberts, A. L., Agnew-Blais, J. C., Spiegelman, D., Kubzansky, L. D., Mason, S. M., Galea, S., . . . Koenen, K. C. (2015, March). Posttraumatic stress disorder and incidence of Type 2

Diabetes mellitus in a sample of women. *JAMA Psychiatry, 72*(3), 203-210. doi:10.1001/jamapsychiatry.2014.2632

Romito, K., & Locke, S. (2014, November). Common coping responses for stress - Topic overview. Retrieved from http://www.webmd.com/balance/stress-management/tc/common-coping-responses-for-stress-topic-overview

Rutter, L. A., Weatherill, R. P., Krill, S. C., Orazem, R., & Taft, C. T. (2013). Posttraumatic stress disorder symptoms, depressive symptoms, exercise, and health in college students. *Psychological Trauma: Theory, Research, Practice, and Policy, 5*(1), 56-61. doi:10.1037/a0021996

Sabin, M. A., Magnussen, C. G., Juonala, M., Shield, J., Kahonen, M., Lehtimaki, T., . . . Raitakari, O. T. (2015). Insulin and BMI as predictors of adult Type 2 Diabetes mellitus. *Pediatrics, 135*(1). doi:10.1542/peds.2014-1534

Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and Health: Psychological, Behavioral, and Biological Determinants. *Annual Review of Clinical Psychology, 1*, 607-628. doi:10.1146/annurev.clinpsy.1.102803.144141

School health guidelines to promote healthy eating and physical activity. (2011). Retrieved from https://www.cdc.gov/MMWR/preview/mmwrhtml/rr6005a1.htm

Serlachius, A., Elovainio, M., Juonala, M., Shea, S., Sabin, M., Lehtimäki, T., . . . Pulkki-Råback, L. (2016). The association between social support, body mass index and increased risk of prediabetes: The cardiovascular risk in young Finns study. *International Journal of Behavioral Medicine*. doi:10.1007/s12529-016-9597-0

Shi, L., Shu, X., Li, H., Cai, H., Liu, Q., Zheng, W., . . . Villegas, R. (2013). Physical activity, smoking, and alcohol consumption in association with incidence of Type 2 Diabetes among middle-aged and elderly Chinese men. *PLoS ONE, 8*(11). doi:10.1371/journal.pone.0077919

Simons-Morton, B., Haynie, D., O'Brien, F., Lipsky, L., Bible, J., & Liu, D. (2017). Variability in measures of health and health behavior among emerging adults 1 year after high school according to college status. *Journal of American college health*, *65*(1), 58-66. http://dx.doi.org/10.1080/07448481.2016.1238384

Sørensen, T. I., & Stunkard, A. J. (1993). Does obesity run in families because of genes? *Acta Psychiatrica Scandinavica, 370*, 67-72. doi:10.1111/j.1600-0447.1993.tb05363.x

Strandberg, R. B., Graue, M., Wentzel-Larsen, T., Peyrot, M., Thordarson, H. B., & Rokne, B. (2015). Longitudinal relationship between diabetes-specific emotional distress and follow-up HbA 1c in adults with Type 1 diabetes mellitus. *Diabetic Medicine, 32*(10), 1304-1310. doi:10.1111/dme.12781

Tatsumi, Y., Morimoto, A., Miyamatsu, N., Noda, M., Ohno, Y., & Deura, K. (2015). Effect of body mass index on insulin secretion or sensitivity and diabetes. *American Journal of Preventive Medicine, 48*(2), 128-135. doi:10.1016/j.amepre.2014.09.009

Taylor, L. M., Raine, K. D., Plotnikoff, R. C., Vallance, J. K., Sharma, A. M., & Spence, J. C. (2016). Understanding physical activity in individuals with prediabetes: An application of social cognitive theory. *Psychology, Health & Medicine, 21*(2), 254-260. doi:10.1080/13548506.2015.1058486

Toschi, E., Camastra, S., Sironi, A. M., Masoni, A., Gastaldelli, A., Mari, A., . . . Natali, A. (2002). Effect of Acute Hyperglycemia on Insulin Secretion in Humans. *Diabetes, 51*(Supplement 1), S130-S133. doi:10.2337/diabetes.51.2007.s130

Trief, P. M., Ouimette, P., Wade, M., Shanahan, P., & Weinstock, R. S. (2006). Post-traumatic stress disorder and diabetes: Co-morbidity and outcomes in a male veterans sample. *Journal of Behavioral Medicine, 29*(5), 411-418. doi:10.1007/s10865-006-9067-2

Twig, G., Gerstein, H. C., Fruchter, E., Shina, A., Afek, A., Derazne, E., . . . Tirosh, A. (2016). Self-perceived emotional distress and diabetes risk among young men. *American Journal of Preventive Medicine*, *50*(6), 737-745. doi:10.1016/j.amepre.2015.12.006

Umberson, D., Crosnoe, R., & Reczek, C. (2010). Social relationships and health behavior across the life course. *Annual review of sociology*, *36*, 139-157. doi:10.1146/annurev-soc-070308-120011

Urena-Bogarin, E. L., Martinez-Ramirez, H. R., Torres-Sanchez, J. R., Hernandez-Herrera, A., Cortes-Sanabria, L., & Cueto-Manzano, A. M. (2014). Prevalence of pre-diabetes in young Mexican adults in primary health care. *Family Practice*, *32*(2), 159-164. doi:10.1093/fampra/cmu047

Uscher, J. (2011). 3 Food Traps to Avoid When You're Depressed. Retrieved from http://www.webmd.com/depression/features/depression-food-traps#2

Vaccarino, V., Goldberg, J., Magruder, K. M., Forsberg, C. W., Friedman, M. J., Litz, B. T., . . . Smith, N. L. (2014). Posttraumatic stress disorder and incidence of Type-2 Diabetes: A prospective twin study. *Journal of Psychiatric Research, 56*, 158-164. doi:10.1016/j.jpsychires.2014.05.019

Wagner, K. A., Armah, S. M., Smith, L. G., Pike, J., Tu, W., Campbell, W. W., . . . Gletsu-Miller, N. (2016). Associations between diet behaviors and measures of glycemia, in clinical setting, in obese adolescents. *Childhood Obesity, 12*(5), 341-347. doi:10.1089/chi.2015.0232

Willi, C., Bodenmann, P., Ghali, W. A., Faris, P. D., & Cornuz, J. (2007). Active Smoking and the Risk of Type 2 Diabetes: A Systematic Review and Meta-analysis. *Jama, 298*(22), 2654-2664. doi:10.1001/jama.298.22.2654

Wilmot, E., & Idris, I. (2014). Early onset type 2 diabetes: risk factors, clinical impact and management. *Therapeutic Advances in Chronic Disease, 5*(6), 234-244. doi:10.1177/2040622314548679

Zaroudi, M., Charati, J. Y., Mehrabi, S., Ghorbani, E., Norouzkhani, J., Shirashiani, H., ... & Oveis, G. (2016). Dietary patterns are associated with risk of Diabetes Type 2: A population-based case-control study. *Archives of Iranian Medicine (AIM)*, *19*(3).

Zen, A. L., Whooley, M. A., Zhao, S., & Cohen, B. E. (2012). Post-traumatic stress disorder is associated with poor health behaviors: Findings from the Heart and Soul Study. *Health Psychology, 31*(2), 194-201. doi:10.1037/a0025989

Table 1

Frequency and Percentage of Characteristics

Characteristic	**Frequency**	**Percentage**
Gender		
Male	10	19 %
Female	44	81 %
Age		
18–21 years	35	65 %
22–25 years	17	31 %
25+ years	2	4 %

Table 2

Paired Smoking and Drinking Frequencies with Trauma History (ACE)

	ACE Score	
Behavior Scale Rating	**0–3**	**4–10**
Cigarette Smoking		
Non-Smoker	40	10
Occasionally	0	1
Semi-Frequently	0	0
Frequently	3	0
Alcohol Drinking		
Non-Drinker	14	4
Occasionally	18	5
Semi-Frequently	8	2
Frequently	3	0

Table 3

Paired Diet and Physical Activity Frequencies with Trauma History (ACE)

Lifestyle Scale Rating	**ACE Score 0–3**	**ACE Score 4–10**
Diet		
1 – Unhealthy	0	0
2	3	1
3	26	7
4	12	2
5 – Extremely Healthy	2	1
Physical Activity		
Inactive	2	0
A Little Active	7	1
Sometimes Active	15	6
Semi-Frequently Active	9	3
Frequently Active	10	1

Table 4

Paired Trauma History (ACE) with Family History of Diabetes

Family History of Diabetes	**ACE Score 0–3**	**4–10**
Yes	15	3
No	25	7
Unsure	3	1

Table 5

Paired Diet and Physical Activity Frequencies with Family History of Diabetes

Family History of Diabetes	**Lifestyle Scale Rating 1–2**	**3**	**4–5**
Diet			
Yes	1	10	7
No	3	20	9
Unsure	0	3	1
Physical Activity			
Yes	4	5	9
No	6	14	12
Unsure	0	2	2

Table 6

Percentages of Paired Diet and Physical Activity Frequencies with Family History of Diabetes

Family History of Diabetes	**Lifestyle Scale Rating**		
	1–2	**3**	**4–5**
Diet			
Yes	5 %	56 %	39 %
No	9 %	63 %	28 %
Physical Activity			
Yes	22 %	28 %	50 %
No	19 %	44 %	37 %

Table 7

Frequency of total ACE Scores

ACE Score	**Frequency**
0	16
1	11
2	11
3	5
4	7
5	0
6	3
7	1
8	0
9	0
10	0

Table 8

Most Commonly Marked Individual ACE Questions

Question	Frequency
1	16
2	6
3	9
4	12
5	1
6	22
7	3
8	16
9	13
10	3

Table 9

Health Indicators for those with an ACE Score of 4 and above

Participant	ACE Score	Diet Rating	Physical Activity Rating	Smoking Status	Drinking Status	Family History of Diabetes
1	4	4	3	No	Yes	Yes
2	6	2	3	No	No	No
3	4	5	4	No	Yes	No
4	4	3	4	No	No	No
5	6	3	4	No	Yes	No
6	7	3	3	Yes	Yes	Yes
7	4	3	2	No	No	No
8	4	3	3	No	Yes	Unsure
9	6	3	5	No	No	Yes
10	4	4	3	No	Yes	No
11	4	3	3	No	Yes	No

Table 10

Paired BMI Values with Trauma History (ACE)

BMI Value: Normal Weight	ACE Score	BMI Value: Normal Weight	ACE Score	BMI Value: Obese	ACE Score
24.9	0	21.5	1	38.2	3
21.5	0	24.9	6	31.5	0
21.5	2	24.9	3	31.5	1
24.9	0	24.9	2	31.5	1
24.9	2	24.9	0	31.5	1
24.9	2	21.5	7	31.5	4
21.5	3	21.5	1	31.5	4
24.9	2	24.9	2		
21.5	0	21.5	2		
21.5	2	21.5	0		
24.9	0	21.5	2		
24.9	4	21.5	3		
24.9	6	24.9	0		
22.5	1	24.9	6		
21.5	4	24.9	1		
24.9	0	24.9	4		
21.5	0	24.9	2		
21.5	4	24.9	0		
24.9	1				

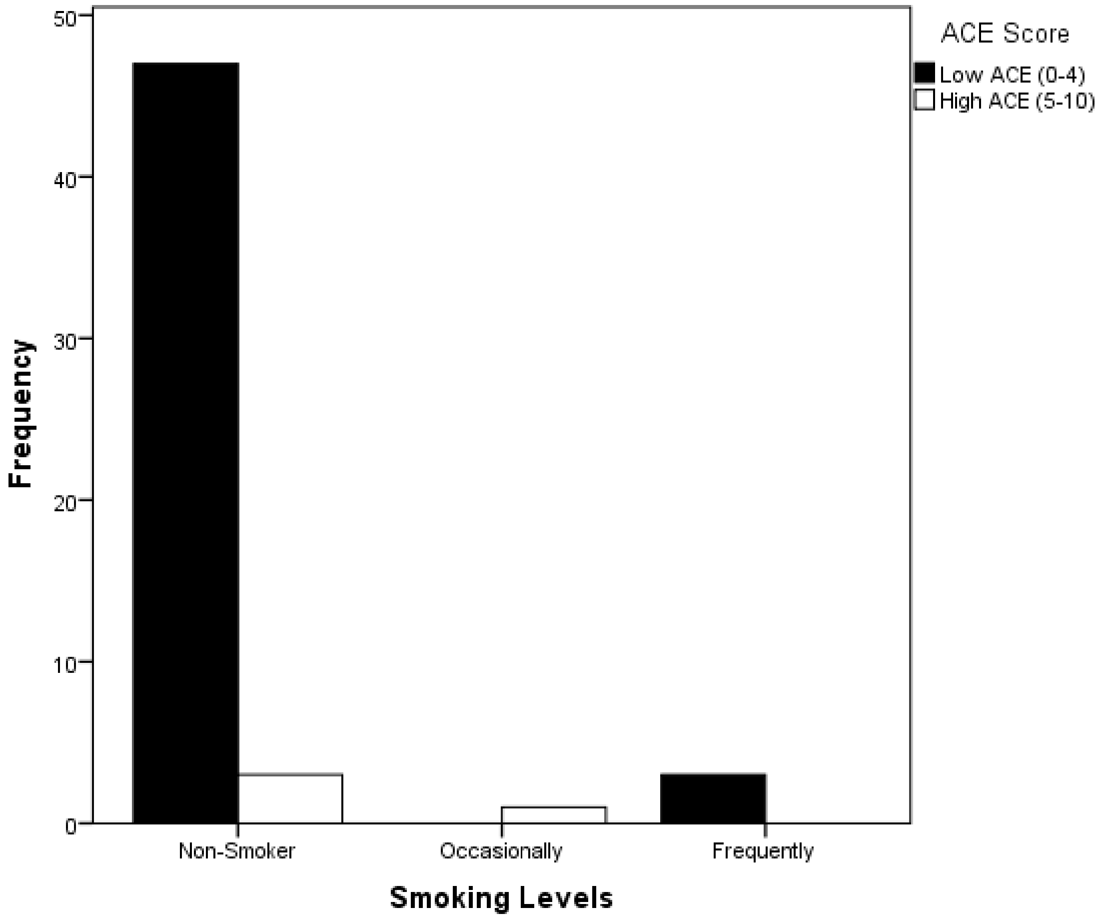

Figure 1. Paired levels of cigarette smoking frequencies with ACE scores.

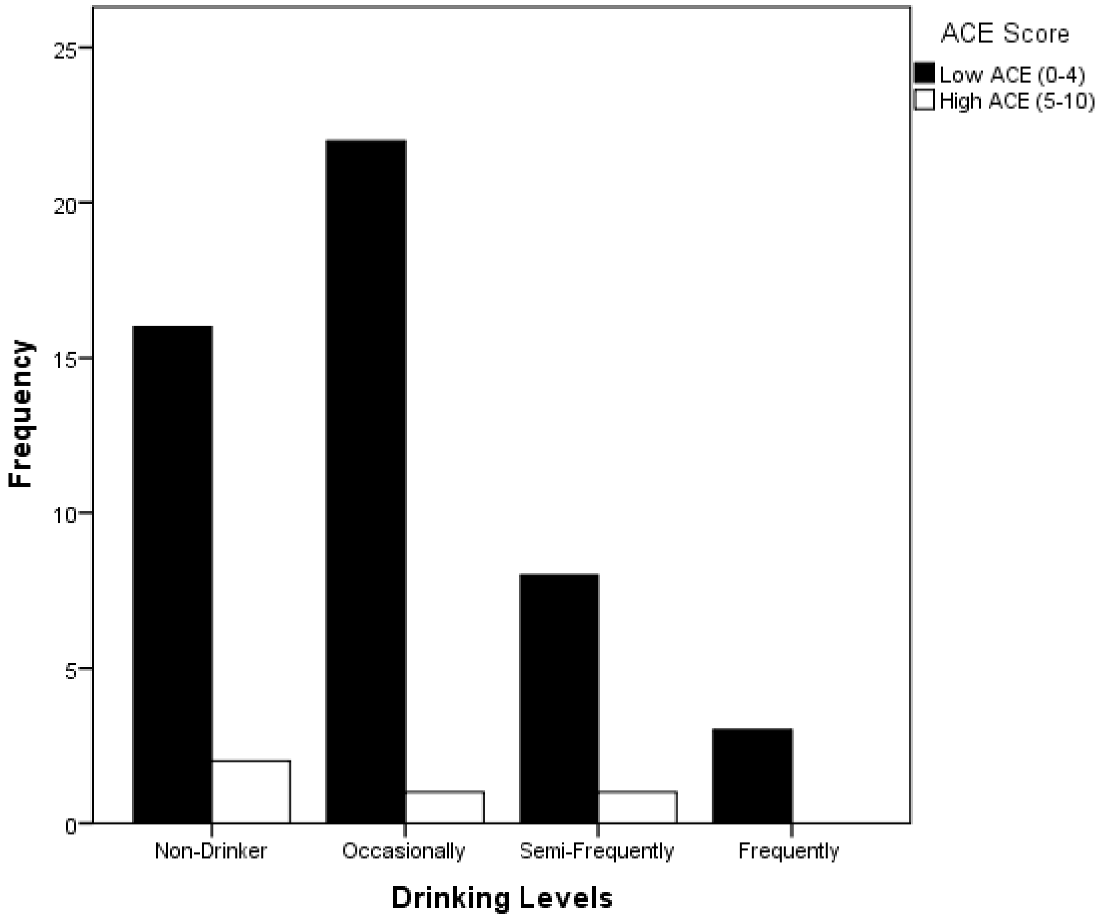

Figure 2. Paired levels of drinking frequencies with ACE scores.

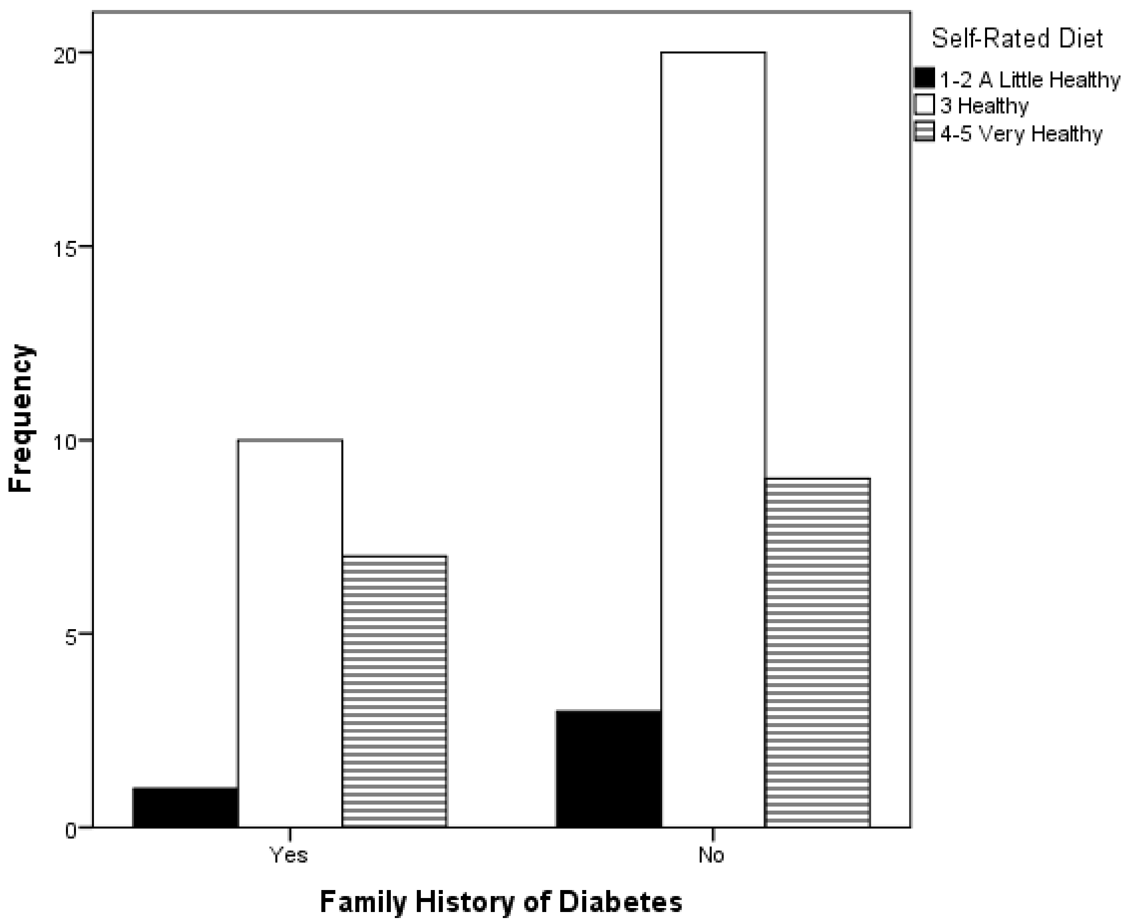

Figure 3. Paired diet scale rating with family history of diabetes.

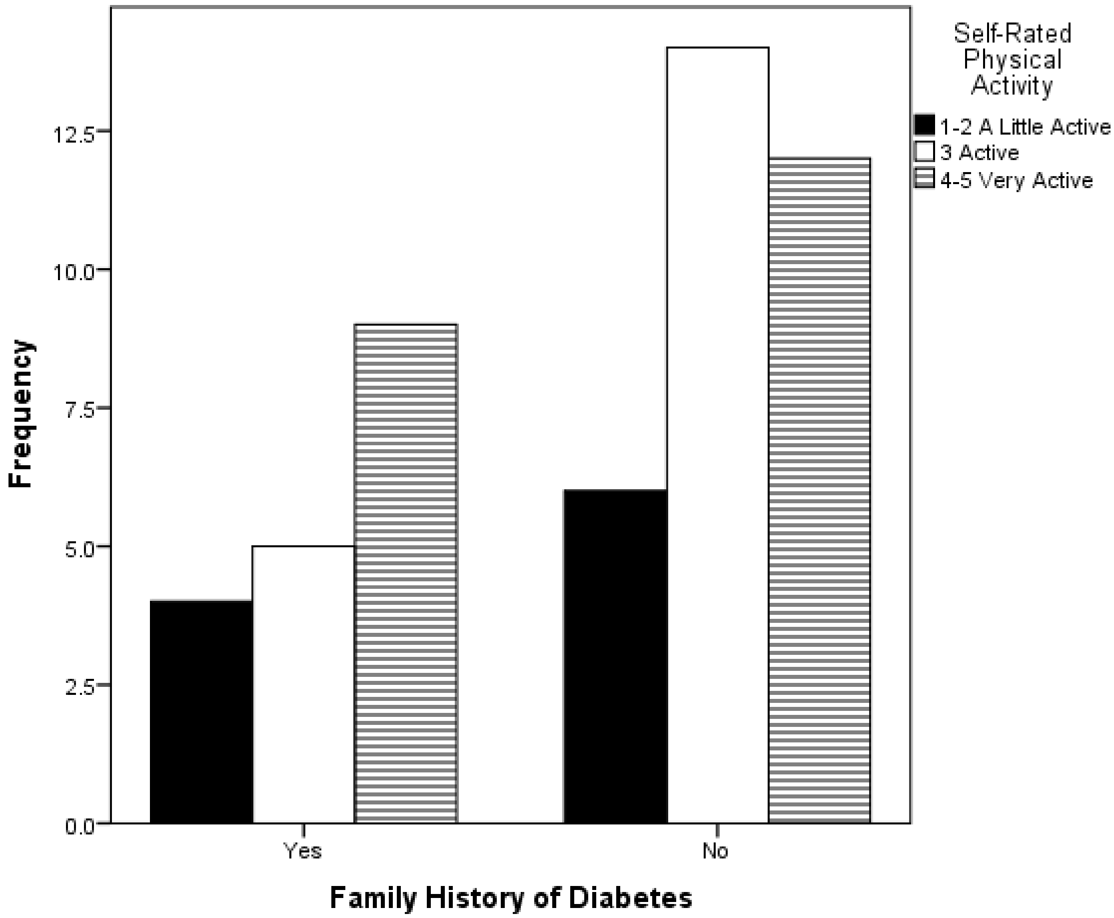

Figure 4. Paired physical activity scale rating with family history of diabetes.

Appendix A

Informed Consent

You are being invited to participate in a research study evaluating the possible association between exposure to adverse childhood events and health behaviors. Results of this survey will be presented in one of the lectures in your Trauma/Introductory Psychology course and for future research.

The decision to participate in this study is entirely up to you. If you agree to partake in this study, you will be asked to complete a survey with questions regarding some demographic information. However, your identity will remain completely anonymous. All data collected for this project will be categorized for analysis, and more importantly, will be kept confidential.

Since participation is voluntary, no negative consequences will follow your choice to discontinue the study.

For any questions or concerns, or for further information, please feel free to contact Tiffany Santiago via email at tiffany.santiago@my.liu.edu or Thomas Demaria, Ph.D. at tdemaria@liu.edu

Thank you.

Please check one of the boxes below.

[ ] I, ________________________________, have read this form and *agree* to give my
Print Full Name
consent to voluntarily participate in this study.

[ ] I, ________________________________, have read this form and *deny* to give my
Print Full Name
consent to voluntarily participate in this study.

By signing this form, I confirm that I have received a sufficient description of the purpose and conditions of this study, as well as the requirements of serving as a participant. It is to my knowledge that I have the option to deny participation in the study, or to opt out at any time. Further, I understand that all data will remain confidential.

________________________________ ________________

Signature of Participant Date

Appendix B

Risk Survey

Please answer the following questions as honestly as possible.

1. What is your gender identity?
   [ ] Female [ ] Male
   [ ] Non-binary/third gender [ ] Transgender
   [ ] Prefer not to say [ ] Prefer to self-describe: ____________________________

2. What is your age?
   [ ] 18–21 years [ ] 22–25 years [ ] 25+ years

3. What is your approximate weight *and* height?
   [ ] < 130 lbs. (< 59 kg.) [ ] < 4’ 0”
   [ ] 130 – 169 lbs. (59 – 76 kg.) [ ] 4’ 0” – 4’ 11”
   [ ] 170 – 209 lbs. (77 – 94 kg.) [ ] 5’ 0” – 5’ 11”
   [ ] 210 – 249 lbs. (95 – 113 kg.) [ ] 6’ 0” – 6’ 11”
   [ ] ≥ 250 lbs. (≥ 114 kg.) [ ] ≥ 7’ 0”

4. How would you rate your level of physical activity (e.g. walking, exercising, biking)?
   [ ] 1 – inactive
   [ ] 2 – a little active (once a week)
   [ ] 3 – sometimes active (2-3 days a week)
   [ ] 4 – semi-frequently active (4-5 days a week)
   [ ] 5 – frequently active (every day)

5. Please rate your diet based on the given scale (1 = unhealthy and 5 = extremely healthy).
   [ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5

6. Do you currently smoke cigarettes?
   [ ] Yes [ ] No
      If *yes*, please check one:
      [ ] Occasionally (couple times a month)
      [ ] Semi-frequently (about once a week)
      [ ] Frequently (more than once a week)

7. Do you consume alcohol?
   [ ] Yes [ ] No
      If *yes*, please check one:
      [ ] Occasionally (couple times a month)
      [ ] Semi-frequently (about once a week)
      [ ] Frequently (more than once a week)

8. Does diabetes run in your family (e.g. parents, siblings)?
   [ ] Yes [ ] No [ ] Unsure

Please ensure that you have answered all *eight* of the questions above.
Thank you for taking the time to participate in this study.

Appendix C

Adverse Childhood Experience (ACE) Questionnaire
Finding your ACE Score ra hbr 10 24 06

While you were growing up, during your first 18 years of life:

1. Did a parent or other adult in the household **often** ...
   Swear at you, insult you, put you down, or humiliate you?
   or
   Act in a way that made you afraid that you might be physically hurt?
   Yes No If yes enter 1 ________

2. Did a parent or other adult in the household **often** ...
   Push, grab, slap, or throw something at you?
   or
   Ever hit you so hard that you had marks or were injured?
   Yes No If yes enter 1 ________

3. Did an adult or person at least 5 years older than you **ever**...
   Touch or fondle you or have you touch their body in a sexual way?
   or
   Try to or actually have oral, anal, or vaginal sex with you?
   Yes No If yes enter 1 ________

4. Did you **often** feel that ...
   No one in your family loved you or thought you were important or special?
   or
   Your family didn't look out for each other, feel close to each other, or support each other?
   Yes No If yes enter 1 ________

5. Did you **often** feel that ...
   You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you?
   or
   Your parents were too drunk or high to take care of you or take you to the doctor if you needed it?
   Yes No If yes enter 1 ________

6. Were your parents **ever** separated or divorced?
   Yes No If yes enter 1 ________

7. Was your mother or stepmother:
   Often pushed, grabbed, slapped, or had something thrown at her?
   or

Sometimes or often kicked, bitten, hit with a fist, or hit with something hard?
or
Ever repeatedly hit over at least a few minutes or threatened with a gun or knife?
Yes No If yes enter 1 ________

8. Did you live with anyone who was a problem drinker or alcoholic or who used street drugs?
Yes No If yes enter 1 ________

9. Was a household member depressed or mentally ill or did a household member attempt suicide?
Yes No If yes enter 1 ________

10. Did a household member go to prison?
Yes No If yes enter 1 ________

Now add up your "Yes" answers: _______ This is your ACE Score

Appendix D

IRB Certificate

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Tiffany Santiago** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 02/02/2017.

Certification Number: 2305749.