Diabulimia: A Systematic Review of Treatment

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by

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Approval Page

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A Dissertation Approved on

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ABSTRACT

Diabetes is a chronic healthcare condition that is frequently associated with other comorbid illnesses, such as eating disorders. Diabulimia is an eating disorder where individuals with diabetes mismanage their diabetes treatment in order to lose weight. Because diabulimia is such a complex disorder, diagnosis and treatment planning can be challenging for healthcare providers. The aim of this study is to create an integrated, comprehensive understanding of relevant literature. The clinical research question is to find what the best evidence is- based treatment methodology for individuals with eating disorders and diabetes, nonadherence to diabetes treatment, and diabulimia. A systematic review will be conducted using specific key terms. The key search terms that will be used represent the concept of intentionally manipulating diabetes medicine in order to regulate weight. Keywords that will be used include: “Diabetes and Disordered Eating treatment”, “Diabetes and Eating Disorders treatment”, “Insulin Restriction Treatment”, “Insulin Omission Treatment”, “Treatment for eating disorders associated with diabetes”, and “Diabulimia treatment”. The terms will find treatment themes and organize them for future reference in literature. The results from this study could help find which interventions work well streamline treatment methods between eating disorders and nonadherence to diabetes treatment in order to create better treatment programs and prognoses for individuals with diabulimia.

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CHAPTER 1

DIABULIMIA: A SYSTEMATIC NARRATIVE REVIEW OF TREATMENT

Diabulimia, which can be defined as individuals with diabetes purposely misusing their diabetes medication to manage their weight, did not have any recognition as a disorder until the 1970s (Shaban, 2013). Individuals with diabetes need to rigorously control a variety of metabolic parameters, such as blood glucose, stress levels, and, in women, some parameters such as the hormonal changes of the menstrual cycle (Shaban, 2013). For one to be in control of such things, an individual must attend to food choices, portion sizes, insulin dose adjustments, exercise, and other healthy lifestyle choices. All of the high demands of taking care of oneself can be perceived as not having control of one's life because of all of the restraints and restrictions associated with diabulimia.

Along with maintaining insulin, there is a possibility of weight gain associated with diabetes due to insulin's function in the body. Weight gain can be paradoxical to an individual trying to live a healthy lifestyle and can contribute to the development of a negative body image. When compared to their peers, diabetic individuals are at a higher risk of developing disordered eating behaviors than non-diabetic individuals (Shaban, 2013). Currently, the Diagnostic and Statistical Manual of Mental Disorders Fifth Edition (DSM-5; American Psychiatric Association, 2013) has three main diagnoses of eating disorders: anorexia, bulimia, and eating disorders, not

otherwise specified (NOS). The latter is characterized by symptoms that may fall into either the anorexia or bulimia categories but do not meet the criteria for a diagnosis of a specific eating disorder, such as diabulimia (Shaban, 2013). There is a higher prevalence of NOS eating disorders than typical eating disorders in the general population due to subsyndromal or atypical presentations, which can be a barrier to treatment because the lack of a diagnosis means health professionals are not able to treat these individuals (Shaban, 2013).

The incidence of diabetes is increasing nationally and internationally, which may make the treatment of diabulimia more pertinent due to the increase of people with diabetes (Nezami, et al., 2018). About 30% of individuals with diabetes mismanage their insulin, either to avoid gaining weight or to help with losing weight (Shaban, 2013). Currently, diabulimia is not a medically recognized condition but the term is used in academic literature to describe the deliberate action of either underusing the correct amount of insulin or the complete omission of insulin to control weight (Shaban, 2013). During the insulin omission process, calories are purged through glycosuria, a condition in which there is excess sugar in the urine. When continuing the omission or underuse of insulin, the buildup of high blood sugars can result in severe hyperglycemia, diabetic ketoacidosis, an early onset of complications from diabetes, and premature death. Unlike other eating disorders where the main concern is weight, individuals with diabetes may also use insulin restriction for a coping method for diabetes-specific distress. Individuals might fear hypoglycemia, have needle anxiety, or another psychological problem that impacts diabetic self-care (ADA-APA Mental Health Provider Diabetes Education Program, 2020). These behaviors involve whether an individual is taking proper doses of medication, so understanding if these are aspects of diabulimia is important in treatment. The variance in the definition of diabulimia makes embarking on an intervention a challenge.

Evidence-based psychological therapy for eating disorders consists of a multidisciplinary team. According to Hastings and colleagues (2016), individuals that misuse their diabetes medication to maintain their weight do not respond well to standard eating disorder treatment. There is no specific approach to treating diabulimia. One of the challenges of future research is trying to understand how the condition of diabulimia should be conceptualized: as an eating disorder, two separate complex conditions, or diabetes with a psychological health condition. This dissertation will review treatment for diabetes medication mismanagement and compare it with treatment for eating disorders to find similarities between the two complex disorders, with the aim to find common themes between the treatments.

Diabetes

Diabetes is a chronic health problem that has severe complications if a person does not keep it under control. As many as 31 million Americans are affected by diabetes and many go undiagnosed (Statistics About Diabetes, 2017). Diabetes is a chronic disease that affects the ability of one's pancreas to properly make or use insulin, a hormone made in the pancreas by beta-cells to convert food into energy. When the body is not producing or metabolizing insulin to create energy from glucose, the body must find energy from elsewhere in the body. The breakdown of fat stores and proteins occurs when insulin is not properly utilized by the body, which causes a person to lose weight (De Paoli et al., 2018).

A person with diabetes has blood glucose levels that are higher than those in a person without diabetes (American Diabetes Association, 2020). A diagnosis of diabetes is complicated and does not fall into a linear pattern. Some genetic factors can lead to the predisposition of diabetes. A study involving identical twins found that, when one twin has type 1 diabetes, the chances the other twin will inherit type 1 diabetes increase by 50%. Also, if one identical twin

develops type 2 diabetes, the chances the other twin will develop type 2 diabetes increase by 75% (American Diabetes Association, 2020). Other factors, such as environmental factors, may contribute to the onset of diabetes or trigger a transition from a predisposition to diabetes into full onset of diabetes. Environmental stressors such as stress or diet can unleash the onset of diabetes if one has a predisposition.

The diagnosis of diabetes is complex and has historically changed with the emergence of new information. Definitions and diagnoses for diabetes have changed over the years since the discovery of diabetes. Previously, type 1 diabetes was known as juvenile diabetes because type 1 diabetes seemed to only be found in children (ADA-APA Mental Health Provider Diabetes Education Program, 2020). Type 1 diabetes is now referred to as such because more adults are being diagnosed with the type 1 category of diabetes. Unfortunately, health professionals will more often misdiagnose adults that have type 1 diabetes with type 2 diabetes because of the association of type 1 with juvenile diabetes. Another diagnosis is known as Mature Onset of Diabetes in Youth (MODY). The MODY diagnosis was made for children who inherited weak pancreases genetically from their parents (Ehtisham et al., 2004). Additional classifications of diabetes include gestational diabetes and pre-diabetes (World Health Organization, 1999).

Insulin

Some form of dysfunction of insulin plays a role in the cause of diabetes. The discovery of the hormone insulin occurred in 1921 by Frederick Banting and Charles Best in Toronto, Canada after a purification process that extracts other hormones from the body (Tokarz et al., 2018). Insulin is an anabolic hormone that promotes dietary carbon source disposition, which processes glucose from food into energy for the body (De Paoli et al., 2018). The synthesis of the hormone provides quality control, delivery, and action regulation in different organs and occurs

through intracellular mechanisms, which is signaled by glucose. Glucose is the main metabolic signal which elicits insulin secretion through a process of chemical to electrical to mechanical signals (Tokarz et al., 2018).

The journey of insulin begins in the beta-cells of the pancreas (Tokarz et al., 2018). The beta-cells are electrically excited in the response to glucose, interact with one another, and do not work in isolation (Tokarz et al., 2018). The communication between beta-cells in healthy individuals occurs within a five- to ten-minute time frame once stimulated by glucose (Satin et al., 2015). How the beta-cells communicate is not entirely clear but there is strong evidence of an intrapancreatic neural network where coordinating activity occurs (Tokarz et al., 2018). After it's synthesis in the pancreas, insulin is exported through the portal circulation. The next organ insulin goes to is the liver. Because the liver is the first organ that encounters insulin, there is a higher concentration of the hormone in the liver than other insulin-responsive tissues, such as muscle and fat (Tokarz et al., 2018). A first-pass occurs where over 50% of the insulin is cleared by the hepatocytes in the liver. The liver is considered the gatekeeper that regulates the amount of insulin that is sent to peripheral tissues (Tokarz et al., 2018).

The remaining insulin travels from the liver through the hepatic vein, which then follows the venous circulation to the heart (Tokarz et al., 2018). Insulin is then distributed throughout targeted areas, such as skeletal muscles, liver, adipose tissue (fat), and the brain, through the arterial circulation of the heart to these tissues. While in the brain, insulin exerts developmental actions on neurons and glial cells and modulates cognition, memory, and mood (Lee et al., 2016). Insulin, while along the arterial tree, promotes necessary vasodilation (Tokarz et al., 2018). The insulin from arterial circulation exerts metabolic actions further as a second-pass through the liver. The insulin then exits blood circulation at the microvasculature level. Insulin then reaches

the muscle and fat cells, where stimulation of GLUT4 translocation and glucose uptake happens. The job of insulin in the muscle and adipose tissues is to help store carbon sources for the energy use by the tissues (Tokarz et al., 2018).

The remaining insulin that is still circulating in the bloodstream is delivered to the kidneys to be degraded (Tokarz et al., 2018). The entire process, once insulin leaves the pancreas, takes thirty minutes and insulin is no longer detectable (Robbins et al., 1985). As evident from the biosynthesis of insulin, which is used throughout the body, the dysfunction of insulin can cause damage throughout the whole body, as well (Robbins et al., 1985).

Some defects can occur throughout the process, which can lead to insulin resistance and diabetes. Defective insulin exocytosis from diabetic beta-cells and impaired pulsatile secretion of insulin in diabetic individuals are mechanistic defects (Lang et al., 1981). In obesity, impaired or reduced hepatic insulin clearance can occur (Jung et al., 2018). Also, in obesity, impaired vasoactive effects of insulin such as capillary recruitment and reduced insulin delivery to muscles happen (De Jongh et al., 2004). Understanding what the defect are can help identify which treatment methods are more efficient for people with diabetes. The journey of insulin is very extensive; a fault in any aspect of the process can lead to insulin resistance and diabetes.

Insulin Resistance

Insulin resistance, a weakened biological response, such as impaired sensitivity to insulin facilitated glucose disposal, is known as insulin resistance occurs when a normal or elevated insulin level produces a weakened biological response (Reaven, 2004). Individuals with type 1 diabetes do not have insulin resistance, as that disease process includes an autoimmune response that directly attacks insulin made in the body (Cefalu, 2001). Insulin resistance can develop into type 2 diabetes over time if left untreated (Reaven, 2004). In most cases of insulin resistance,

there is a faulty insulin signal (Wilcox, 2005). As previously stated, insulin's role is found throughout the body, so the effect of insulin resistance can vary depending on the physiological function of the tissues and organs concerned. Insulin resistance is also influenced by physiological facets.

A physiological factor that can affect whether an individual has insulin resistance is high fat diets, such as diets high in saturated fat and trans-fat (Wilcox, 2005). Studies have found a correlation between fatty acids and the prevalence of type 2 diabetes (Simopoulos, 1999). Another physical factor is when a healthy body goes through chronic sleep deprivation, which can affect insulin and cause insulin resistance due to the stress the body is put in from lack of rest (Wilcox, 2005). Physiological factors can affect pregnancy, as well, since insulin resistance can be an effect in the third trimester of a normal pregnancy (Seely & Solomon, 2003). During pregnancy, an adaptive response diverts glucose to the developing fetus through combined interactions with human placental lactogen, progesterone, estradiol, and cortisol, which counter-regulates to insulin causing the resistance (Butte, 2000). Insulin resistance in a pregnant person, when exaggerated, can lead to gestational diabetes and gestational hypertension (Wilcox, 2005). Insulin resistance can even be a secondary occurrence in other conditions.

Insulin resistance can occur in hepatic cirrhosis, renal failure, acute illness, hyperthyroidism, pregnancy, Cushing's syndrome, and Cushing's disease, as these conditions can increase the production of counter-regulatory hormones (Wilcox, 2005). Genetic disorders, such as Down syndrome, Turner syndrome, Klinefelter syndrome, Thalassemia, Huntington's Chorea, and Myotonic dystrophy are also shown to be associated with insulin resistance. Another cause of insulin resistance is obesity. The areas where the fat deposits are found is important to whether insulin resistance is a possibility. Specifically, changes in waist circumference with a

higher waist-to-hip ratio is an indicator for insulin resistance (Aronne & Segal, 2002). Not only does obesity lead to an increased risk of insulin resistance, but the type of fat tissue is a marker for insulin resistance, also. There are two types of fat: subcutaneous adipose tissue, which is fat found right under the skin, and visceral adipose tissue. Visceral fat has different metabolic characteristics than subcutaneous fat, visceral fat is an intra-abdominal fat around the intestines, which correlates with liver fat and causes insulin resistance. Higher rates of visceral fat leads to insulin resistance (Wilcox, 2005).

Insulin resistance can also occur due to pharmacological influences. There are different medications that can cause abnormalities found in the insulin mechanism which has not turned into diabetes, which is known as impaired glucose tolerance. (Wilcox, 2005). Impaired glucose tolerance is considered an elevation of sugar in the blood that has not yet turned into diabetes (Yudkin et al., 1990). Different types of antihypertensive medications, such as diuretics and beta-blockers along with corticosteroids, oral contraceptives, niacin, and antipsychotics, are reported to impair glucose tolerance. Anti-retroviral protease inhibitors, which are used for the treatment of immunodeficiency virus infections, are also found to affect glucose tolerance (Chen et al., 2002).

Having insulin resistance can lead to insulin resistance syndrome, which is a cluster of abnormalities that may occur more in individuals that have insulin resistances. The syndrome includes glucose intolerance, dyslipidemia, increased ovarian testosterone secretions, sleep-disordered breathing, and other complications (Wilcox, 2005). Insulin resistance is also associated with clinical syndromes such as type 2 diabetes, cardiovascular disease, essential hypertension, polycystic ovarian syndrome, non-alcoholic fatty liver disease, sleep apnea, and certain forms of cancer (Reaven, 2004). The relevance of insulin resistance is important because

it is a predecessor of the development of diabetes. Insulin resistance can become even worse with environmental and physiological stressors such as weight gain, physical inactivity, medications, and pregnancy (Wilcox, 2005). The role and prominence of insulin resistance is a steppingstone into understanding the dysfunction of diabetes.

Insulin Restriction Mechanism

When an individual is diagnosed with diabetes, they require external aid to help their body continue the insulin process (Frayn, 2010). The body may experience impaired glucose utilization if it is not producing enough insulin, which presents as a higher concentration of glucose in the blood and the excretion of glucose that the body requires in urine. Meaning the body is not receiving the glucose as energy, so the body will obtain energy from other sources, such as fat and protein. The breakdown of protein and fat for energy then causes weight loss (Frayn, 2010).

Early Signs of Diabetes

Diabetes is a complicated illness and can affect many aspects of the body, which can include a general lack of comfort, feeling sick to one's stomach, being unsteady, and having a sense of weakness (Inzucchi & Lupsa). Nausea and vomiting are another associated factor from having high blood glucose. Periods of elevated glucose can be short-term and mild or serious and life-threatening. Severe nausea could also be caused by diabetic ketoacidosis, which is caused by a high glucose concentration and reduced insulin level and causes a cascade event affecting other regulatory hormones (Trachtenbarg, 2005). Diabetes can also affect blood pressure levels which can lead to feeling unsteady and dizzy. There might be a sudden feeling of being sick to one's stomach, feeling like one will faint, and then having to sit down and rest to avoid fainting or falling (Inzucchi & Lupsa). This can be especially dangerous when alone, as an individual can

become injured after falling and be unable to call for help. Acknowledging early signs is very important, because identifying the signs will help catch irreparable damages before it is too late.

One early sign of diabetes that a person should see their doctor for is hyperglycemia. Hyperglycemia occurs when there is a higher concentration of glucose in the body, such as a fasting blood glucose concentration over 6.1 mmol/L (Dong et al., 2019). Symptoms of hyperglycemia include increased frequency of urination, increased thirst, and excessive hunger (Pinhas-Hamiel et al., 2007). Increased thirst occurs as a side effect of frequent urination because the body is trying to get rid of accumulated glucose in the bloodstream through the kidneys. Other fluids are dispelled from the body along with the glucose during this process, which leads a person to become dehydrated and increase their fluid intake (Pinhas-Hamiel et al., 2007). Excessive hunger also occurs because glucose that is in the blood cannot go into the cells to produce energy, so the body is sending an individual signal to ingest something in order to gain more energy. Another early sign of diabetes is fatigue (Pinhas-Hamiel et al., 2007).

Diabetes may cause fatigue due to several reasons, such as the body not being able to properly use glucose for energy, inflammation, or dehydration (Pinhas-Hamiel et al., 2007). Having excess glucose coursing through the bloodstream may also make an individual feel fatigued. When glucose, also known as sugar, is in a liquid form such as a syrup, the density is increased and moves slower when compared to other less dense liquids (Pinhas-Hamiel et al., 2007). The density can slow down the circulation of the important oxygen and nutrients that flow through the blood and make a person feel foggy. Furthermore, diabetes sufferers are less likely to fight off illnesses and they might have infections that they are not aware of. More energy is required to fight infections, which can enhance fatigue, as well (Pinhas-Hamiel et al., 2007). Blurry vision may also be an indicator of a possible diabetes diagnosis.

Blurry vision is another early sign of diabetes because eye lenses can swell and change shape and hyperglycemia may cause fluid to seep into the eyes (Pinhas-Hamiel et al., 2007). Because the blood is denser, the body wants to find more fluid from adjacent tissues to adjust for the denseness and thin it out. Fluid will be taken from places such as eye lenses, which can disrupt the ability to focus. Diabetes may also affect reproductive functioning in both men and women.

Another factor that can be associated with diabetes is complications within the reproductive system. Women affected with diabetes are more likely to have yeast infections than women who do not have diabetes (Inzucchi & Lupsa). Yeast lives off of sugar, and when sugar is being dispelled by urination, that sugar can cause yeast to grow around the vaginal area. Erectile dysfunction, or when a man cannot obtain or maintain an erection hard enough for intercourse, can be another problem secondary to a high concentration of sugar in the body. Over time, high concentration of sugar can cause damage to blood vessels and nerves, which could then lead to erectile dysfunction. (Inzucchi & Lupsa). Slow healing wounds and headaches are other issues that may arise due to diabetes.

Slow healing cuts, sores, and wounds are another sign of diabetes due to the reduction of blood circulation, which is beneficial for skin repair (Inzucchi & Lupsa). Unfortunately, slow healing can lead to other complications, such as bacterial infections, fungal infections, gangrene, and possible amputation, if not treated in time (Pinhas-Hamiel et al., 2007). An individual with diabetes may also experience headaches as an early sign of their disorder. These diabetic headaches may occur often and can range from moderate to severe. Although there are many reasons a person can have a headache, diabetes can cause headaches due to a person’s blood

glucose being outside of a normal range (Pinhas-Hamiel et at., 2007). Skin changes can be another early sign of diabetes.

An individual experiencing specific skin changes may want to be screened for diabetes. Acanthosis nigricans is a pigmentation condition that causes patches of velvety dark skin and is one of the more visually noticeable signs of diabetes (Pinhas-Hamiel et al., 2007). Sometimes these areas can become itchy or smell and can show up anywhere on a person's body. Acanthosis nigricans is an early sign that is seen more in people who are obese and have darker skin tones. An individual with early signs of diabetes can also have itchy skin around the vaginal or groin area (Pinhas-Hamiel et al., 2007). Changes in sensation may be another early warning sign.

Having a numb or tingly sensation in hands or feet, a kind of nerve pain known as diabetic neuropathy, can be an early detection of diabetes (Ramachandran, 2014). Diabetic neuropathy can turn into a very severe complication when diabetes is not managed and can cause aches, burning sensations, sharp pains, can spread to other areas, and it can make simple movements very painful to do with the slightest touch being unbearable (Ramachandran, 2014). Not only can the nerves be affected, but weight can be affected, as well.

Significant unexplained weight loss is another early warning sign of diabetes. Losing or gaining several pounds is normal for any person, but unintentional or unexpected significant weight loss is a common sign of diabetes. Weight loss can be considered significant when there is a loss of over ten pounds or more than five percent of body weight is lost (Ramachandran, 2014). Weight loss is an early sign that occurs more in individuals with type 1 diabetes but also happens in people with type 2 diabetes (Ramachandran, 2014). Not only can these signs occur singularly, but they can occur in any combination and cause more discomfort. Awareness of early signs can expedite treatment options.

Fortunately, many of these early signs and symptoms of diabetes are reversible when a person can maintain a normal range of blood sugar prescribed by their doctors (Ramachandran, 2014). If these signs are not taken seriously and one does not go to the doctor to see if they have a diagnosis of diabetes, these reversible health difficulties can turn into serious long-term adverse effects, such as amputations, dialysis, or blindness (Ramachandran, 2014). These early signs can be found in all forms of diabetes, so it is essential to understand the different presentations of the disease.

Types of Diabetes

Gestational Diabetes

Gestational diabetes occurs during pregnancy and 10% of pregnancies in America are affected by gestational diabetes every year (McCulloch, 2007). The causes of gestational diabetes are currently unknown, but one theory states that hormones produced during pregnancy can block the action of insulin in a pregnant individual's body and result in insulin resistance. This can lead to difficulty in the body's use of insulin and the pregnant individual may need to take more insulin to compensate (McCulloch, 2007).

Prediabetes

Prediabetes occurs before an individual develops type 2 diabetes and, quite often, there are no symptoms of prediabetes (McCulloch, 2007). Prediabetes occurs when blood glucose levels are higher than normal but not yet at the level to be diagnosed with diabetes. At the prediabetic level, an individual might have some complications but, if an individual follows a treatment plan, they can prevent the development of full-fledged diabetes (McCulloch, 2007).

Type 1 Diabetes

Type 1 diabetes is generally related to an inherited risk factor from the parents to an individual (McCulloch, 2007). If both parents have type 1 diabetes, then the chances that their child will develop type 1 diabetes increase by 10% to 25% (American Diabetes Association, 2020). Type 1 diabetes can take many years to develop and researchers have found that people with type 1 diabetes have autoantibodies in their blood for many years before diagnosis. Autoantibodies are antibodies that attack the body's own tissue; therefore, type 1 diabetes is considered to be an autoimmune disease (McCulloch, 2007).

Type 2 Diabetes

Type 2 diabetes causes a weakness in the pancreas so it cannot sufficiently produce enough insulin for the body when compared to a normally functioning pancreas. Genetically, type 2 diabetes has a stronger link to family history than type 1 does, which can be observed in the study of twins. Twins share the same genetic material, but if one twin develops diabetes it does not mean the other twin will develop diabetes (American Diabetes Association, 2020). Although there is a strong genetic link in the development of type 2 diabetes, environmental factors can affect the development of type 2 diabetes. In families, certain tendencies of eating and exercising patterns can be found as well as obesity. Although genetics are a risk factor for type 2 diabetes, preventative measures can delay or prevent type 2 diabetes. An individual can change their diet and lose weight in order to help their pancreas support their body (McCulloch, 2007).

Demographically, type 2 diabetes affects ethnic and racial minorities at a greater rate than the majority culture in the United States (Spanakis et al., 2013). American Indians are twice as likely to have type 2 diabetes when compared to their White counterparts. Other ethnicities, such as Latinos, Asians, and African Americans, are at a greater risk, as well. Studies have found that

environmental influences, such as poverty and stress, are powerful risk factors for diabetes (Spanakis et al, 2013). Ethnic and racial minorities are more likely to be poor, face discrimination, lack a college education, and live in neighborhoods affected by crime. A study found that White and Black individuals of similar socioeconomic status had similar rates of type 2 diabetes, which indicates that differences in the rates of type 2 diabetes in racial and ethnic group should be traced to other environmental and social influences (Spanakis et al., 2013).

Symptoms and Complications

Individuals with diabetes can experience a varying range of symptoms, with some people having symptoms so mild that they can go unnoticed (American Diabetes Association, 2020). Some common symptoms are frequent urination, extreme thirst, inability to feel satiated although the person is still eating, excessive fatigue, blurry vision, slow to heal cuts, and bruises. A diagnosis of diabetes can be life-altering and increases the risk of many other serious health problems (American Diabetes Association, 2020).

Diabetes is an illness of the whole body and can lead to many different complications throughout. Diabetes can cause glaucoma, cataracts, other eye problems, and even blindness (Inzucchi & Lupsa). Diabetic nerve damage can also occur, which is known as diabetic neuropathy. Almost half of individuals with diabetes have some form of nerve damage (Inzucchi & Lupsa). Along with neuropathy, complications in the limbs can occur, such as numbness or a lack of feeling. The lack of feeling can lead to amputations because an individual may not realize they are hurt, which can lead to infection and the need to remove the body part before sepsis can take place. Individuals with diabetes can experience high blood pressure at a higher incidence than those without diabetes, which can increase the risk for heart attack, stroke, and kidney disease. If a person does not maintain their diabetes and blood pressure within a specified range,

there is a higher chance of contracting kidney disease, also known as nephropathy. Diabetes, blood pressure, and cholesterol, when not well maintained, is a trifecta that can lead to stroke (American Diabetes Association, 2020). A person with diabetes needs to be able to maintain a strict routine in order to decrease their risk of these complications.

Diabetes Management

Since a large number of people are affected by diabetes and there is no cure, it is important for the patient to find self-efficacy in a daily management routine. Diabetic patients need to consistently check their blood sugars, adjust their insulin and food intake, and take medication daily (Spanakis & Golden, 2013). Living with a chronic illness, such as diabetes, can affect the body as well as the mind, so a person living with diabetes needs to have optimal functioning in their physical and mental health to take proper care of themselves. If the diabetes is left uncontrolled, some short-term symptoms may include tiredness, lack of concentration, thirst, and frequent urination. Long-term effects are much more severe, such as blindness, amputation, heart disease, neuropathy, and even death (Spanakis & Golden, 2013). Due to the detrimental effects diabetes can have on one's life and body when not regulated properly, a strict regimen is required for management.

A facet of diabetes management is heavily focused on diet and regulation of weight. Even when an individual with diabetes is managing their health and blood glucose level with diet regulation, it may not be reflected in their weight due to their medication. Diabetes medication can cause people to gain weight because the body is finally utilizing glucose that was once being dispelled in urine. The discrepancy of gaining weight when taking care of oneself can often lead to disordered eating and, in turn, lead individuals to be noncompliant with their diabetes management (Spanakis & Golden, 2013).

Diabetes Nonadherence

A common theme found among health professionals that take care of patients with diabetes is the struggle with nonadherence (see Footnote 1; Funnell & Anderson, 2000). The nonadherence may be due to the fact that over 95% of diabetes care is done by the patient, which can be very difficult to manage due to the priorities and resources of the patient (Funnell & Anderson, 2000). These individuals have to manage their diabetes with the consideration of family demands, possibility of other health concerns, and personal matters. Nonadherence can also occur due to factors that are not in the control of the patient, such as socioeconomic status (SES). If an individual has a lower SES, they may live in a food desert where they cannot find the right foods to manage their dietary requirements (Funnell & Anderson, 2000). SES can affect the neighborhood a person lives in, if it is safe enough to exercise outside, and if there are affordable places one can work out at to maintain the physical activity requirement of diabetes management. SES can also affect the distance a person lives from health professionals that could help maintain their diabetes and whether or not these individuals can afford the healthcare they need (Funnell & Anderson, 2000). These factors can be influential in how much people adhere to treatment and diabetes care.

Due to the complexity of diabetes, there can be many different types of nonadherence, such as nonadherence to prescribed exercise, diet, oral medications, and insulin. A study done by Hernández-Ronquillo and colleagues (2003), found that, among type 2 diabetic patients, 62% were dietary noncompliant, 85% were exercise noncompliant, 17% were oral medication noncompliant, 13% were insulin application noncompliant, and 3% did not keep medical appointments. The researchers reported that patients have difficulties due to problems with their weight. Even when following a strict diet program and doing everything to manage their

diabetes, people had difficulty with weight loss and they were not seeing any results. The lack in results can lead people to not adhere when they are not seeing any indication of their hard work. The findings of the study help establish the idea that dealing with weight difficulties is a factor in nonadherence (Hernández-Ronquillo et al., 2003). Also, the percentage of individuals mismanaging their medication and insulin was quite small in the study, so there is a possibility that another factor, aside from personal, sociodemographic, or disease characteristics, influences nonadherence in diabetic care (Hernández-Ronquillo et al., 2003). The process of insulin omission and the role of how insulin omission can influence weight can help understand the relationship between nonadherence and weight loss.

Insulin Omission

There is a consensus that insulin is the most effective agent in lowering glucose and at least 25% of people with diabetes take insulin (Rubin, 2005). Lower adherence to insulin regimens has been found to be associated with higher admittance to hospitals for diabetes-related complications and higher A1C levels. A1C is a range of numbers that are associated with the three-month average of glucose serum found in the blood. Rubin (2005) identified factors associated with adherence to any type of diabetes medications, which included medication costs, regimen complexity, patient's emotional wellbeing, patient's perception of medication side effects, and medication-related intrusions on activities of daily living. Additionally, depression is associated with insulin omission in adolescent females (Gonzalez et al., 2008; Rubin, 2005). Insulin adherence is also lower in young women concerned about their weight (Peyrot et al., 2005). Another factor of diabetes nonadherence includes problems related to adherence to insulin injections.

Most insulin-treated patients want to reduce the number of insulin injections they take, and injection-related problems can also affect the number of injections a patient is willing to take (Rubin et al, 2009). A study found about 57% of patients skipped insulin injections when they knew they should take them but reasoning to omit shots was not reviewed (Peyrot et al., 2005). The study found that individuals with a higher household income, a healthy diet, a disability, and older individuals were less likely to skip injections. Participants that were students, type 2 diabetics, or participants with increasing insulin shot frequency were significantly more likely to skip taking their shots (Peyrot et al., 2005). People with diabetes can be affected by how much they feel they are in control of their health.

Diabetes and Locus of Control

For chronic illnesses such as diabetes, health-related behavior, which is the application of behaviors one does to take care of their health, is used to manage one's illness (Strudler-Wallston & Wallston, 1978). For people living with diabetes, these behaviors include diet, exercise, checking blood glucose regularly, and taking medication consistently. A person that is rigorous with their health-related behaviors is more likely to have better control of their diabetes than an individual who is less attentive, and these health-related behaviors can be affected by locus of control. Locus of control is a social learning theory construct that relates to the beliefs a person has in how much control they have over situations and experiences in their lives (Strudler-Wallston & Wallston, 1978). There are two types of locus of control. Internal locus of control is when people believe they are in charge of the situations and experiences they face, while external locus of control is when people believe that outside forces (such as luck or fate) are in control of the situations and experiences they are found in (Strudler-Wallston & Wallston, 1978). Due to the

multiple and chronic demands of diabetes, a patient's perception of control can influence their adherence to medication management (Tillotson & Smith, 1996).

A diagnosis of diabetes can drastically change how a person lives their life because of all of the modifications one has to make to take care of their health. Which can be perceived as losing control of one's existence due to the change in their lifestyle, which is likely to affect whether they will engage in protective health behaviors (Tillotson & Smith, 1996). There are also factors that can affect blood glucose that are out of the individual's control, such as fluctuations in hormones or changes during menstruation, which can influence an individual's perceived control of their illness (ADA-APA Mental Health Provider Diabetes Education Program, 2020). Having diabetes can affect an individual in many ways, but having a comorbid diagnosis, such as mental illness, can increase the burden on a diabetic person's daily life.

Diabetes and Mental Health

In general, individuals with type 1 or type 2 diabetes have a greater occurrence of comorbid diagnoses of mental health conditions, such as depression, anxiety, or eating disorders, than individuals without diabetes (Ducat et al., 2014). A setback relating to the comorbidity of two illnesses is that they can have a cyclical relationship. This means that, as one condition worsens, the other condition's symptoms will most likely worsen, as well (Ducat et al., 2014). Although diabetes and mental health problems can be comorbid, it does not necessarily mean that one is caused by the other.

Unfortunately, mental health comorbidities in individuals living with diabetes can affect adherence to diabetes treatment, which can result in serious short- and long-term complications. Having diabetes can be distressful and lead to many complicated feelings, such as being overwhelmed with constant management of the disorder (Ducat et al., 2014). An individual can

be worried about having a future with the disease because of the shadow of serious complications related to diabetes. Many advances have taken place over the years to try to make living a life with diabetes easier, however. For example, continuous glucose monitors are slowly taking place of glucometers that require an individual to check their glucose by pricking their fingers regularly. Despite these advancements, the burden of the disease is still difficult to manage.

The cost of having diabetes can be overwhelming for a person to think about regardless of age, gender, race, and health insurance status (Egede et al., 2002). These individuals are more likely to spend a lot of money on medication and glucose monitoring equipment and they have an increase in health care usage. Along with these expenditures, there might also be a worry about being able to afford other parts of their diabetic care. Depending on the severity of their diabetes, a person might be required to see more than one health specialist, as well (Egede et al., 2002). Thinking about all of these different factors can affect the mental health and wellbeing of a person with diabetes, which can develop into symptoms that are considered psychopathology. Diabetic individuals have a unique set of mental health difficulties to consider when compared to individuals without diabetes, such as a reduction in diabetic self-care due to mental health problems (Ducat et al., 2014).

Diabetes and Mental Health Self-Care

When an individual is diagnosed with either type 1 or type 2 diabetes, being able to take care of oneself is vital to treating their illness (ADA-APA Mental Health Provider Diabetes Education Program, 2020). Diabetes requires a lot of care and can be overwhelming. The daily regimen of a diabetic person includes physical activity, being aware of the condition of their feet, and checking their blood pressure, among other things. Another type of self-care regimen for the

patient is done several times over the day, such as taking insulin shots and medication, counting carbohydrates, and monitoring blood glucose levels (ADA-APA Mental Health Provider Diabetes Education Program, 2020). The individual has to take an active role in their health throughout their entire lives or they could experience detrimental complications.

An individual with diabetes might already be too exasperated to manage all of the requirements one must do to stay healthy, so a mental health diagnosis may then amplify the frustration and cause the individual to not take care of themselves like they should (Ducat et al., 2014). Reduction in self-care can increase physical complications from diabetes, which can result in higher health costs. Health-related quality of life is a concept that looks at the physical, emotional, and social functioning of a person to assess positive emotions and life satisfaction (Health-Related Quality of Life and Well-Being, n.d.). The reduction in self-care can reduce health-related quality of life and also lead to higher mortality rates.

In a study done by Sakaidra and colleagues (2016), a reduction in self-care for diabetic patients was found in those who were also diagnosed with depression. Some of the depression behaviors looked at were fatigue, sleep-pattern change, irritability, change in appetite, agitation, and sadness; and the self-care behaviors looked at were how many times blood sugars were tested, healthful eating, exercise, and various foot care management techniques (Sakaidra & Weber, 2016). Researchers looked at different relationships between the behaviors of depression and self-care items to see if they were correlated and found negative correlations between the factors. Researcher's results suggest that, when an individual had a symptom of depression, they were less likely to do a self-care behavior (Sakaidra & Weber, 2016). It was concluded that there is a need to overcome psycho-behavioral barriers for ideal self-care management in patients with diabetes and support should be provided for behavioral changes (Sakaidra & Weber, 2016).

Another study by Devarajooh and colleagues (2017) extends the bidirectional strength between diabetes self-care and depressive symptoms. The study expands on an individual's cognition and how self-efficacy can play an important role with self-care management with the effects of depression. Researchers looked at demographic differences regarding what type of self-care practices were used and found depression symptoms were not influenced by external factors such as education level or income (Devarajooh & Chinna, 2017). The study found that self-efficacy is a strong predictor of diabetes self-care management even when the individual showed symptoms of depression. Further, higher levels of self-efficacy helped individuals to deal effectively with the daily regimens of diabetes care (Devarajooh & Chinna, 2017).

These changes in self-efficacy can affect a person's weight and they may experience weight gain. A person who has self-efficacy and an increase in weight might also experience a negative impact mentally. When a person notices weight gain while practicing self-efficacy, the weight gain goes against societal norms. This is because weight loss is seen as healthy and gaining weight can cause health problems (Aphramor, 2005). The juxtaposition of the two can lead to feeling not in control of one's diabetes management when they are doing everything in their control to take care of their health. Nonadherence to diabetes treatment can cause weight loss, which goes with the notion that losing weight is healthy (Aphramor, 2005). Because of how self-care can impact the relationship between insulin and weight there is a possibility of comorbid diagnoses of diabetes and eating disorders.

Eating Disorders

The diagnostic criteria for an eating disorder can be found in the Diagnostic and Statistical Manual of Mental Disorders - Fifth Edition (see Footnote 2; DSM-5; American Psychiatric Association, 2013). Eating disorders are characterized as a persistent disturbance

related to eating that results in the alteration of how an individual will consume or absorb food, which then leads to an impairment in physical health or psychosocial functioning (American Psychiatric Association, 2013). Knowing the prevalence of eating disorders is difficult to estimate due to the fact that eating disorder behaviors are often performed covertly and these individuals are reluctant to share their conditions with others and some may be in denial (American Psychiatric Association, 2013). What can be determined is that the incidence of eating disorders has increased since the 1950s, which may be due to a greater awareness of eating disorders. The DSM-5 provides diagnostic criteria for the following eating disorders: pica, rumination disorder, avoidant/restrictive food intake disorder, anorexia nervosa, bulimia nervosa, binge-eating disorder, and eating disorders, not otherwise specified. There are several risk factors to consider that may contribute to the development of an eating disorder.

Some risk factors for eating disorders are inherited, such as genetic predispositions and neurobiological conditions, while others are external factors, such as social and cultural factors, that portray thinness as attractive (Juruc et al., 2015). Several individuals diagnosed with an eating disorder described in the DSM-5 have endorsed similar behavioral symptoms found in people with substance use disorders (American Psychiatric Association, 2013). These symptoms include certain events leading to triggering responses and patterns of compulsive use. Looking at the link between the two might identify involvement of the same neural system with regulatory self-control and reward (American Psychiatric Association, 2013). Through the connection, the development of treatment options for eating disorders, such as diabulimia, may be made with further research because, currently, the connection is not sufficiently understood. The awareness of the pathology of certain eating disorders, such as anorexia nervosa, bulimia nervosa, and other specified feeding or eating disorder may provide insight into the incidence of diabulimia.

Anorexia Nervosa

Anorexia nervosa can be described as the restriction of energy intake relative to requirements. People with anorexia nervosa will limit their caloric intake to such an extent that they lack the calories required for their bodies to have a sufficient amount of energy. This can then lead to a significantly low body weight and weighing less than the normal range for children and adolescents (American Psychiatric Association, 2013). The level of severity for adults is based on their current body mass index (BMI) while the level of severity for children and adolescents is based on their BMI percentile (American Psychiatric Association, 2013).

Psychologically, an individual with anorexia nervosa has an intense fear of gaining weight and performs persistent behaviors that interfere with weight gain even though they may already have a significantly low body weight. There are two specific types of anorexia-nervosa: restricting type and binge-eating/purging type. In the restricting subtype, a person uses dieting, fasting, or excessive exercise for weight loss for at least three months, without any binging or purging behaviors. For the binge-eating/purging subtype, a person engages in recurrent episodes of binge eating or purging behaviors, which include self-induced vomiting and the misuse of laxatives, diuretics, or enemas, for a duration of at least three months (American Psychiatric Association, 2013). Other factors that may be associated with anorexia nervosa include a lack of insight, medical conditions caused by the disorder, depressive symptoms, and obsessive compulsiveness, which overlaps with substance use disorders, as well.

Individuals with anorexia nervosa can lack insight into their disorder, may deny that they have a problem, and rarely complain about weight loss (American Psychiatric Association, 2013). Due to the lack of insight, acquiring information from other sources, such as family or friends, is important to evaluate the history and symptoms of the illness. When an individual is

suffering with anorexia nervosa, the starvation aspect can lead to life-threatening medical conditions that can affect major organ systems, vital sign abnormalities, and loss of bone density. Women may also develop amenorrhea, which is the absence of menstruation (American Psychiatric Association, 2013). If an individual with anorexia nervosa is extremely underweight, they may also have psychological disturbances that are depressive in nature. The depressive symptoms include depressed mood, social withdrawal, irritability, insomnia, and diminished interest in sex. These symptoms can be found in individuals that are severely malnourished without the diagnosis of anorexia nervosa, so caution must be practiced when giving an additional diagnosis of major depressive disorder (American Psychiatric Association, 2013).

Another psychological aspect that is a prominent feature in those with anorexia nervosa is obsessive compulsiveness (American Psychiatric Association, 2013). These individuals tend to be preoccupied with thoughts of food, such as collecting recipes or hoarding food. Other characteristics that are associated with anorexia nervosa are concerns about eating in public, feelings of ineffectiveness, a strong desire to control the environment, inflexible thinking, limited social spontaneity, and overly restrained emotional expression.

People with anorexia nervosa might also misuse medications to lose weight or avoid weight gain by manipulating dosages. For example, people with diabetes might omit or reduce insulin use to reduce carbohydrate metabolism (American Psychiatric Association, 2013). Another eating disorder important to understand is bulimia nervosa.

Bulimia Nervosa

Bulimia nervosa has three essential features: recurrent episodes of binge eating, recurrent inappropriate compensatory behaviors to prevent weight gain, and self-evaluation influence by

body shape and weight (American Psychiatric Association, 2013). One of the factors that should be assessed in bulimia nervosa are binge eating episodes.

An episode of binge eating, according to the DSM-5, is defined as eating an amount of food in a discrete period of time that is larger than what most individuals would eat in a similar period of time under similar circumstances (American Psychiatric Association, 2013). A discrete period of time is a limited period that is usually less than two hours and the context of the binge eating episode can be left to the clinician's discretion. For example, people tend to eat more at celebrations or holiday meals. A binging episode is also not limited to one setting. An individual may start binging in a restaurant and then continue their binge when they return home. The excessive food consumption must also be accompanied by a sense of a lack of control to be considered a binge eating episode (American Psychiatric Association, 2013). A binging episode may lead to an individual wanting to purge due to emotions involved.

Emotionally, there is a shame component with bulimia nervosa. These individuals are ashamed of their eating disorder and attempt to hide their symptoms (Olatunji et al., 2015). Individuals tend to eat in secrecy or unnoticeably as much as possible. They will also eat until after they are satiated to a point where they are uncomfortable or even in pain. It has been found that common antecedents to binge eating episodes include negative affect, interpersonal stressors such as dietary restraint, negative feelings related to body weight or shape, food, and boredom (Olatunji et al. 2015). The binge eating episode alleviates these stressors short-term, but delayed consequences of dysphoria and negative self-evaluation may then occur. Binging is only one aspect of bulimia nervosa. The other main feature, known as purging or purge behaviors, is a recurrent use of inappropriate compensatory behaviors to prevent weight gain (Olatunji et al., 2015).

Purging behaviors can be done in several ways. The most common purging method is vomiting, but some other ways to purge include the misuse of laxatives or diuretics (American Psychiatric Association, 2013). There are other rare ways to purge, as well, such as misusing enemas, fasting, exercising excessively, and misusing medications. Examples of medication misuse may include the misuse of thyroid hormones, which can be used to prevent weight gain, or people with diabetes may omit or reduce insulin to reduce the metabolism of food consumed during binges. Purging is used to remedy the guilt associated with the food that has been eaten, so bulimia nervosa has an emotional aspect to consider along with several others. One final eating disorder that should be looked into to understand diabulimia is other specified feeding or eating disorder.

Other Specified Feeding or Eating Disorder

The other specified feeding or eating disorder category pertains to situations where the presentation of the individual does not meet the full criteria for any of the disorders in the feeding and eating disorders diagnostic class (American Psychiatric Association, 2013). The symptoms are characteristic of a feeding and eating disorder and cause clinically significant distress. These individuals will have impairment in social, occupational, or other important areas of functioning and the diagnosis should specify why the individual does not meet the full criteria (American Psychiatric Association, 2013). A study done by Stice and colleagues (2007) found that 13.2% of adolescent girls met the criteria for other specified eating or feeding disorder by the time they reached 20 years old. Several components are associated with the development and maintenance of eating disorders. These components include external and internal factors, such as the perception of control.

Eating Disorders and Perception of Control

Eating disorders have been found to be associated with a low perception of control over internal feelings and external events (Sassaroli et al., 2008). There has been a broad amount of research on the domain of control and biased beliefs associated with control and anorexia, but a link has been found among bulimia and control, as well. Researchers found that individuals with any type of eating disorder had a perception of a low internal control and high external control exerted by family and society (Williams et al., 1990). Gaining a sense of control through one's eating can combat the perception of a lack of control (Sassaroli et al., 2008; Serpell et al., 1999). These individuals restrict their experience by focusing on eating, body weight, and body size to achieve some amount of predictability, which, in turn, helps them to regain a feeling of control. However, having a sense of control that is focused on eating can lead them to an unhealthy lifestyle (Sassaroli et al., 2008).

The biopsychosocial model is a scientific construct used in understanding the treatment of diseases and can be a helpful lens when looking at different influences that could affect an individual with an eating disorder. This model looks at different dimensions such as biological, psychological, and social to help understand the patient's suffering in order to respond accurately to help them (Engel, 1980). One external dimension that can affect an individual's pathology of eating disorders is societal influences.

Social Contributors

Societies that have an abundance of foods have been found to value thinness, while, on the other end of the spectrum, societies that are food deserts idealize body shapes that are curvier. (Polivy & Herman, 2002). This suggests that societal ideals are influenced by what is more difficult to achieve (Polivy & Herman, 2002). Currently, eating disorders have been less

influenced by the socioeconomic status a person is in when there is a culture of food abundance due to the mass media portrayal of thinness (Polivy & Herman, 2002).

In societies of food abundance, media tends to bombard the general population with idealized thin body types, which are often unachievable, through television, movies, social media, and magazines. Most forms of media distort reality by the use of technology to airbrush and adjust the body shapes of models, which makes these weight standards impossible to achieve. Eating disorders are ten times more prevalent in females than males, as the idealization of thinness is more intense in females due to what is found in media as well as social circles (Striegel-Moore, 1993).

Not only does media influence a person to value a thin physique, but it can also influence how peers value thinness (Streigel-Moore et al., 2007). Adolescence is a critical time when peer influence is more substantial. Adolescent girls can learn attitudes, such as the importance of being slim and detesting others who are not slim, and behaviors, such as unhealthy dieting methods and purging behaviors, from their peers. Overall, societal factors contribute to the idealization of thinness, which can influence a female's dissatisfaction and distress about their body shape and size (Streigel-Moore et al., 2007). Excessive thinness is pursued by people who see no other way to solve problems, which can be influenced by factors such as their family.

Family Influences

An individual's family can influence the development and perpetuation of their eating disorder in several ways. Families can contribute to eating disorders by providing positive reinforcement to perpetuate the continuation of thinness (Polivy & Herman, 2002). Family members and friends provide positive reinforcement by praising the individual's slenderness and the self-control and discipline that is required to maintain and achieve a thin physique (Polivy &

Herman, 2002). Family dynamics can also play a vital role in the development as well as the perpetuation of eating disorders. Studies have found eating-disordered families to be negating of the individual's emotional needs, hostile, intrusive, enmeshed, and overly concerned with parenting (Minuchin et al., 1978). Another factor in families that is important in the development of eating disorders is attachment style.

Attachment style refers to John Bowlby's theory that people's closest relationships form how a person guides one's exploration of the physical world as well as reflecting on one's internal experience (Levy et al., 2011). When an individual's attachment figure is a secure base, a person can openly and freely explore the world as well as seek support, protection and comfort during stressful times and situations (Levy et al., 2011). The different types of attachment styles are secure and insecure, which include avoidant, ambivalent, and disorganized. An insecure attachment style is often found in the eating disordered demographic (Ward et al., 2000). A common description of families of patients with eating disorders includes a critical family environment with coercive parental control (Haworth-Hoeppner, 2000). People with bulimia report greater parental intrusiveness in the terms of maternal invasion of privacy, jealousy, competition, and paternal seductiveness (Rorty et al., 2000). Mothers can especially play an important role in eating disorders pathology.

Direct comments from maternal figures are more powerful influences than whether the maternal figures were behavioral models for eating disorders (Ogden & Steward, 2000; Smolak et al., 1999). Prospectively reviewing mothers' critical comments about weight predicted eating disorder outcomes for their daughters (Vanfurth et al., 1996). Behaviors from mothers with eating disorders can also negatively influence the weight of their children (Polivy & Herman, 2002). These behaviors include feeding children irregularly and expressing concerns about a

child's weight/appearance as early as age 2. By the age of 5, these children portray more negative affect than children whose mothers do not have eating disorders. Individuals with eating disorders generally display more negative affect, such as poor self-concept, than individuals without eating disorders. Family may influence the development and continuation of eating disorders but do not account for all instances of disordered eating, so individual factors should also be considered (Polivy & Herman, 2002).

Individual Factors

Both inherent individual factors and acquired experiences can contribute to the development of eating disorders (Polivy & Herman, 2002). Certain interpersonal experiences, such as abuse, trauma, and teasing, are linked to the development of eating disorders (Polivy & Herman, 2002). Specifically, self-reports of being teased about one's physical appearance or body shape is found to be increased with eating disorder symptoms (Lunner et al., 2000). These individuals report more life stresses and difficulties premorbid when compared to controls (Raffi et al., 2000; Schmidt et al., 1997; Welch et al., 1997). The combined influence of life stresses and affect defects, such as irritability, anhedonia, generalized anxiety, and depressed mood, is pathognomonic in individuals with bulimia (Raffi et al., 2000). Eating disorders serve as an effort to regulate overpowering negative affect as well as construct a coherent sense of identity when internal characteristic structures are deficient (Rorty & Yager, 1996). Eating disorders also serve as coping mechanisms for some women when handling personal crises if they do not possess healthier coping mechanisms (Troop, 1998). By focusing their attention to weight, shape, and eating, there is a sense of emotional control and individuals with eating disorders can avoid dealing with other concerns (Polivy & Herman, 2002).

Alone, negative emotion is not likely to cause eating disorders, but stress and negative moods are found to be large antecedents for individuals with eating disorders (Streigel-Moore et al., 2007). A complex functional relationship has been suggested for negative affect and eating disorders because of the levels of depression and anxiety that are found in these individuals (Steinberg et al., 1989). Individuals with bulimia have been found to attempt to elevate their mood by eating and then purging to avoid weight gain (Johnson & Larson, 1982). A study by Kaye and researchers (1986) found that people with bulimia reported a reduction in anxiety, guilt, and tension after a bingeing episode. These individuals may realize their binges are out of control and their emotions change to dread and guilt, so binging no longer brings relief by elevating their mood. Purging then takes an emotional role and replaces binging to reduce tension (Johnson & Larson, 1982). Negative affect is only one aspect found in individuals with eating disorders and self-esteem is another important aspect to consider.

Low self-esteem has been found to be prominent in individuals with eating disorders (Streigel-Moore et al., 2007). Self-esteem is a hierarchical and multifaceted concept related to the self-evaluation of oneself in reference to other people or competence within situations (Pierce et al., 1989). A person can have various levels of self-esteem depending on the context. For people with eating disorders, shape and weight-based self-esteem is lower than those without eating disorders (Streigel-Moore et al., 2007). A study done by O'Dea and Abraham (2000) found that adolescents with an increased risk for eating disorder symptomology had decreased risk a year after being put into a program aimed at increasing self-esteem. Women recovering from bulimia reported increases in their self-esteem after being a part of the program which possibly contributed to their recovery (Streigel-Moore et al., 2007). Cognitions are another influential individual factor that should be considered, as well.

There have been certain cognitive themes found in people with eating disorders. These include obsessive thinking, rigid thinking patterns, and inaccurate judgements (Polivy & Herman, 2002). People can evaluate themselves in many aspects, but what is found to be central in self-evaluation for individuals with eating disorders is weight (Streigel-Moore et al., 2007). They often have obsessive thoughts and spend excessive time obsessing about food, eating, weight, and shape (Gleaves et al., 2000). One can also obsess about perfection by either making normal shortcomings more traumatic or looking at one's normal body as a sign of imperfection. Another cognitive tactic used as an escape mechanism is dissociation (Polivy, & Herman, 2002). Dissociation is when unpleasant elements are out of the conscious view and the individual then feels protected from that element (Polivy & Herman, 2002). Binging serves as a dissociative protective measure by protecting the person from emotional distress (Heatherton & Baumeister, 1991; Lacey et al., 1986). In the realm of the biopsychosocial model, biological factors of eating disorders are also important to consider.

Biological factors should be looked at with caution due to the disruption eating disorders cause within the neuroendocrine system and appetite, which makes knowing whether the disruption occurred before or after the eating disorder difficult to understand (Streigel-Moore et al., 2007). From a neuroendocrine perspective, there is a possibility of a hypothalamus dysfunction being the main control of appetite; this dysfunction can affect the ability of a person to feel satiated. Also, serotonin may play a role in appetite. People recovered from bulimia show persistent abnormalities in serotonin function as a deficit, as there may be an underlying factor associated with serotonin in the development of bulimia (Streigel-Moore et al., 2007). A biological factor to consider in anorexia is olfactory impairment, which means these individuals have difficulty with smell. The loss of smell can diminish the appeal of food to those individuals

because smell is an aspect that makes food appealing to eat. All of these factors make eating disorders a complex disease.

The development of eating disorders encompasses many complex biopsychosocial factors, making eating disorders a complex disease to treat. Similarly, diabetes has many complex risks and complications, which makes maintenance of a strict treatment regimen important. Although these are very different disorders, having one of these illnesses does not mean there is safety from contracting the other. The complexity of the biopsychosocial aspects related to both diseases can be influential when leading to a comorbid diagnosis.

Diabetes and Eating Disorders

Comorbidity of Diabetes and Eating Disorders

Diabetes is a risk factor for disturbed eating behaviors (Wisting et. al, 2013). Depending on how one defines, and measures disturbed eating behaviors, the prevalence can range from 10% to 49% in the general population. According to a meta-analysis by Wisting and colleagues (2013), there was a three-time increase in bulimia nervosa and a two-time increase in other specified eating and feeding disorders, as well as subclinical eating disorders, in people with type 1 diabetes. One factor to consider for the increase in eating disorders in a population that has diabetes is the patient weight gain that often occurs during the treatment of diabetes.

The treatment of diabetes helps the pancreas with insulin output to help with glycemic control except in the case of type 1 diabetes. When glycemic control is regained from taking insulin, weight gain is a possible side effect and can lead to people with diabetes having weight concerns (De Paoli and Rogers, 2018). Type 1 diabetes typically occurs in children and adolescents and, when coupled with puberty, this combination can become the perfect storm for eating disorders (Juruc et al, 2015).

During puberty, the body is going through a lot of changes and adolescents are already comparing themselves to one another (ADA-APA Mental Health Provider Diabetes Education Program, 2020). Adolescents want to connect and be a part of their peer group, but type 1 diabetes can make these connections difficult. People with type 1 diabetes have to count their carbohydrates before meals, check their blood sugar levels, and give themselves insulin. The management of diabetes can make a child or adolescent with type 1 diabetes feel alienated from their friends, as they cannot eat whatever or whenever they want like their friends can. The alienation can make adolescents living with diabetes feel helpless about their illness, have lower self-esteem, and have a lack of self-confidence when they compare themselves to kids without diabetes. This comparison can then contribute to the development of eating disorders (ADA-APA Mental Health Provider Diabetes Education Program, 2020).

Another implication of being surrounded by non-diabetic peers and wanting to feel a part of that group is that these adolescents might avoid treatment in front of their friends to fit in. The treatment avoidance can then set up a standard for mismanaging treatment. However, these kids are not mismanaging for weight concerns but to feel like they are a normal kid in front of their friends, which can still set up a pattern for long-term mismanagement of diabetes treatment (ADA-APA Mental Health Provider Diabetes Education Program, 2020).

Individuals with eating disorders often suffer from loss of control (Baechle et.al, 2014). In anorexia nervosa, controlling one’s intake of food is seen as taking control of one’s life when other aspects of one’s life seem to be out of control (Lawrence, 1979). An individual with diabetes may perceive a loss of control of their life because of the rigid rules and behavioral adherence to effective diabetes management. They might perceive taking back control by maintaining a desired weight by manipulating their insulin, psychologically similar to an

individual that is taking some sort of perceived control back in their life with anorexia nervosa. Similar to examining both diabetes and eating disorders from a biopsychosocial perspective, examining the comorbid presentation also requires attention to biological, psychological, and social risk factors in the development and maintenance of comorbid diabetes and eating disorders.

Biological Risk Factors

There are biological factors that are important to consider that contribute to the development of diabetes and eating disorders. Even though insulin analogs have come a long way, they still cannot compete with naturally made insulin and how it interacts with other hormones or neurochemicals in the body (Lee-Akers et al., 2019). Insulin is involved in the consumption and use of energy and is used to regulate leptin, dopamine, and neuropeptide Y. Therefore, when insulin analogs are used, it is more likely that an individual's blood glucose is out of range when compared to someone who is naturally producing insulin (Lee-Akers et al., 2019). Use of insulin analogs means that there is a disturbance of physiological mechanisms, which disrupts satiety mechanisms directly in the brain and indirectly in the intestine through uncontrolled gastric emptying, also known as the stomach clearing. So, when individuals with diabetes eat, they are not satiated like a person without diabetes would be satiated, which, in turn, leads to weight gain.

A biological risk factor that affects adolescents with type 1 diabetes when they are going through puberty is a lower susceptibility of tissues to insulin (Juruc et al., 2015). This means that they will have to keep increasing their insulin dosages to help control their blood glucose, which will lead to a significant increase in weight (Juruc et al., 2015). Biological female adolescents will also experience additional difficulties during their monthly cycles.

When individuals menstruate, there is a change in their hormones that can affect their blood glucose levels (Bennal & Kerure, 2013). Regardless of how well an individual is adhering to their diabetes treatment with medicine, exercise, and diet, those steps will not help with the hormonal fluctuations that are happening during menstruation. All individual's menstruation cycles are different, so an individual can have higher blood sugars at different parts of their cycle. To combat the higher blood sugars at that time, these individuals will increase their insulin doses which can lead to weight gain.

The adolescents are adhering to their treatment plan, but the weight gain associated is affecting their perception of health, which can be a very tough situation. Weight gain in society and culture has negative connotations when one thinks of health conditions such as cardiac disease and blood pressure problems (ADA-APA Mental Health Provider Diabetes Education Program, 2020). Biological factors can affect the prevalence of eating disorders and psychological risk factors are influential, as well. **Psychological Risk Factors**

The psychological component of why a person is not taking their diabetes medication can vary and influence changes in weight that can lead to eating disorders (ADA-APA Mental Health Provider Diabetes Education Program, 2020). Needle phobia is a condition that can happen to an individual who is diabetic. Although there is research looking into taking insulin through the nose as vapor, it is currently not prescribed so the primary delivery method is through injection or other invasive methods such as insulin pods or insulin pumps. A person with diabetes will have to prick themselves several times a day in order to measure their blood sugar and learn patterns, so having a phobia of needles could greatly limit the individual's likelihood of sticking to a consistent medication schedule. (ADA-APA Mental Health Provider Diabetes Education Program, 2020).

A common misconception is that an individual can become desensitized to needles due to giving themselves injections multiple times a day. For example, a person living with diabetes that self-administers insulin through a needle and syringe has to change their injection site. If a person injects repeatedly in the same area, scar tissue can form and render the insulin from not being absorbed. Therefore, when the site is changed, a novel experience occurs again when using a needle (ADA-APA Mental Health Provider Diabetes Education Program, 2020). There are other phobias that can also affect those with diabetes in a manner that inhibits adherence to treatment.

Another phobia that an individual with diabetes can develop is the fear of hypoglycemia, or when an individual's blood glucose level is lower than normal. A hypoglycemic episode can be a very dangerous situation that can lead to unconsciousness or even death (Cryer et al., 2003). Symptoms of hypoglycemia include extreme hunger, extreme sweating, fainting, fatigue, lightheadedness, or shakiness. Cognitively, an individual can experience confusion, irritability, anxiousness, and, in severe untreated cases, death (Cryer et al., 2003). These symptoms can lead an individual with diabetes to be scared of taking their medication and avoid medication, which would lead to the purging of calories and the loss of weight. Because the fear of hypoglycemia can lead to weight loss and the purging of calories, the emergence of diabulimia can occur.

Diabulimia

Diabulimia, at the moment, is not officially recognized in the medical field and there are currently no diagnostic criteria for diabulimia (Brookes, 2018). Diabulimia also has a contested medical status, which means that practitioners and other individuals in the health field do not see diabulimia as an illness but rather as a deviance issue from a prescribed diabetes self-management regimen. However, the DSM-5 recognizes the purging aspect and misuse of

medication for weight loss of diabulimia as a part of an eating disorder. Although diabulimia is not a medical label, giving a name to the symptoms by many of the sufferers has provided a way to identify and share their experiences with one another (Brookes, 2018).

Due to not having a formal diagnostic status, individuals with diabulimia may not receive treatment directly related to their needs. If diabulimia is only treated as a symptom of diabetic treatment nonadherence, detrimental aspects of diabulimia, such as the psychological component of why a person is not sticking to their medical regimen, will be left out. Additionally, insurance companies will not want to help pay for things related to a health problem that is not diagnosed (Brookes, 2018). Not having a diagnosis can lead to negative diabetes-related consequences of having high consistent blood sugars, such as reducing an individual's lifespan by as much as thirteen years (Shih, 2011).

Diabulimia falls under the category of other specified eating or feeding disorder. One might wonder why bulimia is the root of diabulimia when individuals are not purging their food through vomiting. This is largely due to the fact that, when people intentionally do not take their insulin, the sugar that their food is transformed into is being purged through urination by glycosuria. There are four types of glycosuria: diabetic glycosuria, renal glycosuria, glycosuria of cerebral origin, and glycosuria of endocrine (non-pancreatic) origin (Ferrannini, 2011). The one that is associated with diabulimia is diabetic glycosuria. When an individual intentionally lets glycosuria occur, they can have symptoms of thirst, excessive hunger, polyuria, exhaustion, and weight loss.

There is much more to the extent of what glycosuria can do to an individual. A person can have recurrent boils, carbuncles, septic infections, pulmonary tuberculosis, peripheral neuritis, and pains in the legs (American Diabetes Association, 2013). If the body goes into diabetic

ketoacidosis along with glycosuria, a diabetic coma is likely to occur. Although many of these complications happen with glycosuria, these dangers do not make individuals cautious with taking their insulin. The weight loss associated with glycosuria is what individuals with diabetes and disturbed eating behaviors are trying to achieve, so the mechanisms of diabetes and eating disorders is pertinent in understanding diabulimia.

Diabetes has a burden of disease, known as diabetes distress, that comes with the diagnosis (Polanski et al., 2005). A person with diabetes must take an active role in their health throughout their entire life or else they could experience severe, detrimental complications. An individual may feel exasperated to always manage the requirements to stay healthy when living with diabetes and frustrations may arise from the constant management of diabetes. Diabetes distress may lead a person to become apathetic with their life and discontinue their diabetes treatment regimen (Polanski et al., 2005). Therefore, the discontinuation of one's daily management routine can lead to purging of sugar through glycosuria, as well.

Depression is another psychological factor that is correlated with, and impacts on, diabetes and diabetic self-care (Sakaidra and Weber, 2016). In a study done by Sakaidra and Weber (2016), a reduction in diabetic patient's self-care was found in those that were also diagnosed with depression. Some of the depressive symptoms that were looked at included fatigue, sleep pattern changes, irritability, changes in appetite, agitation, and sadness. For self-care behaviors, number of times that blood sugars were tested, healthful eating, exercising, and various foot care management behaviors were assessed (Sakaidra & Weber 2016). Researchers looked at different relationships between the behaviors of depression and self-care items to see if they were correlated and a negative correlation was found. When an individual had a symptom of depression, they were less likely to do a self-care behavior (Sakaidra & Weber 2016). When self-

care, such as taking insulin, is reduced, the individual with diabetes is losing weight due to their meals not being processed with insulin.

The manipulation of insulin can be a part of the intentional act of wanting to lose or maintain weight. Insulin omission is approximately reported in 37% of people with type 1 diabetes (Wisting et. al, 2013). The manipulation of insulin can be seen on a spectrum of individuals, from people who are rigid with treatment to individuals taking less insulin than what their body requires to people who will not take insulin at all. For people who use insulin for diabetes treatment, at least 32% of those individuals are found to use less insulin than what is required for their carbohydrate intake. Some individuals also use insulin to manage their binges when they overeat and 7% of individuals will mismanage their insulin at these times or skip taking their insulin entirely (Wisting et.al, 2013).

Due to the variation of why an individual mismanages their insulin, understanding the variation is an important aspect of how an individual's treatment should be handled. Diabulimia is a misnomer, which might indicate wrong assumptions for treatment goals. Current research has not focused on best treatment options for people with diabetes and the mismanagement of insulin. Because of the lack of research in treatment options, the study will focus on treatment strategies for diabetes and eating disorders in order to find links between the two disorders and optimize treatment for people with diabulimia.

Aims and Scope of Study

The aim of the study is to review and analyze treatment interventions currently used for diabulimia and eating disorders comorbid with diabetes. By exploring diabetes and eating disorder clinical evidence separately a systematic literature review was conducted to find common themes of treatment modalities and what treatments lead to better prognosis of

diabulimia. The systematic review will seek to organize all the empirical evidence that fits the inclusionary criteria to answer the research question (Clarke & Chalmers, 1998).

CHAPTER 2

METHODOLOGY

A systematic literature review is unique in the fact that journals using different methodologies for their results can be brought together in order to make a more comprehensive conclusion (Baumeister, 2013). When various results that use different methods and procedures are systematically reviewed and integrated, this can leave behind hidden aspects of bias or errors to help build enough evidence in favor of a conclusion. The methodological convergence builds strong support for conclusions and can build enough evidence to formulate a broad theoretical framework. According to Baumeister (2013), it is common to have an evolving theory or hypothesis with a literature review and Baumeister recommends keeping an open mind during the entire research process because the nature of the methodology is ever evolving. The studies reviewed were examined individually as well as holistically to ensure the studies are drawn back to the research question. Examining the studies this way presented new information that was not known before during the systematic review.

The terms of interest were operationalized to ensure measurable variables. Diabulimia was defined by reduction in the management of diabetes in order to lose weight or maintain weight. Diabetes was defined as a medical diagnosis related to dysfunction in the insulin process, which is given by a medical doctor and either categorized as type 1 or type 2 diabetes. Eating disorder was defined as a diagnosis given by a certified health professional with the presence of DSM-5 symptoms, which include a dysfunctional relationship with food, body image, and/or weight. Treatment teams were defined as qualified professionals who bring different types of skillsets and expertise to help with biopsychosocial interventions.

Search Methods

In order to find relevant research pertinent to understanding diabulimia, the “search” method used to obtain the literature included Kansas City University library databases and the specific databases used were recorded throughout the conduction of the study. Use of peer reviewed journals, peer-reviewed articles, books, national presentations, diagnostic manuals, and committee references were used for the systematic review. For specific articles of interest that were not accessible, interlibrary loan was used through Kansas City University. Archival search was conducted by using reference lists of studies deemed relevant (Cooper, 1982). Literature review objectives focused on diabetes medication mismanagement, treatment methods, and individuals with diabetes and eating disorders in the medical and psychological field. Databases that were used via EBSCO included: Academic Search Elite, Google Scholar, APA PsycArticles, APA Psycinfo, PubMed, Medline, and Psychology and Behavioral Sciences Collection. The key search terms used to represent the concept of intentionally manipulating diabetes medicine in order to regulate weight included: “Diabetes and Disordered Eating Treatment”, “Diabetes and Eating Disorders Treatment”, “Insulin Restriction Treatment”, “Insulin Omission Treatment”, “Treatment for Eating Disorders Associated with Diabetes”, and “Diabulimia Treatment”.

Inclusion and Exclusion Criteria

The inclusion and exclusion of studies were based on empirically defensible criteria (Siddaway et al., 2019). The PICO framework has been widely used to define which studies were used in a systematic review. The studies reviewed were interpreted through the PICO framework as an explicit search plan to minimize bias (Murdoch University, 2020).

For record keeping purposes, a Microsoft Excel spreadsheet was used to log, organize, and select the final studies that were systematically reviewed. A record keeping log is a step that is strongly recommended for systematic reviewers so that the literature is comprehensively

analyzed (Siddaway et al., 2019). The log included search terminology used, list of studies that were excluded through the screening process (i.e., based on protocol, abstract, brief review), efforts made to obtain work, report of the characteristics of the studies included, and reasoning for exclusion of studies removed in the eligibility stage (i.e., inaccessibility, lack of detail, outdated).

Inclusionary criteria for the articles included in the study were adults 18 and older as participants, providers treating diabetes and/or eating disorders, and treatment teams including psychiatrists, psychologists, endocrinologists, and primary care physicians. Exclusionary criteria included any treatment methods used before the year 2010 in order to review up-to-date treatments. Use of appropriate methodology and sample size stating the power, reliability, and validity of the studies were included. Domains of interest were diagnosis, well-being, adherence, treatment type, and treatment outcomes.

The PICO framework was used to ensure a clear definition of the clinical research question (Murdoch University, 2020). The framework was vital to the research process by aiding in quickly finding information based on concepts, finding relevant information, and providing a checklist of the concepts being searched. The “P” stands for problem, in this review the problem was whether the diagnostic category impacts the type of treatment and how interventions impact adherence provided. As such, diabulimia and diabetes with a comorbid eating disorder was selected. The “I” stands for intervention, the intervention was how the disorder was being assessed, diagnosed, and what treatment interventions were used. The “C” stands for comparison; diagnoses, treatment, and impact of treatment on variables of interest compared across each diagnosis. The “O” stands for outcome, did treatment outcome differ based upon the assigned diagnostic category of these disorders. This framework ensured a clear structure for the

clinical questions explored (Murdoch University, 2020). The questions under investigation for this systematic narrative review included:

1) Explore published treatment studies (well-being, adherence) for patients living with diabetes
2) Same exploration of published treatment studies for patients with eating disorder diagnoses
3) The focus was on comparing and contrasting treatment studies that conceptualize the disorder as diabulimia versus diabetes with a comorbid eating disorder
4) Did the diagnostic category impact the type of treatment provided and the outcome of these treatments?
    A. Did the diagnosis change the treatment?
    B. Did the treatment outcomes differ?

Organization of Studies

The studies included in this review were organized in a table format to add in both the description of the studies and how their results were interpreted. Each table includes the following row categories: 1) Study Reference, 2) Sample, 3) Design, 4) Relevant Results, and 5) Conclusion. Each table is separated by diagnoses 1) Diabulimia and 2) Diabetes comorbid with Eating Disorder. Three tables were created for each independent variable (i.e., well-being, adherence, treatment intervention; see Appendix A). There are 6 total tables.

CHAPTER 3

RESULTS

Study Selection

Article search began April 22, 2021 and ended February 19, 2022. Studies retrieved from the search were screened by the author to identify relevant abstracts. The articles of the potential abstracts were independently reviewed to determine which studies fulfilled the inclusionary criteria. The reference sections of retrieved articles were hand-searched for more potential studies to be reviewed for the systematic narrative review. The literature search resulted in 485 articles, 52 of those had the diagnoses in the studies titles. Once duplicates were removed 38 studies remained. After reviewing for the independent variable, inclusionary criteria, and analyses of the study using the PICO framework, nine articles remained.

Characteristics of Studies Included

Nine studies were included in the systematic review. The main demographic in each of these studies was comprised mostly of women ranging from adolescence to older adults. Three studies were randomized control studies and three more were qualitative studies. One study was a prognosis study which reviewed a case study of an adolescent girl, while another one was a cohort study. Lastly, a best practices article was included due to many of the studies reviewed referencing this article for treatment interventions. Intervention components identified from the research include inpatient rehabilitation treatment, multidisciplinary/interdisciplinary team treatment, psychoeducation, family/social support involvement, cognitive behavioral therapy, and personal factors.

Quality of Studies

Using the PICO framework, the studies succeeded at identifying the clinical question and the rationale for research. The studies did not describe the interventions well in details, constructs were not clearly defined, and the interventions differed heavily. The multidisciplinary/interdisciplinary teams differed with who was all involved in treatment,

although there was an emphasis on having an eating disorder team as well as a medical team component. Overall, the critical appraisal found that two of the studies were considered to be poor to fair quality because the case study did not have a control and the best practices study did not include methodology as to why the treatment interventions should be used as best practices. The seven other studies are of fair quality because they answered the critical appraisal questions of the PICO framework. The overall risk of bias was minimal to low.

Diabulimia and Well-being

The key search terms did not lead to any aspect of diabulimia and the consideration of well-being. Due to the high-demands and rigors of diabetes as well as eating disorders, there was an expectation that well-being would be a construct that would be identified for treatment attributes. Of the nine studies that are used in this review, there was no mention of well-being.

Diabulimia and Adherence

Diabetes is a chronic illness and eating disorders can come back throughout an individual's lifetime, due to the longevity of these diagnoses a person needs to have commitment and maintain factors associated throughout their life. This makes adherence important for maintenance of treatment only one of the nine articles used to review treatment spoke of this topic. Researchers that conducted a thematic review of blogs found that biopsychosocial concepts such as social support and psychological aspects are important for diabetes self-management and influence adherence this includes the use of doing small steps and working with one's emotional well-being (Staite et al., 2018). Change in one's cognition on how health is valued as an important theme. Because when individuals switched their cognition on weight to focusing on healthy lifestyle, this helped with adherence to taking care of themselves. Internal locus of control was identified also due to people writing about being empowered to be in control

of oneself. The state of one's emotions is important as well; individuals spoke of optimism and hope for the future. Having a positive support system in the interdisciplinary team as well as social support influenced people to take care of their diabetes and health. This article is one that took the perspective of people who identify as having diabulimia. Lastly, individuals identified having strict dietary regimens to take care of themselves was an important aspect of adherence (Staite et al., 2018).

Diabulimia and Treatment Interventions

The PICO method and key search terms arrived at one case study to review treatment interventions for an adolescent who identifies with having diabulimia (Candler et al., 2018). Approaches to her treatment included a multidisciplinary team, having three main focuses which include insulin regulation by having her follow a strict regimen, focusing on mental health with having a psychologist work on distortions with self-image, along with a medical approach on diet (Candler et al., 2018)

Table 1

Diabulimia

Well-being					
Author/s	Study	Sample	Design	Relevant Results	Well-Being Conclusion
N/A	-	-	-	-	-
Adherence					
Author/s	Study	Sample	Design	Relevant Results	Adherence Conclusion
Staite et al., 2018.	Diabulimia Through the Lens of social media: A Qualitative Review and Analysis of Online Blogs of People with Type 1 Diabetes Mellitus and Eating Disorders	7 25- 34-year-old female bloggers from the United Kingdom.	Thematic Analysis.	Themes of empowerment, optimism, hopefulness, structured dietary approaches, prioritizing healthy lifestyle overweight loss, and healthy support system	Emotional and diabetes self-management strategies Taking small steps
Treatment Interventions (Diabulimia)					
Author/s	Study	Sample	Design	Relevant Results	Treatment Interventions Conclusion
Candler et al., 2018.	Fifteen-minute consultation: Diabulimia and disordered eating in childhood diabetes	15-year-old adolescent female	Case Study	Case Study of 15-y/o	Multidisciplinary approach with three categories to focus on: Insulin management and medical, dietetic and psychological

Diabetes Comorbid with Eating Disorders and Well-being

No evidence of well-being was found during the research phase or as a construct identified for health and treatment interventions, despite this being an important aspect of health.

Diabetes Comorbid with Eating Disorders and Adherence

Researchers Coleman and Caswell (2020) conducted a qualitive study on diabetes and eating disorder that helped identify what helps people adhere to taking care of the comorbid diagnoses. Their assessment is meant to give vital information to healthcare professionals for guidance and what they should focus on for the future. The study had 45 participants that were diagnosed with Type 1 diabetes mellitus and a history of insulin misuse through an online questionnaire. The participants were given the Eating Disorder Examination Questionnaire (EDE-Q) and 16 open-ended questions which asked about their experience. A T-test was used to compare the EDE-Q score for this demographic to two different general population samples and two eating disorder samples. This indicated that the scores from the participants from the study are consistent to what is found in the eating disorder samples. This helps to validate the idea that insulin misuse more likely than not is an eating disorder. The thematic analysis found that approximately 80% used insulin restriction for weight loss, while other reasons included a hate for diabetes and, lastly, a form of self-harm. The theme on medical experience included that many of the participants were treated for diabetic ketoacidosis which led to discussion of insulin misuse. When it came to adherence to recovery, participants discussed how having reasons to be motivated were very important. Support was another important factor, such as having positive support from family, children, and other sufferers online. Lastly, awareness of their illness was vital (Coleman & Caswell, 2020).

Table 2

Diabetes Comorbid with Eating Disorder

Well-being					
Author/s	Study	Sample	Design	Relevant Results	Well-Being Conclusion
N/A	-	-	-	-	-
Adherence					
Author/s	Study	Sample	Design	Relevant Results	Adherence Conclusion
Coleman et al., 2020.	Diabetes and eating disorders: An exploration of 'Diabulimia'	45 participants	Qualitative research designs	T-test indicated that higher global score of EDE-Q was found in the participants than the general population score indicating the study was valid for eating disorder	Support/positive relationships, motivation and awareness

Diabetes Comorbid with Eating Disorders and Treatment Interventions

The key terms “diabetes”, “eating disorders”, and “treatment interventions” found the most studies that fit with the inclusion criteria with a total of six articles found. Author Jacqueline Allan (2017) wrote the NICE guidelines for treatment of diabetes comorbid with eating disorders that many studies included in this study as well as found during the research phase of this study referred to as guidance. The author discussed some concerns about holes in this topic while offering best practices that should be used for management and treatment. The guidelines listed include collaborative care among eating disorder specialists to work with mental health professionals and medical professionals for the treatment of comorbidities. Having outcome measures reported for the eating disorder, mental health aspect, and physical health aspect help to monitor the effectiveness of treatment and find how they can impact one another. The team should communicate and discuss which part of the team should monitor physical health, the diabetes part of the team or the eating disorder part of the team. Social support was also identified for treatment to help with monitoring blood glucose. Education was another important part of treatment by addressing insulin misuse and explaining why, during blood glucose monitoring is important, diabetes educational intervention, and problems that can occur from insulin mismanagement. Lastly, Allan listed a specific plan with having the patient begin a low-carbohydrate diet, start insulin at a low-level, and then gradually increase insulin to reduce glucose levels. Adjusting glycemic control and carbohydrates to individual needs can also prevent rapid weight gain (Allan, 2017).

Another study that observed treatment interventions was done by Clery and colleagues (2017), in which they reviewed whether existing interventions used to improve glycemic control

is effective with individuals with eating psychopathologies. They reviewed 91 articles and found six studies for a systematic review and three studies for a meta-analysis. The researchers found that there were no current treatments that statistically improved glycemic control in individuals with type 1 diabetes who currently had eating disorders. The researchers suggest that an intensive intervention that focuses on both diabetes and disordered eating is needed. They reviewed inpatient therapy which appeared to be the most effective treatment due to having multiple components such as cognitive behavioral therapy, psychoeducation, and family therapy (Clery et al., 2017).

This review also found researchers that were focused on self-compassion as a specific treatment intervention for patients with diabetes and eating disorders (Boggiss et al., 2020). Twenty-seven adolescents with type 1 diabetes were recruited and randomized to participate in two 2.5-hour sessions of self-compassion interventions that were given one week apart and adapted from a standardized eight session program called “Making Friends with Yourself”. Nineteen participants completed the intervention. The participants were split into two groups: the intervention group and the waitlist-control group. The two sessions included group exercises, discussions, art activities, meditation, individual reflection, and exploring exercises. They were also given self-compassion coping tools to use in daily life when dealing with difficult emotions.

The participants in this study were assessed qualitatively through questionnaires and feasibility was reviewed by attendance and recruitment metrics. The measures were given at baseline and post-intervention for the participant group and the waitlist-control group was given measures at pre-intervention, baseline, and post-intervention group. Measures given included DEPS-R for disordered eating behavior, Self-Care Inventory-Revised Version for adherence to diabetes-related self-care behavior, the Problem Areas in Diabetes survey for diabetes-related

stress, Self-Compassion Scale Short-Form for self-compassion, and the Perceived Stress Scale for stress. Lastly, glycemic control was collected at baseline and during the clinic visit after completing the intervention.

Results indicated that approximately 70% of participants reported increased coping resources. Participants also found value when they learned they are not alone in experiencing difficult feelings and 7 of the 19 participants enjoyed the mindfulness aspect. There was a small mean change between the baseline scores and post-intervention scores, which may lack sensitivity due to the time frame of the 2-week intervention. Qualitative measures may prove more crucial for results because of the time factor. The researchers found that there was a relatively high engagement in participation because many of the tools taught were being used outside of the sessions, and the adolescents would recommend this to others and found this approach non-threatening. The authors indicated that subjective increasing of coping resources is promising because coping is important for chronic illnesses (Boggiss et al., 2020).

One of the studies reviewed focused on identifying personality traits and motivation and how they might influence treatment outcomes. A total of 40 subjects were used in this study. Twenty participants had a comorbid diagnosis of type 1 diabetes and an eating disorder that was matched to 20 participants with eating disorders only (Custal et al., 2014). This study used an assessment that included a semi-structed interview by a psychologist and several questionnaires, such as the Temperament and Character Inventory-Revised (TCI-R) and the Eating Disorders Inventory-2 (EDI-2). Patient’s stage of change was assessed with a visual scale. Lastly, their medical visit obtained weight, height, glycemic control, and insulin adherence. After this assessment, patients received 16 sessions of cognitive behavioral therapy and eating disorder treatment.

Afterwards, the patients were re-evaluated and categorized as either total remission, partial remission, or no remission and voluntary treatment discontinuation. T-tests and binary logistic regressions compared the two group's clinical outcomes. The type 1 diabetes group scored significantly lower on motivation to change and these subjects were characterized by low perseverance, instability, giving up easily when confronted with frustration, and low accomplishment levels. Only 10 subjects showed partial or full remission when compared to the only eating disorder group where 15 subjects showed partial or full remission (Custal et al., 2014).

The fifth study found focused on a multidisciplinary residential treatment which included physical and psychological outcomes. One of the treatment approaches at the residential program included an intuitive eating nutrition approach that would help restore awareness and responsiveness to internal hunger and satiety cues (Dickens et al., 2015). Archival data was collected from females with type 1 diabetes and co-occurring eating disorders and these subjects were then admitted to a residential treatment center in the Western United States. This occurred between January 1, 2008 to March 14, 2012 and resulted in 29 participants.

Measures used included blood glucose levels and psychological assessments. Blood glucose was measured pre- and post-treatment using HbA1c which is a three-month average of blood glucose level along with checking fructosamine, an average blood glucose level over three weeks. For psychological symptoms, subjects were given the Eating Disorder Inventory-3 (EDI-3) which reviewed psychological indices of drive for thinness, bulimia, body dissatisfaction, eating disorder risk composite, and general psychological maladjustment composite pre- and post-treatment. Treatment at the residential center included a multi-disciplinary approach that

included licensed psychotherapists, their supervisees, registered dieticians, psychiatrists, physicians such as endocrinologists, registered nurses, and mental health technicians.

Therapeutic approaches used were cognitive behavioral therapy, person-centered therapy, family therapy, and feminist therapy. The overall goal for treatment was to help manage eating disorder thoughts and urges that disrupt diabetes management through cognitive and emotional skills. In general, patients participated in family sessions once or twice a month, had individual therapy two to three times a week, and met with their nutritionist and psychiatrist once a week. The multi-disciplinary team met weekly to review progress and goals of participants.

To statistically review whether residential treatment did impact physical and psychological outcomes, repeated measures analyses of variance (ANOVAs) were conducted to analyze significant differences in scores from admission to discharge of treatment. ANOVAs were also repeated to review whether outcomes were impacted by length of treatment. Pearson's correlations examined if there was an association between treatment duration and change. There were statistically significant improvements of moderate effect sizes for all the measures assessed. No treatment by duration interaction affects were found to affect blood glucose levels but found for psychological indices body dissatisfaction, bulimia, EDRC and GPMC. This study found clear benefits of residential treatment but understanding whether this treatment is more advantageous compared to other treatment approaches are unknown (Dickens et al., 2015).

The final study was a longitudinal study to pinpoint what helped women stop insulin restriction after 11 years (Goebel-Fabbri et al., 2011). This study followed 207 women who endorsed insulin restriction and then followed up after 11 years to see which participants still endorsed insulin misuse and which participants stopped insulin misuse. Information gathered from these participants included BMI and A1C. Self-reported measures were used for

psychosocial assessment of diabetes self-care, diabetes self-management, diabetes distress, psychological distress, and eating disorder symptoms.

Several statistical analyses were used such as Wilcoxon two-sample ran sum to compare differences in means, chi square, and Fisher exact tests to compare proportions in categoric variable and logistic regression analyses to predict insulin restrict status at follow-up. The logistic regression found that women who lowered their level of fear of weight gain had improved blood-glucose and fewer problems with diabetes self-management, which also predicted discontinuation of insulin restriction. Researcher findings suggest that focusing on the fear of weight gain should be given greater attention by treatment teams to help women combat insulin restriction (Goebel-Fabbri et al., 2011).

Table 3

Treatment Interventions (Diabetes with Comorbid Eating Disorder)

Author/s	Study	Sample	Design	Relevant Results	Treatment Intervention Conclusion
Allan 2017.	Diabetes and eating disorders: Update to the NICE guidelines	People with Type 1 diabetes and Insulin omission	Case report and series	Research from literature: Peveler and Fairburn, 1989 and Colton et al, 2015	Collaborative Teams: Eating disorder, diabetes team. Family involvement Specific plan for misusing insulin
Clery et al., 2017.	Systematic review and meta-analysis of the efficacy of interventions for people with type 1 diabetes mellitus and disordered eating	Medline, Embase, PsycINFO, the Cochrane Library, PubMed, and OpenGrey databases were searched for all years up to and including August 2016	Systematic Review and Meta-analysis	Six articles fulfilled the criteria for the systematic review and three for the meta-analysis	Intensive inpatient therapy most beneficial compared to outpatient and psychoeducational groups Duration of intervention may be influential joint or tailored 'diabetes-associated eating disorder' intervention
Boggiss et al., 2020.	A brief self-compassion intervention for adolescents with type 1 diabetes and disordered eating: a feasibility study	19 adolescents in New Zealand Area	Qualitative and Quantitative measures: Pre and Post interventions means and differences	Patients liked social component, mindfulness, coping resources	Patients enjoyed the self-compassion interventions but feasibility of making the groups due to traveling and population is difficult

Table 6 (Continued)

Author/s	Study	Sample	Design	Relevant Results	Treatment Intervention Conclusion
Custal et al., 2014.	Treatment outcome of patients with comorbid type 1 diabetes and eating disorders	20 Females in Barcelona, Spain	Qualitative and quantitative measures: Pre and posttest measures comparing ED without diabetes and ED with Type 1 Diabetes	Individuals with Type 1 diabetes are at 50% higher dropout rate compared to individuals without	Motivation levels and personality traits influence treatment outcome
Dickens et al., 2015	Multidisciplinary Residential Treatment of Type 1 Diabetes Mellitus and Co-Occurring Eating Disorders	29 women with Type 1 diabetes in Western US	Quantitative: Review of physical and psychological impact in residential stays by reviewing measures in blood glucose, psychological screeners. From admission to discharge, and reviewing if time duration of stay impacted measures also	Significant improvement in HbA1C, and reductions on ED13 scales found	Residential care leads to quicker medical stability, ease in coordinating care and higher initial treatment dose
Goebel-Fabbri et al., 2011	Improvement and Emergence of Insulin Restriction in Women with Type 1 Diabetes	207 females with Type 1 diabetes	11-year longitudinal study comparing characteristics of women who discontinued insulin restriction and women who newly started insulin restriction after baseline measurement	Women's whom BMI increased, their fear of improvement of glycemic control increased weight gain	Women's weight concerns should be taken seriously and be addressed when meeting with physicians

CHAPTER 4

DISCUSSION

This study aimed to review and analyze treatment interventions currently used for diabulimia and eating disorders comorbid with diabetes. A systematic literature review was conducted to explore common themes of treatment modalities as well as what treatments lead to a better prognosis of diabulimia by examining diabetes and eating disorder clinical evidence separately. The systematic review explored all the empirical evidence that fit within the inclusionary criteria identified to answer the research question (Clarke & Chalmers, 1998).

Nine studies were included in this review and results indicated that the term diabulimia does not result in many treatment interventions, while diabetes comorbid with eating disorders resulted in more review of treatment interventions. Both definitions found themes of multidisciplinary treatment, social support, and internal locus of control. Specific to diabetes comorbid with eating disorder, similarities were found in the components of treatment interventions which involved a multidisciplinary approach with an eating disorder treatment component, psychotherapy, and medical interventions. Several of the studies reviewed treatment interventions varied by discussing family therapy, having social support, and one study reviewed treatment given in an inpatient rehabilitation center.

The search term diabulimia did not result in many findings overall when compared to diabetes comorbid with eating disorders, but pertinent results were still found. It was unexpected that cross referencing “diabulimia” and “well-being” would result in no findings. The reason for

the lack of results could be due to the fact that well-being is an important aspect of health conditions known by health professionals while diabulimia is not a medically recognized diagnosis. Another deduction for the lack of research found could be due to the lack of awareness of diabulimia as one diagnosis, but rather seen as two individual illnesses. This is significant in the fact that diabetes and eating disorders are two chronic illnesses that can influence a person's well-being. Conceptualizing diabulimia as two different disorders comorbid with one another and looking at well-being according to diabetes and eating disorders can be indicative of finding aspects of well-being. In a literature review conducted by Inzucchi and Lupsa, the researchers discussed many complications that can occur with diabetes if well-being is not considered by an individual and there is a lack of diabetes management. It is also crucial to review well-being and eating disorders, as eating disorders have one of the highest mortality rates amongst mental health disorders. An important component can be acknowledged from these findings generally, it was found that people who identify with having these diagnoses use the term diabulimia while researchers use the term diabetes comorbid with eating disorders. Well-being is an important component, so it is essential to understand treatment adherence. Currently since there are well-being measures separately for diabetes well-being and eating disorder well-being, they can both be utilized for diabulimia interventions. The Eating Disorders Well Being Questionnaire (EDwell) looks at three factors of eating disorders: perfectionism/control, loneliness/avoidance and social functioning and considers of physical and psychosocial distress (Castellini, et al., 2013). The Problems Area in Diabetes (PAID) scale is used to review how much diabetes distress that a person is under, this can be very beneficial since individuals can stop adherence to their medication management when they are under a lot of diabetes distress (Reddy et al., 2013). These two scales can be used in future research to help

understand more about how diabulimia affects overall well-being and help make new measures for diabulimia well-being to see what is more pertinent in the scales and what seems to be irrelevant in the measurements as well.

The review of diabulimia and adherence literature demonstrated that people who identify with diabulimia online discussed what they believe is most important with adherence to their treatment regimens. One aspect of adherence to recovery is awareness of the disease, which can lead to having more social support, knowing that there might be other people whom they can relate to, and knowing they are not alone in this struggle (Staite et al., 2018). Because awareness is a part of recovery for many individuals and the term is not recognized by many in the health field or known outside of the population with the diagnosis, finding a cohesive term between health professionals and lay people could help guide further development in awareness. There might be a lack of awareness with diabetes comorbid with eating disorders because this can entail a person with diabetes that is not misusing their insulin for weight management but is also diagnosed with another eating disorder. This term encompasses a much broader population which may make people who have diabulimia not be seen or given awareness to. This study by Staite and colleagues (2018) supports the principle that one must acknowledge and accept that they have an eating disorder, especially due to the secrecy within eating disorders and the fact that diabulimia is often unknown. Being able to accept and identify with a disorder can change the perception of the person's diabetes. Many medical professionals do not dive into seeing the manipulation of medicine as an eating disorder, as well, so they might think their patients are nonadherent to treatment or a "bad diabetic patient." There can be shame associated with this personification and can lead people with diabulimia to not show up for their doctors'

appointments. Awareness for both the people who suffer from diabulimia as well as health professionals can help improve overall adherence.

The other principle that helps support awareness as an aid for treatment adherence is social support. The biopsychosocial construct supports that there are three dimensions that interplay with one another that can either be supportive or detrimental to health, so the lack of social support can cause more health problems. An individual can feel very isolated, lonely, and detached from society because there is no one who knows what they are going through, so awareness can bring people who are suffering from diabulimia together and build a sense of community. Also, these individuals can share what has helped them adhere to treatment and pass those ideas along to others with diabulimia. Even having moral support and empathy from others may be very helpful. Having this understanding is significant because this means that finding ways to raise awareness, which has been done with other illnesses, can promote adherence. One such recommendation could be taken from breast cancer awareness efforts that use ribbons and marathons to bring the whole community together, which could be similarly utilized for diabulimia. Along with awareness, components that help switch to an internal locus of control also help with adherence.

Overall, how one thinks about their disease is a major influence on the individual's prognosis. One way people can view illness is by locus of control. Internal locus of control was important for some of the treatment themes found for diabetes comorbid with eating disorders. When people did not leave diabulimia to external factors that are out of one's control, such as fate or luck, this positively affected treatment adherence, adherence rates to medication management improved, and lifestyle changes improved. People who identified with having diabulimia endorsed adjusting the way they related with the illness, decided they had more

control of the illness with feelings of empowerment, prioritized having a healthy lifestyle over weight loss, and were more optimistic and hopeful (Staite et al., 2018). It has also been found that, in women affected by the fear of weight gain due to glycemic control, reducing this fear of weight gain showed a reduction in insulin misuse (Goebel-Fabbri et al., 2011). These three factors of reframing relation with illness, prioritizing healthy lifestyle and optimism involved utilize the internal locus of control because these individuals changed their perceptions of having more control in their own lives by reframing their cognitions. Instead of identifying with societies context of health as being skinny, they focused more on healthy lifestyle changes instead of what their bodies looked like. Another cognition that was changed was weight gain associated with insulin use. Reframing why insulin is vital to taking care of oneself can be used as an intervention. Education on the function of insulin, and how it is utilized in the body can be beneficial to help people with diabetes understand why treatment is important. Also, the lack of insulin in the body and how this can be detrimental can inform the individual to make better decisions when it comes to insulin. Lastly, reframing the cognition from having no power over their disorder to feeling more empowered to take control of their health was useful. Internal locus of control has also been found to be beneficial in adherence to diabetes regimen (Tillotson & Smith, 1996). Adapting one's frame of mind was shown to be beneficial in these studies.

Knowing that looking at internal locus of control has benefited those with diabulimia and seeing that changing cognitions was the most useful aspect of cognitive therapy, cognitive reframing and guided discovery could be useful interventions to challenge a person's current beliefs. Exposure work can also help people challenge the fear they have associated with gaining weight and insulin, while journaling and thought records could help find whether the person has more of an internal or external locus of control. The current study also reported that making

small steps and the use of specific, measurable, achievable, realistic and time-limited (SMART) goals are an important intervention, as well (Tillotson & Smith, 1996). The study found information from blogs that did not provide much structure to individual for their treatment. Having structure may enhance the benefits patients found. Going forward, looking at internal locus of control and a structural treatment model such as cognitive therapy could be the next step in looking at diabulimia and treatment adherence as well as looking at this as a way of implementing treatment interventions.

Diabulimia and treatment interventions focused primarily using multidisciplinary teams. The case study of a 15-year-old girl with diabulimia that narrowed down the foci of treatment with several categories to focus on which include insulin management, medical, dietetic, and psychological components (Candler et al., 2018). There was also the mention of a multidisciplinary team. However, having a multidisciplinary team is not sufficient enough in understanding how treatment teams should be utilized because this is a broad term and could consist of a vast number of disciplines and approaches to treatment. Specific team members are important to know because there are many health professionals that can be beneficial in the care of a person with diabulimia. Having only a couple of professionals may not be sufficient but having too many may be overwhelming for the patient. For the psychological components in the study there was a lack of clarification on a definition of therapy intervention. Interventions could have varied by a clinical psychologist, or handouts by a health profession and what was the type of treatment focus which could be generalized treatment interventions or an eating disorder specialist. An eating disorder specialist would be most beneficial to help with the disordered thinking that comes with having an eating disorder. For the dietetic aspect of treatment, a clear definition of was not given whether a nutritionist or dietician used. A dietician can be most

advantageous because they are licensed to treat clinical conditions. For the medical and insulin management aspects, it remains unclear which professionals were used a primary care physician or an endocrinologist or both would be beneficial. Having a nurse help with the insulin management was not clearly stated, or the specialty of the nurse such as generalized nurse or a nurse that specializes in diabetes management. These questions remain but overall health professionals that are more specific to diabetes and eating disorders would be most beneficial. These are the main findings of health constructs with diabulimia, and diabetes comorbid with eating disorders overall had more findings.

It was unexpected that a search of the literature did not reveal work on diabetes comorbid with eating disorders and well-being. Well-being is a quality measure that tends to be reviewed when looking at outcomes of health in diabetes as well as a measure found in eating disorders (Erskine et al., 2016; Kinmonth et al., 1998). It was thought that, because both disorders review well-being separately and the disorder is perceived as two chronic illnesses, this should have led to some findings. Going forward it is recommended that well-being in diabetes comorbid with eating disorders be studied. Fortunately, diabetes comorbid with eating disorders and adherence resulted in some findings.

Two of the core aspects of adherence to diabulimia treatment was also found in diabetes comorbid with eating disorders and adherence. Social support was important for treatment adherence, and positive relationships and support from others were an integral part for the individuals with diabetes comorbid eating disorders (Coleman & Caswell, 2020). Because of these findings, treatment could benefit from having a positive social component as a focus. This helps maintain the principle that taking a biopsychosocial lens is heavily conducive to helping individuals with this disorder. Possible recommendations going forward could include having

family therapy as a component of treatment because only a few of the interventions used in the multidisciplinary teams included family therapy when this could be an integral part to help patients. Another idea that could come out of this finding might be a psychoeducation group for people with loved ones dealing with diabetes comorbid with eating disorders to help the support system understand the disorder and find ways to support their loved ones. Also, online support was the context of support for individuals who were wanting to connect with other sufferers, so having an in-person support group could be even more advantageous to treatment and adherence overall. In-person support groups can provide more structure as well as have a knowledgeable health professional leading it to strengthen adherence. Going forward, research can be done to compare two such social support groups as interventions; an online unstructured group that only connects individuals with the diagnosis and a structured in-person group led by a knowledgeable health professional to help bring in topics and find ways for people to process their feelings. This could be one of the associated treatment interventions going forward, which was not discussed as a key treatment intervention although diabetes comorbid with eating disorders found the most relevant findings for this systematic narrative review.

Diabetes comorbid with eating disorders and treatment interventions had the most relevant findings for this systematic narrative review. There was a consensus in the examined literature that there should be a multidisciplinary team approach for treatment. What was missing from these studies, however, were clear definitions for the intensity and complexity of treatment terms. What could be deciphered from the findings of this review is that intensive inpatient therapy is more beneficial compared to outpatient and psychoeducational groups (Clery et al., 2017). Residential treatment may be particularly advantageous for such a high-severity and medically compromised group due to quicker medical stabilization, greater ease in coordinating

multidisciplinary treatment, and higher initial treatment dose (Dickens et al., 2015). The duration of the inpatient rehabilitation was also found to be influential, leading to more longer-term success for patients that stayed longer (Dickens et al., 2015). Given the other themes identified from this review, such as social support and awareness, the camaraderie that can be found when patients intermingle with one another on the inpatient unit was shown to be beneficial for adherence.

The multidisciplinary approach to treatment could also be easier to conduct while inpatient because it can reduce a lot of barriers when it comes to outpatient treatment. First of all, it is easier for health professionals to come and check on the patient more consistently to observe blood glucose levels and if they are taking their medication. In outpatient settings, most of this would have to be done by going along with the word of the patient which would be difficult to trust due to the secrecy associated with this disorder. Another advantageous aspect of inpatient treatment could involve the seamlessness in communication with the treatment team. All of the documentation would be on one electronic health record, there would be no waiting for faxes from different clinics or waiting on release of information, and it may make having meetings with other health professionals easier to conduct.

Many barriers are removed when individuals receive inpatient treatment. One barrier removed with inpatient treatment is lack of adequate transportation. Transportation issues can lead to missed treatment opportunities, which can be problematic in this case due to the multifaceted aspects of meeting with different health professionals and attending group therapy possibly at different times. Patients on an inpatient unit will also have an easier time asking questions if they forget something regarding the diabetes management, nutrition, and eating disorder education they have been given. If a person in outpatient treatment were to forget such

information, it might be difficult for them to find a way to reach back out to the health professional that taught them. Although several barriers are removed by individuals receiving inpatient care the feasibility of this being a treatment option causes a lot of difficulties for racial and ethnic diverse populations that are more susceptible to type 2 diabetes as well as having challenges in resources. One hypothetical way to combat this difficulty is making sure that there are laws in place that make sure people who need inpatient treatment will receive medical leave with pay from their job. To help with medical expenses the treatment facilities can get federal funding and grants to ensure the people who qualify for financial needs will not have to pay. There also is a need to work with insurance companies as well. Currently since diabulimia is seen as two different diagnoses and not as a single illness this can cause a lot of problems with insurance companies wanting to pay for treatment. If the health community can come together to define diabulimia as one diagnosis and not diabetes comorbid with an eating disorder this would help streamline insurance companies approving and paying for treatment.

Having therapy was identified as helpful because of working with patients to change their perceptions on health as well as focusing on finding ways to bring more of an internal locus of control. Personality characteristics and motivation can also be affected by locus of control. Personality characteristics were another theme listed in diabetes comorbid with eating disorders and treatment interventions.

Personality characteristics found in individuals that are more likely to drop out of treatment included low accomplishment level, low tolerance to frustration, and low persistence (Custal et al., 2014). These personality characteristics along with low motivation were found approximately 50% more in people with diabetes and eating disorders compared to individuals with only eating disorders (Custal et al., 2014). Because these factors influence treatment

outcomes, working on ways to have coping skills and self-compassion can help when these characteristics are found in individuals. A study focused on showing adolescents self-compassion interventions set out to do this and they found that the adolescents enjoyed the sessions, were using the coping skills they learned outside in their daily lives, were practicing mindfulness, and also enjoyed the social component of knowing that they were not alone and had others to relate to (Boggiss et al., 2020). A general feeling of social support can be another helpful treatment component. These identified themes can be beneficial in making therapeutic interventions specific to this population by focusing on emotion regulation to help with the personality characteristics that are identified along with teaching coping skills to help with fostering self-compassion and self-esteem.

Since the fruition of this review there have been several eating disorder centers including Princeton Health, Magnolia Creek, and Center of Change along with several others that have been implementing diabulimia treatment and are using several of the themes found. Princeton Health is utilizing the inpatient treatment intervention with a multidisciplinary team approach. Center of change focuses on the primary diagnoses to be an eating disorder and Type 1 diabetes as the secondary diagnoses. From what was discussed earlier this can be a challenge because diabulimia is not defined as a specific eating disorder. There are specific diabetes related challenges to taking one’s medicine that would not be categorized as an eating disorder symptom and would be missed in treatment. While other individuals would not even qualify for help. Also, with diabulimia not being categorized as an eating disorder insurance may not approve for treatment cost. These centers are using a multidisciplinary approach but what has been found to be lacking in these centers is the much-needed social support and awareness that people with

diabulimia have found helpful. Overall, the centers can improve in how these individuals are receiving treatment.

Strengths

The current review looked at recent relevant research within the past 12 years. Also, this study is the first of its kind to compare diabulimia and diabetes comorbid with eating disorders and categorically review adherence, well-being, and treatment interventions to evaluate whether conceptualization can affect perception of treatment interventions and health outcomes.

Limitations

The main limitation of this review was the lack of published research on this topic. Research was limited to studies written in English, which can lead to bias in the type of studies that were used. The types of studies reviewed varied vastly in the types of study designs used from case studies to thematic analysis and, thus, made comparing construct themes difficult across diagnoses definitions. Use of formal diagnostic criteria varied from study to study which can change the population used for participants which, then, could change the interpretations for this review.

Conclusion

There were many gaps in the literature with there being no focus on well-being at all for people who are diagnosed with diabulimia. There was a lack of research on adherence, which is quite astounding because diabetes is a chronic illness and people with eating disorders can relapse. Treatment for these individuals should consider long-term considerations. Overall, more experimental studies are needed to review diabetes and eating disorder, specifically diabulimia. Many of the relevant research in this area combines best practices from eating disorder treatment and diabetes treatment. While reviewing for this topic, it was relevant that this topic has been out

there for a while and the topic is stagnant in updating new information. This review does set up precedent for preliminary ideas of having one cohesive term, focusing on internal locus of control, having positive support, and emphasis on inpatient rehabilitation and duration of treatment.

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APPENDIX A: SYSTEMATIC NARRATIVE REVIEW FLOWCHART