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Perceptions of Quality of Life, Peer Relationships, and Health Literacy in Adolescents with Phenylketonuria (PKU)

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Perceptions of Quality of Life, Peer Relationships, and Health Literacy in Adolescents with
Phenylketonuria (PKU)

by

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A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
in School Psychology
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DEDICATION

To my Lord and Savior, Jesus Christ, for calling me to step out in faith and follow Him, and for making the journey far greater than I could ever have imagined.

To my parents, for their unconditional love and never ending encouragement to follow my dreams wherever they take me.

To my dear friends Heidi, Crystal, Jenna, and Lindsay for the endless hours of prayer, encouragement, and support you have given me in order to achieve this dream.

Thank you.

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ABSTRACT

Phenylketonuria (PKU) is a rare inborn error of metabolism that can be managed through lifelong treatment adherence to a restricted diet and supplemental medical formula (Vockley et al., 2014). Untreated PKU can result in severe intellectual disability, anxiety, depression, executive functioning deficits, and seizures (Cappelletti et al., 2013; Moyle et al., 2007). Even individuals who are continuously treated for PKU can experience high rates of anxiety and depression, executive functioning deficits, social difficulties, and lower full-scale IQ scores than their siblings and parents (Bosch et al., 2015; Manti et al., 2016; Waisbren et al., 2007). Additionally, adolescents are at risk for social difficulties due to the restricted diet and treatment of PKU (Bosch et al., 2015). Quality of life is just beginning to be studied in individuals with PKU. Most studies have focused on adults or on parent or clinician ratings of children and adolescents' quality of life. Results of these studies have been varied with some individuals with PKU and their parents reporting normal quality of life compared to peers (Cazzorla et al., 2014; Thimm, Schmidt, Heldt, & Spiekerkoetter, 2013) and others showing parents rate their children with PKU as being less happy, confident, and joyful than healthy peers (Landolt, Nuoffer, Steinmann, & Superti-Furga, 2002).

A qualitative interview study was conducted with five adolescents with PKU between the ages of 14 and 18 years. The purpose of this study was to gain an in-depth awareness of the beliefs and perceptions of these adolescents with PKU on how they understand and conceptualize their condition, the impact it has on their life, factors that influence their quality of

life, and perceptions of their peer relationships in regard to their illness. A romantic conceptualization of interviewing was used to build rapport and trust between the interviewer and interviewee in order to access the authentic self of each participant (Roulston, 2010a). Each adolescent participated in a series of four semi-structured individual interviews. Data were analyzed using thematic analysis (Braun & Clarke, 2006).

Results indicated adolescents with PKU describe their overall quality of life in positive terms and report similar influences on their life satisfaction and quality of life as other adolescents. Adolescents with PKU identified relationships with family and friends as the most salient influence on their life satisfaction. They largely perceive their social lives to be similar to their peers and believe they are more similar to their peers than different. Adolescents with PKU describe few challenges in social settings and view these challenges as simply inconveniences. However, adolescents with PKU minimize their condition and the impact it has on their life. When talking about PKU, sharing it with others, or when it comes up in social situations they use words that describe it as minor in consequence and significance. The majority of participants had a general understanding and knowledge of how they got PKU, their treatment, and potential consequences. Nevertheless, adolescents also reported a number of incorrect consequences, a lack of awareness of consequences, and misconceptions about PKU and the impact it can have on their life. Implications for medical providers and behavioral health professionals who work with adolescents with PKU include the importance of monitoring and providing extra support during natural transition times, such as moving from elementary school to middle school and then to high school. Current findings also indicate there is room for improvement in health literacy among adolescents with PKU and specific strategies are discussed. Future research should continue to explore the experiences of individuals with PKU during late childhood and

early adolescence, the time frame identified as most difficult in the current study. Another direction for future research is further exploration of how PKU influences the idea of self-concept and self-image.

CHAPTER ONE:

INTRODUCTION

Statement of the Problem

Due to advances in medical care and early detection of disease children and adolescents with chronic or childhood diseases that were once fatal or highly disabling are able to live longer, relatively normal lives. Adolescents with a chronic illness experience higher rates of internalizing symptoms including anxiety and depression (Pinquart & Shen, 2010; Pinquart & Shen, 2011) and experience more social difficulties (Reiter-Purtill, Waller, & Noll, 2009) compared to healthy peers. Medical professionals treating individuals with a chronic disease often ignore the psychological impacts of the disease (Boice, 1998). Thus, adolescents may experience psychological, emotional, behavioral, or social problems related to their illness that are undetected. For children and adolescents a chronic illness may prevent them from regularly attending school, completing schoolwork, and engaging in normal childhood activities. Management of a chronic illness may require frequent treatment from a doctor, consistent medication, or regular use of special equipment (e.g., to help with mobility or breathing; Van Cleave et al., 2010).

Adolescence is a time of major change and growth. For adolescents with a chronic illness, trying to manage their condition while also trying to develop as an individual can present significant challenges for the adolescent, their family, and medical providers (Michaud, Suris, & Viner, 2007). Delayed growth and puberty are frequent side effects for adolescents with a

chronic illness (Michaud et al., 2007). In addition to physical symptoms, significant stress and risk for emotional and/or behavioral problems may be a result of living with a chronic illness and can interfere with treatment regimens and adherence to medical recommendations (Compas et al., 2012).

Phenylketonuria (PKU) is one of the once disabling childhood diseases that can now be managed through treatment starting at birth. PKU is a rare condition that occurs in one in 10,000 to 15,000 newborns in the United States (NHGRI, 2014). While there is no cure for PKU, children who adhere to treatment for the disease can live a relatively normal, healthy life (Regnault et al., 2015). PKU is an inherited disorder of metabolism that prevents the body from converting phenylalanine (PHE) into tyrosine. Increased levels of PHE in the blood stream can lead to severe cognitive/intellectual, psychiatric, and neurological impairments, as well as epilepsy, microcephaly, and academic and behavioral problems (NHGRI, 2014). Since the 1960's children have been tested for PKU through a newborn screening at birth (Paul, 1997). Children are treated for PKU by adhering to a lifelong diet of limited protein and supplementation of an amino acid rich medical formula. Despite early and continued adherence to the diet many people with PKU still have social or emotional concerns that may impact their quality of life (Gentile et al., 2010; Manti et al., 2016).

Medical professionals know how to manage the biological aspects of the disorder and there is recognition of the prevalence of mental health problems in individuals with PKU. Yet, less is known about how these individuals experience the impact of adhering to a strict diet, the social implications of treatment of PKU, and the challenges that go along with living with this specific chronic illness. These experiences recently have been explored in Europe, but have yet to be examined in the United States. Additionally, there is a range of experiences among the

PKU population. Some individuals may experience extreme challenges and difficulties related to PKU while other individuals may not have any negative consequences. Therefore, it may be more relevant to look at the individual experiences of adolescents with PKU rather than grouping them together and treating them as a homogenous population.

Summary of the Literature

Individuals with PKU experience a range of cognitive and executive functioning difficulties. Untreated PKU results in severe intellectual disability ($IQ \leq 50$; Walter, Lee, & Burgard, 2006). Children who are continuously treated and adherent to diet have IQ scores within the normal range, but these scores are nearly half a standard deviation lower than peers without PKU (Bone, Kuehl, & Angelino, 2012; Weglage et al., 1996), and lower than their siblings without PKU (Koch, Azen, Friedman, & Williamson, 1984) and their parents (Weglage et al., 1992). For individuals with PKU, increased PHE level in the blood is associated with decreased cognitive performance (Moyle, Fox, Arthur, Bynevelt, & Burnett, 2007; Waisbren et al., 2007). Executive functioning deficits also are prevalent in individuals with PKU and can impact school performance, treatment adherence, and social interactions (Brumm, Bilder, & Waisbren, 2010; DeRoche & Welsh, 2008; Gassio et al., 2005; Moyle et al., 2007).

Although there is some variability, numerous studies indicate individuals with PKU have an increased prevalence of internalizing symptoms compared to healthy controls (Cappelletti et al., 2013; Gentile, Ten Hoedt, & Bosch, 2010; Smith & Knowles, 2000; Weglage et al., 2000). Even individuals who have continuously received treatment are at risk for social problems, anxiety, depression, and impaired psychosocial outcomes (Manti et al., 2016). Increased levels of anxiety and depression are the most commonly reported mental health problems in individuals with PKU (Manti et al., 2016; Smith & Knowles, 2000). Internalizing symptoms often go

undetected and taken together with the increased prevalence of cognitive and executive functioning deficits may impact quality of life for youth with PKU.

Quality of Life. Quality of life (QoL) is an increasingly popular subject of study in the literature. Research across several different chronic illnesses in children and adolescents has reported health related quality of life (HRQoL) is lower in these individuals than in healthy controls and may decrease as symptoms of disease increase (Elliott, Lach, & Smith, 2005; Flokstra-de Blok et al., 2010; Kamath et al., 2015; Kim et al., 2014; Murray, 2015). A wide variety of factors have been determined to influence QoL in healthy adolescents and adolescents with a chronic illness with the most common determinants being friends and family (Chen, Tseng, Shieh, Lu, & Huang, 2014; Helseth & Misv er, 2010; Luyckx, Missotten, Goossens, & Moons, 2012; Seid, Huang, Niehaus, Brunner, & Lovell, 2014; Suldo, Frank, Chappel, McMahan Albers, & Bateman, 2014). In chronic illness populations (e.g., cerebral palsy), the illness or symptoms of the illness has not been a prominent factor in determining QoL for these adolescents (Shikako-Thomas et al., 2009). Based on the range of factors adolescents believe influence their QoL current measurement instruments may not be accurately assessing all of these domains, particularly for specific illness populations who may have unique factors that contribute to their overall QoL. Additional research is warranted into the determinants of QoL for specific illness populations to gain a broader understanding of the influences and perceptions of this multifaceted construct.

In children and adolescents with PKU, QoL is emerging as a field of interest. Within the current literature there is a range of findings on QoL in individuals with PKU. Some studies have found QoL to be within normal ranges compared to healthy peers, while other studies have found areas of decreased satisfaction within the population. Specifically, individuals with PKU have

experienced decreased positive emotions, decreased school functioning, and increased negative social impacts related to diet (Bosch et al., 2015; Landolt, Nuoffer, Steinmann, & Superti-Furga, 2002; Thimm, Schmidt, Heldt, & Spiekerkoetter, 2013). Prior studies have largely examined QoL using generic quantitative measures, which focus on problems rather than well-being, and may not accurately evaluate the specific factors that contribute to QoL in individuals with PKU. There is a need for further research to understand the determinants of QoL in individuals with PKU, specifically the perspectives and experiences of adolescents with PKU in the United States in order to develop and provide appropriate services and care for these individuals.

Peer Relationships. Peer relationships are essential in the developmental process and influence children and adolescents in a number of positive and negative ways including influencing self-concept, behavior, health, and achievement (Bukowski, Buhrmester, & Underwood, 2011; Rosen & Patterson, 2011). Peer friendships are shown to improve outcomes for children and adolescents by increasing health and well-being and decreasing school behavior problems (Rankin Williams & Anthony, 2015; Traylor, Williams, Kenney, & Hopson, 2016). Friendships also have been found to decrease the risk for depression and increase happiness in both boys and girls (Uusitalo-Malmivaara & Lehto, 2013). Adolescents with chronic illnesses are at risk for social and peer challenges due to activity limitations, treatment regimens, changes in physical appearance, and time away from school (La Greca, 1990; Reiter-Purtill et al., 2009). Teachers have rated children with a chronic illness as less prosocial, and children with a chronic illness have described themselves as having less peer contact and more social anxiety than their healthy peers (McCarroll, Lindsey, MacKinnon-Lewis, Chambers, & Frabutt, 2009).

Adolescents with PKU experience a number of social challenges due to their dietary restrictions and the neurological and cognitive impacts of this illness. Particularly, adolescents

with PKU have described themselves as less socially oriented, less extraverted, having less autonomy than healthy peers, and they view their social lives as highly restricted (Weglage et al., 1996). Similarly, adults with PKU report more social inhibition, avoidance of social interactions, and difficulty with relationships than healthy controls (Jahja et al., 2013). Compared to healthy controls, individuals with PKU have more difficulty with recognizing, responding to, and understanding social cues, and display poorer social skills (Jahja et al., 2016). Several qualitative studies have examined the difficulty of social relationships related to eating patterns or habits. Adolescents have described feeling noticeably different in social settings that include eating and reported struggles related to eating with others (Di Ciommo, Forcella, & Cotugno, 2012; Vegni, Fiori, Riva, Giovannini, & Moja, 2009). These findings suggest individuals with PKU experience a range of difficulties with social relationships, which may be due to a combination of factors related to biological impacts of PKU and environmental factors related to treatment for PKU. Further research is needed on the social functioning of adolescents with PKU from their perspective to understand the difficulties encountered and how to improve these situations.

Health Literacy. Health literacy encompasses one's knowledge of their health condition, the ability to adhere to treatment, advocate for medical needs and decisions, adapt to illness, and have a positive QoL (Kickbusch, 2008). The current research on health literacy has largely focused on adults while little remains known about health literacy in adolescents (Manganello, 2007). In adults reduced health literacy is associated with less knowledge of chronic conditions, decreased self-management behaviors, and poor health outcomes (Mancuso & Rincon, 2006; Powell, Hill, & Clancy, 2007; Rothman et al., 2009; Schillinger et al., 2002). In adolescents, increased literacy skills have been linked to a higher likelihood of improved outcomes in disease prevention and health promotion (Sanders et al., 2009). Many of the studies on health literacy in

adolescents have focused on parental health literacy and found low literacy in parents was associated with a range of adverse health behaviors, but did not provide information about adolescent health literacy (DeWalt & Hink, 2009). Health literacy is typically examined through quantitative measures that have largely focused on reading ability and have not been determined to be reliable and valid for use with adolescents (Perry, 2014). Thus, the comprehensive concept of health literacy as described by Kickbusch (2008) has rarely been explored in adolescents. Additional research on how health literacy is understood among adolescents with chronic illnesses is needed in order to know how to assess health literacy in specific illness populations and develop interventions to improve care and positive outcomes.

Currently, no studies directly examining health literacy in individuals with PKU could be located, but several studies have indirectly examined health literacy. Across these studies both adolescents and parents had poor knowledge about PKU, the diet, the amount of PHE in food, the etiology of PKU, and consequences for not adhering to the diet (Bekhof et al., 2003; Di Ciommo et al., 2012; Vegni et al., 2009; Weglage et al., 1992). There is a need to explore health literacy from the perspectives of adolescents living with PKU. Learning about how adolescents understand their condition will inform and guide additional research on how to conceptualize and measure health literacy and inform intervention development for this specific population.

Adolescents with PKU are at risk for cognitive, psychological, and social problems. Although the prevalence of these concerns has been well documented in the literature there is limited research exploring the experiences of these individuals. Current research has shown QoL can be normal for adolescents with PKU, but there are concerns about whether measures used to quantify this construct in this population are valid. Difficulties with social skills and social relationships have been documented in children, adolescents, and adults with PKU, but less is

known about the specific areas of difficulties and experiences of these individuals in social settings. Preliminary research on these topics has been conducted in Europe, but there is a need for an in-depth examination of adolescent perspectives on PKU in the United States, including the challenges they experience, how they understand PKU, and the factors they believe influence their QoL.

Theoretical Framework

Traditional medical and mental health treatment focuses on decreasing negative symptoms of illness. Additionally, the majority of current conceptualizations and measurement tools for QoL focus on the absence of illness and do not address factors related to well-being. It is noted in the literature that decreasing negative symptoms does not guarantee an increase in positive characteristics; however, increases in positive characteristics may also help to decrease negative symptoms (Eaton, Bradley, & Morrissey, 2013). Consequently, it is advantageous to study the impact of positive characteristics in order to both increase positive outcomes and decrease negative outcomes. The positive psychology movement focuses on optimal functioning and strengths of an individual by looking at positive indicators of well-being and understanding the factors that help individuals, as well as communities and societies, to thrive (Seligman & Csikszentmihalyi, 2000). Positive psychology emphasizes subjective experiences in the past, present, and future. Past experiences focus on well-being, contentment, and satisfaction; present experiences focus on flow and happiness; and future experiences are about hope and optimism (Seligman & Csikszentmihalyi, 2000). Learning about the characteristics and experiences that enhance resilience and lead to well-being in adolescents will help to inform development of interventions to promote growth and help individuals thrive.

The dual factor model within positive psychology has found utility in explaining how well-being and psychopathology are connected and are both important constructs to examine. The dual factor model of mental health for youth states it is a combination of well-being and decreased symptoms of illness or psychopathology that describe overall mental health (Suldo & Shaffer, 2008). The dual factor model looks at psychopathology and well-being as distinctive constructs that are connected and provides an improved understanding of functioning (Greenspoon & Saklofske, 2001; Suldo & Shaffer, 2008). Traditional mental health models have focused on children and adolescents who experience high life satisfaction and low psychopathology or children and adolescents who experience high psychopathology and low life satisfaction. Two additional groups of mental health emerge in the dual factor model for a total of four possible mental health groups for children and adolescents. The additional groups represent children and adolescents who experience high life satisfaction while also experiencing psychopathology or who experience low life satisfaction without experiencing symptoms of psychopathology (Antaramian, Huebner, Hills, & Valois, 2010; Greenspoon & Saklofske, 2001; Suldo & Shaffer, 2008). This model of mental health indicates the importance of examining positive characteristics along with symptoms of psychopathology to fully understand mental health of children and adolescents. This study aimed to understand the positive characteristics and experiences, as well as, the challenges and negative symptoms adolescents with PKU face in order to better understand their complete mental health.

Significance

There are no immediate physical symptoms or visible consequences if an individual with PKU is non-adherent to their diet. Consequently, PKU can be referred to as an invisible disorder that may only be manifested during social situations involving food or through internalizing

difficulties experienced by the individual. Those living with PKU may not look sick to others and may not feel or consider themselves sick. Although research has demonstrated the psychological needs and prevalence of psychological problems in this population, it has not previously examined how individuals with PKU interpret their condition and the psychological sequelae associated with PKU from the adolescent's perspective. Similarly, while QoL in individuals with PKU has begun to be quantitatively studied there is a lack of research exploring the perceptions, beliefs, and factors that influence QoL in individuals with PKU and no studies have been conducted in the United States. Prior research on QoL in adolescents with PKU focuses on symptoms of pathology and disease and may not fully encompass the domains influencing social relationships, knowledge of their condition, and their QoL.

Learning about the concerns and trials adolescents experience will help psychologists, medical professionals, and other individuals working with these children provide services to meet their needs and hopefully prevent similar challenges for other adolescents with PKU in the future. Health literacy and positive psychology are fields of increasing interest within medicine and psychology, and gathering knowledge about these domains can provide essential information on how to collaborate to create long lasting beneficial outcomes for adolescents with PKU.

Purpose

The purpose of this study was to conduct a qualitative investigation to understand the perspectives and experiences of adolescents with PKU in the United States. This study aimed to understand whether adolescents with PKU experience any specific challenges or struggles related to PKU, how they understand their condition and the impact it has on their life, their perceptions and beliefs of how PKU impacts their QoL and well-being, and the perceptions of their peer relationships in regard to their illness. Understanding the experience of the individual

is essential to providing a higher quality of care for individuals with PKU and for learning about the experience of living with a chronic illness. The purpose of the study was not to generalize the results, but to gain an in-depth understanding of the perceptions and experiences of 4-8 adolescents with PKU in the United States.

Research Questions

The following research questions were used to guide the study:

1. How do adolescents with PKU describe their quality of life? What factors do they identify that positively and/or negatively impact their quality of life?
2. How do adolescents with PKU describe their social lives? What challenges, if any, do they experience in social situations and peer relationships?
3. How do adolescents with PKU believe their life is different from their peers?
4. How do adolescents with PKU conceptualize and understand their condition? How do they describe and make sense of their treatment?

Definition of Terms

The following terms and provided definitions were used for this study.

Phenylketonuria (PKU). PKU is an inherited inborn error of metabolism that prevents the body from breaking down an amino acid found in protein (phenylalanine; PHE) into tyrosine, a precursor for dopamine (NHGRI, 2014; Walter et al., 2006; Vockley et al., 2014).

Accumulation of PHE in the blood can lead to intellectual disability and other psychiatric and neurological problems.

Continuously treated. Continuously treated refers to individuals with PKU who were diagnosed at or near birth and have been on a restricted diet and supplemental medical formula

for PKU since their diagnosis. They have not stopped the diet or medical formula at any point in their life (Bone et al., 2012).

Health literacy. Health literacy is an individual's knowledge about their health condition and his/her ability to make wise decisions about his/her health (Kickbusch, 2008). Health literacy influences one's knowledge about their condition, their ability to follow treatment procedures, and adapt to living with a chronic illness while maintaining a positive quality of life.

Quality of life. Quality of life is an individual's perception of their life related to their physical health, psychological health and emotional functioning, social relationships, socioeconomic status, and environment (WHOQOL Group, 1993). Quality of life is a subjective experience comprised of multiple constructs.

CHAPTER TWO: LITERATURE REVIEW

Focus of Review

This chapter begins with an overview of phenylketonuria and its sequelae, and then focuses on a review of the literature in three domains; quality of life (QoL), peer relationships, and health literacy. Each of these domains is reviewed broadly then narrows to what is currently known regarding adolescents with PKU. The literature in some domains is sparse regarding these topics in adolescence or in individuals with PKU. Consequently, an overview of previous studies exploring these constructs in adults or other chronic health conditions is provided.

Phenylketonuria (PKU)

Phenylketonuria (PKU) is an inherited inborn error of metabolism and the first disorder identified through the use of newborn screening. PKU prevents the body from converting phenylalanine (PHE) into tyrosine (TYR), a precursor for the neurotransmitter dopamine. As a result, untreated individuals with PKU have an accumulation of PHE in their blood and decreased levels of TYR due to diminished function of the enzyme phenylalanine hydroxylase (PAH; Singh et al., 2016). PKU is sometimes also called PAH deficiency. The activity of the enzyme PAH occurs along a continuum in individuals with PKU, and as a result there are different classifications of PKU and symptoms may range from mild to severe. PHE is an essential amino acid found primarily in high protein foods (e.g., meat, dairy, eggs, nuts; MediResource, Inc., n.d.; NHGRI, 2014). Increased levels of PHE in the blood stream can lead

to permanent central nervous system damage resulting in severe cognitive/intellectual, psychiatric, and neurological impairments, as well as epilepsy, microcephaly, school and behavioral problems (NHGRI, 2014; Walter et al., 2006).

Types of PKU

PKU occurs on a continuum of severity based on the level of enzyme deficiency. Individuals are categorized according to their untreated blood PHE levels. Individuals with complete enzyme deficiency are classified as classic PKU, which is considered the most severe form. These individuals have untreated blood PHE levels of 20 mg/dL or more (Vockley et al., 2014). Mild PKU is classified as individuals with some enzyme activity and blood PHE levels at or above 6 mg/dL but below 20mg/dL. Individuals with blood PHE levels of greater than 2mg/dL but less than 6mg/dL are categorized as hyperphenylalaninemia, also called hyper PHE (Walter et al., 2006).

Diagnosis

PKU is a rare condition with an estimated global prevalence of one in 12,000 screened newborns (Walter et al., 2006). The prevalence of PKU varies among populations and is more common in Caucasians and is especially common in Ireland (1 in 4,500 newborns) and Turkey (1 in 2,600 newborns; Vockley et al., 2014; Walter et al., 2006). In the United States, PKU occurs in one in 10,000 to 15,000 newborns with a higher prevalence in Caucasians and Native Americans and a lower prevalence in African Americans, Hispanics, and Asians (National Institutes of Health, 2000; NHGRI, 2014). There is no difference in prevalence between males and females. PKU is an autosomal recessive condition as children acquire PKU by inheriting two copies of an abnormal gene. As a result, parents of a child with PKU have a 25% chance of having another child with PKU. Siblings with PKU have similar levels of PHE tolerance and

enzyme deficiency (Vockley et al., 2014). Siblings without PKU have a two thirds risk for being a carrier of PKU (Vockely et al., 2014).

Since the 1960's children have been tested for PKU through newborn screening at birth to determine the amount of PHE in their blood (Paul, 1997). PKU was the first disorder to be identified through the use of newborn screening. In the United States, nearly all cases of PKU are diagnosed through newborn screening, which typically occurs 24 to 48 hours after birth (Paul, 1997; Vockley et al., 2014). However, some cases may be diagnosed later in life or go undiagnosed due to births outside of a hospital or if parents refuse newborn screening. Newborn screening for PKU is conducted in all 50 states and there are 61 countries in the world that participate in the Newborn Screening Quality Assurance Program (Centers for Disease Control and Prevention [CDC], 2014). After a positive newborn screening additional plasma amino acid analysis is required for confirmation and diagnosis (Vockley et al., 2014).

Treatment of PKU

Treatment for PKU begins as early as possible after diagnosis, ideally within the first two weeks of life, and is recommended to continue for life (Vockley et al., 2014). The goal of treatment is to lower levels of PHE in the blood while maintaining adequate nutrition intake. Patients who begin diet shortly after diagnosis and continue treatment for life are known as continuously treated patients, while patients who discontinue treatment after childhood are often described as early-treated patients (Bone, Kuehl, & Angelino, 2012).

Diet. The first line of treatment for individuals with PKU is a diet low in protein and dietary PHE. Dietary PHE is found in natural protein sources such as meat, fish, dairy products, eggs, and bread. Individuals with PKU are typically restricted from including these items in their diet. Some individuals with hyperphenylalaninemia may have a small protein allowance based

on their individual PHE tolerance and be able to incorporate some of these high protein items into their diet, at a reduced intake. Most individuals with PKU are restricted to 5-10 grams per day of natural protein (MacLeod & Ney, 2010), which is less than or equivalent to one egg (six grams of protein) or a piece of string cheese (7-8 grams of protein). The diet for PKU is tailored to each individual based on his or her age, growth, PHE levels, general health, and lifestyle. The diet for PKU is often referred to as a prescription, and the recommended foods and amounts in the diet are considered medication for the individual with PKU (Singh et al., 2014; Singh et al., 2016; Vockley et al., 2014). A typical diet for PKU consists of fruits and vegetables, special low protein foods, small amounts of cereals, fats, and sugars. However, many fruits and vegetables still need to be restricted in the amount consumed (e.g., potatoes, spinach, broccoli; Walter, Lee, & Burgard, 2006). It is important to adhere to the diet consistently over the course of one's life and not make any changes without consulting a metabolic dietician and physician to prevent negative effects of PKU. However, limiting the intake of dietary protein can lead to delayed growth and development and it is therefore necessary to supplement the prescribed diet with special medical foods.

Medical Formulas and Food. Special medical formulas are available to provide the necessary PHE free protein, amino acids, vitamins, and nutrients for growth and development to individuals with PKU (Boyer, Barclay, & Burrage, 2015; Singh et al., 2016; Vockley et al., 2014). This is the main form of protein equivalents in the PKU diet. The combination of medical formula along with adherence to the prescribed diet allows individuals to receive all the needed vitamins and nutrients for typical growth and development. Medical formula comes in a variety of flavors and consistencies, including coolers, gels, powders, capsules, and ready to drink boxes (Boyer et al., 2015; Singh et al., 2016) to meet the different tastes of individuals. Additionally,

there are special modified low-protein foods that individuals with PKU can substitute in their diet and are modified for children, adolescents, or adults based on nutrient requirements (Singh et al., 2014). These items include breads, pasta, and cereals that are low in protein and can provide variety to the diet. Along with variety these items can provide some normalcy to meals and eating with others. Adherence to the diet for PKU is difficult and costly. Individuals must learn about the amount of PHE in different foods, how to track and plan for their daily consumption, and how to adjust the amount of PHE they are receiving in their diet if their levels are too high (Singh et al., 2014).

Monitoring PHE Levels. Due to the difficult nature of adherence to the diet and changes in PHE tolerance during growth and development, it is important to monitor PHE levels to inform treatment and dietary intake. Levels are monitored to adequately adjust nutrient intake and nutrition therapy to ensure optimal outcomes (Singh et al., 2016). PHE levels in the blood are monitored through the use of filter cards. The filter card uses a few drops of blood from a heel or finger prick to determine PHE levels in the blood. While normal levels of PHE in the blood fall below 2 mg/dL, the recommended goal for individuals with PKU is between 2-6 mg/dL (MediResource, Inc., n.d.; Vockley et al., 2014). Based on age there are recommended guidelines for how often to monitor PHE levels. For example, in the first year of life levels should be monitored weekly. From 1 year old until 12 years old levels should be monitored biweekly to monthly, and for well-controlled adolescents and adults monthly monitoring may be appropriate (Vockley et al., 2014). Monitoring may be initiated more frequently during growth periods, illness, when not well-controlled, or as determined by a physician or medical team.

The National PKU Alliance conducted a survey on the health status of individuals with PKU and their desires for new treatments to improve the PKU lifestyle. The survey respondents

included individuals with PKU ($N=220$), parents ($N=362$) and caregivers ($N=39$) of children with PKU. Parents and caregivers answered the survey questions based on their child's health status. Results were examined across all survey participants, individuals with PKU, parents, and caregivers combined. Of all participants surveyed 53% of respondents were 18 years of age or younger. Results indicated 46.7% of individuals surveyed reported PHE control outside of the recommended range. While PHE control was greater for individuals under 18 years of age, 25.5% still had PHE levels higher than the recommended range (Brown & Lichter-Konecki, 2016). When asked about management of PKU, 51.7% of respondents reported PKU treatment is difficult and two-thirds reported it restricted their lifestyle (Brown & Lichter-Konecki, 2016). Individuals who had blood PHE levels within the recommended range tended to report management of PKU was easy compared to individuals with PHE levels outside the recommended range. The most commonly reported desired improvements in lifestyle for all survey respondents included increasing protein intake without an increase in symptoms (77.7%) and being able to eat any food desired irrespective of protein content (76%). These survey results demonstrate the difficulty of adherence to treatment for individuals with PKU and also the perceived difficulty for parents and caregivers of children with PKU. Both individuals with PKU and parents and caregivers desire improvements in treatment for PKU, which would result in a more normal diet.

Medication. Currently, sapropterin is the only approved medication for treatment of PKU. The U.S. Food and Drug Administration approved sapropterin for treatment of PKU in 2007 (Vockley et al., 2014). Sapropterin is a synthetic form of a cofactor of PAH and helps to metabolize PHE into TYR; however, sapropterin is not effective in all people with PKU. The American College of Medical Genetics and Genomics (ACMG) guidelines indicate sapropterin

is suitable for all individuals who may respond to treatment (Vockley et al., 2014). A trial is needed to determine if an individual responds to sapropterin before initiating a routine course of treatment. During the trial phase the medication is taken daily and blood PHE levels are monitored. A decrease in PHE levels of 30% or more in the blood is typically considered the threshold for an individual to be considered a responder. Individuals who respond to sapropterin may still need to maintain a restricted diet, but are able to increase their dietary intake of protein and PHE, which may positively impact QoL for some individuals (Singh et al., 2014; Vockley et al., 2014).

In summary, PKU severity occurs along a continuum and is managed through diet and supplemental medical formula. Some individuals with PKU may respond to a newly developed medication, which can increase dietary protein intake and impact QoL. Early treatment and continuous adherence to diet and medical formula for life produces optimal outcomes and can reduce negative effects of PKU. However, despite early and continued adherence to the diet many people with PKU still experience social or emotional concerns and may develop intellectual and other neuropsychiatric problems over time (Gentile et al., 2010; Manti et al., 2016; Vockley et al., 2014). The next section will review the effects of PKU including cognitive and psychological effects for continuously treated and non-treated or late treated individuals with PKU.

Effects of PKU

Serious neuropsychological effects of PKU, including cognitive impairment, seizures, and developmental delays, have been well documented in the literature for individuals who were not treated or stopped treatment for PKU (Gentile et al., 2010). Lack of treatment or discontinued treatment also has been related to academic and school difficulties, behavioral problems, and

increased internalizing problems including anxiety and depression (Bone et al., 2012). Similarly, even individuals with PKU who have been treated continuously are at risk for mental health concerns (e.g., anxiety, depression), social stigma and peer difficulties, and impaired psychosocial outcomes (Manti et al., 2016). These difficulties appear to be largely correlated with the extent and length of exposure to elevated PHE levels.

Cognitive Effects. The most well studied sequela of PKU is intellectual disabilities and impaired cognitive functioning. Accumulation of PHE in the blood leads to cognitive, intellectual, and psychiatric deficits (Bone et al., 2012; Manti et al., 2016; Walter et al., 2006). Untreated PKU results in severe intellectual disability ($IQ \leq 50$; Walter et al., 2006). Today, due to newborn screening, early initiation, and continuous treatment, most individuals with PKU have cognitive functioning within the normal range. Yet, even with treatment they have increased PHE levels in the blood, which may still lead to cognitive, executive functioning, or psychiatric problems. Children who are continuously treated and adherent to diet have been shown to have IQ scores within the normal range, but these scores are nearly half a standard deviation lower than peers without PKU (Bone et al., 2012; Weglage et al., 1996) and lower than their siblings without PKU (Koch, Azen, Friedman, & Williamson, 1984) and their parents (Weglage et al., 1992). Thus, PKU can still impact cognition and intellectual functioning despite continuous treatment.

Waisbren and colleagues (2007) completed a meta-analysis on 40 studies to determine if there is a significant correlation between PHE levels and IQ in patients with PKU. The authors conducted within study correlations between IQ and PHE level on subgroups of participants. The critical period was defined as birth to 12 years of age. They found a statistically significant moderate correlation between IQ and PHE level for early-treated patients in the critical period.

Specifically, during the critical period, a 100 $\mu\text{mol/l}$ increase in PHE predicted a 1.3 to 3.1 point drop in IQ. Similarly, for early-treated patients a significant moderate correlation was found between concurrent PHE levels and IQ where a 100 $\mu\text{mol/l}$ increase in PHE predicted a 0.5 to 1.4 point drop in IQ. Results of the meta-analysis support the use of PHE level as an accurate predictor of IQ for individuals with PKU and provide further evidence for the importance of adherence to treatment.

Another meta-analysis on six domains of intellectual functioning and neuropsychological symptoms of continuously treated adolescents (13-18 years old) and adults (18 years and older) with classic PKU found significant differences between patients with PKU compared to controls on five domains. Moyle and colleagues (2007) examined the effect of PHE levels on cognitive functioning after childhood treatment in adolescents and adults across 11 studies. Full scale IQ was analyzed in five studies and significantly lower scores were present in individuals with PKU compared to controls. An analysis of processing speed revealed significantly lower processing speed in individuals with PKU compared to a control group. Individuals with PKU were found to demonstrate decreased functioning on attention tasks and their ability to inhibit responses compared to a control group. Patients with PKU also demonstrated significant impairment in motor control compared to control groups. Only three studies examined working memory and results demonstrated no significant differences between groups with PKU and controls. These results again confirm the relationship between increased PHE level and decreased cognitive functioning.

Angelino, Bone, and Kuehl (2012) conducted a self-report survey of 34 metabolic clinics on their procedures for identifying patients with cognitive impairment and subsequent referrals for evaluation and services. Respondents included physicians, dieticians, nurse practitioners, and

genetic counselors. Over half of the respondents (56%) believed cognitive problems impact patients' access to regular care. The most frequently seen factors impacting access to care included ambivalence towards care, frustration with diet, missed appointments, and financial and transportation difficulties. The majority of clinics reported patients are screened for cognitive impairment (70%), and reported a mean positive screen rate of 31%. Yet, only 15% reported use of a standardized screening measure. The need to increase screening for cognitive and psychiatric needs is apparent in the PKU population. Screening should be a regular part of patient care to account for changes in diet and to improve QoL and care. Additionally, the impact of high PHE levels may not only be disrupting daily life and cognition, but also preventing individuals with PKU from receiving the health care and services they require, thus creating a vicious cycle of increased PHE levels and decreased access to care.

Executive function difficulties are consistently reported in the literature for individuals with PKU and commonly examined along with cognitive functioning (Brumm, Bilder, & Waisbren, 2010; DeRoche & Welsh, 2008; Moyle et al., 2007). Burton and colleagues (2013) implemented screening for psychiatric problems and executive function deficits in three metabolic clinics in the United States. The clinics used the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000) to assess executive function deficits and the Pediatric Symptom Checklist (PSC; Jellinek & Murphy, 1988), the PSC-Youth Report (PSC-Y), or the Brief Symptom Inventory (BSI; Derogatis, 1993) to assess psychiatric symptoms. Results of the study revealed 29% of all participants screened for executive function deficits received a positive screen and 22% of participants under the age of 12 received a positive screen. Although the positive screen does not indicate a diagnosis it does speak to the high level of executive function impairments experienced by individuals with PKU

and the need to closely monitor these skills in these individuals. Other studies have looked more specifically at executive function skills in youth with PKU compared to controls at a variety of levels.

Azadi and colleagues (2009) compared 10 continuously treated children with PKU in Iran to 15 typically developing children to measure differences in executive functioning. The Raven Intelligence Scale (Raven, 1998) was used to assess intelligence. Although not statistically significant the authors noted the mean IQ score for the PKU group was lower than the control group. On a test measuring inhibition, planning, organization, and working memory, the PKU group showed significant differences in planning and execution time when asked to complete complex problems that required 2, 3, or 4 steps to solve compared to controls. On a test measuring response inhibition and sustained attention, the PKU group had a significantly greater number of omission errors (failing to respond to the stimulus) and significantly fewer positive matches than controls. Overall, children with PKU had greater difficulty with planning, attention, and problem solving compared to children without PKU.

Cognitive and executive functioning impairments have also been examined in relation to academic performance at school. Gassio and colleagues (2005) studied the relationship between cognitive functioning, academic performance, and dietary control in 26 continuously treated Spanish youth with PKU (aged 7-19 years). Compared to a group of 21 age and sex matched controls, youth with PKU had significantly lower IQ scores. Compared to controls the children with PKU also demonstrated significant differences in attention problems, difficulty with response inhibition, slow information processing, and fine motor functioning. There was a significantly higher rate of school problems in patients with PKU compared to controls. Parents of half of the individuals with PKU reported their child had school problems including receiving

special tutoring (38.5%) and repeating classes (11.5%) compared to less than a quarter of parents of controls (23.8%) reporting school problems. All of the PKU patients receiving tutoring needed help across all subject areas whereas control participants typically reported needing help in only one area (e.g., reading). Also of note is a significant difference in IQ scores of the PKU patients who reported school problems and patients with PKU without school problems. PKU patients with more school problems also had lower IQ scores and significantly more difficulty controlling their diet in the six months prior to the study as compared to PKU patients without school problems. This suggests a potential link between cognitive functioning, dietary control, and school problems among individuals with PKU.

In summary, individuals with PKU experience a range of cognitive and executive functioning difficulties. These difficulties can create significant impacts on their life including decreased academic and school performance. Deficits in executive functioning can lead to poor treatment adherence, which can increase PHE levels in the blood and further decrease executive functioning skills resulting in a continuous cycle leading to poor outcomes. Even when individuals are adherent to treatment they are still at risk for and experience difficulties with problem solving, working memory, inhibitory control, and conceptual reasoning. Although individuals who are continuously treated for PKU can have IQ scores in the normal range they tend to be lower than their peers and siblings without PKU. These cognitive and executive function deficits may also impact psychosocial functioning, development of interpersonal relationships, and autonomy. This next session will review the psychological impacts of PKU.

Psychological Effects. Individuals with PKU report a number of psychiatric symptoms including anxiety, depression, low self-esteem, social withdrawal, and other emotional problems (Walter et al., 2006). In general, individuals with PKU have an increased prevalence of

internalizing symptoms compared to healthy controls (Cappelletti et al., 2013; Gentile, et al., 2010; Smith & Knowles, 2000; Weglage et al., 2000). These symptoms often go undetected for years and can lead to psychosocial problems, adherence difficulties, and problems with social and interpersonal relationships. Gentile and colleagues (2010) described these problems as hidden disabilities, which may not be identified by the typical surveys and questionnaires given to individuals with PKU, but are important to be aware of and necessitate further investigation of the prevalence and consequences of these difficulties.

In a review of the literature, Smith and Knowles (2000) found differences in behavior and perception of self between individuals with PKU and healthy controls. The authors reviewed the results of four empirical studies of greater than 20 participants with PKU. Results of the review support a higher prevalence of a range of internalizing behavioral problems in individuals with PKU. These difficulties were consistently reported across a range of ages, nationalities, and locations of individuals with PKU compared to control groups. Individuals with PKU experience heightened symptoms of anxiety (fears and phobias), depression (sadness, withdrawal, isolation), and decreased sense of self (poor self-image and lack of autonomy) compared to their peers. Smith and Knowles (2000) reported the literature reviewed did not provide enough evidence to definitively conclude the increased prevalence of behavior and psychological problems in the population were due to PKU. However, they report the evidence suggests both the neurobiological impairments of PKU and stress of treatment of PKU likely contribute to the increased prevalence of behavioral problems.

Manti and colleagues (2016) examined the rate of psychiatric symptoms and disorders in 46 Italian PKU patients (aged 12-44 years) compared to 30 age-matched controls. The authors found higher rates of psychiatric internalizing disorders in adolescents (56%) and early-treated

adults with PKU (25%) compared to healthy peers (20%; Manti et al., 2016). Anxiety and depression were the most commonly self-reported symptoms with 37% meeting criteria for a psychiatric diagnosis based on DSM-5 criteria compared to none of the healthy controls. Adolescents were more likely to be diagnosed with an anxiety disorder, while depressive and personality disorders were more common in adults. Over half of the PKU patients reported at least one symptom that fell in the clinically significant range compared to only 20% of the healthy controls. These high rates of psychiatric problems may influence day-to-day functioning and QoL, but it remains unknown if they are a result of living with the burden of a chronic illness and restrictive diet or a direct result of biological factors.

Several studies have compared youth with PKU to youth with other chronic health conditions and found varying results. Weglage and colleagues (2000) studied 42 German adolescents with PKU (mean = 14.7 years old) compared to 42 German adolescents with Type I Diabetes (mean = 14.8 years old) and healthy controls. No difference was detected in IQ scores across the groups. Using the Child Behavior Checklist (CBCL; Achenbach, 1991), results showed on behavioral symptoms there was not a significant difference between the adolescents with PKU and the adolescents with Diabetes, however both groups reported significantly more internalizing problems compared to the healthy controls. They specifically reported more problems with anxiety, depression, social isolation, social problems, attention, school, and physical ailments. The presence of these symptoms resulted in pathological or borderline pathological symptoms on the social isolation, physical complaints, anxiety/depression, and competences subscales and the overall internalizing problems scale while elevations were not seen on the externalizing scale. There was a significantly different presentation of symptoms

among youth with a chronic illness with an increased prevalence of internalizing problems but not externalizing problems compared to healthy controls.

Contrary to the previous findings a study of 20 continuously treated adolescents and young adults with PKU in the United States did not find a heightened risk for psychological problems compared to age matched controls and other chronic illness controls (Sullivan, 2001). Twenty adolescents with PKU (aged 14-25 years), who were continuously treated since birth, were compared to 17 chronically ill and 16 healthy peers. A comparison across groups showed no significant differences in the number of full or subthreshold symptoms, full or subthreshold diagnoses, or combined full and subthreshold diagnoses using the Minnesota Multiphasic Personality Inventory-2 (Butcher, Dahlstrom, Graham, Tellegen, & Kaemmer, 1989) or the Adolescent version (Butcher, Williams, Graham, Archer, Tellegen, Ben-Porath, & Kaemmer, 1992) and the Tennessee Self-Concept Scale-2 (Fitts & Warren, 1996). However, individuals with PKU and the chronic illness comparisons were more likely to have received help for psychological problems, though this did not necessarily indicate they had received a diagnosis. Results also indicated individuals with PKU did not have significant differences in self-concept compared to both control groups. Results of this study suggest the possible protective influences of early treatment and adherence to diet for individuals with PKU, although these results may also be due to the use of different measurement instruments.

In a recent study conducted in Italy, Cappelletti and colleagues (2013) studied behavioral symptoms, executive function problems, and cognitive functioning in 35 children and adolescents (aged 4-24, mean age 11.5 years) with PKU. Intellectual functioning was in the average range for the majority of participants. An average deficit of 1.8 standard deviations was noted in executive function scores across the majority of PKU participants compared to the

normal mean on the Italian Version of the Tower of London Test (Sannio Fancello, Vio, & Cianchetti, 2007). Rates of internalizing problems were higher in patients who were adherent to treatment compared to patients who were not adherent. The most commonly reported problems on the Child Behavior Checklist (Achenbach & Rescorla, 2000) were symptoms of anxiety, depression, and social difficulties. Although the study did not utilize a control group the authors reported the rates of internalizing problems were higher than the prevalence typically seen in Italian adolescents (12.9% v. 9.8%). Interestingly, these results suggest for some adolescents the rigidity and intensity of adherence to diet and treatment for PKU may be related to increased stress and internalizing symptoms.

While some variability exists, the results of numerous studies in the literature document there is an increased prevalence of internalizing symptoms in individuals with PKU compared to healthy controls. Most commonly this includes increased symptoms of anxiety, depression, decreased self-concept, and impairment in social relationships. It is unknown at this time whether these difficulties are related to biological effects of PKU or a result of strenuous lifelong adherence to a diet that can be socially isolating and difficult to manage. Regardless, internalizing symptoms can often go undetected and taken together with the increased prevalence of cognitive and executive functioning deficits may affect overall QoL for youth with PKU. A more comprehensive review of QoL and issues related to youth with PKU follows.

Quality of Life

Quality of life (QoL) in children and adolescents is a growing topic of interest. Within this area there are a range of approaches, definitions, and measurement instruments used throughout the literature. This section focuses on providing a definition of QoL, an overview of

the approaches to QoL, and then summarizes current literature on both QoL in chronic illnesses and in children and adolescents with PKU.

Definition. There are many different definitions of QoL based on the approach and often the researcher or study being conducted. QoL is commonly described as a multidimensional construct and most frequently includes social, physical, cognitive, and emotional functioning. Additionally, QoL generally encompasses a subjective component and may also include objective indicators. The World Health Organization (WHO) defines QoL as, “an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, and their relationship to salient features of their environment” (WHOQOL Group, 1993; p. 153). For this study the WHO definition of QoL will be used.

Approaches to Quality of Life. There are three main approaches or ways of conceptualizing and understanding QoL in children and adolescents described in the literature; health related quality of life (HRQoL), social indicators, and subjective well-being (SWB; Wallander & Koot, 2016). Each of these approaches has strengths and limitations in defining and measuring QoL in children and adolescents. Based on a review of these approaches, for the purpose of this study, HRQoL and SWB will be explored. Social indicators will not be used because they are objective “statistical representations of people’s conditions” (Wallander & Koot, 2016; p.135). They provide a broad overview of society and may not accurately represent individual experiences.

HRQoL is the foremost approach discussed and examined in child and adolescent literature and typically has been utilized when looking at specific illness populations. Despite a

wide range of definitions used for HRQoL it is generally established that it is a multidimensional concept and is subjective (Wallander & Koot, 2016). HRQoL encompasses physical, emotional, mental, and social areas and can also include school and family among other domains. Since HRQoL is subjective it is agreed it is best measured using the individual child or adolescent's perspective.

There are a wealth of measurement instruments to assess HRQoL in healthy and disease specific populations. Two of the most frequently used measures are the Pediatric Quality of Life Inventory (PedsQL; Varni, Seid, & Rode, 1999) and the KIDSCREEN (Ravens-Sieberer et al., 2008). As Wallander and Koot (2016) note the majority of measures and definitions of HRQoL focus on the absence of illness and neglect to take into account the presence of well-being. Based on the dual factor model of mental health for youth it is a combination of well-being and decreased symptoms of illness or psychopathology that describe overall mental health (Suldo & Shaffer, 2008). Therefore HRQoL, as currently measured, may be missing many important characteristics that factor into QoL by only measuring the absence of illness. Additionally, the current measures don't allow for understanding of the subtle differences and impacts among individual children or adolescents.

Another common approach to QoL is subjective well-being (SWB). SWB is the technical term for happiness, satisfaction, and meaning, and is composed of several elements: positive affect, negative affect, and life satisfaction (Diener, 2000). Some of the most commonly used measures are the Students' Life Satisfaction Scale (SLSS; Huebner, 1991) a global measure of well-being, and the Multidimensional Students' Life Satisfaction Scale (MSLSS; Huebner, 1994) that measures five domains of life satisfaction. SWB currently provides a subjective measure of QoL that utilizes a full range definition of well-being, from positive to negative, that other

approaches have not included. However, our understanding of SWB in children and adolescents is continuing to grow and further research is needed to understand the nuances of this construct in children and adolescents and how they perceive QoL and what influences their SWB.

Quality of Life in Chronic Illnesses. QoL has been widely studied in adults and children with chronic illnesses. Children and adolescents often experience physical, psychological, emotional, and social symptoms associated with their condition, as a result of having a chronic health condition, or related to their treatment and medical regimen. Due to the range of symptoms associated with chronic illnesses it is often expected that individuals in these populations will experience or be at risk for a lower QoL than healthy peers. Within these populations QoL is most commonly examined using a HRQoL approach.

Across a variety of chronic illnesses in children and adolescents HRQoL has been found to be lower than healthy controls (Flokstra-de Blok et al., 2010; Kamath et al., 2015; Murray, 2015; Sawyer et al., 2004). Children and adolescents with chronic illnesses have reported decreased QoL due to illness interfering with participation in physical activities, schoolwork, and activities with family or friends (Elliott, Lach, & Smith, 2005; Sawyer et al., 2004). Other studies have examined how the progression and severity of disease relates to QoL in a variety of chronic illnesses. Based on child self reports, as symptoms of disease (e.g., fatigue and sleep problems) and related sequelae (e.g., depression) increase children with a chronic illness report less social support, less life satisfaction, and decreased school and social functioning (Kim et al., 2014).

Although these studies suggest QoL in children and adolescents may be impacted as a result of having a chronic illness and may be lower than healthy controls, it is unknown if children and adolescents with all chronic illnesses are at risk for decreased QoL. The use of qualitative methods can provide unique insight into the specific domains impacted by the

presence of a particular illness and how those relate to QoL (Elliott et al., 2005). Moreover, qualitative methods provide a unique insight into how children and adolescents view and define QoL, and what they believe influences QoL. Determinants of QoL among children and adolescents will be reviewed next to shed light on the differences and similarities between professional and adolescent conceptualizations of QoL.

Determinants of Quality of Life. Current definitions and measures of QoL may not be fully capturing all the pertinent domains that determine and influence QoL in children and adolescents. Several scholars have called for a greater look into the perceptions of adolescents on this topic to advance our knowledge and generate theory of this complex construct (Huebner et al., 2004; Wallander & Koot, 2016). Few studies exist that examine the determinants of QoL for adolescents and fewer still for specific populations of adolescents with chronic illnesses. Among the studies that have been completed there are two approaches employed. Several studies have used a deductive approach to determine how well pre-identified factors, constructs, or characteristics influence QoL in adolescents and to the extent they account for and predict QoL (Chen et al., 2014; Cikrikci & Odaci, 2016; Luyckx et al., 2012; Seid et al., 2014;). Several other studies have used an inductive approach to discover themes and factors that naturally arise in interviews with participants (Helseth & Misvær, 2010; Shikako-Thomas et al., 2009; Suldo, Frank, Chappel, McMahan Albers, & Bateman, 2014). These studies have provided information to suggest the determinants of QoL varies across populations and may include more themes and areas than are currently being used to measure and quantify QoL.

Studies examining determinants of QoL among healthy adolescents have found friends and family to be the most prominent influence on life satisfaction and QoL (Helseth & Misvær, 2010; Suldo et al., 2014). Healthy adolescents have described QoL as a positive cycle that is

composed of feeling good about one's life, having a positive attitude, and being satisfied with themselves (Helseth & Misv er, 2010). In addition to the common themes of friends and family, qualitative interviews with adolescents have revealed new themes that influence life satisfaction not currently measured by life satisfaction instruments. Stress, extracurricular activities, and pets were identified as new themes with half of the adolescents interviewed mentioning stress and extracurricular activities relate to their life satisfaction (Suldo et al., 2014). Other salient factors that have been found to influence life satisfaction and QoL include positive self-image (Helseth & Misv er, 2010) and metacognitive awareness and self-efficacy (Cikrikci & Odaci, 2016). Results of these studies suggest current measures of life satisfaction may not encompass all the relevant domains and influences adolescents believe influence their QoL.

Some similar and some unique themes have been found in studies of youth with chronic illnesses. A qualitative study sought to understand the perceived determinants of QoL in Canadian adolescents with cerebral palsy. Twelve adolescents (aged 12-16 years) were interviewed about factors related or not related to cerebral palsy that influence their QoL. Responses were coded according to grounded theory then placed into one of three themes: intrinsic, extrinsic, or the interaction between intrinsic and extrinsic. Overall, cerebral palsy was not an important factor influencing QoL (Shikako-Thomas et al., 2009). One of the most significant factors to emerge was the ability and chance to participate in activities that were important to the adolescent. Other extrinsic factors important to QoL were family, friends, school, and participation in community activities. Intrinsic factors that impacted QoL revolved around personal strengths, for instance self-advocacy, mastery, and motivation. This study provides light into the complexity of factors that contribute to QoL in adolescents. Additionally,

this study suggests that illness, which is often a primary measure of QoL (i.e., HRQoL), may not be the most germane factor in QoL among adolescents with a chronic illness.

Another study of children with cerebral palsy in Taiwan used the domains of the International Classification of Functioning, Disability, and Health (ICF) to determine which domains influence QoL (Chen et al., 2014). The seven domains included social well-being and acceptance, functioning, participation and physical health, emotional well-being, access to services, pain and impact of disability, and family health. Caregiver ratings indicated 40-75% of the determinants of QoL, across all seven domains measured were due to environmental factors (e.g., family coping patterns, caregiver stress, and family impact; Chen et al., 2014). Other important determinants included the child's behavior or emotional problems and caregiver's psychological well-being. This study showed that even though motor and physical impairments are the main symptoms of children with cerebral palsy other factors had more influence on their QoL based on caregiver reports.

Luyckx and colleagues (2012) examined the influence of parental support, peer support, and sense of coherence on QoL of Dutch adolescents (aged 14-18 years) with congenital heart disease. Data was collected across two time points nine months apart. The authors used structural equation modeling to observe the direction of effects across time points (Luyckx et al., 2012). Family composition, parental support, perceived health status, and sense of coherence predicted increases in QoL over time, after controlling for sex. Peer support was not predictive of QoL over time, but was positively related to QoL at each measurement point. Findings also revealed perceived health status and sense of coherence predicted peer support across time points. Adolescents who believed they were healthier and reported a stronger sense of coherence perceived themselves to have greater peer support across time. Overall, the findings from this

study suggest both individual and contextual/environmental factors play a role in adolescents' perceptions of QoL and should be considered in understanding this construct.

Another study of determinants of HRQoL looked at children with newly diagnosed juvenile idiopathic arthritis (Seid et al., 2014). Parents and children (aged 2-16 years) completed the PedsQL Rheumatology Module (Varni et al., 2002). The aim of the study was to examine the extent to which nonmedical factors explain variance in HRQoL. After controlling for medical factors an additional 30% of the variance in self-reported QoL and psychosocial functioning was explained by nonmedical factors. Nonmedical factors included social support, coping, self-efficacy, access to care, family climate, parental distress, and socioeconomic status. Seid and colleagues (2014) found nonmedical factors to be related to HRQoL overall and particularly related to psychosocial functioning of newly diagnosed children.

In summary, a wide variety of factors have been determined to influence QoL in healthy adolescents and adolescents with a chronic illness. Friends and family appear to be the most common determinants of QoL. In chronic illness populations, interestingly the illness or symptoms have not been a prominent factor in determining QoL. Therefore, when examining QoL in chronic illness populations it may be important to look more broadly at determinants of QoL to know how to improve QoL in children and adolescents with chronic illnesses. In addition, there may be unique factors to chronic illness populations not covered in current measures. Most studies have assumed we are aware of all the relevant determinants of QoL and there are few studies that have examined determinants of QoL from adolescents themselves. When adolescents have provided direct insight into their perceptions the results show adolescents acknowledge additional areas that influence their QoL. As a result, our current understanding of

QoL may not fully be capturing all the influences and determinants of QoL and warrants additional inquiry into determinants of QoL in adolescents.

Quality of Life and PKU. QoL is just beginning to be examined in children and adolescents with PKU. There is a range of findings on this topic in the literature and while QoL has, for the most part, been found to be within normal ranges there are areas of decreased satisfaction within the population. Additionally, the majority of these studies utilized generic QoL measures that may not be sensitive to the hidden impairments individuals with PKU experience and, as a result, may account for the normative scores seen in the literature. Additionally, QoL has rarely been explored from the perspective of adolescents. As a result, there is a need for additional exploration of the determinants of QoL for individuals with PKU in order to better understand whether current measures are accurately assessing this construct.

In an initial study on QoL in children, adolescents, and young adults with PKU Landolt, Nuoffer, Steinmann, and Superti-Furga (2002) examined 37 patients aged 3-18 years old (mean age 10.9 years) in Switzerland using the parent forms of the TNO-AZL Questionnaire for Children's Health-Related Quality of Life (Vogels et al., 2000) and the Child Behavior Checklist (CBCL; Achenbach, 1991) and compared them to healthy peers. Results from the study showed that parents rated children with PKU within the average range on all but one dimension of QoL. Parents reported decreased positive emotions in children with PKU compared to healthy peers. Specifically, children in the study were reported to be less happy, confident, and joyful (Landolt et al., 2002). On the CBCL children and adolescents were rated to have significantly less problems with internalizing and externalizing behaviors compared to healthy controls. However, participants with higher mean PHE levels in the first year of life were rated as having more cognitive and emotional functioning problems at the time of the study and were less

psychologically well-adjusted compared to participants with better PHE levels. Although the results of the study suggest children with PKU can have normal QoL, this information is based on parent report and therefore might overestimate the well-being of children in the study or not take into consideration other environments that may significantly impact QoL in children and adolescents (e.g., school, social settings).

Cotugno and colleagues (2011) investigated QoL in Italian pediatric patients using the self-report Child Health Questionnaire (CHQ; Ruperto et al., 2001) and the parent form, translated into Italian, for patients under 18 years old and the SF-36 (Apolone & Mosconi, 1998) questionnaire for patients over 18 years old. Forty-one patients (mean age = 10.7 years old) participated in the study. Several findings are unique to this study. QoL was lower than controls in children and adolescents with PKU on the CHQ, however, QoL among 18-24 year olds in the study was found to be within normal ranges using the SF-36 questionnaire. Decreased QoL was seen across psychological and physical summary scores. This may be due to the fact that different measures may focus on different areas related to QoL and result in different findings across studies. Adherence to treatment was not significantly correlated to QoL except in the domains of global health and family activities. These findings suggest varied impact and the need for additional assessment of QoL to better understand how PKU influences QoL in children and adolescents.

Concerns regarding school achievement and success in life are also related to QoL in children and adolescents with PKU. Thimm, Schmidt, Heldt, and Spiekerkoetter (2013) studied 50 German children and adolescents (0-18 years, median age 9.9 years) and their parents' ratings of HRQoL using the KINDL-R (Ravens-Sieberer & Bullinger, 1998). Total HRQoL score was not significantly different for self-reported or parent reported HRQoL compared to healthy

controls. However, parents of children with PKU reported HRQoL related to everyday functioning in school to be significantly lower than parents of control children. The domain of functioning in school specifically covered concerns about homework, enjoying lessons at school, and worries about getting bad grades. Another finding was parents of children with PKU, who had recommended PHE levels and good metabolic control, anticipated their children to have increased HRQoL related to school success. Parents of children who did not meet recommendations for metabolic control were increasingly worried about school success and success in life.

QoL also has been examined in relation to responsiveness to medication (BH₄/sapropterin) for PKU in The Netherlands (Demirdas et al., 2013). Patients (aged 4 to 44 years) were recruited to complete measures of QoL before beginning BH₄ and, two years later, after completing responsiveness testing for BH₄ and initiating treatment if they were a responder. Patients (aged 4-17 years) and their mothers completed a generic QoL measure, the PedsQL (Varni et al., 1999) and the DISABKIDS measure for chronic illness (Ravens-Sieberer et al., 2007). Patients 18 to 44 years completed the TNO-AZL Adult Quality of Life Questionnaire (Vogels et al., 2000) for adults and a modified DISABKIDS (Ravens-Sieberer et al., 2007) for adults. After completing BH₄ responsiveness testing 22% of patients were found to be responders and started medication therapy. Surprisingly, there were no differences between QoL before starting BH₄ and after treatment based on child, adolescent, adult, or parent reports. There were also no differences in QoL between patients who were determined to be responders and those who were not after the responsiveness trial. HRQoL was found to be comparable to the control population for children 5-12 years old. Interestingly, adolescents (aged 13-17) reported significantly higher overall HRQoL compared to controls as evidenced on the total and

psychosocial functioning scales. Adolescents also reported a trend towards higher scores for social functioning and school functioning. Children aged 8-12 years also reported higher HRQoL on the physical functioning scale. Overall HRQoL was comparable to controls for adults, with the exception of significantly lower HRQoL on cognitive functioning. Demirdas and colleagues (2013) attribute the interesting higher HRQoL findings in adolescents to response shift. They hypothesized that individuals with PKU are aware of the potentially detrimental consequences of their disorder and as a result are more appreciative of their own abilities. They also suggest the lack of change in HRQoL for patients who responded to BH₄ may be a result of the small sample size or the use of generic HRQoL measures. This leaves the question of whether or not responsiveness and use of BH₄ can improve QoL in individuals with PKU unanswered and a need for further investigation into the influence of medication on QoL.

A comparison of QoL was examined in individuals with classic (n=21) and mild PKU (n=22) in Italy (Cazzorla et al., 2014). All mild PKU patients were receiving sapropterin therapy and considered responders. Patients ranged in age from 6 to 35 years. Patients with classic PKU had a mean age of 18.9 years and patients with mild PKU had a mean age of 15.4 years. Patients 6-16 years old completed the self-report form of the PedsQL (Varni et al., 1999) and parents completed a proxy-report form. Patients age 17 years and older completed the WHOQOL-100 (WHOQOL Group, 1998). Pediatric and adults patients did not rate their QoL significantly different from healthy controls. Overall QoL based on parent report was found to be within normal ranges for children with both classic and mild PKU. However, children and adults with mild PKU who were also being treated with medicine (BH₄) had significantly higher QoL than individuals with classic PKU only managing PKU through diet (Cazzorla et al., 2014). An increase in QoL for both children and adults was associated with the length of treatment

regardless of whether patients were receiving sapropterin treatment or only diet. Despite these findings patients consistently reported the diet impacts their daily activities and it is difficult to adhere to the diet. Cazzorla and colleagues (2014) suggest future research should focus on patient perceptions of limitations and social repercussions from PKU and should further look at whether there are associations between PKU severity and QoL.

The previously reviewed studies have all utilized general QoL measures because of a lack of a PKU specific QoL measure. To address this discrepancy Regnault and colleagues (2015) developed a PKU specific QoL measure (the PKU-QOL) designed to detect the nuances of physical, social, and emotional impacts of PKU for children (9-11 years), adolescents (12-17 years), and adults (18+ years) with PKU, and parents of children with PKU. The questionnaires are divided into sections asking about symptoms of PKU, the impact of PKU on patients' life, and the impact of treatment for PKU including diet and supplemental medical food. The use of these measures has been validated in France, Germany, Italy, The Netherlands, Spain, Turkey, and the UK. Clinical validity of the PKU-QOL indicated patients with classic PKU who exhibit poorer health had lower HRQoL compared to patients with mild PKU.

Bosch and colleagues (2015) conducted exploratory post hoc analyses on the PKU-QOL validation data compared to generic health related QoL measures in patients with PKU and parents of a child with PKU. Children and adolescents in the study completed the PedsQL (Varni et al., 1999) and the PKU-QOL child and adolescent versions (Regnault et al., 2015), adults completed the adult PKU-QOL form (Regnault et al., 2015) and the Medical Outcome Survey short form (Ware & Sherbourne, 1992), and parents completed the PKU-QOL parent form (Regnault et al., 2015) and the Child Health Questionnaire 28 item Parent form (Landgraf et al., 1996). A total of 306 patients with PKU and 253 parents completed the measures. Results from

the PedsQL survey showed children and adolescents with PKU had comparable scores on all domains, except social functioning, compared to normal controls. Although no significant differences were found between individuals with PKU and healthy controls on the generic QoL measures, differences were seen on the PKU-QOL measures between individuals with classic and mild PKU.

On the PKU-QOL the highest scores were related to emotional impact and management of PKU. Adolescents with classic PKU experienced greater impact on practical and emotional areas due to PHE-free supplements, and in social and emotional areas due to dietary restriction. There was an overall relationship between better health status and lower symptom and impact scores of PKU, which was especially seen in adult and parent ratings. In other words, those who reported better health status also reported lower symptoms and PKU had a smaller impact on their QoL than those who reported poorer health and more symptoms. These results show that generic measures report QoL to be within normative ranges among individuals with PKU, and the PKU-QOL specific measures indicated PKU has the most impact on the emotional domain. Across different types of PKU, adolescents with mild PKU reported less mood swings and enhanced health status, decreased impact in emotional, practical, and social domains, and there was a trend to less overall impact of PKU compared to adolescents with more severe PKU. Differences were also seen in dietary impacts where adolescents with mild PKU reported less social and practical impact of the diet, less guilt for not following the diet, less food temptation, and more enjoyment of food than adolescents with more severe PKU (Bosch et al., 2015).

Overall, Bosch and colleagues (2015) demonstrated there is a clear link between increased severity of PKU and decreased HRQoL in the emotional impact domain. Additionally, there were differences in treatment regimens, with individuals who had a less restricted diet and

lower required supplemental medical food intake reporting less impact on HRQoL. This was further seen in adolescents who receive sapropterin (BH₄) therapy who reported less sadness, as well as, less social impact and food temptation than adolescents only on diet and medical food supplementation treatment. Generic QoL measures are not specific enough to pick up on the unique challenges and domains of impact among individuals with PKU. Although the PKU-QOL measures do not allow comparison to the general population, they do provide insight into the differences in experiences among individuals with varying levels of PKU. However, because this is the first study conducted using these measures, and data were gathered primarily for validation purposes, further analysis is needed to confirm the results.

In conclusion, the majority of QoL research has focused on HRQoL, which largely focuses on problems rather than well-being. Although the current literature shows individuals with PKU can have comparable QoL compared to control populations, there is still an increased emotional and social burden that is detected among individuals with PKU. The majority of these studies used generic QoL measures, which may not be accurately assessing the factors that contribute to QoL for individuals with PKU (i.e., restricted diet, lifelong adherence, social implications). Further research is needed to understand the specific factors that determine QoL in individuals with PKU and how these factors may or may not be influenced by having PKU. Additionally, this topic has rarely been studied in the United States and little is known about the perspectives and experiences of American adolescents with PKU. Among children and adolescents with PKU, social functioning is a noted area of deficit in QoL compared to peers. Next a review of the importance of social relationships and the impact of PKU on peer and social relationships will be discussed.

Peer and Social Relationships

Social development occurs over time and is an essential component of childhood and adolescence. Social development and competence is influenced by both biological and environmental factors and can influence mental and physical health (Semrud-Clikeman, 2007). Peer relationships are decidedly important in the developmental process and can influence children and adolescents in a variety of ways including self-concept, behavior, health, and achievement (Bukowski, Buhrmester, & Underwood, 2011; Rosen & Patterson, 2011). This section will review the importance of peer relationships, how peer relationships influence adolescents, the impact of chronic illness on social competence and relationships, and what is currently known about social competence and functioning in adolescents with PKU.

Importance of Peers. Adolescence is a time when youth gradually begin spending less time with their family and more time alone and with peers and friends, particularly girls (Larson & Richards, 1991). Friendship is uniquely influential to psychological adjustment and well-being during adolescence. Friendships impact the development of self, autonomy, and promote exploration of new behaviors and beliefs. Recent results from a number of studies suggest the benefits of peer friendships in adolescence and the risks associated with peer rejection are not just salient to that time period but can extend into middle adulthood and predict internalizing and externalizing problems experienced in adulthood (Bukowski et al., 2011; Marion, Laursen, Zettergren, & Bergman, 2013). Therefore the quality of friendships in adolescence and the influence peers have on behavior and adjustment may be more long lasting and relevant for lifelong well-being.

Influence of Peer Relationships. Along with an increase in the time spent with peers during adolescence, peers increasingly influence and impact the thoughts and feelings

adolescents' experience. Peer friendships can serve as a protective factor against family or individual risk factors while difficulties with peer relationships can predict later adjustment problems. The presence of two or more close friends in adolescence can decrease the likelihood of being at risk for depression for boys and girls (Uusitalo-Malmivaara & Lehto, 2013). Additionally, for boys and girls, having only a few friends has been found to predict decreased happiness (Uusitalo-Malmivaara & Lehto, 2013), while difficulties in peer relationships and having no close friends during adolescence have been found to significantly predict depression in young adulthood for males (Pelkonen, Marttunen, & Aro, 2003). Other studies have shown children from at-risk families with high quality friendships develop fewer problems than their at-risk peers who have low quality friendships or are friendless (Bukowski, Motzoi, & Meyer, 2009). The experience of peer rejection in children can lead to negative outcomes including more externalizing and internalizing problems (Sandstrom, Cillessen, & Eisenhower, 2003). The presence of peer friendships improves outcomes in children and adolescents. Adolescents who report more support from friends have better health, more positive behavior, significantly greater well-being, and less school behavior problems than peers with lower levels of friend support (Rankin Williams & Anthony, 2015; Traylor, Williams, Kenney, & Hopson, 2016).

Impact of Chronic Illness. Despite the wealth of information on the importance of peer relationships, there is less known about peer relationships of children and adolescents with chronic health conditions. Children with chronic illnesses may experience challenges with peer relationships due to activity limitations, treatment regimens, changes in their physical appearance, and time away from school (La Greca, 1990). Adolescents with chronic illness are often reticent to disclose their illness and symptoms to peers due to fear of rejection, discrimination, or stigmatization (La Greca & Mackey, 2009). The majority of studies have

examined peer relationships based on parent, teacher, or self-reports using questionnaires or checklists. There is limited information on how children with a chronic illness view friendships and peer relationships and the struggles they perceive exist in those relationships.

Decreased social competence and less prosocial behavior have been found in children with a range of chronic illnesses compared to healthy peers (Martinez, Carter, & Legato, 2011; McCarroll, Lindsey, MacKinnon-Lewis, Chambers, & Frabutt, 2009; Reiter-Purtill et al., 2009). McCarroll and colleagues (2009) found teachers rated children with a chronic illness as less prosocial (saying supportive comments and being helpful to peers) than their healthy peers. They also found, based on self-report measures, children with a chronic illness described themselves as having less peer contact (including the number of friends and times spent with friends) and more social anxiety than their healthy peers. Additionally, children with chronic health conditions that lead to impairment of the central nervous system (CNS) are at risk for social difficulties with peers and have shown the largest deficits in social competence compared to other chronic illnesses and healthy peers (Martinez et al., 2011; Reiter-Purtill et al., 2009). Impairment to the CNS can result in cognitive impairments in memory or attention or changes to their physical appearance, which may cause difficulty with social skills and friendships. Parent reports frequently indicate greater levels of deficits in social functioning and competence than self-reports (Martinez et al., 2011; Reiter-Purtill et al., 2009). These studies suggest children with chronic illnesses are at risk for deficits in social competence and further research is needed on social competence and peer relationships of children with a wider variety of chronic illnesses.

Social Difficulties in PKU. Children with chronic illnesses, in general, often experience difficulties in social functioning, but the social and peer relationships of children and adolescents with PKU have rarely been examined. While executive functioning difficulties and the presence

of psychological problems have been clearly examined there is less known about the specific domains of social competence, social skills, and friendships among adolescents with PKU. Based on executive functioning difficulties commonly seen in individuals with PKU it has been hypothesized these deficits may impact social skills and social cognition in individuals with PKU, but further research is needed on this potential connection. What follows is a summary of the literature specifically examining social functioning in individuals with PKU.

Weglage et al. (1996) examined retrospective data on psychosocial features of children (aged 10 years) and adolescents with PKU (mean age 14.6 years) in Germany. Adolescents with PKU showed significant differences in social and psychological domains compared to healthy peers. Adolescents reported significantly less carefreeness and desire for autonomy. On measures of personality they described themselves as less open, less socially oriented, less extraverted, and less emotional than healthy peers. Adolescents with PKU also reported more family support and having less autonomy. The adolescents with PKU who reported more social and emotional problems also had greater difficulty controlling their blood PHE levels. These same problems and levels of difficulty were not reported among children with PKU in the study. Adolescents saw their social lives and social personality as noticeably constrained (Weglage et al., 1992). The majority of mothers described being overprotective and exceptionally careful and restrictive (Weglage et al., 1992). The authors hypothesize the psychosocial difficulties may be the result of stress and demands of living with a chronic disease and maintenance of a difficult diet.

The Dutch PKU-COBESO study is a multicenter longitudinal study examining social, behavioral, and cognitive effects compared to metabolic control in continuously treated individuals with PKU (Jahja et al., 2013). Preliminary results of 53 PKU patients (30 adults, 23 children and adolescents under 18 years old) and 21 controls (14 adults, 7 children and

adolescents) examined mental health and social problems in relation to metabolic control. Adults (mean age 27.8 years) reported more internalizing problems including avoidant personality, characterized by feeling inadequate, social inhibition, and avoidance of social interaction, and they had more difficulty with relationships and self-care than control adults. PKU children under 18 years old (mean age 11 years) did not report a significant difference in social skills and behavior problems compared to controls. However, for PKU children and adolescents under 18 years old current high blood PHE levels were associated with greater behavior and mental health problems. When examining metabolic control the authors found adult patients who had high blood PHE levels as children reported more somatic and thinking problems, and more physical complaints as adults.

Jahja and colleagues (2016) further examined social skills and social cognitive functioning along with metabolic control in 95 individuals with PKU (mean age 21.6 years) compared to 95 healthy controls (mean age 19.6 years) as part of the PKU-COBESO study. Consistent with previous studies individuals with PKU had IQ scores in the average range, but they were significantly lower than the control group. Results were broken down into age groups of children (<12 years), adolescents (12-17 years), and adults (≥ 18 years old). Individuals with PKU showed decreased social cognitive functioning and social skills as compared to healthy controls. After controlling for cognitive ability, across all participants individuals with poorer social skills had higher lifetime PHE levels, however there was no association with current PHE levels. Adolescents and adults had lower social cognitive functioning (e.g., the ability to recognize, respond, and understand social cues) and adults had more difficulty with social skills compared to controls. Examining PHE levels for adults over their lifetime indicated negative correlations between social skills and PHE levels from 0-12 years old, and nearly significant

negative correlations for 13-17 years old. Results indicated PHE levels in childhood and adolescence are related to social functioning in adulthood again demonstrating the importance of adherence in early years.

Another social area prominently impacted is eating and eating related behaviors, including sharing meals with family and friends. Eating is in large part a social activity and changes to eating patterns or habits can influence social settings and relationships. In a qualitative study a prominent theme across participants was feeling different in regards to eating, especially in a social setting (Di Ciommo, Forcella, & Cotugno, 2012). This difference was particularly noticeable in adolescents. A 17-year-old girl described her experience as:

When I went out with my friends, I always felt a bit down ... Different. From this point of view yes. With my friends. But not only. Also when you're at home and maybe you're eating with relatives and you say 'I can't have this because I've got this problem' ... (p. 232).

The experience of a 13-year-old boy speaks to missing out on opportunities and feeling left out, "Then just after lunch I wanted to go and have fun with my friends but I had to stay in my room preparing this supplement. And even that was ... let's say a duty I didn't like" (p. 232). A particularly burdensome issue related to eating was refusing food from friends or relatives. Individuals with PKU felt uncomfortable in these situations and were afraid of how the friend or relative would interpret their behavior. As a result, some reported concealing their condition and sometimes avoiding situations involving food.

A qualitative study from Italy explored how individuals with PKU experience their condition and treatment across the lifespan and the impact it has on their social interactions (Vegni et al., 2009). Interviews were completed with 10 individuals with PKU in each of the

following age groups: 8-12 years old, 13-17 years old, 18-22 years old, and 23 years and older. Participants were asked to tell their story of living with PKU in a narrative format. A prominent theme emerged regarding the struggle around food and social interactions. Participants across ages reported making a decision to avoid eating with others so they could feel or be seen as normal or to reveal their illness and feel different from others. A 15-year-old male reported, “Until you hang out with someone, the problem doesn’t exist, I’m a normal person, you’re a normal person, then when you come to dinner that’s when, ok, I say: I have this problem” (p. 542). Moreover, deciding to talk about PKU and share it with others was described as a test of trust and disclosure varied across participants. The authors characterized PKU as a “social disease” (p. 546) and shared, “From the patients’ perspective, the main topic in being affected by PKU is not the illness itself nor the diet, but the continuous and difficult balance between being different but socially included and be healthy and alone” (p. 547).

The results of these studies suggest social functioning is impacted in a variety of ways in adolescents with a chronic illness. Adolescents with PKU may experience unique social problems and difficulties as a result of their dietary restrictions and treatment for life. Studies also highlight the importance of adherence in childhood and adolescence and how this influences social skills and behavioral functioning in adulthood. Further, additional research on social functioning among individuals with PKU is needed to understand the difficulties encountered during adolescence in social relationships from the adolescents’ perspective.

Health Literacy

Health literacy is an important factor in one’s comprehension and knowledge of a health condition. Health literacy encompasses the domains of communication, literacy, knowledge of health behavior and care, and interaction with health providers. Health literacy leads to many

beneficial results including improved health outcomes, more positive attitudes, positive health behaviors, acquisition of new knowledge, and increased self-efficacy (Baker, 2006). Low levels of health literacy can restrict access to healthcare and lead to poor health outcomes (Pirisi, 2000). Health literacy not only influences one's knowledge of a health condition, but also the ability to adhere to treatment, advocate for medical needs, adapt to illness, and have a positive QoL.

Research on health literacy focuses largely on the association of literacy levels and health outcomes in adults, while little is known about health literacy for adolescents (Manganello, 2007), despite adolescents reporting an interest in learning about health (Brown, Teufel, & Birch, 2007). Multiple studies in adults show low health literacy is associated with poor knowledge of chronic conditions, self-management behaviors, and clinical outcomes (Mancuso & Rincon, 2006; Powell et al., 2007; Rothman et al., 2009; Schillinger et al., 2002). Collectively, these studies reveal the need for interventions to focus on increasing health literacy in patients to improve disease management and prevent associated side effects of chronic illnesses. Low health literacy can affect a patient's ability to manage their chronic illness and should be taken into consideration when educating patients about their disease. Similarly, Sanders and colleagues (2009) reported adolescents with high literacy skills have a greater likelihood of superior outcomes in disease prevention and health promotion. Additionally, developing health literacy in adolescents is expected to enable them to participate in health-promoting activities, which will result in more engaged, productive, and healthier adolescents (Borzekowski, 2009).

Definition. Kickbusch (2008) who defines health literacy as, “the capacity to make sound health decisions in the context of everyday life” (p. 102) reports the three areas that contribute to improvement in health literacy in most people are society and culture, the education system, and the health system. To improve health literacy all three of these systems must be engaged and

health literacy should be emphasized from a young age to promote positive health outcomes. Three steps to health literacy are offered: “1. Take the time to investigate health issues and treatments. 2. Consider the best and most effective ways of improving simple areas of health such as diet and exercise. 3. Select your health information from the most reliable and trusted source” (Kickbusch, 2008, p. 103). These guidelines speak to the more comprehensive nature of health literacy as not just the ability to read and understand material, but the ability to think about health care and decisions, and interact with health systems and providers in regards to your own health. For this study, Kickbusch’s definition of health literacy will be used.

Measurement of Health Literacy. Current measures of health literacy have mainly focused on literacy skills and may not adequately measure the full definition of health literacy as conceptualized by Kickbusch (2008). The Test of Functional Health Literacy in Adults (TOFHLA; Parker, Baker, Williams, & Nurss, 1995) and the Rapid Estimate of Adult Literacy in Medicine (REALM; Murphy, Davis, Long, Jackson, & Decker, 1993) are the most frequently used measures to assess health literacy in adults, but have not been validated in adolescents. These measures help to identify informational materials that can simplify medical instructions and care, but may miss information related to the patient’s knowledge of their condition and other functional skills. Baker (2006) argues more comprehensive measures of health literacy are needed to understand the discrepancy between a patient’s capacity and the demands of their health care system in order to inform education and information development about health matters. Before a measure can be developed assessing these comprehensive domains, recent research has suggested more information is needed from the patient’s point of view and their perspective of health literacy.

Jordan, Buchbinder, and Osborne (2010) conducted a qualitative study of 48 adults (25 to 85 years old) in Australia. Participants included individuals with a chronic health condition (n = 20), individuals who had recently visited an emergency room (n = 14), and healthy individuals (n = 14). There were seven key themes from the patient perspective, which contribute to their ability to seek, understand, and utilize health information in a healthcare setting. The authors defined the seven themes as “knowing when to seek health information, knowing where to seek health information, verbal communication skills, assertiveness, literacy skills, capacity to process and retain information, and application skills” (p. 41). Several of these key themes are directly related to the definition of health literacy provided by Kickbusch (2008). Asking patients about their abilities, which influence health literacy, is important to the understanding of this complex topic and how to measure health literacy in a way that encompasses the patient perspective. Additional inquiries of different populations, particularly adolescents, will further expand upon the knowledge base and give new insight into the development of interventions for health professionals.

A more comprehensive understanding of how patients view health literacy and the important tenets of the concept is needed to assess health literacy according to the definition provided by Kickbusch (2008). Knowledge of patient understanding and perspectives can be used to develop measures to comprehensively assess health literacy and address domains relevant to patients and medical providers. Consequently, improving communication and collaboration between patient and provider. Some of the noted domains important to patients are difficult to directly measure, therefore additional qualitative research on differing populations by age or condition may provide the most relevant information regarding health literacy and aspects important to patients and specific populations.

Health Literacy in Adolescents. Health literacy in adolescents is an understudied topic. Even less research has been conducted on the associations of health literacy in adolescents with a chronic illness. Available research regarding adolescents has demonstrated a strong association between adolescent health behaviors and adolescent literacy skills (Sanders et al., 2009), but there is little examining the comprehensive definition of health literacy previously discussed.

A study by Brown, Teufel, and Birch (2007) looked at 9-13 year old adolescents' health literacy. Over 90% of the adolescents believed they were "very or sort of" healthy, while over 40% stated they were interested in learning about health, and almost two thirds thought kids can do "a lot" to become a healthy adult. School and medical personnel were the informants that taught them the most about health. The greatest predictors for interest in and motivation to follow guidelines about health were age and a belief of personal influence and control over their own health in the future. As participants' age increased motivation and interest to follow the guidelines being taught about health decreased. This information speaks to the need to understand how health literacy is cultivated and can be improved from an early age to produce lasting positive health outcomes. It is especially salient to reach adolescents with a chronic illness early because adolescents who believed they were at least somewhat healthy were 3-4 times more likely to attempt to follow what they were taught about health and be interested in health than their peers who considered themselves unhealthy (Brown et al., 2007).

Much of the research related to child and adolescent health outcomes has focused on parental health literacy. In a review of the literature from 1980 to 2003 DeWalt and Hink (2009) found 44 articles directly addressing the relationship between health literacy and health outcomes, but only 10 of those articles addressed the effects on child health outcomes, and 8 of those 10 looked at parental literacy as opposed to the child's knowledge. Across the studies low

literacy in adolescents and parents was associated with many adverse health behaviors, such as smoking, violence, adherence, correct dosing, and ability to get medicine. Even though a transition to self-management and care of a chronic illness may begin in adolescence, adolescents may not implement the necessary level of care to prevent poor health outcomes (DeWalt & Hink, 2009). Developing health literacy in adolescents fosters a belief that this skill will enable them to participate in health-promoting activities, which will lead to more engaged, productive, and healthier adolescents (Borzekowski, 2009).

Perry (2014) completed an integrative review on the state of health literacy interventions and instruments for adolescents. A total of 10 studies were reviewed, five examining health literacy instrument development and validation and five examining health literacy interventions. There was only one instrument reviewed that showed reliable and valid use with adolescents in English: the Rapid Estimate of Adolescent Literacy in Medicine (REALM-teen; English; Davis et al., 2006). The majority of studies conducted on health literacy in adolescents have used measures that have not been examined for reliable and valid use in adolescents. Thus, there is a need for continued exploration of how to measure health literacy in adolescents and in specific populations of adolescents (e.g., differing chronic illnesses). Accurate measurement of health literacy will lead to a more precise picture of the state of health literacy among adolescents. This knowledge will then inform intervention development and understanding of how to improve health literacy among adolescents.

Health Literacy and PKU. No studies directly examining health literacy in individuals with PKU could be located. However, several studies indirectly looked at health literacy although it was not referred to as such and most did not go in depth about the findings. For example, Weglage and colleagues (1992) conducted a retrospective study on 34 adolescents with

PKU (mean age = 14.6 years old) in Germany. The study examined psychological and social effects of PKU and also looked at adolescents' and their mothers' understanding of PKU. Both mothers and adolescents had poor knowledge about PKU and the diet even though all patients routinely met with doctors and dietary assistants. One third of adolescents reported they did not know the etiology of PKU and only two thirds reported too much protein as the reason for having high blood PHE levels. While the majority of mothers (88.2%) reported PKU was hereditary, a startling number also endorsed believing it was due to too much protein during pregnancy (52.9%) and due to damage during pregnancy (55.7%). This confusion among mothers may contribute to the lack of knowledge among adolescents. Additionally, 59% of adolescents self-reported they could not manage their diet and treatment without the help of their mother. Low levels of knowledge about PKU and treatment resulted in increased dependence on parents to adhere to dietary recommendations. The confusion and misinformation believed about PKU among adolescents and their mothers is concerning and speaks to the need for further exploration into health literacy and disease knowledge in this population.

The knowledge of PKU also was explored in a study of adolescent girls who attended a weeklong metabolic summer camp (Singh, Kable, Guerrero, Sullivan, & Elsas, 2000). A group of 13 adolescent girls were followed over the course of camp, one year following camp, and then for three succeeding years of camp. Camp activities focused on providing education and increasing knowledge about diet, how to prepare low protein meals, how to select appropriate meals at a restaurant, the effects of noncompliance for themselves and future children they might have, reproductive development, and how to integrate the diet into their daily lives. The girls ranged in age from 11 to 18 years with a mean age of 13 years old. Data on knowledge of PKU

and diet were collected using multiple-choice questionnaires on the first and last days of camp then at 4, 8, and 12 months following camp.

Results immediately following camp were overwhelmingly positive. All participants had decreased PHE levels and greater knowledge about PKU and the diet compared to the start of camp. Participants universally reported having a more positive attitude towards PKU, feeling less isolated because of PKU, and saw fewer barriers to following the diet at the end of camp. Longitudinally, similar results were obtained following each subsequent year of camp. Participants had higher knowledge about their diet one year later compared to new camp participants and repeat camp participants demonstrated more knowledge about PKU. Noteworthy is that the majority of girls in this study were aware of the benefits of adhering to their diet and medical formula before coming to camp, but still had elevated blood PHE levels. While all participants gained knowledge, these results suggest there may be other psychosocial or environmental factors that also contribute to improved outcomes and adherence, especially since maintenance of post camp PHE levels was not achieved once participants returned home. Singh and colleagues (2000) explained this related to a number of factors stating, “The long-term decreased dietary compliance was associated with lack of support, feelings of peer rejection, and increased barriers due to lack of information and availability of PHE-restricted foods” (p. 802). Although these results indicate health literacy can be improved in adolescent girls with PKU, further research is needed to see if the results seen post camp could be replicated in other settings (e.g., schools, medical clinics) and maintained over time.

A more recent study explored knowledge of PKU among parents of 161 PKU patients and 62 PKU patients (Bekhof et al., 2003). A survey of 14 questions asking about the cause of PKU, outcomes, definition of PHE, and diet specific questions was administered to parents and

PKU patients. Results showed parents had greater knowledge about PKU than their children and adolescents. However, overall only 52% of parents were able to answer three fourths of the questions correctly and only 29% of PKU patients answered three fourths correctly. Parents and patients with PKU struggled with knowing the amount of PHE in different food items and what happens to PHE levels when you do not eat for an extended period of time. After adjusting for confounding variables there was not a significant relationship between knowledge and blood PHE levels. The authors report it is not just knowledge that influences metabolic control, but believe psychosocial, emotional, and environmental factors also may influence adherence.

Di Ciommo and colleagues (2012) conducted a qualitative study in Italy to explore the lived experiences of children, adolescents, and young adults with PKU. The study explored responses to four specific research questions 1) how patients learned about PKU and conceptualized it, 2) how they did or did not follow the diet in everyday life, with an emphasis on school, 3) their perceptions of risk associated with inadequate treatment adherence to diet, and 4) how they believe PKU impacts their social and family life. Twenty interviews were conducted with individuals with PKU who were older than seven years.

The majority of patients viewed PKU as something other than a disease. Participants described PKU as an “allergy,” “problem/trouble,” “intolerance,” and “disorder” and one 10-year-old boy stated, “No. Disease is when you feel ill and allergy is something you can’t eat!” (Di Ciommo et al., 2012, p. 231). The majority of responses also indicated patients see themselves as healthy and not ill. A 14-year-old boy shared he did not feel ill and in response to being asked if he ever gets ill replied, “No. And then if I am ill it’s not related to Phenylketonuria” (p. 231). Another theme discovered was not feeling a risk of immediate consequences for not adhering to diet or treatment recommendations. Patients reported not

feeling pain or other somatic complaints when they had been non-adherent, but some patients did report noticing behavioral and mental changes (e.g., feeling more irritated, not being able to reason as well). This study provides further insight into the current knowledge on health literacy related to how patients conceptualize PKU and their understanding of the risk of not adhering to treatment.

Another Italian qualitative study conducted by Vegni and colleagues (2009) found similar results. The majority of participants did not describe PKU as a disease. Participants had difficulty describing PKU and knowing details about the consequences of the condition. Children and adolescents often referred to their doctors and parents explaining some of it to them but not fully understanding PKU. In general there was a lack of knowledge about PKU across participants indicating a need to improve knowledge and understanding of PKU among patients across the age span by reinforcing and continuously providing and updating information at differing age spans.

In conclusion, little is known about health literacy in adolescents. Further research and investigation is needed into general and specific health literacy among healthy adolescents and adolescents with chronic health conditions. The majority of studies have focused on adult populations and additional information is needed to understand the state of health literacy in adolescents. Health literacy also should be examined from the adolescents' perspective to gain insight into the unique abilities and factors pertaining to this age group. Furthermore, appropriate ways to assess health literacy and effective interventions for improving health literacy among adolescents with chronic health conditions is needed. No studies directly examining health literacy in individuals with PKU were found. Gathering information about health literacy in this population and specifically the perspectives of adolescents living with PKU on their condition

will inform and guide additional research on how to conceptualize and measure health literacy and inform intervention development.

Conclusions

Adolescents with PKU face a wide range of challenges and unique needs based on their biological predisposition to certain cognitive and psychological problems and the psychosocial implications of living with a chronic illness that can impact social functioning and QoL. While the prevalence of these sequelae has been largely documented in the literature there is little knowledge about the perspectives and experiences of the adolescents themselves and health literacy has yet to be examined in individuals with PKU. Furthermore, this population and these domains related to PKU have rarely been studied in the United States leaving a need for investigation into the experiences and perceptions of adolescents with PKU. This study aimed to gain an in-depth understanding into the perceptions and experiences of adolescents with PKU by addressing current gaps in the literature.

CHAPTER THREE:

METHODS

This qualitative interview study explored the perceptions of quality of life, peer relationships, and health literacy of adolescents with PKU. This chapter describes the methodology used to conduct the study. It begins with a detailed description of the research paradigm that guided the inquiry, and then describes the research design, participants, data collection and procedures, data analysis, ethical considerations, and validity measures that were used for the study.

Research Paradigm

A research paradigm is a worldview that guides the researcher based on ontological, epistemological, and methodological assumptions (Guba & Lincoln, 1994). Ontological assumptions tell us what is real, while epistemological assumptions tell us where knowledge comes from and how we know what we know, including the relationship between an individual and what is known (Crotty, 1998; Guba & Lincoln, 1994; Willis, 2007). These assumptions guide the qualitative researcher through the research process by providing a context and shaping the way the researcher views the research process, as well as, the decisions they make regarding the production of knowledge during the research process (Crotty, 1998). Methodological assumptions then outline the rationale, techniques, procedures, and processes to conduct the research and how the researcher links methods to desired outcomes to learn and gain knowledge

about the world (Crotty, 1998: Guba & Lincoln, 1994). These guidelines also shape how what is studied is understood and interpreted by the researcher.

Researchers who ascribe to interpretivist philosophy accept there is not one true reality, but that multiple realities exist and are constructed through the experiences, interpretations, and meanings an individual prescribes to them (Denzin & Lincoln, 2013; Gall, Gall, & Borg, 2007). Therefore, interpretivists do not seek to find one single truth. Instead, from an interpretivist point of view the aim is to understand and interpret the meaning of experiences through an individual's own understanding of their interaction with their environment (Schwandt, 2000). Similarly, Lichtman (2013) describes interpretivism as focusing on "analyzing meanings people confer on their own actions" (p. 24). Furthermore, each individual's perception of their experience is valid due to the unique interaction between the individual and the environment they live in. Because knowledge is created from the experience of the individual and the individual cannot separate himself or herself from what they know, interpretivists trust in specific, local, created realities (Guba & Lincoln, 1994). As such, an individual constructs the world around them based on their own experiences and the meaning they place on their own actions. In interpretivism the reality the individual has created is emphasized and the goal is to understand experiences within a particular context (Sipe & Constable, 1996).

An interpretivist paradigm guided this study. Using the core principle of the interpretivist paradigm, I believe there is not a single or a correct way to experience living with a chronic illness and no "truth" to be discovered about living with PKU. Instead, I believe adolescents with PKU create meanings from their own experiences with PKU, which are varied and unique to each individual. Therefore, in this study I did not seek to reveal the "truth," but instead sought to understand the experience of living with PKU from the perspective of the adolescents

interviewed. Interviews are a research method “where knowledge is constructed in the interaction between the interviewer and the interviewee” (Brinkman & Kvale, 2015, p. 4). Through interviews with each participant I gained and created knowledge of the authentic experiences of each adolescent with PKU by learning about the meaning and understanding they place on their experiences.

Research Design

The aim of a qualitative interview is to “understand the world from the subjects’ point of view, to unfold the meaning of their experiences” (Brinkman & Kvale, 2015, p. 3). Interviews are an excellent way to learn how individuals interpret the world around them and the particular experience of an individual in a given context (Willis, 2007). The aim of an interview is to understand and interpret human behavior by generating knowledge. Interviews allow knowledge to be constructed out of the interaction and dialogue between the interviewer and the interviewee. This study utilized an interview design based on a romantic conceptualization of interviewing guided by recommendations from Brinkmann and Kvale (2015) and Roulston (2010a, 2010b).

Roulston (2010a) described a romantic conception of interviewing as focusing on the relationship between the interviewer and interviewee. Based on the rapport developed between the interviewer and interviewee intimate conversation is created during the interview, which allows the authentic self of the interviewee to be revealed (Roulston, 2010a). Through established trust and intimate conversation between the interviewer and interviewee, in-depth information is produced that allows rich insight into the participant’s worldview and experiences (Alvesson, 2003). A romantic conception of interviewing celebrates my role within the research and allowed me to develop a relationship with my participants and openly show my interest in

the topic. I also provided them with verbal and nonverbal feedback and encouragement throughout the interview process such as “mmhmm” and “that makes sense to me” and nodding my head.

Five adolescents with PKU participated in a series of interviews to better understand their experience living with PKU. Specifically, the interviews explored how they believe PKU impacts their peer relationships, their knowledge and understanding of their condition and its treatment, and their perception of the influences on their quality of life. Each adolescent with PKU provided in-depth information that was essential to increasing understanding of the beliefs and perceptions of specific adolescents about how PKU impacts their peer relationships, influences their quality of life, and how they understand PKU and its treatment. It was not a goal for this study to generalize the findings to all adolescents with PKU. Instead the primary goal was to understand the experiences and beliefs of the specific adolescents selected to participate in this study. As a result, the themes and results of the study may inform future research for the larger population of adolescents with PKU.

Participants

Purposeful sampling was used in order to obtain participants that were “information-rich” and helped achieve an in-depth understanding of the phenomena being studied, living with PKU (Patton, 2002). Criterion based selection is a type of purposeful sampling method that chooses participants based on a set of pre-established criteria by the researcher (Gall, Gall, & Borg, 2007; Roulston, 2010b). In this study criterion sampling was used to select adolescents who were able to participate in the interviews and provide detailed information into their experience of living with PKU. Each participant met the following criteria for the study: 1) diagnosed with PKU and treated with a restricted diet; 2) between the ages of 11-18 years; 3) continuously treated for

PKU; 4) willing and able to provide assent to participate in interviews; 5) parents or caregivers willing to provide consent for participation in interviews. Individuals who had intellectual disabilities, were not fluent English speakers, or had not been continuously treated for PKU were excluded. Individuals with an intellectual disability were excluded due to the potential limited ability to fully reflect on their experiences living with PKU and share those experiences through interviews. Additionally, individuals who had not been continuously treated were excluded because they may have experienced different challenges associated with being on and off treatment due to biological and environmental variables.

The goal of this study was to gain an in-depth understanding of the experience and perceptions of adolescents with PKU. A total of five adolescents participated in the study. Lichtman (2013) reminds us that because the “goal in qualitative research is to describe and interpret rather than to generalize, there are no hard rules about how many participants you should study” (p. 193). Rather the purpose of qualitative research is to look at the particulars of an experience and context and it is not meant to generalize findings to a larger population (Lichtman, 2013). The literature indicates fewer participants are needed when large amounts of data are collected from the same participant through multiple interviews and the quality of the data is rich and focused on experiences (Morse, 2000). Additionally, fewer participants may provide a sufficient understanding of a topic when studying a hard to reach population (Baker & Edwards, 2012). Adolescents with PKU proved to be an extremely hard to reach population. The section that follows describes recruitment procedures and efforts made to reach this population.

Recruitment

Participants were recruited over eight months through pediatric metabolic clinics in Florida and through online sources (i.e., Facebook and the National PKU Alliance). Descriptions of recruitment procedures used at each site are described below.

Pediatric Metabolic Clinics. Participants were recruited through four pediatric metabolic clinics across the state of Florida, the University of South Florida's Division of Genetics and Metabolism Metabolic Genetics Clinic, the Metabolic Clinic at St. Joseph's Children's Hospital, the Pediatric Genetics Clinic at Arnold Palmer Hospital for Children, and the University of Florida Health Shands Children's Hospital. Each metabolic clinic provides diagnosis, genetic counseling, dietary management, and metabolic monitoring to its patients. The clinics provide care to pediatric and adult patients from birth through adulthood with a range of inherited metabolic disorders. Each patient and their family work with a variety of medical providers including a genetic counselor, a metabolic dietician, and a metabolic geneticist. Patients attend clinic to discuss dietary management, monitor metabolites, and discuss challenges and symptoms they are experiencing. Patients typically attend quarterly to yearly scheduled visits based on their metabolic control and age. However, patients are often seen more frequently to provide the level of care they need.

Initially the metabolic dietician in each clinic identified a list of all patients falling in the determined age bracket. After developing the list, they completed a screening questionnaire (Appendix A) for each potential participant to rule out any active patients who did not meet the inclusion criteria for the study. All potential participants who were within the age range, had been continuously treated for PKU, were on a diet for treatment, were fluent in English, and did not have a known intellectual disability were invited to participate in the study. The metabolic

dietician contacted each potential participant via phone or e-mail to introduce the study and ask if they were interested in the study (Appendix B). Potential participants who were interested in the study were given my contact information and told to contact me for further details. Per the University of South Florida Institutional Review Board (IRB) guidelines, I was not permitted to conduct direct recruitment of potential participants. Eight adolescents were informed about the study from the USF Metabolic Genetics Clinic and approximately 10-12 adolescents were informed about the study from the Metabolic Clinic at St. Joseph's Hospital. I was unable to obtain information about how many potential participants were informed about the study from the Pediatric Genetics Clinic at Arnold Palmer Hospital for Children or the University of Florida Health Shands Children's Hospital. I received a total of four inquiries from individuals of these metabolic clinics. Two were from the USF Metabolic Genetics Clinic and two were from the Metabolic Clinic at St. Joseph's Hospital. Three inquiries were from parents (two via e-mail and one phone) and one was from an adolescent (via e-mail). For e-mail inquires I asked to set up a time to speak with a parent on the phone. During the initial phone contact I provided them with information about the scope, purpose, and involvement for the study. An additional screening interview was completed with a parent of each participant to ensure they met the inclusion criteria using the screening questionnaire (Appendix A). All three inquiries from parents were able to set up a time to speak on the phone and complete the screening interview. I was not able to reach the parent of the adolescent who inquired about the study. As a result, a total of three participants were recruited through the metabolic clinics. Two participants were recruited from USF's Metabolic Genetics Clinic and one participant was recruited from the Metabolic Clinic at St. Joseph's Children's Hospital.

Online Sources. Social media also was used to recruit participants due to the very limited response from the metabolic clinics. Recruitment on social media began after obtaining approval from the USF IRB. Participants were recruited through PKU support groups and organizations on Facebook and through an e-mail blast from the National PKU Alliance. A flyer (Appendix C) with information about the study was posted to 16 Facebook groups related to PKU asking interested participants to send me a private message or e-mail to get further information about the study. The groups ranged from teen groups, to parent groups, to state support groups, to general awareness or support groups. Some groups were private and some were public. I asked to join several groups and was allowed to post once I was given access to the groups. One group deleted and removed the post reporting it was not appropriate for the aim of the group. The exact reach of the posts is unknown and it is not possible to track how many people saw the posts. However, the total membership and participation of all of the groups where the flyer was posted included 29,186 people. It is estimated that some of these people may be in multiple PKU groups and therefore this may be an overestimation of the number of people who saw the posts. In addition, at least six individuals shared the post and it is unknown how many additional people saw these shared posts. The posts received 35 total “likes” and 17 comments from individuals.

I received nine inquiries through private messages, e-mails, or comments on the posts about participating in the study. Each inquiry was responded to through a private message or e-mail with a brief description of the study and the initial steps to gain consent to participate. For inquiries from adolescents information was provided about the need to speak with their parent or guardian about obtaining consent to participate in the study. For inquiries from parents or guardians each individual was asked if they would like to set up a time to talk on the phone or

through video conferencing (i.e., Skype or FaceTime) about the study. Of the nine inquiries, three were from individuals who did not meet initial inclusion criteria for the study. Of the remaining six inquiries, three were from adolescents and three were from parents of adolescents with PKU. Of the six inquiries that met initial criteria for the study only two responded to requests to speak with me over the phone or video conferencing. One was a member of the group “PKU Friendly” and the other was a member of the group “Support for PKU Parents.” Two parents completed phone calls reviewing information about the study and completed screening questionnaires for their adolescent with PKU. After reviewing the consent forms verbally over the phone, consent forms were e-mailed to each parent to sign and return via e-mail. Only one parent returned consent forms and scheduled a screening interview for his adolescent. As a result, only one adolescent was recruited through a PKU support group on Facebook.

The National PKU Alliance is a non-profit organization that aims to improve the lives of families and individuals with PKU through research, support, education, and advocacy. I contacted the Executive Director and the Project and Communications Coordinator via e-mail to ask for assistance in recruiting participants for the study. The Executive Director agreed to share my study. The National PKU Alliance sent an e-mail blast with the flyer for the study to their e-mail list and also posted the flyer to their Facebook page. The project and communications coordinator reported the Facebook post reached 2,609 people. The flyer was sent to 1,058 e-mails and was opened by 352 people. I received four responses to the e-mail flyer. One inquiry was from a parent of a child outside the age range of the study. One was a narrative response from a grandfather of two children with PKU supporting the study. One was a response from a researcher interested in the findings of the study. One parent responded to the e-mail and expressed interest for her son to participate. The remaining recruitment procedures were the

same as those used for Facebook. In total, one adolescent was recruited through the National PKU Alliance in response to the e-mail blast.

Procedures

Pilot Test. A pilot test was completed prior to beginning recruitment for the study. The pilot test was conducted to test the questions to be included in the interviews on quality of life, peer relationships, and health literacy, determine the approximate length of the interviews (Roulston, 2010b), and assess the relevance of questions to individuals with PKU. The pilot test was completed with a 34-year-old adult female with Classic PKU who reflected on her experiences as an adolescent. The pilot test participant was chosen based on recommendations from the metabolic dietician and geneticist at the USF Metabolic Genetics clinic. She expressed an interest in participating in the study and gratitude that I was conducting a study on the experiences of adolescents with PKU. The pilot participant works as an advanced registered nurse practitioner and lives in a small city in the southeast. She is married and her current treatment is a very strict low protein diet and supplemental medical formula. Her family and friends are currently all aware of her PKU diagnosis and she reported as an adolescent her family and close friends were also aware of her PKU diagnosis. She reported she was well connected with the PKU community and knew others with PKU as an adolescent. The pilot study participant met all study inclusion criteria, with the exception of falling outside the age range for study participants. The three interviews for the pilot test were completed in one hour and 45 minutes. Each individual interview took between 25 to 45 minutes. The pilot study participant reported the interview questions were logical, relevant to the experiences of an individual with PKU, and made sense to the participant. The results of the pilot test were not included in data analysis.

Consent. During the first contact I had with each parent and potential participant the IRB approved parent consent (Appendix D), adolescent assent (Appendix E), or adult consent (Appendix F) forms were verbally reviewed in detail. This occurred after the screening questionnaire was completed with parents and prior to the screening interview for each participant. For in person interviews consent and assent forms were given to the parent and adolescent and they were given time to review the forms and ask any questions prior to providing consent. For video conferencing participants the consent and assent forms were e-mailed to the parent and they were asked to return them via e-mail once they had time to review the forms and ask any questions.

Screening Interview. A screening interview was completed with each participant to determine if they were able to provide in-depth information and answers in line with the purpose of the study. The screening interview also provided an opportunity to build rapport and learn about each participant. A brief semi-structured interview guide was used for the screening interview (Appendix G). All participants who completed the screening interview were determined to meet criteria to participate in the study. The screening interviews lasted between 20-32 minutes. At the end of the screening interview participants were asked to select a pseudonym to be used in place of their name to protect confidentiality.

Demographic Questionnaire. Each participant completed a demographic questionnaire (Appendix H) at the end of the quality of life interview. Demographics for each participant are reported in Table 1. The demographic questionnaire gathered information such as ethnicity, type of PKU, and treatment received for PKU. The demographic questionnaire also provided additional information about the participant's knowledge of their condition and their treatment. The demographic questionnaire took approximately two to three minutes to complete.

Adolescents interviewed in person completed the questionnaire independently. For adolescents interviewed on FaceTime I asked the questions while each participant verbally responded and I recorded their responses on the questionnaire.

Table 1

Demographics of Study Participants

Pseudonym	Gender	Age	Race	Type of PKU	Treatment
Isaiah	Male	15	Caucasian	Classic	Low Protein Diet Medical formula
Santiago	Male	14	Hispanic	Classic	Low Protein Diet Medical formula Kuvan
Oliver	Male	18	Caucasian	Classic	Low Protein Diet Medical formula
Jack	Male	14	Caucasian	Classic	Low Protein Diet Medical formula
Jamie	Male	17	Caucasian	Classic	Low Protein Diet Medical formula Kuvan

Note. Kuvan = sapropterin, the only approved medication for treatment of PKU.

Interviews. I conducted all interviews in person or over FaceTime. Every interview was conducted one-on-one to allow the interviewee to provide honest information and responses without influence from others or concern about their responses. Thirteen interviews were conducted in person and 12 interviews were conducted over FaceTime. At the beginning of each interview I informed the participant the interview was being audio recorded, reviewed confidentiality, and provided participants an opportunity to ask any questions before beginning the interview. Interviews ranged in length from 26 minutes to an hour and 32 minutes. Interviews were completed in four or five sessions with each participant. One participant completed the

screening interview and the first interview on the same day for a total of four sessions. Another participant completed the quality of life interview and the peer relationships interview on the same day for a total of four sessions. All other participants completed each interview during an individual session for a total of five sessions. None of the participants requested to stop the interviews at any time due to distress or discomfort, and therefore there was not a need to provide information for a referral to USF Health Psychology services.

Location. To strengthen rapport and improve trust between the participants and myself interviews were conducted at a location of the participant's choosing to ensure the setting was somewhere comfortable to the person and a quiet and private place (Lichtman, 2013). One adolescent who was interviewed in person elected to complete the screening interview and the first interview at a public library in a private study room. The remaining interviews were completed at the participant's home. The rest of the adolescents chose to complete all of the interviews in their homes.

Compensation for Participation. Participants were given a \$10 gift card for their participation in each interview. Therefore, each participant received a total of \$40 in gift cards for participating in the study. For in-person interviews gift cards were given after each interview. For video conferencing interviews one participant elected to receive the total amount of gift cards electronically and the other participant elected to receive the gift cards in two installments sent through the U.S. mail. The pilot study participant was given a \$30 gift card for her participation.

Data Analysis

Data analysis utilized an inductive and thematic analysis approach across participants and interviews in order to interpret common themes and patterns among participants. My goal was to

explore the themes and patterns that naturally occurred in the data rather than apply predetermined codes to the data. Therefore, I followed a six step thematic analysis process outlined by Braun and Clarke (2006).

First, I transcribed all interviews verbatim. Then I read each interview while listening to the recording of the interview to become familiar with the voices of my participants and the experiences they shared (Braun & Clarke, 2006). As I listened I wrote down some initial impressions and thoughts about the data. For the second step, I reread the transcripts again and generated initial codes across my data. I used both descriptive codes that summarized what participants were talking about, in vivo codes that used their words to represent a piece of data, and codes related to my research questions. In vivo coding was chosen as a method because it highlights the participant's voice and has been noted as a useful method when working with youth to gain a broader understanding of their worldview (Saldaña, 2009). Descriptive codes use a word or short phrase to summarize the topic in a section of data and were used to understand and highlight topics and influences generated by my participants (Saldaña, 2009).

The third step began with me grouping the codes into categories and potential themes by creating word maps of the potential themes and subthemes. This process required me to look across the codes and potential themes and condense similar or redundant codes into unified, representative themes. I then collected data that were relevant and representative of each potential theme. The fourth step of analysis necessitated checking the themes to make sure they were representative of individual coded extracts and the entire data set as a whole (Braun & Clarke, 2006). I then created new thematic maps of the themes. During the fifth step of analysis I looked for commonalities and developed interpretations of what the themes mean, what was represented in the data, and how the themes related to one another. This was an ongoing process

that resulted in generating names for the themes to allow for understanding of what they represent and what they explain (Braun & Clarke, 2006; Brinkmann & Kvale, 2015). Finally, I selected compelling examples of the themes in the data set to answer my research questions and represent my analysis.

Validity Measures

Several strategies were used to enhance the credibility of the study including reflexivity, data recording, member checking, detailed description of methods, and low inference descriptors (Peshkin, 1988; Roulston, 2010b; Tracy, 2010). Additionally, multiple interviews with each participant allowed development of rapport and relationships and established an ongoing interaction between the interviewer and the interviewee (Roulston, 2010a).

Role of the Researcher/Reflexivity. Reflexivity is a tool in the research process that “acknowledges the researcher’s role in the construction of the research problem, the research setting, and research findings” (Pillow, 2003; p. 179). Consistent with a romantic conception of interviewing, I acknowledge that as the researcher I am not objective and play a role in the research process (Roulston, 2010b). Furthermore, romantic interviewers are aware of their own subjectivities (Roulston, 2010b). Reflexivity is an ongoing process that continually reveals personal subjectivities and was revisited and revised throughout the research process (Roulston, 2010b). Part of the reflexivity process was learning about my own personal qualities and feelings that are made known through my interaction with the research phenomenon (Peshkin, 1988).

As part of my reflexivity process I wrote a reflexivity statement prior to beginning the data collection process, I also wrote in a journal during recruitment, throughout data collection, and during the data analysis process. My journaling during recruitment included my reactions (e.g., frustration, disappointment, annoyance) and thoughts about the difficulties I encountered

(e.g., lack of interest, too many middle men in the process). My journaling during the data collection process included brief statements about the interactions with my participants, thoughts on their responses, engagement, and interest in the study. I also documented initial reactions (e.g., excitement, curiosity), thoughts, and themes I had during the interviews. During the data analysis phase my journaling focused on looking across participants and the entire data set.

Reflexivity requires being honest and transparent about my preconceived biases and conceptions about the topic, participants, and expected discoveries (Tracy, 2010). As part of that process, I describe what led me to be interested in researching adolescents with PKU and what developed along the way. Food is an integral part of our lives as part of culture, socialization, and sometimes even identity. Social situations and interactions almost always involve some kind of food or drink and sharing food is a meaningful experience. Yet, when you live with a restricted diet eating and social situations can be a source of stress, anxiety, or even frustration. I know this from my own personal experience living with a restricted diet. Eating requires constant vigilance and social situations are often permeated with thoughts of “will there be anything I can eat” or “will I have to explain why I can’t eat ... again” or even “will I be excluded next time because it’s easier to not have to worry about my restrictions and special needs?”

My foray into life with a severely restricted diet, due to medical necessity, began as an adult. In the early years I lived a constant battle trying to balance participating in social events, without being different or needing to change plans, and adhering to a diet that was required to prevent me from getting sick. Even as an adult, and perhaps as a result of this occurring later in life, it took time to learn how to negotiate and feel comfortable in these situations. Years later I’m able to navigate social and food situations without worry or concern, but when I learned

about PKU I wondered how children and adolescents navigated such situations. Admittedly my interest initially arose out of my own experience and struggles living with a chronic condition, but then grew as a result of my interactions with patients with PKU in the metabolic clinic.

As a psychologist, I value and recognize the importance of the therapeutic relationship and was drawn to qualitative inquiry and romantic interviewing because of the emphasis on developing rapport between the interviewer and interviewee with the goal of uncovering the authentic self. Coming from a post-positivist background I initially struggled with my beliefs about knowledge and reality. Through examination of my own experiences, the principles of interpretivism resonated with me. No one else has had the same experience I have with my condition. I have seen my perspectives change over time and as a result of the environment I'm in, my own understanding, and my experiences. However, I also recognize that my own experience does not mean I know the truth of their experiences or know specific areas or concerns in their reality and was frequently confronted with this truth throughout the conversations I had with my participants. Through my work in medical clinics and hospitals I believe the old adage "children should be seen and not heard" is often still employed when working with youth with chronic illnesses. As a psychologist who focuses on children and adolescents with chronic illnesses I strive to empower youth to advocate for themselves and be active participants in their medical care. Consequently, in this study my goal was to tell the experience adolescents have living with PKU and how they believe PKU impacts different aspects of their life. I desired to help them to tell the stories they haven't previously told or shared in order to better understand their experiences and share their perspectives so they are not only seen but also heard.

Data Recording. Each interview was audiotaped. I recorded notes after interviews, after listening to each interview recording, and while reading each transcription. Each interview was transcribed verbatim and was listened to again while following along with the transcription to assess accuracy and make any corrections or changes.

Triangulation. Triangulation was conducted by completing multiple interviews over multiple days with the same participant. Each interview briefly discussed and reviewed the prior interview and addressed any questions, concerns, or thoughts that arose after the interview to confirm the meaning of the previously collected data.

Member Checking. Member checks were completed with each participant throughout the data collection and analysis process. I provided interview summaries for each participant and interview. Each participant had the opportunity to provide feedback and describe if they believed their beliefs and perspectives were accurately described in the summary across the interviews. The goal of the member checks was to confirm adequate understanding and accuracy of the data collected in the interviews. When needed participants were asked follow-up questions to clarify their responses and beliefs. Additionally, participants were provided a copy of the transcripts of each interview to review and assess for accuracy. Participants reported some areas of confusion and I discussed these areas and resolved them during the member checks. This resulted in greater clarity and understanding of their beliefs and perspectives related to the interview questions.

Detailed Description of Methods. To address rigor and sincerity a detailed account of the methods used in the study is provided (Tracy, 2010). This description provides a step-by-step process that can be replicated and makes the intended process transparent (Roulston, 2010a) and replicable for any readers of the study.

Low Inference Descriptors. Direct quotations were used to illustrate the themes and concepts that emerged from the interviews. The aim of using direct quotations was to minimize bias, interpretation, and allow the reader to connect with the perspective of the participant (Roulston, 2010b). Additionally, the use of direct quotations was to show the reader perspectives of the participants and allow them to come to conclusions about the data presented (Tracy, 2010).

Ethical Considerations

Children and adolescents are considered a vulnerable population and those with chronic health conditions, including PKU, may be considered more vulnerable. Therefore, precautions were taken to ensure ethical conduct and treatment for the participants in the study. There are several guidelines on ethical considerations when conducting an interview study regarding consent, confidentiality, and the risks and benefits of participation in the study (Brinkmann & Kvale, 2015; Opsal et al., 2015; Wolgemuth et al., 2014). First, approval to conduct the study was obtained from the University of South Florida Institutional Review Board (IRB). No data was collected until approval was received. Second, steps were taken to ensure confidentiality of participants. Consent and assent forms were kept in a locked cabinet at my residence. No personally identifiable information was disclosed during the research process or when reporting results of the study. Participants chose a pseudonym after completing the screening interview and were only referred to by that pseudonym in all written notes and transcripts. I am the only one with knowledge of the pseudonyms participants chose to go by. Demographic questionnaires and screening questionnaires were labeled with the pseudonym to protect participant confidentiality. Only participant's first names were used in e-mail correspondence during the study and no pseudonyms were used in e-mail correspondence. Participants were provided with information

about what would be done with the data collected and my right to publish all or parts of the interviews, using a pseudonym without any personally identifiable information in written results of the study. Noted benefits to participating in interview research include self-expression, learning there are others who share participant experiences, understanding and accepting their experience, and the possibility of helping others (Opsal et al., 2015). I aimed to enhance participants benefits of participating in the study by validating and empathizing with their experiences, developing rapport and a trusting relationship with each participant, asking about personal experiences, using personal disclosure when it was appropriate, and conducting multiple interviews with each participant (Opsal et al., 2015; Wolgemuth et al., 2014).

CHAPTER FOUR:

RESULTS

The purpose of this chapter is to present the results of this interview study and answer the following research questions: 1) *How do adolescents with PKU describe their quality of life? What factors do they identify that positively and/or negatively impact their quality of life?* 2) *How do adolescents with PKU describe their social lives? What challenges, if any, do they experience in social situations and peer relationships?* 3) *How do adolescents with PKU believe their life is different from their peers?* and 4) *How do adolescents with PKU conceptualize and understand their condition? How do they describe and make sense of their treatment?* The data analyzed represent the beliefs and perspectives of five adolescent males with PKU. The chapter begins with a description of each participant in the study. Next, themes are presented in relation to each research question including quotes from the participants. In addition, one extra emerging theme is presented that occurred in the data and was not directly connected to the research questions. These data were analyzed using thematic analysis based on Braun and Clarke's (2006) six-phase process.

Participant Descriptions

Descriptions of each of the five adolescents with PKU are described below. These descriptions include information collected from the screening questionnaire and interview, as well as the demographic questionnaire and transcribed interviews. All names are pseudonyms to

protect the identity of each adolescent who participated in the study. Participants chose their own pseudonyms.

Isaiah Thomas. Isaiah is a 15-year-old white male. He is in the 10th grade at a public charter high school and enrolled in advanced classes. He was diagnosed with Classic PKU at birth. Isaiah's treatment includes a special low protein diet and a daily medical formula. Isaiah reported all of his family and a few friends know about his PKU diagnosis. His mother reported he has always received treatment and been on a diet for PKU. Isaiah is an only child and lives with his mother and father in a small suburban community in the southeast. Isaiah was reserved around his family, but became extroverted during interviews and it was easy to establish rapport with him. He had a great sense of humor and was very articulate in his responses to interview questions. Isaiah plays soccer and enjoys the guitar. Isaiah reported he did not know anyone else with PKU.

Santiago. Santiago is a 14-year-old Hispanic male. He is in 8th grade at a public middle school. Santiago reported he did not know what type of PKU he was diagnosed with at birth. His father reported he was diagnosed with Classic PKU. Santiago's treatment includes a daily medical formula and Kuvan (sapropterin, the only approved medication for treatment of PKU). Santiago reported everyone knows he has PKU. His father reported he has always been on a low protein diet for PKU. Santiago is an only child. His parents are divorced and he lives primarily with his mother but sees his father "maybe every other day." He lives in a small city in the southeast. Santiago speaks both English and Spanish but prefers English. He participates in band at school. Santiago was reserved throughout the course of the interviews. He was extremely polite and respectful, and typically provided short answers without much elaboration. Santiago reported he did not know anyone else with PKU.

Oliver. Oliver is an 18-year-old white male. He graduated high school one year ago from a public high school. Oliver works full time at two jobs. He lives with his mother, father, and younger brother. He also has an older sister who does not live at home. Oliver reported he was diagnosed with Classic PKU at birth. His treatment includes a low protein diet and daily medical formula. Oliver reported family and some friends know he has PKU. His mother confirmed he has always followed a diet for PKU. Oliver was animated and verbose during the interview process. He was very expressive and often used his hands while talking. Oliver shared examples and provided expansive responses to questions. Oliver enjoys working on cars and spending time with his friends. Oliver reported he did not know anyone else with PKU.

Jack. Jack is a 14-year-old white male. He is in 9th grade at a public high school. When asked what type of PKU he is diagnosed with Jack reported he was unsure. Jack's father reported he was diagnosed with Classic PKU at birth. Jack's treatment includes a special low protein diet and a daily medical formula. Jack reported "anyone who has asked" knows he has PKU. His father reported he has always received treatment for PKU, and his diet has increased as he has gotten older to allow for a broader range of foods. Jack lives with his mother and father and has two older sisters who live outside the home. Jack lives in a small city in the south. Jack was articulate and seemed wise beyond his years often using advanced vocabulary in conversation. He was insightful and provided in-depth answers with honesty and clarity in response. Jack enjoys spending time with his family and friends and prefers indoor activities such as watching Netflix. Jack reported he has casually met others with PKU at PKU events he has attended in the past.

Jamie. Jamie is a 17-year-old white male. He is in 12th grade at a public high school and is enrolled in mostly advanced placement classes. Jamie reported he was diagnosed with Classic

PKU at birth. Jamie's treatment for PKU includes a special low protein diet, daily medical formula (PheBLOC), and Kuvan. Jamie reported anyone who knows him knows he has PKU. His mother reported he has always received treatment for PKU and been on a diet. Jamie lives with his mother and father in a large metropolitan area in the west. He has two older brothers who live outside of the home, one who also has PKU. Jamie was very relaxed and easy to talk to. Despite his laidback style, Jamie was thoughtful and reflective with his answers frequently taking a few seconds to think before responding to questions. Jamie plays rugby and enjoys surfing and snowboarding. One of Jamie's older brothers has PKU and Jamie also has casually met others with PKU through PKU community events.

Research Question 1: How do adolescents with PKU describe their quality of life? What factors do they identify that positively and/or negatively impact their quality of life?

Two themes emerged that were related to how adolescents described their quality of life and the factors that influence their quality of life: 1) positive description and satisfaction with life because "it could be worse", and 2) relationships, both positive and negative, are the most important.

Theme 1: Positive description and satisfaction with life because "it could be worse"

All of the adolescents in the study described their life overall in positive terms. They reported positive social-emotional experiences, thinking about their life in positive terms, reframing challenges in an adaptive way, and feeling satisfied with their lives. The immediate response from all participants was positive when asked questions about their satisfaction, mood, and how they feel in general about their life. For instance, Santiago and Jack immediately responded with "good" and "great" to describe how they felt about their life. Oliver described his life as "crazy, but fun", and Isaiah stated, "My life in general is a, it's a really, happy, great life."

As participants thought more about their lives and were asked additional questions they were able to identify and report areas of difficulty in their lives, including stress, school, and problems with family or friends. Yet it remained that when they were asked about their overall appraisal they consistently returned to focusing on the good things and describing their life in positive terms. Participants described their life in terms of current circumstances and events happening to them, as well as taking time to reflect and think about experiences throughout their life.

Participants described their satisfaction with life in overall positive terms. Jack, Jamie, and Oliver all reported being “very satisfied” with life, and Isaiah reported his satisfaction was “9 out of 10.” While participants acknowledged life could probably be better or worse, they focused on the positives and reported high satisfaction with life with little room for improvement that they could think of or note when asked. They attributed their satisfaction to positive relationships and recognized that things “could be worse” in their life. One prominent idea that showed up across participants was an appreciation for the life they have and a recognition and insight into how grateful they are and fortunate they feel based on their circumstances and situations. For example, Jamie reported, “I’d say I’m very satisfied, yeah I mean I’ve had a really good life and very lucky for the life I have,” Oliver stated, “I’m very blessed,” and Isaiah used the word “privileged” multiple times. Jamie also mentioned how “fortunate” he feels for his life. These responses demonstrate a higher level of insight of the factors that can influence satisfaction and their perspective and worldview. The adolescents shared an ability to think about others and to view life not just in terms of material items or how they currently feel, but also in relation to the opportunities they have had and the relationships they’ve experienced throughout their life.

For the majority of participants, comparison to others was a common point of reference when discussing how they felt about their life. Across participants they used comparisons that allowed them to view their lives more positively compared to someone else or to a condition or situation that made their life appear better. This was often apparent when the adolescents were describing an area that was more challenging in their lives or when talking about the impact PKU has on their life. Overwhelmingly participants used the phrase, “it could be worse” to describe their experience with PKU and their life. This mindset seems to serve as a way to make sense of the difficulties of having PKU while still viewing their life positively. From this resilient mindset PKU is almost seen as something to be grateful for in their life, or at least a facet that has made them more appreciative of what they have in their life.

Isaiah mentioned this twice during his interviews when he commented:

I do have a really privileged life compared to people in other parts of the world. That’s something I can always look upon. I, I feel appreciation toward my life. I feel lucky that I am the way that I am, ‘cause it could, it could always be so much worse.

He then later reported:

Like I said earlier, I feel like I’m a really privileged person if you look at kids elsewhere like in Afghanistan or something or just any given city in Africa they’ve got it worse, with that philosophy it kind of keeps me in check as to, as to how lucky I am to have the things that I have and to not have to deal with the things that maybe some other kids do.

For Oliver he focuses on how things could be worse when he is comparing his life both to others with PKU as well as people without PKU. He stated:

Well, I know that other people have it way worse than me for starters. With this disorder too, people who have PKU, my Mom has told me they can’t even eat a little sliver of

chocolate it's so bad. So the doctors are always saying how good I have it, I don't take it for granted you know, I don't wake up everyday saying thank you for that, but I always am thankful for it 'cause people have it way worse than me, way worse than us, way worse than all of us. People have it way worse... I don't take it for granted that other people have it way worse, PKU wise, otherwise people have it way worse and I can't forget that. You just can't.

While Jack commented:

'Cause like everyone has their own thing, like some people really do have depression and stuff, or my parents constantly say, like you have PKU but you could've been born without like an arm or something, so there's always going to be someone worse off than you, so it's not really influenced my life.

By thinking about how things could be worse in their life, the participants are able to appreciate what they currently have and put their struggles into perspective of what they could experience in life.

Participants also judged their life to be positive by describing an absence of negative experiences or events in their lives. For instance, when asked how satisfied he was with his life Jack stated, "Very I guess, there hasn't really been any big like traumatizing experience in my life to make it, you know, bad or anything."

Isaiah similarly commented:

I don't have any traumatizing experiences or anything like that, which is another lucky thing is I haven't had to deal with any of that. I haven't suffered any massive injuries or anything like that. I've in general; I've had a relatively easy life.

Oliver also referred to a lack of negative experiences when he said:

You know I've been grateful to, you know, ... I don't have nobody I've known, like very closely, like a best friend, no one I've seen everyday has really died or anything, so it's like nothing really bad has happened to me, and I know that other people have it way worse.

Participants used the absence of difficult events as a reference point in how their life measures up to others. They focused on how their life compares to others by what events they have or have not encountered and based on the result of the comparison this influenced the level of satisfaction and appreciation for their current life and circumstances.

Theme 2: Relationships, both positive and negative, are most important

Across all participants relationships with family and friends were described as being the most salient influence on their lives and the greatest factor contributing to their mood and satisfaction with their life. For example, Jack described the influence of others on how he feels about life in this way: "Other people, like definitely to just sum it up. It's like always going to be other people, just the way they say something or do something, that can always end up being a neutral, good, or bad thing." Participants perceived their relationships as both positive and negative influences on their mood, satisfaction, and overall how they feel about their life.

Relationships with family and friends were described in terms of the support they provide, the time they spend together, and the way they make them feel and how they influence their mood.

Jamie shared the following reasons why relationships are important, "Well family and friends they're like a supportive system for me, they're always there to help and then my friends are always there to make me laugh." Relationships were also described positively as the most important thing in participant's lives and giving their life meaning.

For instance, Jack commented:

“Friends and family and stuff you know, you rely on them in everyday life and everything, they’re just what makes your life a thing, that you talk to people and everything, otherwise it just like doesn’t mean anything because you’re just alone or something.”

It was commonly noted that it wasn’t necessarily an experience or activity, but rather whom participants were with and simply being with friends or family that would improve mood and satisfaction with life. Isaiah made this comment regarding his mood, “That depends on the group of people I’m around ... Just hanging out with friends affects it positively.” Santiago described the presence of his mom as a positive influence because, “Well she’s always, you know, here most of the time... she’s always with me” and later remarked, “having more time with my family” as the only thing that could improve his satisfaction with life. Jamie also commented on the presence of people he cares about versus activities being important when he stated:

Obviously my parents make my life so much better, always being there with me and for me, and then like my best friends they’re all there. That always seems to make my life so much better being there with me. I can’t think of any like specific events, just yeah that’s pretty much it.

Oliver described people as being the primary influence on his satisfaction and what motivates him by stating, “I’d say the people in it. I know a lot of good people and you surround yourself around good people, makes you want to do better. You surround yourself around bad people, you’re just going to do worse.” Participants described the presence of people rather than

activities or experiences with people as being most important to them and most influential on their lives.

In addition to being positive influences on mood, satisfaction, and how they feel about their lives interactions with family and friends were also described as influencing and predicting negative moods and dissatisfaction. For instance, Santiago said, “Usually I’m always happy and when I’m, you know, low and kind of sad is when my parents start arguing. That’s pretty much the only part.” This was one example of how relationships between others and not just relationships the adolescents are involved in influence them. Relationships were also sometimes viewed as a double-edged sword across participants.

Jack stated:

Like friends, they can always influence it to be better or worse based on what they said or do or what you say or do towards them... relationships are always, can be good or bad with you know, animals or people and family and friends and stuff... for everything there can be a negative to it or a positive.

The mood of friends and family and what they are experiencing was also something noted as being able to have a negative impact on the participant’s mood. Jamie reported:

My family influences definitely how I’m feeling, if they’re all angst and there’s something going on or everyone else is upset or they’re stressed about something it will definitely affect how I’m feeling... same goes with friends, if someone’s like going through something or someone’s not feeling well it’ll affect, or if like maybe all my friends are gone like that’ll affect how I’m feeling.

While other things were mentioned as having the ability to influence their mood or satisfaction, such as school, grades, losing a friend, or a pet dying, these events were described as

temporary influences that participants quickly move past and were not reported as pertinent to how participants viewed their life overall, or as being particularly impactful when thinking about positive and negative influences on their life.

Jack described these events in this way:

But those are like, you know, the smaller things that like you don't really want to care too much about 'cause they'll start growing in your head more and more and it'll start affecting you in a worse way over time. So if you just get those smaller things in your life that are negative and move past them it's always going to be better.... Like your dog dying or something.... something more smaller like that, it's still like a sad thing, but it's not something you need to stop your life for.

Oliver further described other influences this way, "Well, materialistic things, you know... but it doesn't mean as much as the people, good people, people are more important than materialistic things." Collectively, as illustrated by the previous quotes, participants were more focused on people and relationships as the most important and biggest influences on their satisfaction and quality of life.

It is important to note that universally PKU was not viewed as an influence on the participant's life satisfaction or as a factor in determining how they view their life. This is despite the fact that all participants described PKU as more of a "negative" than positive event in their life. The majority of the participants did not directly discuss PKU as an influence on their life when talking about either positive or negative influences. When asked how they think PKU does or does not influence their life some of the participants described PKU as not influencing their life because they don't know what life would be like or is like without having PKU. For instance, Santiago noted it didn't influence his life because, "It's something I've had to deal with

since I was born so... I'm used to it" and Jack similarly commented, "It's my everyday thing" and "I've had it since birth, it's like been my life. So it's been in my life since I've been born so it's hard to say whether or not it's really affected it 'cause I wouldn't know." Living with PKU since they were born has enveloped PKU into their everyday routine and as a result it is often forgotten about or not paid attention to in daily life. Oliver stated, "Doesn't really influence it much for me, only because like I said, I kind of forget that I even have it."

Jamie and Isaiah were the only participants that mentioned PKU without prompting or direct questioning regarding their satisfaction and how PKU influences their life. Jamie casually brought it up by saying, "I mean if we're going to talk about like diet" when asked about negative influences on his mood and reported feeling "more short tempered and like more agitated" when he is off diet or hasn't kept up with his formula for the day. For Isaiah it was related to what could improve his satisfaction with life. He reported, "Not having the diet would probably put it up there. That's probably the only thing that's keeping it from a 10." While Jamie and Isaiah both noted that life would be "less stressful" and they may have more satisfaction without the diet for PKU, they also denied PKU as influencing their life overall. Instead, they reiterated other influences that were more salient and described PKU as something that shouldn't influence your life and is less important. When asked how PKU influences his life Jamie commented, "I don't think it really does in the end of the day. I think if you have like good friends and family, like that's what should matter, not what food you're eating."

Isaiah shared:

I don't think honestly it, as far as the things that I really need to be concerned with in life, it doesn't affect that as much as some other things would. Like basic ability to function,

go to school, succeed, make friends, keep friends, be close with your family ... the sort of really most important things, I don't think the diet has any real direct effect on that.

Overall, participants referred to their life, mood, and satisfaction in positive terms. This was seen in the word choice they used to describe their mood and satisfaction with life, as well as describing what negative events they haven't experienced in their life. Participants unanimously reported relationships with family and friends as being the most important influence on their mood and satisfaction with life. Other factors were mentioned, but described as short-term influences and not sustaining factors on overall mood or quality of life. Interestingly, the majority of adolescents focused on how their life compared to others to judge and describe how they felt about their life, instead of describing the things in their life that they perceive make it positive. They also noted a lack of negative events as a point of reference for how positive their life is or has been. It was unanimously reported that in general PKU is not a salient influence on life for the participants. However, PKU may have a small influence on life satisfaction, or be noted more readily for individuals with a more intensive treatment regimen as mentioned by Isaiah and Jamie.

Research Question 2: How do adolescents with PKU describe their social lives? What challenges, if any, do they experience in social situations and peer relationships?

Theme 1: It's normal; challenges are limited because having PKU doesn't change things that much

Participants shared about what it is like to have PKU in different social settings including parties, at school, and during the holidays. Largely participants perceived their experiences with social situations to be similar to their peers when spending time with friends, eating lunch at school, and during holidays. For example, in regards to being with his friends Oliver stated, "It's

the same as I think as anyone else, you know” and Jamie reported, “I think for me it’s no different than what it is for any of them [my friends]... I don’t think it changes anything for us.” Younger participants reported spending more time with friends at school or connecting and staying in contact with friends through technology and social media. Participants who were older described spending more time with friends in person playing sports, “hanging out”, or engaging in other activities. Although, neither younger nor older participants reported more challenges in social settings, the older participants did report an increase in responsibility in those settings that slightly changed their awareness of food and what they can and can’t eat during social events. Participants did report a few challenges regarding having PKU in social settings, but when noted they described them more as inconveniences rather than challenges and did not place much weight on them in social settings.

For younger participants social situations were described with little difficulty in part because they experience less of them and are less in charge of them. For instance, both Jack and Santiago reported they rarely eat out or go over to a friend’s house and when they do they are able to adjust to those situations and don’t let PKU get in the way. They reported this is because, as Santiago stated, “you always work it out.” This was described as eating before they go somewhere or their parents making something for them to bring along to the social event. When he does go out to parties or to other’s houses Santiago causally reported, “You just got to bring your own food” and mentioned it without concern. While Jack takes a more preventive approach and stated:

I usually don’t go to another friend’s house. They usually come over, but if I went to a friend’s house it would usually be my neighbors, but they live right by my house, and I know a bit of what they have there, so it’s not, you know, any real problem there.

Whereas, older participants spent more time with their friends and decide on social activities, and therefore they have more opportunities to engage in situations where they might need to navigate food and make choices on their own. Nevertheless, instead of reporting more challenges when they were older these adolescents reported more responsibility as they got older to know about their diet and make good choices in social settings. Jamie discussed how he experienced growing responsibility over his treatment and thus the resulting challenges of making decisions in social settings.

He shared:

I'd be going out more with my friends not spending every meal at home, so it kind of it forced itself on me, like I had to take control of my diet. I had to know what I can and can't eat if I was going to be able to go out with my friends, so I just kind of had to learn.

Otherwise I would have to rely on my Mom for everything else.

Oliver also shared a similar experience about gaining responsibility as he got older and was spending more time with friends and less time with his family at home:

When I got older, you know, I have school and they [my parents] have work so they can't always be on me, they're kind of like you got to learn what you can and can't eat yourself...when I was in high school... when I came home Dad went to work or she [Mom] was at work until like 4 or 5, so I was home at like 2, 2:10 or something, it's like you're on your own kind of, where I would go out with friends after that so when they [my parents] were getting home I was already going back out and when I was coming home they were asleep.

For most participants eating lunch at school was described as not being any different from their peers because they eat similarly and bringing a lunch from home is consistent with

their friends. Santiago reported little difference at school when eating with his friends, as he commented, “It’s not really a big deal either, it’s just you know, you’re not eating, you know, the food that the school makes. Anyways most of the people do bring their own food so it’s nothing different.” Isaiah reported he doesn’t really think about it at school because “it’s not relevant.” Jamie similarly reported his friends eat a diet that is similar enough that currently he doesn’t stand out amongst his friends:

School there’s really no difference... usually I’ll just pack a salad or something like that... but I mean, lunch everyone eats like healthy foods... like all my friends have like salads or something like that with them, it’s never been a huge deal me eating vegetarian at lunch.

Participants also did not report challenges when social settings involve family members such as holidays or parties, despite some of these situations having a focus on food. Jack reported these situations don’t feel any different to him because, “It’s my family and they all know about it and it’s not like, you know, weird for me or anything because they know about it.” Oliver stated for holidays there is, “No difference” for him compared to others. He also attributed this to being a result of spending these events with family and said, “It’s family. I don’t think twice, they know what I have, like it’s not a big deal at all, it’s like another day.” Isaiah also denied experiencing challenges during holidays because, “Usually I stay within family for like Christmas dinner and such, yeah. I’m always satisfied with something.” Jamie also viewed holidays as not being different, but described a slight difference in his holiday experience when he stated, “Holidays sometimes can get a little annoying just ‘cause Grandma goes overboard and makes me a separate everything and I don’t usually do that at home, so it’s like, it’s made into a bigger deal.” The common factor across adolescents was that events where family is

present are not problematic because family is aware of the restrictions for PKU. Thus, family makes accommodations or modifications to those events so that the participants don't feel different.

In other social settings, such as parties, participants similarly described a lack of worry or concern about those situations. Participants reported being able to navigate those situations without difficulty and make them work as Jack commented, "It's never been like a huge worry for me, because I realize I can handle it usually," Isaiah similarly commented, "There's always some sort of bowl of chips that I can have, it's not really something that I think of, and if there's nothing I can have there's always soda or something," and Jamie reported, "I mean usually there's like pizza or something I can have. It's not too bad, so I can always find something, you know." Participants described an overall positive attitude where they are able to navigate these situations without difficulty. Instead of focusing on what they couldn't have in these situations participants reported positive and optimistic thinking about them. They chose to focus on always being able to find something and make these situations work for them instead of viewing them as difficult. This may be related to another theme found that participants try to minimize PKU. If they found social situations to be difficult or focused on the areas where it was challenging it would require them to pay more attention to PKU and acknowledge it in these settings. By "making it work" participants are able to maintain their mindset and framework that PKU isn't a "big deal."

Going out to eat was a social situation where participants reported they are slightly more aware of PKU. This however varied across participants and became more of an issue when participants were with friends versus going out to eat with family. These situations were described differently among participants. For some they were talked about as "not a big deal"

and relatively easy to navigate because they have become routine. For others, going out to eat was perceived as less of an exciting or fun activity because of the limitations related to their diet. Still for the majority it was mentioned as a non-issue. Jack commented, “You know, unless we’re at a restaurant or something and even then no one would really notice because I order food like everyone else.”

He also shared:

I used to be a lot more of a like a picky eater when it came to that [going out to eat], but over time it’s just, you know, it’s the same categories of restaurants, you know, Mexican, Italian, and I order basically the same thing at every place.

While Oliver said:

You know, everyone likes going out to eat, but I kind of, no matter the place I’m going to have the same thing, you know, so it’s kind of like it doesn’t really matter. So I wish I could eat more, but it could be worse.

However, for a few of the participants they reported being more aware of the difference in what they can and cannot eat in these settings and experiencing some anxiety and worry in these situations. For instance, Oliver reported, “hoping they have something” that he can eat in these situations and an increased awareness of PKU because “in the back of my head I know that I can’t eat most of the stuff on the menu.” Whereas, specific worries and anxieties were most prominent when Isaiah talked about going out to eat, in particular when he goes out to eat with friends:

Going out to eat, definitely, because there’s a really limited list of things that I can have on a regular menu at a normal restaurant... There is a self-consciousness when going out

to restaurants and such, but there's probably no real need to be. Yeah, out with friends.

There is a self-consciousness, but it's not really their concern.

Isaiah reported the most distress in social eating situations because very few of his friends are aware he has PKU and he is concerned about them finding out. He remarked,

Like if I were to go to a restaurant and just get fries, which is usually what I do, you know, every time I have to say well I'm not really that hungry right now that sort of thing. And it's always, it's always a really big fear that like someone who's gone to a restaurant with me enough times will start to realize like they've never seen me eat anything other than vegetables or things like that, so they start to notice. So I guess that's what I'm afraid of the most is that people would notice and think things of it.

Isaiah also reported he grew up with the mentality that, "You're not really supposed to tell anyone" about PKU. This likely contributes to his trepidation in social situations and heightened self-consciousness and concern that someone may find out he has PKU. For the other participants whose friends are aware of PKU they did not report the same level of concern.

The only time participants specifically reported "challenges" in social situations was when they have little control over the food or making choices related to food. For instance, Oliver uniquely reported experiencing challenges when he played football. He described the challenge as:

Not being able to eat. When I played football they always had a game meal and I couldn't always eat everything in the game meal, or like one or two times I could have nothing in the game meal so I had to bring snacks and all that... not being able to eat is really the main thing [challenge] for me.

Jack also shared the challenge of “not having food available that you can eat” when he talked about going to a friend’s house and not wanting to be a burden or inconvenience on someone else because of his dietary restrictions. He shared:

If I go to someone’s house at night and they’re eating dinner and there’s nothing really there I can eat I’ll just kind of take the plate, and if they notice I’m not eating I’ll explain it, and then usually they get pretty considerate about it and they’ll be like ‘Oh, we can make you something different,’ but I usually just stick to basic snacks around the house and stuff ‘cause I don’t want to make them, have them make something completely different for me.

Even when discussing these challenges, participants did not view them with a high level of distress. This is likely due to the fact that they are used to these challenges and while they would prefer not to have them, it is their normal and so they don’t view it as challenging as it would be if they were newly adjusting to a diagnosis or recently had to make changes to their diet. Oliver specifically discussed this when he said:

But it would definitely be different if I were to get it [PKU], like I said, right now. I think it would be 20 times harder and 10 times different... when you’re a kid it’s easy you don’t do anything, so you could just get used to it, you’re growing it’s part of the growing up process, it’s just part of your life, where if it happens now, it’s like ‘Whoa, do I need to bring formula to this?’

Since participants have always had to think about bringing food to events, or having limited options at menus it is a routine for them and something they appear to have developed coping skills around over the years.

Overall, social situations are easier for participants to navigate when they involve people who know about PKU and are aware of the participants' dietary restrictions. When participants encounter novel social situations they described being able to “work it out” and vastly reported a low level of distress in these situations. Social situations were described positively with relatively few challenges, and when challenges arose participants consistently reported feeling capable of navigating these challenges, and these challenges were viewed less as challenges and more as limitations or inconveniences by participants.

Theme 2: Challenges ebb and flow across age

Despite current positive descriptions of their social interactions, all participants described a greater level of social challenges when they were “younger.” These challenges were described in relation to interactions with friends and peers, as well as difficulties in family and other social settings. During early elementary school participants did not report any concerns or difficulties with social situations, but participants described a time in late elementary school to early middle school where they realized there was something different about them and for a few years they encountered situations where they felt “different” by having PKU. Prior to these years while growing up Isaiah stated, “No one really paid attention to it” and this seemed consistent across participants. In their early years, parents were more in charge of the treatment and maintenance of PKU and this likely contributed to the unawareness for participants and lack of impact on their life. Isaiah shared, “My mom took care of, took care of it for the majority of like when I was first born until probably 10 years old and even since then you know I’ve had to start assuming more responsibility for it.” This was consistent across participants with there being a slow transition in responsibility beginning around 10 or 11 years old that coincided with experiencing more challenges in social situations. Another reason for decreased difficulty in the early elementary

years is that for the majority of participants they grew up with the same friends and went to the same school, as a result everyone around them was used to them eating differently even if they didn't know why the participant ate differently. Therefore, PKU was never directly addressed with these friends or in these situations. Isaiah shared his experience with this when he said:

Well some friends... I guess they just sort of found out over time. That would be the friends that went with me from... Pre-K to 8th grade. They have a general understanding that I don't eat meat, at least they all know that.

Therefore, it was less challenging for participants in the younger years, because they didn't have to answer questions or explain about their diet. They also understood less about PKU so had less responsibility around informing others as Jack reported:

From like those ages, that was when you know I barely had an understanding of it... when I was about 11 or 12 that's when I started to be like okay I know how to explain this better, and so that's when I started being able to be a lot more independent with you know explaining it.

It was just accepted and known by friends during these early years and parents were more involved in the treatment and maintenance of PKU for participants during this time. The adolescents described that parents were mainly in charge of PKU until later elementary school, which decreased the immediate responsibility and involvement participants had in their diet and social settings during these early years.

None of the participants reported experiencing any teasing or bullying or even difficult interactions with peers regarding their diet or PKU. However, they described feeling different and being treated differently. It seems participants often perceived differences and there was an internal recognition and struggle with feeling different in social situations. Several participants

reported differences related to feeling self-conscious when they were younger. They explained this partially was a result of not understanding PKU and not understanding that everyone has differences. Consequently, they didn't want to be known as the kid who was different or labeled as having something different during these years. Jamie illustrated this point when he said, "I guess it made me a little more self-conscious when I was younger, yeah, socially 'cause again it's back to I didn't want to be known as the different kid, but other than that, no." The challenges and struggles the participants reported changed over time. When they were younger they struggled with feeling different and worrying about what peers may think or what peers would say or do if they found out about PKU.

Jack described this when he said:

I think there was like a time between like when I was like 7 and 10 where like it was hitting me I have PKU and it's different from everyone else and I can't eat all of this, I think those are the ages where everyone is treated about the same so having to be treated differently was, like it was so weird for me, and I was like I am so different than everyone else, but by the time I got into like a, when we moved here it was like it really doesn't matter, it only really affects me when I get home and like drink my formula or something or I bring a lunch everyday, but that's never a huge factor or anything.

Jamie also noted that when he was younger PKU made things harder in social situations and he felt more different in those settings. He shared:

Yeah, like going out to eat was definitely harder, just 'cause my diet was more restricted when I was a lot younger. Pretty much all I ate was French fries and Caesar salads for a while and finally my diet opened up and I got to experience more foods and it's gotten a lot better and socially it was a lot harder. Like growing up every little kid wants to be the

same, you don't want to be different, you want to be normal, so having to be different and like having a bottle with my drink, like 'Oh, why are you drinking that?', like 'Oh, I have to 'cause I can't eat protein', 'Oh my god, you can't eat protein?', and so that was hard for me to go through. Yeah, I mean everything was pretty much a lot harder when I was younger because I just wanted to be normal. I didn't want to be the kid that couldn't eat protein. I just wanted to be a normal kid...

During the elementary school years peers were often described as being unaware or not noticing participants ate something different at lunch. For instance, Santiago described how "no one knew, no one understood" in elementary school, but once he got into middle school "they understood more about it" and so as a result of peers being more aware of PKU Santiago felt he was different from them.

For Oliver he reported he was "more worried" when he was younger and on guard about having PKU, but as he has grown older his thoughts have changed and it has impacted him less. He shared this has changed because:

That's 'cause your mindsets different, my mindset wasn't like, 'Oh, I'm the same.' I kind of was thinking maybe I am a little different 'cause I can't eat all that. I'm coming to lunch eating cookies and they're having trays, and like 'Why don't you want to try this?' And it's kind of like they won't care, they're just curious, they're not trying to make fun of it they're just kids, they're curious, like 'Why won't you eat?' At the same time you're kind of like just drop it, you know, 'I don't want to talk about it.' I was kind of defensive. I didn't want to, like I was kind of afraid to eat, like they're all going to be looking at me like 'Why's he eating this?' You know it's weird, but now I just don't care, so I'd say I changed probably like middle school. I probably started thinking there's really no

difference. Some people choose to eat that stuff over this, you know, there's not really any difference, it doesn't make you anything different. I don't think so.

Then when participants reached the middle school years and began taking on some responsibility for their treatment and food choices the differences became relevant and more challenging to navigate. This was also when friends began to notice and ask about why participants were eating "differently" than their peers. Santiago shared this experience about how friends began asking about his diet, "Well 'cause I don't eat like school foods and I every single day I bring popcorn so they asked, 'Why do you always bring popcorn?' and I'm like 'cause I can't really eat much at school.'" Oliver also shared about his friends asking more questions as he got into middle school and having to navigate those questions. He reported:

They were curious, they're kids. They're all like, 'Come on man, you're only going to eat that? That's why you're straight bones and so skinny,' but they don't know, so they're just going to say that... It was never bad where they're all like laughing or nothing like that, but they'd be like 'Oh, you're straight bones because you eat that.' I never told them why. I'd just be like, 'I want to eat this,' but of course on the inside I was like, 'Why you got to point me out?'

Jack reported an increase in questions from peers as he got older when he commented:

No one really noticed when I was younger, I don't think until now when everyone's getting older and they're eating more and I'm still eating the same amount, but just a little more... so they start to notice like you're not eating the same as everyone else and they're all like, 'How are you getting your protein?' and then I explain like the formula and stuff...

Still, for nearly all the participants this different feeling diminished by the time they reached high school and they felt less insecure about having PKU and being “different.” Participants also reported a growing awareness during these years that everyone is different and they learned people around them didn’t really care about what they were eating. Jamie noted, “Now everyone’s more accepting and it’s gotten a lot easier on my diet,” and Oliver stated, “Kids stop worrying about other kids when they get to like high school ‘cause no one cares.” The feeling of being different and perceiving they were different from their peers diminished once participants reached high school. At this point in their lives participants began to recognize they weren’t really limited by PKU, it only created minor differences, and they were able to live their life in a way that was similar to their peers. Oliver stated, “As you go on through life you see that you’re doing everything else that they do the only difference is that you can’t eat the same thing and got to eat the formula.” Jamie noted that he began to feel less different in high school because the choices peers were making around him were similar to his restrictions. He shared:

Probably like middle school or the beginning of high school, like ‘cause people are like more health conscious, like people start to eat better and they’re like ‘oh, I’m having a salad’ people aren’t batting an eye, like you can have that. It’s not a big deal, but being younger having a salad is a little weird. Most of them were like having chicken nuggets so it was a little different.

For the older participants, at the end of or after high school, they reported encountering challenges related to logistics of treatment and their treatment regimen and described current challenges in social situations mostly related to logistics of having PKU instead of feeling different. This was primarily discussed in terms of extra planning and needing medications or

supplies. For instance, Isaiah shared this challenge, “Sometimes if we’re going on vacation somewhere to a hotel we’ll have to make arrangements to like send special food up there with us.” While talking about his treatment Jamie reported, “It’s also just a really big hassle, to stop your day always be thinking about it, have to stop, I take my pills then let’s eat and then I go on... always have to have some in your car.” Santiago also commented on the extra planning for PKU and time it takes as current challenges. He reported, “The measuring, the time... how you have to take it out, you have to plan at what time you’re going to cook it so you can take it to the place you’re going to.” Once again these current challenges were viewed more as inconveniences to participants, and as Jamie mentioned “a hassle” more than a true challenge they struggle with in their daily lives. Isaiah summarized participants’ feelings about social situations and challenges when he stated, “But on a typical day you don’t really think about it, it’s just an inconvenience when it does come up at meal times.”

Research Question 3: How do adolescents believe their life is different from their peers?

Theme: We are more similar than different

Although the participants noted differences, in general all participants described their life as more similar than different compared to their peers, evidenced by this statement from Oliver regarding his friend’s lives, “Their lives I don’t think are really different from mine, in my point of view at least.” Similarly when asked about his friend’s lives Jamie commented, “I’d say for the most part they’re pretty similar.” Participants easily noted similarities between their lives and their friends’ lives in both personal characteristics and external characteristics such as preferences and interests. Differences that were reported varied across participants without a consistent response and ranged from external factors to personal values and perceptions. PKU was a difference that was noted, but little time was spent on discussing it, and it was discussed in

relation to the diet and treatment versus ways PKU makes their life significantly different from others.

When asked to elaborate on similarities or differences the participants most frequently described the way they were similar to their friends according to interests, preferences, and shared activities. For instance, Isaiah reported the following similarities, “Well I have friends from soccer so athletics is a similarity for some, humor is probably the biggest similarity between all friends. Different shows on TV that we that we watch, I guess.” Oliver reported similar things between he and his friends when he said, “We have the same interests...like the same music, like the same clothes, like doing the same things.” While Jamie reported:

We’re all active like especially in sports...and then for the most part we all like the water and we all like to adventure and we’ll go on hikes or go fishing, do something cool like that, and also we all have pretty much the same hobbies.

Personality and background were other areas that were mentioned as similarities. For instance, Santiago said, “Well most of, most of my friends are Hispanic,” and Jack stated, “You know we’re in the same age group, you know most of them are guys, and their personality is, you know, kind of the same, all of that makes them similar.”

Participants acknowledged PKU as a way they are different from their friends, but when they reported this difference it was in a passive way that did not give much weight to the difference and appeared they didn’t put much thought into it past acknowledgement. For instance, when asked about how he is different from his friends Jack commented, “Besides you know the whole PKU thing,” Oliver used the term “obvious” to describe PKU as a difference, and Isaiah reported, “The diet is blatant.” Participants further described PKU as a difference that was often not seen or apparent or only became applicable in certain situations. Therefore they did

not view it as relevant in most of their peer relationships and PKU was seldom noted in their interactions with peers. Oliver explained this as follows:

Yeah, you can't tell, like I said if you put me and a whole bunch of my friends all into the same room and said pick the one who actually has it, you can't, you can't just tell, but then when you actually get to know somebody or see them eat then you can probably tell, so really you can't really, there's no difference just looking at the basic picture, but when you're actually, the activity's going out to eat, stuff like that, you know going to the gym, you know, I can't do what they can do, you know, and stuff like that. There's differences in that, but I don't think we're different I don't see it.

Santiago said:

It really doesn't matter that much 'cause the really, the only difference between people who don't have it and who do have is just the difference between the protein, in you can't eat too much protein. You're pretty much the same; you just don't eat as much protein as the others so it doesn't really make it different.

Isaiah reported only a few of his close friends know he has PKU, so even though PKU was the first thing he mentioned when asked about differences, he quickly dismissed it and downplayed it as not being an important difference as he stated, "But most friends, 99%, don't know about it, they don't know that there is that difference, other than that I don't think there is really that much of a notable difference."

Jamie framed thinking about PKU as a difference in this way:

I don't know it's not a big deal, oh it's just PKU, everybody's got something. I just can't eat protein; it's not that it's a big deal. It's different from everyone else, but I mean it's not that big of a deal. It doesn't change anything about me.

Differences related to PKU, when noted by participants, were not described in negative terms or seen as central to who they are as illustrated by Jamie's quote above. He normalized the difference of having PKU by saying everyone has something, which allows him to maintain a mindset of being more similar since he believes PKU doesn't change him or make him different from peers on a deeper level. The way participants discussed differences related to PKU frequently sounded more factual and descriptive instead of representative of who they are or holding significant meaning in their lives. For instance, Jack described having PKU as a difference because, "I'm like the only one in (my town) with PKU... but that's never been like a huge divider between me and someone else." PKU was often mentioned as casually as you would mention a difference in hair or eye color and dismissed as not really a difference. For example, Oliver commented, "There's no barriers just 'cause of the PKU, there's no barrier. We're not different in any type of ways that I see." By thinking about PKU in these terms the adolescents are able to maintain the framework they are more similar than different compared to their friends.

Interestingly, it often seemed like the participants mentioned PKU only because they knew we were having a conversation because they had PKU. Whereas, if they had been randomly selected to be interviewed, and not chosen for having PKU, they might not have brought it up at all or talked about it as a difference. When discussing the difference of PKU with Oliver he commented he likely wouldn't have brought it up if we weren't having a conversation because he has PKU. For him other differences are more salient as he mentioned, "I don't think I would [mention PKU], 'cause it's not a huge thing to me, I don't think I actually would... It's like, oh it's there, but I'm more worried about this stuff." Yet, it's unclear whether this is because they truly do not perceive it as a difference as evidenced by the previous quotes or

whether it may be due to another theme that was found, namely that adolescents try to minimize and simplify PKU in order to appear more normal.

For Jamie the only difference he sees in his life from his friends' lives was described in terms of his treatment for PKU and the added stress it brings to his life. This difference is not a defining feature of his relationships with friends and only plays out in situations that involve eating.

He reported:

Other than having to take a few more pills and powdered drinks I don't think it is that much different, which I think is very fortunate. Yeah, I mean other than when we go out they get a regular burger and I get a veggie burger just, we're all the same pretty much though other than that.

He described PKU as adding more stress into his life compared to his friends and an added component to be thinking about that was always present in his life. This was mainly described in terms of his treatment when he stated:

It's a lot of taking drugs. It's kind of just more stress, especially for me, more stress just piled onto an already stressful time, other people are worried about applications, I'm worried about did I take my drugs this morning and did I write applications. It's definitely just an added thing in the back of your mind; it's always there. You can never just like, you can never just forget about it.

Still, Jamie sees himself as "more similar" than different from his friends and focused on describing those similarities as evidenced by the following quote:

We all do the same hobbies, we all hang out together, we have the same sense of humor, we all, we're all like athletes, we all play sports, yeah we're all pretty much the same surfer, athlete, jock, students, just one doesn't eat protein the others do.

Oliver and Santiago both described the way they "were raised" as a difference from their friends' lives. This difference was described both in relation to cultural differences and differences in values and family composition. Oliver reported:

A lot of my friends their parents are divorcing, where in my family my parents are actually close. So their lives are kind of different than mine, they don't have the same household as mine, and they weren't raised the same.

Family composition was an important difference for Oliver because, "family's big and if your parents are divorcing that's kind of hard to go through, that's almost all of my friends, which kind of sucks to me." In contrast to his friends, Oliver reported his parents as close and the composition of his household being a main difference between his life and his friends' lives. In reference to being raised differently, Oliver discussed values or customs that his parents have taught him that he shares with his friends. In particular, he described his parents teaching him how to tip when going to a restaurant. He also recognizes that his friends have been taught other customs and traditions he hasn't and views his friendships as opportunities to learn from each other. He stated, "It kind of works both ways, you know, we don't know everything, we were raised two different ways, but both ways were actually effective and we can help each other out on stuff we don't know."

For Santiago the way he was raised is both a prominent similarity to some of his friends and a difference from other friends. This similarity and difference is described in terms of his cultural identity as "Hispanic" and related to family discipline practices and responsibilities.

He shared:

Well it's different since I'm growing up in a Hispanic family and most of the people are, like you know, growing up in American family... it's different, you know. 'Cause a different way is a thing with Hispanics; they do discipline them with taking away their phones. I'd say taking away their stuff, but usually with people who are born here they do take it away, but after a while they do give it back. You know it's different you have to fight for it to get it back with a Hispanic family.... Like, you know we have more responsibilities at home... You have to do a lot of the chores. You have to help out a lot. They expect you to do it.

When Santiago described similarities with his friends they were parallel to the differences he noted with other friends:

Well, most of them are as I said before Hispanic, so we pretty much deal with the same problems or, you know are pretty much the same, raised the same... Like in a Hispanic house, you know, it's pretty much the same way, you know, with the same rules.

Despite this difference in culture and family practices overall Santiago believes his friends are "pretty similar" to himself.

Although there were similarities and differences noted for each of the participants between their life and their friends lives they strongly believe they are more similar to their friends on the whole. PKU was only noted by a few of the participants as a difference and when it was described those participants dismissed it as an unimportant difference. Participants reported they and their friends did not emphasize or focus on PKU in their relationships and it was rarely talked about and discussed after the initial disclosure.

Research Question 4: How do adolescents with PKU conceptualize and understand their condition? How do they describe and make sense of their treatment?

Theme: PKU is simplified and minimized, in other words “it’s not a big deal”

Participants conceptualize PKU in a way so as to not bring attention to it and deemphasize the role it plays in their life. PKU is minimized and simplified in the way participants think about PKU, what they call PKU, how they talk about it with peers, the impact they believe it has on their life and daily functioning, and their treatment for PKU. One of the most commonly used phrases by participants was a variation of describing PKU or an aspect of PKU as, “It’s not a big deal.” Thinking and talking about PKU as “not a big deal” appears to serve as both a coping skill and protective factor for participants by allowing them to see themselves as a more typically developing adolescent. Conceptualizing PKU as “not a big deal” may also be a consequence of low health literacy about PKU, specifically a lack of understanding and awareness of how PKU impacts the body, short and long-term consequences, and why treatment is important to remain healthy with PKU.

When asked about what they know and understand about PKU universally participants described PKU as something they were born with and got from their parents. They expressed knowledge and understanding of a genetic or hereditary component to how they acquired PKU and acknowledged PKU as a diagnosis, disorder, or condition. When asked how they would describe PKU to others, participants explained and understood PKU to mean they can’t break down protein. For instance, Santiago described PKU as, “It’s just something you’re born with that means that you can’t eat much protein.” Oliver reported he describes PKU to others by saying, “I say I just can’t break down proteins.” While Jamie reported he describes this way, “I’d basically say it’s a genetic disorder that ... makes it hard for my body to digest protein in a way.”

PKU is viewed as something they have, but not something that directly impacts their life. All participants view themselves as healthy and not having a problem because of having PKU. As illustrated by Oliver's comment, "I don't have anything wrong with me, I'm just an average person."

However, the adolescents rarely referred to PKU by name which appears to be a way of conceptualizing PKU that makes adolescents feel more normal and less as though something is wrong with them. Instead of saying PKU, Isaiah described PKU as "a diet," while Jack used the term "food disorder," and Oliver referred to it as, "I can't have protein." They denied thinking about PKU as a disease or sickness and were reluctant to use those terms because as Santiago put it, "Cause you know a sickness is, you know, cancer, diabetes, kind of like, you know, different things, but PKU it's, you're not really doing much to yourself."

Isaiah further described this thought when he said:

After diet I would probably call it a condition, hesitant to use the word disease. Even though technically that's you know, that's it, because I think if I were to describe it as a disease to someone, someone would make the quick connection that it's sort of contagious, that type of thing, so disease is one of the last things I would use. Disorder and, disorder, condition, and diet are probably the 3 things I would use casually.

Adolescents in the study consistently described PKU in terms that made it appear more normal and less like something is wrong when talking about it with others and when thinking and describing it to themselves. They chose words that made it sound less different or troublesome and less like a diagnosable condition or known disorder or illness.

For Oliver, in particular, the words used to describe PKU and how he explains it to others are extremely important. He stated, "You got to think about how you say it," and he has put a lot

of thought into how he discusses PKU in order to show, “there’s nothing wrong with you.” He does his best to normalize PKU in order, “to make it as minor as possible, like it’s not a big deal.” This is a result of how he has grown up thinking about PKU and how he doesn’t want PKU to be a defining factor in his life or who he is as a person.

Oliver further explained it this way:

When you start putting terms onto things that really makes something wrong with you as a disorder. I don’t have it, a disorder. To me, it’s not a disorder. I still, I can do whatever I want in life I don’t have a disorder to stop me. It’s not a disorder to me, it’s just I can’t break it down. Once you start using words for it, like diabetes or something it starts being something, to me it’s just another thing, it’s just you know I just can’t break it down, but when you start using PKU to me it just makes it more like something is wrong, I know it’s not, I know people won’t think that way, but it’s just a mindset, you know I don’t like being defined by a word, ‘cause once you use the word PKU, they’ll be like ‘Oh he has it.’ I don’t like being generalized by that if that makes any sense. It probably sounds weird hearing it, but that’s just how I am, you know.

PKU is also minimized when disclosed to or discussed with friends. Participants varied in how open and forthcoming they are with disclosing they have PKU, but the majority reported not providing information about PKU or mentioning it until someone asked or made a comment to them that prompted a response related to PKU. Santiago commented, “Well, I would tell them, you know, if they asked me why I’m eating different things. Then that’s the only way I would really tell them.” When discussing meeting new people Oliver reported, “I wouldn’t tell them off the bat.” For Isaiah trust and knowing someone for an extended amount of time factors into who he tells he has PKU.

Oliver also stated:

I don't really tell a lot of people, not because I don't want to, but because it never really comes up. I'm not going to tell you, but if you ask I won't mind. I'm not going to come out here and be like 'Hey, just so you know I have this,' but if they start asking about it, I'll be like, 'I guess I don't mind telling you about it,' but I'm not going to tell you...

Another way it was minimized with friends was how participants described making an effort to talk about PKU in a way that makes it seem less important, or to minimize talking about PKU altogether with peers in order to maintain an air of normalcy with peers and in social situations. Oliver reported he doesn't mind sharing with others when they ask about PKU, but he tries to spend as little time as possible on the subject, he reported: "So when someone, when they ask for it, it's kind of like I don't mind talking about it, but I do mind, I don't mind telling someone so they know, but I don't like being on that subject." Isaiah spoke of the topic of PKU with his friends in this way, "It's not really something worth noting, it's just something that, you know, they know is to be left alone... I've made it clear that they don't really have to make a big deal about it." Isaiah also commented, "You know they can kind of sense that it's a subject that I would rather it be kind of left alone, not really dwelled upon, so no it never comes up." When asked who knows he has PKU Jack shared, "Anyone I've told. Yeah, pretty much, I mean they might not know it's PKU, they just know it's some kind of food thing, so I'll just say like it's a food disorder." He later commented on how his friends think about PKU in these words, "I think they just think it's a normal food disorder that doesn't you know really impact me in any way." Word choice proved to be an effective strategy for shaping how PKU is perceived by others and also important in participants own self talk about PKU.

None of the participants reported ever experiencing teasing or having anyone say something mean to them because of PKU as previously mentioned. Yet, they expressed a concern to conceal it for fear of being made fun of or having friends think of them differently or think something is wrong. Isaiah described trying to conceal PKU with friends because, “Like I know rationally that the friends I have they wouldn’t dare make fun of it, but still it’s just embarrassing for them to, for them to have the thought that like there’s something wrong.” Therefore, he tries to keep it out of conversation with friends and is reluctant to share about PKU.

Oliver explained his reasoning as:

When you use the word it shows that you have something wrong, if you don’t use the word about it, it kind of shows there’s nothing wrong with you... It’s more as in protecting myself more of a mindset, ‘cause I just, this is not what I have to me, you know it’s like this is something that is different about me, but it doesn’t define me. Like I said when you put the word PKU on, it starts defining who you are to me... But to me I don’t want to be defined to who I am as in having that, ‘cause let’s say one day I was successful or something I don’t want to be defined as he was the first PKU kid to even do this, don’t want to be defined by that one thing. To me I don’t have anything wrong with me I’m just an average person.

Disclosure of PKU varied across participants and for participants who kept PKU to themselves it appeared to be a way to maintain their thoughts about PKU not being a big deal. The logic appears to be that if they don’t tell others about PKU then other people aren’t able to say something is wrong or classify PKU in a way that is inconsistent with how they want to conceptualize PKU.

Treatment for PKU was also described in general as not a big deal in terms of what they have to do for treatment and how they adhere to treatment. Often this was described as not worrying about what they are eating. It also included talking about treatment as though it wasn't really treatment. For instance, when asked about his treatment Jamie responded "My treatment is my Kuvan and my formula and the, I call it PHE block, don't remember the name, but those drugs and then a low protein diet that's my treatment for PKU, I guess." His added descriptor at the end "I guess" was characteristic of how the participants don't necessarily think about treatment as being treatment. When asked the same question Oliver responded with, "I don't know about treatment, just drink formula that's it, there's no real treatment plan." This likely is related to how they do not conceptualize PKU as a disorder or disease, as previously discussed, and therefore don't think they have something to be treated. However, treatment for all participants included a low protein diet and a daily medical formula. Despite all of the participants reporting having a different or restricted diet they frequently dismissed this when describing their diet and reported it as "normal" or basically "the same" as others around them.

Santiago commented:

It really doesn't matter that much, because the really the only difference between people who don't have it and who do have is just the difference between the protein. In you can't eat too much protein. You're pretty much the same. You just don't eat as much protein as the others, so it doesn't really make it different. You do eat special foods, but it's pretty much the same thing.

Jack described his treatment as:

Different diet than everyone else and a simplified protein shake. And the diet is just less protein and nothing that contains phenylalanine, which is a lot of gum and some you

know diet drinks, but for the most part it's normal, besides when you get into like steak and cheese and dairy and stuff, but not really that different from everyone else.

Participants also described their eating habits in a routine way and seemed surprised or confused when asked how they know what to eat or how they decide what to eat.

Jamie reported:

Just like any other person would. Look at my options, if there's more than one then I'll pick the one that would taste better or if I'm feeling healthier, whatever the healthier thing is. Yeah, just like any other person would.

Making sure they adhere to the low protein diet did not appear to be something the majority of participants thought about throughout their day or during meal times. Instead, they reported little thought went into what they chose to eat. Participants reported these decisions are made similar to anyone else which aligns with their framework about PKU and helps minimize the impact their treatment has on daily life while also normalizing PKU. For instance, when asked how they decide what to eat Oliver said, "whatever I feel like eating, I just eat" and Jack commented, "Really just anything I'm in the mood for." Similarly, Santiago reported, "It just depends what I want, what I feel like eating, and if I've like eaten pasta like two days in a row already, you know, I'll have rice to change it up." Isaiah acknowledged his diet restrictions, but talked about eating in a similar way. He stated, "There are a lot of things that I can and enjoy eating, so it's just whatever I, I feel like, you know, of course within the restrictions. There are a lot of things that I can eat."

Although the low protein diet plays more of a role when eating in public or social situations (eating with friends, going out to eat, parties) participants also described these settings in a routine way. They described being able to always find something or make these situations

work and as a result they were viewed as potentially limiting but not problematic. Santiago reported he doesn't eat out due to family preferences and commented about parties, "I just work it out."

Isaiah stated:

If it's with family then, I probably won't even think about it at all, but if it's like if I'm out with friends and I'm eating then it's I still don't think about it all the time, but sometimes it is in the back of my mind, but it's still staying aware, that part's always there, but, it's extremely rare that I would ever get the feeling of being left out if I was out eating with friends. I don't really feel that, it's just a way of life now, but yeah I definitely think about it more if my family's not there.

Jamie reported his location plays a factor in helping to diminish the difficulty of eating in social settings. He explained:

For me, especially like in this area ... like there's a lot of vegetarians. Everywhere I go I can find a vegetarian option. Like so going out or anywhere is really not a huge deal, and like if I know we're going somewhere where there may not be food I'll eat something before so I'm not super hungry and looking for food. So it's really not that big of a deal for me, and I'm probably eating healthier foods when I go out with my friends then what they're eating so it's really not a huge deal for me.

Oliver acknowledged social settings as being "different" for individuals with PKU, but he also was quick to dismiss it as a problem and described his experiences with restaurants and parties as follows:

It makes it different, 'cause I know I can't eat what they're eating and I'm always hoping that there's something there for me to eat, but I'm never like nervous or anxious or

nothing like that, I'm just hoping they have something, but if not oh well, that's how I see it, you know if I can't eat, I just can't eat it, it's not a big deal.

While participants recognized the differences and limitations of the diet for PKU they did not emphasize them in these settings. Instead, they were discussed as unchanging elements as previously mentioned.

Participants discussed the potential consequences of PKU with uncertainty. There was also a lack of risk associated with the consequences of PKU. While some participants knew there could be harmful and negative effects from not following their diet and treatment, these effects were described in general terms. There was a lack of understanding and uncertainty surrounding the consequences of PKU that allowed participants to view PKU and the potential outcomes as less serious than they actually are for individuals. For Oliver this appeared as denial of the consequences and not wanting to know what could happen in order to view PKU as more innocuous. Oliver also discussed how he has never experienced consequences from PKU and that has allowed him to deny the presence of PKU in his life.

When talking about the consequences Oliver stated:

When you research it, it makes it real and makes it a part of you. When if you don't, you could just live more normal, I mean it's good to know I guess, but at the same time I kind of would rather not know... I've never had a problem with it that was like a life or death problem, so I never had a problem with it, so it's not real to me.

For others this was uncertainty about the consequences, what they are, when they would start, or how long they would last. Santiago reported his knowledge of what may happen as, "They said just maybe a cold like your immune system at the lower stages the defense would be low. Yeah, the highest would probably be like ... autism, I don't know."

Jack stated:

I don't know most of it, I just know one of the more obvious signs is the mood swings and emotional you know stuff like that ... I don't know. I just know that it does something to your brain, but as far as I know it just kills off a few brain cells and that's saying you went with too much protein. I don't know what would happen if you didn't take the simplified protein everyday, because I've gone a few days where I've just forgot.

Isaiah reported knowing more about the consequences but was still uncertain about what they would specifically be. He described what he thought the consequences would be in this way:

Probably a decline into mental retardation. Well not probably, that's what would happen...I think not just the brain's development, I think the entire body's development, it would sort of become like, muscular dystrophy, that's what would happen I think. It would make sense to me if what would happen is I would just lose, lose all healthy sort of fat built up and that sort of thing.

Jamie also knew more about the consequences for young children with PKU, but was less sure about what impacts he could experience at his current age or in the future. He stated:

Well I just know like if as a baby you weren't diagnosed and you have a regular diet you'd be like mentally retarded, so that's a big difference from having an anxiety attack, but when you're older your brain's more developed something so it's harder to more fully destroy it I guess, so it would be harder to fully switch to that like retardation or anything that severe, so I don't know what would happen if I just stopped.

Jamie uniquely shared two aspects of his life that have contributed to PKU not being a big deal; having a brother with PKU and living in a region where alternative diets are common and there are naturally lots of low protein options at restaurants and in his environment. As a

result the diet part of his treatment for PKU is less like treatment because it is commonplace in the region he lives. For instance, Jamie reported his diet is similar to a vegetarian diet and commented, “At least where I live there’s a lot of people that are vegetarian just by choice, so it’s really not a big deal to be eating the diet I’ve been eating.” He also acknowledged that other places may create more difficulties for individuals with PKU. He noted, “it’s definitely harder in certain places than (my city), yeah, for sure.”

For Jamie, having a brother with PKU has helped to normalize his condition and make it less of a significant factor in his life. It has given him a framework to think about PKU and an example to see how PKU can influence your life and what you can do with PKU. He attributes his positive attitude to his brother and shared:

I think it kind of comes from having a brother with PKU... I mean I’d say again my biggest impacts at least with dealing with my diet would be my brother for sure and that, I have learned to have a more positive outlook and like seeing the good that’s going to come out of it and, yeah, that’s pretty much it.

Jamie is open with peers when they ask and shares that he has PKU with “any person that I’ve had a real conversation with pretty much.” When Jamie began telling his friends about PKU when he was younger he reported they asked some questions about it, but currently for Jamie and his friends PKU has become less of a topic and is rarely brought up and is less noticeable because of the familiarity as he stated in the following:

Not as much anymore, definitely when I was first telling them, they were first learning, yeah, but I mean now it’s just kind of a thing that we all know, oh I’m getting a vegetarian thing, not a big deal.

Jamie acknowledged that having PKU can be challenging and there are good days and bad days, but he doesn't believe it influences his life and summed it up by saying "for the most part it's not really a big deal."

Another factor that helps participants minimize PKU and think of it as not a big deal is the lack of symptoms they experience on a regular basis. None of the participants reported feeling sick because of PKU. Several reported experiencing some small effects such as headaches or fogginess but they reported these quickly went away by drinking their formula or changing what they were eating. Consequently they weren't viewed as concerning or symptoms that something may be wrong. Instead they were looked at more as innocuous side effects of having PKU. Oliver reported, "I feel normal. I forget I even have it." Oliver also reported he is okay with his levels being higher because he doesn't feel anything wrong when they are. He also reported he doesn't think this will impact him long term and doesn't see the need to change his diet currently as a result.

He stated it this way:

Yeah, as long as it doesn't affect me and it won't have an affect on the future or an affect on a day-to-day basis then I don't have a problem with it [high levels], 'cause just 'cause the level is high, I don't know, I can't feel it being high, you know... if no one says anything's going to happen and I don't feel anything happening then I don't see a reason why to stop.

While Isaiah described it as, "It's just sort of like an inconvenience really... like an extra step that other people don't have to take to stay healthy."

In addition to the themes discussed in relation to the research questions there was one additional unexpected theme that emerged from the interviews; developing a self-concept with

PKU. This theme arose in four out of five of the participant's interviews. Thus, this theme provides opportunity for further exploration in the future, but is examined here related to current information shared during this study.

Emerging theme: Developing a self-concept with PKU

As discussed above participants for the majority described their lives and interactions in positive terms. Externally participants did not report struggling with peer interactions or social situations; however, there appears there may be an internal difficulty that adolescents experience with navigating how PKU influences and is incorporated into their self-concept. Several participants shared a conflict between feeling different and a deep desire to be normal and telling themselves they are normal. Oliver said:

I just want to be an everyday person... Of course everyone wants to be normal and not have any problems, just live an everyday life, but it's [PKU] not something that haunts me, you know it's there. I forget about it sometimes, you know, it's not a big deal... I don't think I'm different, I think you know we're the same... but obviously I am different in that way.

Jack shared he would "just be a little more normal" if he didn't have PKU. Participants recognized that having PKU makes them different or unique in some way, but they struggle with understanding or accepting that difference and making sense of it in their day-to-day life. For Isaiah this struggle is seen in how he doesn't share that he has PKU with many people. He reported he is afraid, "they might think differently of me for that reason like just think that it's weird, that sort of thing" and that he doesn't want them to know because, "I feared that would kind of change our friendship." He also reported feeling "self-conscious" about PKU because "...it feels different. It feels different from what other people have to or don't have to deal with."

He was unable to provide more clarification as to what “different” felt like or he experienced. For the majority of participants this topic seemed difficult to articulate likely because they haven’t thought much about the topic before, despite encountering the feelings throughout their life.

PKU appears in some ways to have helped create a more mature and resilient mindset for the participants. This is seen in participants having an awareness of the ways people are different. It is also apparent in their insight into how in their own life things could be more difficult, or they could be worse off with PKU or in other areas of life. For instance, Jamie shared, “You learn to mature a lot younger, like as a little kid, you learn it’s okay to be different from a younger age, you have to.” While Jack noted, “Everyone has their own thing,” and as previously discussed, the resounding theme across participants that “it could be worse” plays into this as well.

In addition to the traditional struggles in adolescence about developing a self-concept that is developmentally appropriate, PKU appears to add a challenge with integrating PKU into their self-image. There was a sense of feeling self-conscious about their physical appearance because of PKU and a direct belief they would look different physically, for the better, if they didn’t have PKU. Largely participants believe PKU has influenced their physical appearance and this is an area they report struggling to deal with in regards to their self-concept.

Isaiah said:

I guess my size is another inconvenience, but that’s just my own self consciousness...maybe the biggest inconvenience, the biggest thing that I don’t really like about it is the fact that I’m not getting as much protein as other people is it has stunted my growth. Like, I guess height’s not really that big of a problem, but it’s my

weight that's not where it should be. I'm just not really able to build anything around myself.

For Isaiah his feelings about his appearance, specifically his height and weight, create personal conflict for himself. Although he is frustrated by his appearance, he is also conflicted about whether or not it is okay for him to feel that way. He has tried to reframe the struggles and create strategies to cope with his feelings, but when discussing it he also mentioned struggling with feelings of selfishness and guilt for having those thoughts and tried to dismiss it as he is able to handle it and it isn't a big deal in the end. He described it this way:

Yeah it's frustrating, I wouldn't say that I'm picked on for it, because I'm not, I'm really not picked on for it so I can't say that, but when I am playing sports that is frustrating that I'm not as big as some of the other kids, but I learned how to kind of work around that. It's, I guess when I'm saying it now it seems really like really selfish, kind of petty I guess, but probably the biggest problem I have with my size is that, being as thin or as skinny as I am is probably not attractive, so that's probably the biggest problem that I can find with it, other than that there are ways to work around it.

Jack also reported feeling PKU has impacted his appearance and without PKU his appearance would change. Similar to Isaiah when discussing his thoughts he began to share and then corrected himself to make it sound like a smaller issue than he may actually believe it to be in his life. Regarding what he would like to change and the challenges of PKU Jack reported:

I'd be able to gain a little more weight, that'd be the only, if there was a big thing that I had to say it'd be not being able to gain too much weight that easily, 'cause having the same amount of food each day keeps you at this weight, and over time I'll get a bit more, but growing as tall as I'm getting and not really being able my weight to catch up with it

too well that's not been like a huge thing though, 'cause I'm not like super scrawny, but it's enough to where it's, you know, kind of an inconvenience but it's not anything that I'd change massively.

Jamie reported conflicting opinions about how he feels about not being able to gain weight or muscle when he shared, "Just because it's harder for me to gain muscle, I don't think it really affected anything other than I'm not as muscular or can't get as muscular as fast." However, he also mentioned, "I mean I wish I could gain more muscle yeah, I guess that one would be up there for sure" when talking about what he wishes he could do if he didn't have PKU. Oliver discussed his difficulty with gaining muscle in relation to playing sports and working out. He shared, "it's like 10 times harder for me to get muscle than the average person," and shared he always wanted more muscle "for football" and it was difficult to watch his peers achieve things he thought he wasn't able to do because of PKU.

Oliver reported:

Like I used to go to the gym with my friends... and we would go every day for like, it was like two months, and they all made progress and I wasn't making the same progress, and it kind of sucks seeing them build up and you're just kind of in the same spot, but you put in the same amount of time as them... that's the only thing that really sucks about it.

Oliver uniquely talked about one aspect of PKU when he repeatedly reported PKU is "not real" to him. This appears to stem from how he doesn't want to integrate PKU into part of who he is as a person. Multiple times throughout the interviews he mentioned, "It's [PKU] not real to me, obviously it's real and all that, you know what I'm saying, but it's just not real to me." When asked to further elaborate on this point he stated, "It's more not acknowledging it [PKU] as in, if

I don't really think about it, I don't know, it's, I don't know what words to use for it." Then later he was able to articulate the concept in this excerpt:

It's like I don't want to keep remembering I have it, it's not a huge deal, but at the same time I don't want it, so when I do forget about it, I kind of, I kind of like forgetting about it, does that kind of make sense?

This was an interesting way he struggled to understand and accept PKU as something he has and is a part of who he is as a person. He would like to "forget about it" and continue to live his life as though he doesn't have PKU. He shared how he wouldn't want to be "known" because he has PKU and explained this as not wanting anyone else with PKU to feel bad that they couldn't do the same thing. He also reported he knows very little about PKU because, "I'm kind of afraid to research it, 'cause I don't want to know about it." For Oliver, he has tried to distance himself from PKU and make sure PKU is not a part of who he is by not learning about it and trying to "forget" about having PKU.

Conclusions

The findings of this study suggest that adolescents with PKU describe their quality of life in positive terms and report similar influences on their satisfaction and quality of life as other adolescents. They also perceive their social lives to be similar to that of their peers and report they are more similar than different from their peers. Adolescents with PKU described few challenges in social situations and when encountered viewed these challenges more as inconveniences than true challenges. The most prominent finding is that adolescents with PKU minimize their condition and the impacts it has or could have on their life. They try to make PKU as minor as possible when talking about it, sharing it with others, or even when it does come up in social situations. Finally, knowledge of PKU varied across participants, with the

majority of participants having a general understanding of how they got PKU, what their treatment is, and some possible consequences. Yet, participants also reported a number of incorrect consequences and misconceptions about PKU.

CHAPTER FIVE:

DISCUSSION

This chapter begins with a discussion of the research findings presented in chapter four associated with each research question, as well as one emerging theme that was not directly associated with any of the research questions. Next, implications of the results are provided and discussed followed by limitations of the study. The chapter concludes with directions for future research.

Research Question 1: How do adolescents with PKU describe their quality of life? What factors do they identify that positively and/or negatively impact their quality of life?

The themes related to the first research question were a positive description and satisfaction with life because “it could be worse,” and relationships, both positive and negative, are most important. The adolescents in this study reported an overall satisfaction with their lives and described the quality of their life in positive terms. Although they identified room for improvement, they attributed this as normal and that there is always room for improvement in everyone’s life. Interestingly, participants in the study judged their overall quality of life based on an absence of negative experiences and events instead of attributing it to positive events. They were less likely to identify specific events or experiences that made their life positive when asked to think about their life in general, but rather spoke of how they haven’t experienced difficult situations and therefore believe their life has been good in comparison because “it could be worse.”

The positive outlook of the participants largely came from focusing on comparing their current circumstances to potential events that would be significantly worse than their life experiences. This allows them to see their struggles in perspective of the larger scope of challenges they could experience. As a result, the participants are able to appreciate their current state of affairs. This finding is similar to that of Demirdas and colleagues (2013) who hypothesized that individuals with PKU are aware of the potentially detrimental consequences of their disorder and as a result are more appreciative of their own abilities. However, in the current study it appears these adolescents are more aware of other potentially more detrimental diseases or events they could experience, rather than the consequences of PKU, which makes them appreciate their current abilities. Although they did not specifically mention PKU as an influencing factor, it may be interpreted that having PKU provides them with a broader perspective and a greater appreciation of the importance of life. PKU is used as the reference point for how things “could be worse” and as the reminder to not take aspects such as health or family for granted.

Participants identified relationships with friends and family as the most salient factor that influences life satisfaction and QoL. Numerous studies also have found that healthy adolescents and adolescents with a chronic illness identify friends and family as the most common determinant of QoL (Chen, Tseng, Shieh, Lu, & Huang, 2014; Helseth & Misvær, 2010; Luyckx, Missotten, Goossens, & Moons, 2012; Seid, Huang, Niehaus, Brunner, & Lovell, 2014; Suldo, Frank, Chappel, McMahan Albers, & Bateman, 2014). Although just the presence of others was identified as important, participants specifically described the multifaceted nature of relationships as being essential. It is not just having relationships, but the support they provide and the time they spend together that influences their mood and gives meaning to their lives. In

particular, relationships were identified as a factor that influences their life both positively and negatively. Other factors discussed (e.g., school, pets, materialistic items) were identified as temporary influences and not relevant to participants overall perception and evaluation of their QoL and life satisfaction.

Prior research in some other chronic illness populations (Shikako-Thomas et al., 2009) has found the illness itself is not a salient factor in determining perception of QoL and other factors are more influential (Chen et al., 2014). Similarly, the majority of current participants did not directly mention PKU as a contributing factor to how they perceive their current QoL, and all participants believe PKU does not influence their life satisfaction. When speaking about how their life could be worse, some of the participants mentioned PKU as a reference point, but did not provide specific examples of how it currently influences their QoL. Rather, using PKU as a reference point appeared more as a protective factor in thinking positively about their life satisfaction. This is despite PKU being described as neutral or negative rather than positive when asked directly if they consider PKU to be a positive or negative element. Participants attributed it as a neutral or negative element due to the inconveniences they endured from having PKU and the fact that they would prefer not to have PKU. Still, participants shared how they don't know what life would be like without PKU so it is difficult for them to identify the impact PKU may have had on their life. A couple of participants also described PKU as being something that "shouldn't matter." It's unclear whether this is consistent with the previously discussed perspective that PKU makes individuals more appreciative of what they have or whether this is something the two participants have been taught to believe. Regardless, it appears to be another positive coping strategy that prevents PKU from negatively influencing their lives.

Research Question 2: How do adolescents with PKU describe their social lives? What challenges, if any, do they experience in social situations and peer relationships?

Themes related to the second research question included: social lives are normal and challenges are limited because having PKU doesn't change things that much, and challenges ebb and flow across age. Adolescents described their social lives as being the "same as anyone else" and when initially asked about any differences in social situations seemed almost confused by the question. Yet, when they were asked about specific situations and settings they were able to note some challenges, but these challenges were viewed as inconveniences and participants dismissed the idea that they were truly challenges. Adolescents in the current study felt they had the skills and ability to handle and "work out" most situations they encounter that involve food. They view these situations in a positive light and are optimistic that they can always "find something" (i.e., some type of food or drink) in those situations they are able to eat. This may be attributed to the tendency to minimize PKU and the impact it has and instead believe they can engage in any social situation without restriction. It may also be attributed to limited health literacy, specifically a lack of understanding about the consequences and need to adhere to diet all the time. For instance, the items participants noted they most often can find and eat in social situations (e.g., pizza, chips) are not items that should be eaten on the PKU diet, or need to be consumed in very limited quantities, which participants did not acknowledge. Another possible explanation is the development of resilience and adaptability over time as a result of encountering these situations throughout their entire life. Based on current findings it seems likely to be a combination of these factors that produces the adaptive coping style participants describe in social settings.

The inconveniences varied across participants, as well as the perception of the adolescent's role in social situations that involve food. Older adolescents (17 and 18 years old) reported these situations require them to take on more responsibility and awareness of what they can or cannot eat. None of the adolescents reported PKU prevents them from doing anything they want to do. This finding is contrary to prior research that found adolescents felt their social lives were constrained (Weglage et al., 1992; Weglage et al., 1996). Instead of allowing PKU to limit or restrict their activities they have risen to the challenge by taking on responsibility of managing their diet in these settings. However, older adolescents noted taking on more responsibility appeared to be something that was "forced" on them rather than a welcome change and task. For example, both Jamie and Oliver discussed that in order for them to do the activities they wanted to do at school, in sports, and with friends they were required to learn about how to navigate their diet in more unpredictable social situations where their parents were not present to provide guidance and information.

Younger participants (14 and 15 years old) did not report this same level of awareness or concern in social settings or need for responsibility. For the younger participants this was partially due to the limited number of social situations they engage in on a routine basis. The younger participants reported eating at home more frequently and when going somewhere it typically involved a parent or a familiar situation (e.g., a close friend's house) where they did not have to make many decisions about food. The younger participants also took a more proactive approach to social situations involving food stating often they would eat before they go somewhere, bring food with them, or invite people over to their house.

The social situation adolescents described as the most challenging was going out to eat. For adolescents whose friends know they have PKU they talked more about going out to eat

being less exciting or fun because they “always have the same thing.” Whereas, for Isaiah, whose friends do not know he has PKU, going out to eat is a threatening situation where someone could find out about PKU or notice he is eating differently. As a result, it is a challenging situation that makes him more aware of his diet and differences due to PKU. Adolescents identified social situations that are unpredictable (e.g., a party at someone’s house, a new restaurant) as the most difficult to navigate due to the uncertainty around what will be present and if it will meet their dietary needs.

Across all participants social settings were noted as less challenging when they involved family versus peers. All participants noted their family members are aware of their diagnosis and making special food for them, even during holidays, is a routine to which they are accustomed. In social situations with peers inconveniences varied across participants based on whether or not peers were aware of their diagnosis. Disclosing a PKU diagnosis has been described as being a test of trust and the amount of disclosure varies among individuals (Vegni et al., 2009). This was somewhat consistent with current findings. Three of the participants reported being very open about having PKU and described almost everyone, if not everyone, in their lives being aware of their diagnosis. These adolescents referred to PKU as information they don’t consider “private” or something to not share with others. In comparison, for two of the participants the decision to share their diagnosis is one of trust and they think carefully about with whom they share the information and what information is shared. Although there are several reasons behind why these individuals are more guarded about sharing their PKU diagnosis (e.g., family practice, lack of understanding or acceptance of diagnosis) they also both appear to be grounded in a fear of being different or judged for having PKU, and worry about what others may think of them.

Adolescents in the study described experiencing distinct challenges and levels of challenges at various points in their life. The early childhood years were described without difficulty in part due to their lack of understanding that anything in their life was unique. Their diet for PKU was their everyday “normal” and peers grew up with the participants and were used to their restricted diet. As participants reached late childhood and early adolescence the realization that their diet was not the same as others became more noticeable and participants described struggling with feeling different and peers noticing and asking about the discrepancies in their diet. This is consistent with prior studies that found adolescents felt noticeably different in food related settings (Di Ciommo, Forcella, & Cotugno, 2012; Vegni, Fiori, Riva, Giovannini, & Moja, 2009). Adolescents reported feelings of not being normal or standing out from peers were most prevalent during lunch or when teachers were handing out snacks at school, all situations involving food.

During the time of increased social difficulty in late elementary and early middle school participants reported they felt discrepant from peers specifically because of having PKU and spoke of recognizing the restrictions of their diet and how it might limit them in social situations. They spoke of wanting to be “normal” and most commonly described feeling self-conscious in these settings. What is unclear at this point is whether or not the perceived difficulty in social interactions and feeling “different” is consistent with developmental issues confronted by healthy children or whether it is more significant in children with PKU. Self-esteem tends to be high in childhood and decline in adolescence. This is often attributed to difficulties with self-image and the increased ability to evaluate their own efforts and abilities, as well as make comparisons to others (Broderick & Blewitt, 2015; Robins & Trzesniewski, 2005). From the perspective of the adolescents they felt these situations were more difficult for them and commented on wanting to

“be a normal kid.” Yet by the time they reached high school these feelings had subsided. The adolescents attributed this to a recognition and awareness that everyone is unique and that PKU does not really limit what they can do in life. This may indicate it is more a developmentally appropriate feeling of self-consciousness that comes with exploring their self-identity (Broderick & Blewitt, 2015). Challenges slightly increased again towards the end of high school with the increase in responsibility of management of their PKU. However, at this point in time the challenges discussed were practical and logistic in nature and not related to feeling self-conscious or dissimilar from peers. Specific challenges mentioned included planning meals and remembering to take medicine or drink formula on their own without the help of a parent. Again adolescents described these challenges as being more of a burden or extra step than actual challenges and generally believed they could manage the inconvenience of these extra requirements.

Research Question 3: How do adolescents believe their life is different from their peers?

The theme related to the third research question is we are more similar than different. The adolescents in this study perceived themselves to be similar to their friends. They identified similarities in terms of interests, education, hobbies, and personalities. Participants’ initial reaction when asked how they are similar or different from their friends was unanimously “we’re similar.” This initial reaction is to be expected based on social psychology research that indicates we naturally as humans gravitate towards people we have things in common with and with whom we share interests, beliefs, or perspectives (Crisp & Turner, 2014). This initial reaction also speaks to the participants’ view of trying to minimize PKU and preventing it from playing a role in their lives. When asked further, participants acknowledged they were different due to diet and having PKU, but the adolescents tended to dismiss it as an “obvious” factor or talk about it

as one that doesn't need to be mentioned. Adolescents also described PKU as a distinctive characteristic that was not readily apparent and only became relevant in certain situations (i.e., involving food) as previously discussed. Participants' responses were consistent with Gentile and colleagues (2010) description of PKU as a hidden disability that only emerges in certain settings. Other noted differences among the adolescents included the way they were raised and family composition. These variations were discussed as interesting, but not defining in their relationships with peers.

One consistent theme across participants seemed to be recognition of some type of difference between themselves and their friends due to PKU and then a dismissal that having PKU doesn't really make them disparate or is not important in the relationship. The dismissal of PKU being distinct or deeming PKU not important appears to be related to the theme that adolescents minimize PKU in their life and their resilient framework and mindset that they can handle having PKU. It may also be attributed to the lifelong nature of living with PKU and not ever knowing life without it, and as a result it doesn't feel abnormal to them because it is their normal. It should be noted as well that I had the sense the adolescents only reported PKU as a difference because they were being interviewed for having PKU. Without the context of participating in the interviews due to having PKU it is possible PKU would not have been mentioned. Oliver confirmed this thought and reported there were other things that are more relevant than focusing on or discussing PKU.

Research Question 4: How do adolescents with PKU conceptualize and understand their condition? How do they describe and make sense of their treatment?

The theme related to research question four is PKU is simplified and minimized, in other words "it's not a big deal." Adolescents conceptualize PKU in a way that appears to minimize

the significance and impact of PKU and allows them to view themselves as a typically developing adolescent. For example, they view themselves as healthy and do not believe PKU has an impact on their daily functioning. Adolescents also rarely refer to PKU by name instead calling it a “diet,” “food disorder,” or saying, “I can’t have protein.” These findings support previous studies that have found the majority of individuals with PKU do not describe PKU as a disease and view themselves as healthy and not ill (Di Ciommo et al., 2012; Vegni et al., 2009). Although minimizing PKU may appear to be problematic from the medical perspective, for those living with PKU they may not actually be minimizing the role it plays in their life. Instead, it appears there may be a dichotomy between the adolescent’s perspective and the perspective of professionals who work with individuals with PKU. It is possible that the adolescents are truly not impacted by PKU and are okay living with this chronic health condition. They may view themselves as healthy and use other terms to describe PKU because those are accurate from their viewpoint. It may also be true that both explanations apply to different adolescents or even to the same adolescent at different points in time.

For the adolescents, PKU is a piece of who they are, but does not influence or compose a large portion of their identity. It is not a “big deal” because they view it as just another feature of themselves, similar to eye or hair color, and not one they are known by or one that defines who they are or what they can do in life. Still, this perspective may allow the adolescents to be less concerned about adhering to their diet and less aware of problems or indicators of side effects or consequences from elevated PHE levels. For example, Oliver reported he only checks his blood levels a few times a year and assumes they are “fine.” He reported, “I mean as long as I don’t feel like anything’s wrong with me I guess nothing is wrong.” Some adolescents reported getting headaches when their PHE levels increase, but not all adolescents reported feeling physical

symptoms. Mostly they reported Oliver's motto that if they feel fine they must be fine. This speaks to a lack of understanding of how PHE levels can impact their bodies and why it is important to monitor their blood levels. Adolescents consistently describe PKU without addressing the consequences of PKU, thus making it sound innocuous. The simple explanation most frequently reported was PKU means you can't break down protein. Word choice appeared to be an important component of how they conceptualize and understand PKU, as well as how they shape others' perceptions and understanding. Adolescents used words to describe PKU and the treatment that made it sound less like a disorder or something is wrong and instead made it sound more normal and common.

Although there has not been any prior research directly on health literacy in individuals with PKU, there are a few studies that have examined knowledge of PKU, treatment, and consequences. Both adolescents and parents have been found to have poor knowledge about PKU, the diet, the amount of PHE in food, the etiology of PKU, and consequences for not adhering to the diet in these studies (Bekhof et al., 2003; Di Ciommo et al., 2012; Vegni et al., 2009; Weglage et al., 1992). Current findings suggest adolescents understand basic information about PKU such as it is genetic, they have to be on a restricted diet, and they are supposed to regularly check their blood levels. However, adolescents reported largely not worrying about what they eat which appears consistent with previous research that has noted poor knowledge about the amount of PHE in food.

Adolescents were initially perplexed when asked about their treatment for PKU and reported they did not have a treatment despite describing a restricted diet and drinking formula. This appears to be yet another way for them to think about PKU as not a big deal and make having PKU more normal. Adolescents dismissed the diet as being difficult and perceived it to

be mainly the same as those around them. This is inconsistent with previous research that found over half of individuals with PKU reported treatment to be difficult and two-thirds reported it was restricting for their lifestyle (Brown & Lichter-Konecki, 2016). Similarly adolescents were confused when asked how they know what to eat and how they make decisions about what to eat and reported it to be “the same as anyone else.” This may be due to the fact that while the adolescents make some decisions for themselves the majority still relies heavily on their parents to inform them about what they can and cannot eat, especially in novel situations. By not giving much thought to what they eat this allows the participants to once again maintain PKU as a minimal factor in their life. Yet, thinking about treatment this way is not necessarily problematic and supports the idea that adolescents may have a different perspective on PKU than professionals would expect. This may be viewed as an adaptive coping strategy that prevents them from more significant worries or concerns regarding PKU.

The area where adolescents were most lacking in knowledge was regarding the consequences of nonadherence to the diet for PKU. Adolescents were uncertain about what the consequences could be, when they would start, and how long they would last. They frequently reported thinking the consequences would be similar to other medical conditions such as Autism or Muscular Dystrophy, but also believed it would take a while for the consequences to occur. Adolescents also reported they had not experienced consequences and therefore this appears to allow adolescents to maintain their view that PKU is not harmful or potentially damaging. The lack of knowledge about the consequences is concerning from an outside perspective and while adherence to the diet was not directly addressed in this study it appears likely that several of the individuals are more laidback about adherence because of the perceived lack of truly harmful consequences from nonadherence to diet. Consequences were discussed as only really being

concerning to adolescents if they were life or death matters. Other more nuanced consequences or consequences that could be in the future, but were not felt in the present, were dismissed and not thought of by the adolescents which may be consistent with their developmental stage and thinking focused on the present rather than the future. Although this may be alarming to medical providers or professionals with knowledge about PKU, this may actually be a positive viewpoint from the adolescent's perspective and important for those without PKU to consider. Not focusing on all the possible consequences that could occur appears to allow the adolescent to live more fully in the present moment and prevents them from added worry, stress, and concern. It's hypothesized that the lack of symptoms adolescents currently experience plays into their viewpoint of the consequences not being salient or personally relevant.

Emerging Theme

One additional theme emerged that was not directly related to the research questions, but warrants additional discussion: developing a self-concept with PKU. Adolescence is a time of discovery and development of self-concept, confidence, and self-image. PKU appears to add an additional layer of challenge during a time when individuals are already developing and potentially struggling with their self-concept. Although many adolescents struggle with their physical appearance during this time in their lives, the adolescents in this current study described struggles with their physical appearance they perceived were directly related to having PKU. A number of studies have found individuals with PKU display higher levels of internalizing symptoms compared to healthy controls (Cappelletti et al., 2013; Gentile, Ten Hoedt, & Bosch, 2010; Smith & Knowles, 2000; Weglage et al., 2000) and issues with self-concept and self-image may contribute to those internalizing difficulties. As a result, although it may be developmentally appropriate for the adolescents to be questioning their physical appearance they

would likely benefit from some additional education and information related to whether or not PKU may be causing their concerns. While participants initially shared their thoughts on self-image and were forthcoming, they did not want to talk about it in depth. This may be due to the gender differences between myself and the male participants, or a result of self-concept and self-image being an unexpected topic and something I was not fully ready to explore regarding their thoughts and experiences with the topic. Regardless, it leaves opportunity for further exploration in the future across genders. Previous research has found a higher prevalence of decreased sense of self (poor self-image and lack of autonomy) in individuals with PKU (Smith & Knowles, 2000). Although they were not able to conclude the increased prevalence was due to PKU, with the current emerging findings this is an area that deserves further exploration to determine if and how PKU is contributing to poor self-image and influencing self-concept.

Implications

The results of the current study have a number of practical implications for behavioral health professionals, medical providers, and others working with adolescents with PKU, as well as, parents and individuals who know an adolescent with PKU. Adolescents shared new insight into how they conceptualize and think about PKU. Behavioral health professionals, medical providers, and other professionals who work with adolescents with PKU can use this information to better understand, relate to, and work with adolescents on issues related to PKU.

The most prominent finding in this study was these adolescents view PKU as “not a big deal” in their lives and try to minimize PKU in their daily life. However, this may not be true for all adolescents with PKU and therefore it is important to ask about the impact and perceived role PKU plays in an adolescent’s life. Additionally, describing PKU as “not a big deal” may be an indicator of limited health literacy and further assessment of the adolescent’s knowledge and

understanding of PKU may be warranted. Understanding more about the attitude and perception towards PKU can help behavioral health and medical providers make more informed decisions about what to prioritize during medical appointments and who should be regularly involved in their care. It may be useful for behavioral health professionals and medical providers working with adolescents with PKU to ensure adolescents who view PKU as “not a big deal” understand the consequences of nonadherence to their diet are a big deal even though they may not be seen or felt by the adolescent in the present. Several of the current participants reported that if they don’t feel like anything is wrong then they believe nothing is wrong. It would be important for behavioral health and medical providers to have honest conversations that are developmentally appropriate to help adolescents understand the long-term effects and consequences of current actions and the importance of maintaining adherence and awareness of PKU in the present. However, behavioral health professionals and medical providers should not automatically assume viewing PKU as “not a big deal” is harmful or disadvantageous. Instead, the focus should be on understanding the reasoning and experiences that have contributed to the adolescent’s view of PKU in their life and honoring their perspective and understanding.

The results also speak to the importance of having behavioral health providers integrated into settings where adolescents are receiving their medical care to help facilitate the integration of physical and mental health. Behavioral health providers can offer specific guidance on what biological, psychological, and social factors may be important for a specific adolescent and why they may or may not view PKU as “a big deal.” As a result, they can help improve communication and collaboration between medical providers, adolescents, and their families and foster relationships between the systems in which the adolescent lives. Behavioral health professionals and medical providers should use motivational interviewing (Miller & Rollnick,

2013) when talking with adolescents with PKU to understand why or why not PKU is “a big deal” in an adolescent’s life. Motivational interviewing focuses on understanding the individual’s perspective, without judgment, and coming alongside them to promote change. Using motivational interviewing can help behavioral health professionals promote adolescents engagement in their care and treatment adherence. It can be particularly helpful when working with adolescents who view PKU as not a big deal, but who are having difficulty adhering to their diet or displaying high levels and do not recognize the current or long term impact or implications. Using the spirit of motivational interviewing, which includes partnership, acceptance, compassion, and evocation (Miller & Rollnick, 2013), can improve communication and collaboration among adolescents and their medical team and promote understanding of the goals and objectives for everyone involved in their care. This can result in more efficient and effective medical visits, improve understanding of the adolescent’s perspective, and promote positive change.

The challenges associated with having PKU changed depending on the age and stage of the adolescent and this highlights the importance of paying attention to the natural transition times when adolescents are likely to experience more challenges. Natural transition times that all children will undergo include moving from elementary to middle school and then to high school. Other times that should be also be monitored include after an individual move or changing schools at a time other than a natural transition. It may be beneficial to provide additional support and ask specific questions during these times to accurately assess whether or not an adolescent is struggling or facing challenges. It was also found that changes to peer groups and friends might increase the perceived difficulties in social situations. In addition to the natural transition times all children will endure, this finding may transfer to other scenarios where

adolescents with PKU are among new peer groups such as after a move, a change in school not at a known transition point, or when starting a new hobby or activity (e.g., a new team sport). Therefore, it may be important to provide these adolescents with additional support around how to share about PKU with peers and why disclosure can be helpful and is important. Additionally, identifying the sources of stress and challenges can provide information on appropriate interventions and services that may help to reduce the challenges in these settings. One way that may be beneficial is teaching adolescents advocacy skills including ways to be more proactive and assertive in sharing and educating others about PKU, as well as taking responsibility and control in social situations involving food. Behavioral health providers can provide training on and suggest using active coping strategies in these situations to address any concerns adolescents may have or experience.

Current findings indicate there is room for improvement in health literacy among adolescents with PKU. This has practical implications for how medical specialists provide education and share knowledge with adolescents, as well as what they spend time discussing during regular appointments. Going out to eat was an area that was identified as the most difficult for adolescents due to not knowing what they might be able to eat or if there is something available at a restaurant. Providing education on how to make decisions about what to get on restaurant menus would help to decrease anxiety and concern in these situations. Another strategy would be encouraging adolescents to go online to review restaurant menus and make meal choices before going to a restaurant. These strategies may empower adolescents with the knowledge of being able to eat out and partake in regular activities with family and friends.

Another area in which to improve health literacy is related to physical appearance and impact of PKU on height and weight. Although this was an emerging theme in the current study,

it appears it may be a common experience among adolescents with PKU. Having additional conversations with adolescents about their satisfaction or concern with physical characteristics may help to identify false beliefs and improve knowledge of the impacts and consequences of PKU. Knowledge of this information would be useful when discussing diet and treatment adherence and help problem solve any barriers to adherence.

For Jamie, the most important influence on him being able to navigate life with PKU was having a brother with PKU. None of the other adolescents reported having a relationship or knowing anyone else with PKU. Having a relationship with someone else with PKU helped to normalize the condition for Jamie and helped him have a positive outlook on life with PKU. He believes it is essential for everyone with PKU to know someone else with PKU for support, understanding, and to help with the challenges that arise. Behavioral health and medical providers could assist adolescents in meeting and identifying others with PKU. Although there are many support groups that are often recommended to individuals with PKU, having more of a mentoring relationship with someone who is older and has already experienced and lived through difficult situations may be more beneficial for individuals. This would allow a personal connection and someone to trust and confide in who is able to empathize and provide advice from experience in a way some professionals are not able to provide. While not all adolescents may be interested in such a relationship, behavioral health or medical providers can ask about interest and offer this connection to interested individuals to promote positive coping strategies and reduce stress associated with PKU.

Limitations

There were several limitations to the current study. The purpose of this study was to gain an in depth understanding of the perspective of adolescents with PKU that could be transferred to

other adolescents with PKU. Purposeful sampling was used to recruit participants who could fully reflect on their experiences of living with PKU. Criterion based selection was used to determine the criteria for participation in the study. There is not a difference in prevalence of PKU between males and females in the United States. Therefore, an effort was made to recruit participants that were representative of the larger PKU population in the United States. However, the sample did not reflect this effort. For example, one adolescent female expressed repeated interest in participating in the study but unfortunately her parent was not able to be reached to provide consent to participate. As a result of the sampling methods used, the final sample included five adolescent males. Although the sampling methods were purposeful they did not result in a sample that was representative of the prevalence of PKU in males and females. The results of the study were meant to describe the experience of specific individuals with PKU. Therefore, based on the sample the results may be more representative of males' experiences.

Another limitation is the study investigated the experiences of adolescents with PKU who were from specific geographic regions. The interpretivist framework emphasizes the relationship between an individual and their environment and geographic location played a role in the environment in which participants lived. Additionally, the interpretivist framework focuses on specific, local realities (Guba & Lincoln, 1994). The majority of participants were located in a similar geographic region and consequently the findings of the study may not be representative of the experiences of adolescents with PKU in different geographic regions and may limit the transferability to adolescents with PKU from other locations. For example, Jamie (who was located in a different geographic region from the other participants) highlighted several times throughout his interviews that he believes his geographic location makes having PKU easier and he perceives less challenges in social situations regarding his diet because it is similar to other

diets in his geographic region. This limitation could be overcome in future research by conducting interviews with multiple participants in each geographic region represented.

The goal of the study was to gain understanding of adolescents' perspectives and beliefs about their experiences living with PKU. The study utilized a romantic conceptualization of interviewing in order to promote sharing of the authentic self during the interview process. However, an additional limitation is that it is not possible to know whether the adolescents in the study shared their true beliefs and opinions about life with PKU. To promote an environment where adolescents felt comfortable sharing their authentic selves multiple interviews were conducted to allow for time to develop rapport and revisit topics previously discussed. I also emphasized that I wanted to understand their unique experiences and perspective during the interviews. In addition, member checks were conducted on each interview to allow the adolescents time to further elaborate or reflect on the information they provided. The purpose of the member checks was also to allow the adolescents an opportunity to confirm their perspectives were accurately understood and represented.

Suggestions for Future Research

The results of this study contribute to the knowledge of the perceived challenges and experiences of adolescents living with PKU. This was an exploratory study and therefore there are many directions for continued and future research. It would be beneficial to continue to gather information on the lived experiences of adolescents with PKU. Further studies could explore the experiences of individuals with PKU during late childhood and early adolescence (the time identified by current participants as most difficult) to understand the challenges and experiences of individuals with PKU at that time point in their lives, instead of based on recalled information. This may provide additional insight into ways to support and help these individuals

in this stage of life. Additionally, it may be beneficial to conduct future research with groups of adolescents with PKU. Individuals with PKU frequently do not know others with this condition and coming together to talk about experiences may provide a more comfortable format for adolescents to share their true experiences.

A second direction for future research could investigate the perceptions of parents and peers on the challenges individuals with PKU experience during specific life stages. The results of this type of study could yield information that could be beneficial in understanding whether the challenges experienced are more internal or external. It also may provide valuable information into the types of support and education needed by parents, families, and peers of individuals with PKU. A third beneficial direction for future research would be to explore whether or not the type of PKU impacts adolescents' perceptions of how this condition influences their life. Although treatment is largely the same across types of PKU, the amount of restrictions and supplemental formula and other drugs varies across types, which could potentially produce different qualitative experiences of living with PKU.

Finally, it would be important to conduct further in-depth exploration of the idea of how PKU influences the development of self-concept and self-image. It would be enlightening to explore this idea across males and females and see whether or not they have similar struggles or perceptions of the influence PKU has on self-image. For males, in particular, examining their beliefs on the role that PKU plays in their weight and physical appearance would help to understand how, and if, those perceptions influence their adherence to treatment for PKU. Further, it may be informative to explore how education about the influences of the PKU diet on normal growth and development change these perceptions or beliefs. For example, this could lead to a greater understanding of when to educate these individuals about different aspects of

the condition, impacts, and treatment and provide a more meaningful approach to patient education.

Conclusion

In conclusion, findings from the current study show adolescents with PKU describe their lives in positive terms and similar to their peers. They do not believe PKU has a significant impact on their lives and conceptualize this condition in a way that allows them to argue PKU is only a small variable in their life. Adolescents have basic knowledge of PKU and believe their current level of knowledge is sufficient for their daily lives. Having PKU is not part of how they identify themselves and they believe it is not a defining feature of their lives. In other words, as the adolescents frequently said, “it’s not a big deal.” The results of this study provide information indicating a need for future research with adolescents who are living with PKU.

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APPENDIX A:
SCREENING QUESTIONNAIRE

Date: _____

Potential Participant Study ID: _____

1. Date of Birth: _____

2. Fluent in English? Y N

3. Type of PKU diagnosis?
a) Classic
b) Mild
c) Hyper Phe

4. On diet for PKU? Y N

5. Always received treatment/followed a diet for PKU? Y N

6. Ever received an intellectual evaluation? Y N

If YES, what were the results of the evaluation (e.g., FSIQ score, standard scores, diagnoses, recommendations)? _____

APPENDIX B:

SCREENING FOR PARTICIPANT RECRUITMENT

- Greeting. *Hello Mr. /Mrs. /Ms. _____.*
- *I am calling to briefly tell you about a research study and see if you and CHILD'S NAME would be interested in learning more about the study.*
- *The research study will include adolescents diagnosed with PKU who are between 11 and 18 years old.*
- *The purpose of the study is to learn about how adolescents with PKU believe it impacts their quality of life and their friendships, as well as learning how much adolescents know and understand about PKU and its treatment.*
- *The study will require your child to participate in a screening interview (20-30 minutes), then four interviews (30-60 minutes each). The interviews can be conducted at a location that is comfortable and convenient to you and your child (example: home, community location).*
- *Participants will receive a \$10 gift card for each interview they complete for a total of \$40.*
- *The research study presents minimal risk. There is no direct benefit from being in this study. However, participating in this study may help other adolescents with PKU in the future.*
- *Whether or not you chose not to participate in this study will not impact the services or medical care you receive through our clinic.*

- *Would you and CHILD'S NAME be interested in learning more about the study?*
 - *If YES, I need your permission to provide the researcher, Katherine Wesley, with your phone number so she can contact you directly.*
 - *What is the best number to reach you? Is there a day/time that would be best to receive this call?*
 - *Thank you for your contact information. Katherine Wesley will be calling you within one week (or at preferred day/time) to talk more about the study.*
 - *If NO, Thank you for your time. If you reconsider, please feel free to contact Katherine Wesley at 503-332-8483.*

**APPENDIX C:
ONLINE RECRUITMENT FLYER**

Teens with PKU



- **Are you between the ages of 11 and 18 and have PKU?**
- **Are you interested in sharing your experiences about living with PKU?**

Katherine Wesley, M.S. at the University of South Florida is conducting a research study on the experiences of teenagers with PKU. Qualifying participants would complete a series of five interviews either in person or via online video conferencing (e.g., Skype or FaceTime) lasting a total of 4 hours 30 minutes.

Qualifying participants would receive \$10 in gift cards for each interview completed.

For more information or if you are interested in being in the study, please contact Katherine Wesley at wesleyk@mail.usf.edu.

University of South Florida IRB #: Pro 00028808



APPENDIX D:

PARENTAL CONSENT FORM



Parental Permission for Children to Participate in Research Involving Minimal Risk

Information for parents to consider before allowing your child to take part in this research study

Pro # 00028808

The following information is being presented to help you and your child decide whether or not he/she wishes to be a part of a research study. Please read this information carefully. If you have any questions or if you do not understand the information, we encourage you to ask the researcher.

We are asking you to allow your child to take part in a research study called: **Perceptions of Quality of Life, Peer Relationships, and Health Literacy in Adolescents with Phenylketonuria (PKU).**

The person who is in charge of this research study is Katherine Wesley who is working on her dissertation. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. She is being guided in this research by Dr. Kathy Bradley-Klug.

The research will be conducted at an agreed upon location of you and your child's choosing.

Purpose of study:

The purpose of this study is to learn about the perceptions and experiences of adolescents with PKU, in order to promote understanding about what they believe influences their quality of life, how they experience peer relationships, and what they know and understand about PKU.

Why is your child being asked to take part?

We are asking your child to take part in this research study because he/she is an adolescent between the ages of 11 and 17 who is diagnosed with PKU.

Study Procedures:

If your child takes part in this study, s/he will be asked to meet with the researcher in person or online (Skype or FaceTime) to complete a screening interview to determine if they meet criteria for the study. Children who are able to provide detailed responses to questions, elaborate on their answers, and self-reflect on their experiences will be able to take part in this study. This interview will take approximately 30 minutes. You will be informed if your child meets criteria for participation in the study following the screening interview. If your child participates in the study they then will be asked to meet with the researcher on four more occasions for approximately one hour each, for a total of four hours and 30 minutes. Each of these meetings will include your child engaging in a conversation with the researcher guided by open-ended interview questions. The questions are based on the themes of quality of life, peer and social relationships, and knowledge of PKU and its treatment. Each of the meetings will be audio recorded. However, only the researcher and her doctoral committee will hear the recordings.

Your child will be asked to select a fake name that will be used to identify him/her in all written documentation. The fake name will be used during audio recordings to keep your child's information confidential. Your child will be asked to complete a demographic form that provides information about their knowledge of the type of PKU they have and their treatment for PKU. This information will assist the researcher in describing the participants in written form.

You and your child will be allowed to choose the location of the study visits. Your child will participate in one screening interview and if they qualify for the study would participate in four more study visits that will last about an hour, but may be shorter or longer. The first visit is a screening interview and will include the researcher introducing herself, describing the purpose of the study, providing information about participation in the study, and a conversation based on interview questions. The second visit is a study visit and will include a conversation based on interview questions. The third visit is a study visit and will begin with a review of information collected during the previous interview and the opportunity for your child to change or add additional information to his/her responses, and then a conversation based on interview questions. The fourth visit will again begin with a review of information collected during the previous interview and the opportunity for your child to change or add additional information to his/her responses, and then a conversation based on interview questions. The fifth visit will review information collected during the previous interviews and allow your child to change or add any additional information collected during the interview process. This visit may be conducted through phone or video conferencing (e.g., Skype or FaceTime), if preferred.

Total Number of Participants

Approximately eight individuals will take part in this study at USF.

Alternatives / Voluntary Participation / Withdrawal

If you decide not to let your child take part in this study, that is okay. Instead of being in this research study your child can choose not to participate. You should only let your child take part in this study if both of you want to. You or your child should not feel that there is any pressure to take part in the study to please the study investigator or the research staff.

If you decide not to let your child take part:

- Your child will not be in trouble or lose any rights he/she would normally have.
- You child will still get the same services or health care benefits he/she would normally have.

You can decide after signing this informed consent form that you no longer want your child to take part in this study. We will keep you informed of any new developments, which might affect your willingness to allow your child to continue to participate in the study. However, you can decide you want your child to stop taking part in the study for any reason at any time. If you decide you want your child to stop taking part in the study, tell the study staff as soon as you can.

Benefits

There is no direct benefit to your child from being in this study. If your child takes part in the study, he/she may help others in the future. For example, information from this study may provide information about challenges and strengths of children with PKU and possibly be used to inform and improve care for children with PKU.

Risks or Discomfort

The risks for participating in this study are minimal. There is a chance your child may experience some discomfort when answering some of the questions or thinking about difficult feelings or experiences. If at any point your child says he/she is uncomfortable or is upset the interview will be stopped immediately. You and your child will be able to decide if you would like to continue the interview or not. If you and your child choose to stop the interview then time will be taken to discuss the meeting and any questions. If desired, you and your child will be provided with referral information for psychological services from the USF Health Psychology Team.

Compensation

Your child will be compensated \$40 in pre-paid gift cards if he/she completes all the scheduled study visits. If you withdraw your child for any reason from the study before completion, your child will be paid \$10 in pre-paid gift cards for each study interview he/she completes. For participants completing video conferencing (e.g., Skype or FaceTime) interviews, gift cards will be mailed to a postal address provided by you or provided electronically via e-mail.

Costs

It will not cost you anything to let your child take part in the study.

Privacy and Confidentiality

We will keep your child's study records private and confidential. Certain people may need to see your child's study records. Anyone who looks at your child's records must keep them

confidential. These individuals include:

- The research team, including the Principal Investigator, study coordinator, and dissertation committee members.
- Certain government and university people who need to know more about the study, and individuals who provide oversight to ensure that we are doing the study in the right way.
- The USF Institutional Review Board (IRB) and related staff who have oversight responsibilities for this study, including staff in USF Research Integrity and Compliance.

We may publish what we learn from this study. If we do, we will not include your child's name. We will not publish anything that would let people know who your child is.

You can get the answers to your questions, concerns, or complaints.

If you have any questions, concerns or complaints about this study, please contact Katherine Wesley at 503-332-8483 or wesleyk@mail.usf.edu.

If you have questions about your child's rights, or have complaints, concerns or issues you want to discuss with someone outside the research, call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Consent for My Child to Participate in this Research Study

I freely give my consent to let my child take part in this study. I understand that by signing this form I am agreeing to let my child take part in research. I have received a copy of this form to take with me.

Signature of Parent of the Child Taking Part in Study

Date

Printed Name of Parent of the Child Taking Part in Study

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their child's participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

Signature of Person Obtaining Informed Consent

Date

Printed Name of Person Obtaining Informed Consent

APPENDIX E:

ADOLESCENT ASSENT FORM



Assent of Children to Participate in Research

Pro # 00028808

Title of study: **Perceptions of Quality of Life, Peer Relationships, and Health Literacy in Adolescents with Phenylketonuria (PKU)**

Why am I being asked to take part in this research?

You are being asked to take part in a research study about adolescents who have PKU. You are being asked to take part in this research study because you have been diagnosed with PKU. If you take part in this study, you will be one of about eight people in this study.

Who is doing this study?

The person in charge of this study is Katherine Wesley who is working on her dissertation. She is being guided in this research by Dr. Kathy Bradley-Klug. However, other research staff may be involved and can act on behalf of the person in charge.

What is the purpose of this study?

By doing this study, we hope to learn about the experiences of adolescents with PKU on different areas of their lives.

Where is the study going to take place and how long will it last?

The study will be take place at a location of your choosing. If you take part in this study you will be asked to participate in a screening interview that will last approximately 30 minutes to determine if you meet criteria for the study. If you meet criteria to participate in the study you will then be asked to participate in four more visits that will take about one hour each. The total amount of time you will be asked to volunteer for this study is four hours and 30 minutes over the next two months.

What will you be asked to do?

- You will be asked to meet with the researcher on five occasions, in person or online (Skype or FaceTime) once for approximately 30 minutes to complete a screening interview to determine if you meet criteria to participate in the study. If you meet criteria to participate in the study then you will meet with the researcher four times for approximately one hour each, for a total of four hours and 30 minutes.

Visit	Content	Length
1	Screening Interview	30 minutes
2	Introductions/interview	1 hour
3	Review/revise previous responses, new interview	1 hour
4	Review/revise previous responses, new interview	1 hour
5	Review/revise previous responses	1 hour

- During each of these meetings you will be asked to answer questions about your experiences related to life, friends, and your health.
- You will have the opportunity to ask questions.
- You will be asked to complete a questionnaire that asks some questions about yourself.
- Your identity will be kept private. You will make up a fake name to be used in written documents for the research study.
- All conversations will be audio recorded so the researcher can later listen to and write up the conversation.

What things might happen if you participate?

This study will include asking you questions about whether or not you have experienced any challenges in your life. As a result, you may feel uncomfortable while remembering this information. This may include feelings of sadness, anger, frustration, or anxiety related to the challenges you have faced.

Although we have made every effort to try and make sure this doesn't happen, you may find some questions we ask may upset you. If so, we will tell you and your parents or guardian about other people who may be able to help you with these feelings.

Is there benefit to me for participating?

We cannot promise that you will receive benefit from taking part in this research study. You may experience a positive feeling related to the opportunity to share your experiences and opinions.

What other choices do I have if I do not participate?

You do not have to participate in this research study.

Do I have to take part in this study?

You should talk with your parents or guardian and others about taking part in this research study. If you do not want to take part in the study, that is your decision. You should take part in this

study because you want to volunteer. If you do not want to participate in this study it will not impact your medical care.

Will I receive any compensation for taking part in this study?

You will receive a \$10 pre-paid gift card for each interview you complete in this study. If you stop participating before the study is over, the payment you receive will be based on the amount of time you were in the study. For participants completing video conferencing (e.g., Skype or FaceTime) interviews, gift cards will be mailed to a postal address provided by you or provided electronically via e-mail.

Who will see the information about me?

You will choose a made up name that will represent you in written documentation about the study. Your information will be added to the information of other people taking part in this study so no one will know who you are.

Can I change my mind and quit?

If you decide to take part in the study you still have the right to change your mind later. No one will think badly of you if you decide to stop participating. Also, the people who are running this study may need for you to stop. If this happens, they will tell you when to stop and why.

What if I have questions?

You can ask questions about this study at any time. You can talk with your parents, guardian or other adults about this study. You can talk with the person who is asking you to volunteer by calling Katherine Wesley at 503-332-8483. If you think of other questions later, you can ask them. If you have questions about your rights as a research participant you can also call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Assent to Participate

I understand what the person conducting this study is asking me to do. I have thought about this and agree to take part in this study. I have been given a copy of this form.

Name of person agreeing to take part in the study

Date

Printed name & Signature of person providing information (assent) to subject

Date

APPENDIX F:

ADULT CONSENT FORM



Informed Consent to Participate in Research Involving Minimal Risk

Pro # 00028808

You are being asked to take part in a research study. Research studies include only people who choose to take part. This document is called an informed consent form. Please read this information carefully and take your time making your decision. Ask the researcher or study staff to discuss this consent form with you, please ask him/her to explain any words or information you do not clearly understand. The nature of the study, risks, inconveniences, discomforts, and other important information about the study are listed below.

We are asking you to take part in a research study called:

Perceptions of Quality of Life, Peer Relationships, and Health Literacy in Adolescents with Phenylketonuria (PKU).

The person who is in charge of this research study is Katherine Wesley who is completing this study for her dissertation. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. She is being guided in this research by Dr. Kathy Bradley-Klug.

The research will be conducted at an agreed upon location of your choosing.

Purpose of the study

The purpose of this study is to learn about the perceptions and experiences of adolescents with PKU, in order to promote understanding about what they believe influences their quality of life, how they experience peer relationships, and what they know and understand about PKU.

Why are you being asked to take part?

We are asking you to take part in this research study because you are an adolescent who is 18 years old who is diagnosed with PKU.

Study Procedures:

If you take part in this study, you will be asked to meet with the researcher in person or online (e.g., Skype or FaceTime) to complete a screening interview to determine if you meet criteria for the study. Individuals who are able to provide detailed responses to questions, elaborate on their answers, and self-reflect on their experiences will be able to take part in this study. This interview will take approximately 30 minutes. You will be informed if you meet criteria for participation in the study following the screening interview. If you participate in the study you will be asked to meet with the researcher on four more occasions for approximately one hour each, for a total of four hours and 30 minutes. Each of these meetings will include engaging in a conversation with the researcher guided by open-ended interview questions. The questions are based on the themes of quality of life, peer and social relationships, and knowledge of PKU and its treatment. Each of the meetings will be audio recorded. However, only the researcher and her doctoral committee will hear the recordings.

You will be asked to select a fake name that will be used to identify yourself in all written documentation. The fake name will be used during audio recordings to keep your information confidential. You will be asked to complete a demographic form that provides information about your knowledge of the type of PKU you have and your treatment for PKU. This information will assist the researcher in describing the participants in written form.

You will be allowed to choose the location of the study visits. You will participate in one screening interview and if you qualify for the study would participate in four more study visits that will last about an hour, but may be shorter or longer. The first visit is a screening interview and will include the researcher introducing herself, describing the purpose of the study, providing information about participation in the study, and a conversation based on interview questions. The second visit is a study visit and will include a conversation based on interview questions. The third visit is a study visit and will begin with a review of information collected during the previous interview and the opportunity for you to change or add additional information to your responses, and then a conversation based on interview questions. The fourth visit will again begin with a review of information collected during the previous interview and the opportunity for you to change or add additional information to your responses, and then a conversation based on interview questions. The fifth visit will review information collected during the previous interviews and allow you to change or add any additional information collected during the interview process. This visit may be conducted through phone or video conferencing (e.g., Skype), if preferred.

Total Number of Participants

About 4 individuals will take part in this study at USF. A total of 8 individuals will participate in the study at all sites.

Alternatives / Voluntary Participation / Withdrawal

You do not have to participate in this research study.

You should only take part in this study if you want to volunteer. You should not feel that there is any pressure to take part in the study. You are free to participate in this research or withdraw at

any time. There will be no penalty or loss of benefits you are entitled to receive if you stop taking part in this study.

Benefits

The potential benefits of participating in this research study include helping others in the future who have PKU. For example, information from this study may provide information about challenges and strengths of children with PKU and possibly be used to inform and improve care for children with PKU.

Risks or Discomfort

The risks for participating in this study are minimal. There is a chance you may experience some discomfort when answering some of the questions or thinking about difficult feelings or experiences. If at any point you are uncomfortable or upset the interview will be stopped immediately. You will be able to decide if you would like to continue the interview or not. If you choose to stop the interview then time will be taken to discuss the meeting and any questions. If desired, you will be provided with referral information for psychological services from the USF Health Psychology Team.

Compensation

You will be compensated \$40 in pre-paid gift cards if you complete all the scheduled study visits. If you withdraw for any reason from the study before completion you will be paid \$10 in pre-paid gift cards for each study visit you complete. For participants completing video conferencing (e.g., Skype or FaceTime) interviews, gift cards will be mailed to a postal address provided by you or provided electronically via e-mail.

Costs

It will not cost you anything to take part in the study.

Conflict of Interest Statement

There are no conflicts of interest to report.

Privacy and Confidentiality

We will keep your study records private and confidential. Certain people may need to see your study records. Anyone who looks at your records must keep them confidential. These individuals include:

- The research team, including the Principal Investigator, study coordinator, and dissertation committee members.
- Certain government and university people who need to know more about the study, and individuals who provide oversight to ensure that we are doing the study in the right way.

- The USF Institutional Review Board (IRB) and related staff who have oversight responsibilities for this study, including staff in USF Research Integrity and Compliance.

We may publish what we learn from this study. If we do, we will not include your name. We will not publish anything that would let people know who you are.

You can get the answers to your questions, concerns, or complaints

If you have any questions, concerns or complaints about this study, or experience an unanticipated problem, call Katherine Wesley at 503-332-8483.

If you have questions about your rights as a participant in this study, or have complaints, concerns or issues you want to discuss with someone outside the research, call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Consent to Take Part in this Research Study

I freely give my consent to take part in this study. I understand that by signing this form I am agreeing to take part in research. I have received a copy of this form to take with me.

Signature of Person Taking Part in Study

Date

Printed Name of Person Taking Part in Study

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

Signature of Person obtaining Informed Consent

Date

Printed Name of Person Obtaining Informed Consent

APPENDIX G:
SCREENING INTERVIEW

1. Welcome adolescent and parent/caregiver.
 - Hi! Thank you for meeting with me today. How are you doing?
2. Provide each adolescent and their parent/caregiver two copies of assent/consent forms.
 - Please read the forms carefully.
 - Verbally review sections related to confidentiality and involvement in the study.
 - Do you have any questions?
 - Collect one signed copy of each form.
 - Ask parent/caregiver to leave the room.
3. Introduction to Screening Interview:
 - Thank you so much for agreeing to be a part of my research. Today we're going to complete the screening interview. The interview today should last about 30 minutes. Then I will let you know if you are able to participate in my research in the next week.
4. Screening Questions:
 1. What school do you go to?
 - What is your favorite subject?
 - What do you like/dislike about school?
 2. What do you like to do with your friends?
 3. Tell me about your favorite hobby (sport, activity) that you like to do?
 - How long have you participated in the sport (hobby, activity)?
 - What is a favorite memory of a time you participated in the sport (hobby, activity)?
 4. What did you do over winter break?
 5. Now I'm going to ask you a question about PKU. How would you describe PKU to others?
 - What would you tell someone who doesn't know what PKU is?

APPENDIX H:
DEMOGRAPHIC QUESTIONNAIRE

Date: _____

1. How old are you? _____

2. Are you (circle one): Male Female

3. What is your race/ethnicity?

- a) African American/ Black
- b) Asian/Pacific Islander
- c) Caucasian/ White
- d) Hispanic
- e) Native American/ Alaska Native
- f) Bi-racial/Multi-racial
- g) Other, please specify _____

4. What type of PKU are you diagnosed with?

- a) Classic
- b) Mild
- c) Hyper Phe
- d) I don't know

5. What kind(s) of treatment do you receive for PKU? (Circle all that apply)

- a) Special diet
- b) Medical formula
- c) Kuvan
- d) I don't receive treatment
- e) Other, please specify _____

6. Who knows you have PKU? _____

APPENDIX I:

INSTRUCTIONS FOR INDIVIDUAL INTERVIEWS

1. Welcome adolescent and parent/caregiver (if present).
 - a. Hi! Thank you for meeting with me today. How are you doing?
2. Introduction to interviews.
 - Thank you so much for agreeing to be a part of my research. I'm interviewing teenagers who have PKU and am going to ask you a series of questions about your life, friends, and PKU. Please tell me as much information as you feel comfortable sharing. This is the first of four times we will meet together. I am excited to hear about your experiences. If you feel uncomfortable at any time, please let me know right away, and you can stop the interview. The interview should last about 30-40 minutes, but we can keep talking about your experiences for longer if you want. After we finish talking today, you will receive a \$10 gift card as a thank you. You will also receive a gift card after each of our next two meetings.
3. Confidentiality.
 - I am going to record each of our meetings so I can listen to it later and remember exactly what you said about your experiences. I may write down some notes as we are talking. I will also type out our conversation and bring it with me to our next meeting so we can go over what we talked about. Our second and third meetings will review what we talked about and ask you about some other areas of your life. There are no right or wrong answers to the questions. I am here to listen and learn about your experiences. I want you to choose a fake name that I will use when I type up our conversation and share the results of my study. Everything you share with me will be kept confidential and will not be shared with your parents, doctor, or anyone else. However, there are three things that I'm not able to keep confidential. If you tell me you are going to hurt yourself, you are going to hurt someone else, or that someone is hurting you, I will have to let another adult know in order to make sure you and others are safe. Do you have any questions before we start? What fake name would you like me to use for you?

APPENDIX J:

INTERVIEW GUIDE, QUALITY OF LIFE INTERVIEW

1. I would like to know more about your life. How do you spend your time . . . ?

Probes:

- a. At school?
- b. With family?
- c. With friends?
- d. In social/physical activities/hobbies?

2. How would you describe your life right now?

Probes:

- a. What are the most important things in your life?
- b. How would you describe your mood or the way you feel?
- c. What influences your mood and the way you feel?

3. I'd like to know more about your satisfaction with life and the positive/good and negative/bad things in your life that influence how you feel about your life.

Probes:

- a. How satisfied are you with your life?
- b. What positive/good events/things/characteristics influence how you feel about your life?
- c. What negative/bad events/things/characteristics influence how you feel about your life?

4. How is your life different from your friends' lives?

5. How does having PKU influence how you feel about your life?
6. Is there anything else you would like to share?

APPENDIX K:

INTERVIEW GUIDE, PEER RELATIONSHIPS INTERVIEW

1. Tell me about your friends.

Probes:

- a. How do you know your friends?
- b. Are they similar to you or different from you?
- c. What do you like to do with your friends?

2. Who knows you have PKU?

Probe:

- a. Do your friends know you have PKU?
- b. How did they react when you told them you had PKU?

3. What do your friends know/think about PKU?

Probes:

- a. Do they ask you about PKU?
- b. Do they know what you can and can't eat?
- c. Do they know what will happen if you don't follow treatment?

4. What's it like having PKU?

Probes:

- a. What is it like going out (to eat, to parties, etc.)?
- b. What is it like being at school?
- c. What is it like being with your friends?
- d. What is it like during holidays?

5. Does having PKU get in the way of doing things you want to do?

Probes:

- a. Why or why not?
 - b. What do you wish you could do if you didn't have PKU?
6. Is there anything else you would like to share?

APPENDIX L:

INTERVIEW GUIDE, HEALTH LITERACY INTERVIEW

1. What is PKU?

Probe:

a. What do you call it (e.g., sickness, illness, diet, lifestyle)?

2. How did you get PKU?

Probes:

a. When did you learn you had PKU?

b. Who told you?

3. What is it like having PKU?

Probes:

a. How do you typically feel?

b. How do you feel when your levels are good?

c. How do you feel when your levels are bad?

d. Do you ever feel sick/ill?

e. How does PKU impact your body?

4. What does it mean to you to have PKU?

5. What is your treatment for PKU?

Probes:

a. What would happen to you if you didn't follow your treatment?

b. How do you know what you can and what you cannot eat? How do you decide what to eat?

c. Do you manage PKU by yourself? Who helps you?

- d. Do you have a protein allowance? What is it?
 - e. Do you have a target phenylalanine level? What is it?
 - f. How do you check your levels? How often do you check your levels?
 - g. How often are you supposed to check your levels?
6. What are the challenges to having PKU?
- Probes:
- a. Is there anything you can't do because of PKU?
7. What are the benefits to having PKU?
8. Is there anything else you would like to share?

APPENDIX M:

INSTITUTIONAL REVIEW BOARD LETTER OF RESEARCH DETERMINATION



RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX(813)974-7091

February 3, 2017

Katherine Wesley
Educational and Psychological Studies
Tampa, FL 33612

RE: **Expedited Approval for Initial Review**

IRB#: Pro00028808

Title: Perceptions of Quality of Life, Peer Relationships, and Health Literacy in Adolescents
with
Phenylketonuria (PKU)

Study Approval Period: 2/3/2017 to 2/3/2018

Dear Ms. Wesley:

On 2/3/2017, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):

Protocol Document(s):

[Protocol, Version #1](#)

Consent/Assent Document(s)*:

[Adult Written Consent Version #1.pdf](#)

[Child Written Assent Version #1.pdf](#)

[Parental Permission Version #1.pdf](#)

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve

only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Study involves children and falls under 45 CFR 46.404: Research not involving more than minimal risk.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,



John Schinka, Ph.D., Chairperson
USF Institutional Review Board